LIFESTYLE MEDICINE – EVIDENCE REVIEW

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I. DEFINITIONS AND DIFFERENTIATION

A. DEFINITIONS OF LIFESTYLE MEDICINE

There doesn't seem to be a standard definition, but the available definitions are really saying basically the same thing: The use of lifestyle interventions within conventional medicine to lower the risk for a number of lifestyle-related chronic diseases or, if such conditions are already present, to serve as an adjunct to the management plan.

Current definitions include:

Egger, 2008:
- The therapeutic use of lifestyle interventions in the management of disease at all levels to help manage the growing number of cases presenting to doctors now with a lifestyle-based cause of disease such as obesity and type 2 diabetes.
- The application of environmental, behavioral, medical and motivational principles to the management of lifestyle related health problems in a clinical setting.

ACLM:
- The use of lifestyle interventions in the treatment and management of disease.

ALMA:
- The therapeutic use of lifestyle interventions in the management of disease caused primarily by lifestyle.

Rippe, 1999:
- The integration of lifestyle practices into conventional medicine to lower the risk for chronic disease and, if disease is already present, to serve as an adjunct to therapy.

Rippe Health:
- The study and practice of how to help individuals understand that their daily habits and practices have a profound impact on their short and long term health and quality of life.

ACPM, Johnson, Barry, 2008:
- A defined scientific approach to decreasing disease risk and illness burden by utilizing lifestyle interventions such as nutrition, physical activity, stress reduction, smoking cessation, avoidance of alcohol abuse, and rest.

Greenstone, 2007:
- The study and practice of how simple lifestyle measures such as proper diet, proper exercise, and stress reduction are thoughtfully and comprehensively integrated into conventional Western medicine practices; includes promoting health through prevention and therapeutic strategies.

Additional descriptions:
- Bridges the gap between health promotion and conventional medicine. [ALMA]
- Includes primary prevention, secondary prevention and tertiary prevention. [Egger, ALMA]
- An essential component of the treatment of most chronic diseases; incorporated in many national disease management guidelines. [Rippe, 1999]
- A clinical discipline which involves general practitioners working with a team of allied heath professionals to develop a patient specific intervention. [Egger]
- Involves a range of health professionals working as a team to prevent, manage and treat the ~70% of modern health problems which have a lifestyle-based cause. [ALMA]
- Brings together sound scientific evidence from diverse health related fields to assist clinicians in the process of not only treating disease, but also promoting good health. [Rippe, 1999]
- Requires patients to change high risk health behaviors to behaviors that will help to reverse the pathology and or reduce the likelihood of disease progression. [Egger]
- Changes the emphasis to an approach in which the patient becomes increasingly involved in his or her care. [ALMA]
- Isn't simply about prolonging life, it's about ensuring people can enjoy their later years with less pain and disease. [Rippe Health]

Interventions included:
- Nutrition, physical activity, stress management, sleep management, smoking cessation, personal hygiene and a variety of other non-drug modalities [Egger, 2008]
- Diet (nutrition), exercise, stress management, smoking cessation, and a variety of other non-drug modalities. [ACLM]
- Coaching patients to improve personal lifestyle choices regarding weight, physical activity/exercise, nutrition, smoking, stress management, and depression management. [Harvard ILM]
- Protocols and advice about physical activity, diet and nutrition, stress management, smoking cessation and other modalities related to lifestyle decisions and habits. [Rippe, 1999]

Trends:
- Becoming the preferred modality for not only prevention but also treatment of most chronic diseases, including type 2 diabetes, CHD, hypertension, obesity, insulin resistance syndrome, osteoporosis, and many types of cancer. [ACLM]
- Is often prescribed in conjunction with pharmacotherapy, e.g., diabetic patients on medication to control the blood glucose levels prescribed a diet and exercise intervention to assist in the long term management.   [Egger]

Egger G., Binns A., Rossner S. (2008). Lifestyle Medicine. McGraw-Hill.
ACLM [American College of Lifestyle Medicine] http://www.lifestylemedicine.org
ALMA [Australian Lifestyle Medicine Association] http://www.lifestylemedicine.net.au/
Rippe J. Lifestyle Medicine. Blackwell Science, 1999
http://www.lifestylemedicineinitiative.com/what_is_lifestyle_medicine.php
Harvard Institute of Lifestyle Medicine http://www.institutelifestylemedicine.net/home.html
Rippe Health, James Rippe: in press release dated 12-5-08 about Orlando Health partnering with the University of Central Florida (UCF) Center for Lifestyle Medicine and renowned cardiologist, James M. Rippe, MD to become the first hospital in America to create a lifestyle medicine department and integrate it into patient care and resident education.
http://www.rippehealth.com/pressroom/index.php
ACPM, Johnson M, Barry M. ACPM Lifestyle Medicine Initiative description, Sept 2008
Greenstone CL. A Commentary on Lifestyle Medicine Strategies for Risk Factor Reduction, Prevention, and Treatment of Coronary Artery Disease. Am J Lifestyle Med 2007; 1: 91-94

B. COMPARISON WITH OTHER NONTRADITIONAL TYPES OF MEDICINE

Lifestyle Medicine is based on the recognition of the central role of lifestyle in many chronic disease conditions; the use of lifestyle change interventions within conventional medicine to lower the risk for chronic disease or, if disease is already present, to serve as an adjunct to the management plan.
- Includes exercise, eating habits, stress management, tobacco and alcohol use

Complementary Alternative Medicine (CAM) is a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine. [NCCAM]
- These practices are not typically taught in medical school, not used in hospitals and not reimbursed by medical insurance
- The list of what is considered to be CAM changes continually, as those therapies that are proven to be safe and effective become adopted into conventional health care and as new approaches to health care emerge.

Complementary Medicine is used **with** conventional medicine. [NCCAM]
- An example of a complementary therapy is using aromatherapy - a therapy in which the scent of essential oils from flowers, herbs, and trees is inhaled to promote health and well-being to help lessen a patient's discomfort following surgery.

Alternative Medicine is used **in place** of conventional medicine. [NCCAM]
- An example of an alternative therapy is using a special diet to treat cancer instead of undergoing surgery, radiation, or chemotherapy that has been recommended by a conventional doctor.

- Types of alternative medicine include: 1) Alternative medical systems (e.g., traditional Chinese medicine, acupuncture, homeopathy, naturopathy, ayurveda), 2) Mind/Body techniques (e.g., meditation, biofeedback, relaxation, hypnotherapy), 3) Biologically based therapies (e.g., herbal therapies), 4) Body based therapies (e.g., chiropractic, massage, reflexology), and 5) Energy therapies (e.g., reiki, therapeutic touch)

Mind Body Medicine focuses on the interactions among the brain, mind, body, and behavior, and on the powerful ways in which emotional, mental, social, spiritual, and behavioral factors can directly affect health. [NCCAM]
- It regards as fundamental an approach that respects and enhances each person's capacity for self-knowledge and self-care, and it emphasizes techniques that are grounded in this approach.
- Includes relaxation, hypnosis, visual imagery, meditation, yoga, biofeedback, tai chi, spirituality, etc

Integrative Medicine combines treatments from conventional medicine and CAM for which there is some high-quality evidence of safety and effectiveness. It is also called integrated medicine. [NCCAM]
- Many health care institutions have begun integrating therapies that aren't part of mainstream medicine into their treatment programs. A number of medical schools now include education on nontraditional techniques. As complementary and alternative therapies prove effective, they're being combined more often with conventional care. This is known as integrative medicine.

References:
NCCAM: http://nccam.nih.gov/health/whatiscam/overview.htm
Merck Manual of Medicine Information, Second Edition. Pocket Books: NY, 2003
Mayo Clinic: http://www.mayoclinic.com/print/alternative-medicine/PN00001/METHOD=print

Preventive Medicine includes all aspects of medical care aimed at preventing health problems; includes:
- Maintaining good health habits: daily exercise, weight control, proper nutrition, avoidance of smoking and drug abuse, abstinence from, or moderation of, alcohol use
- Proper control of any diseases or disorders, such as high blood pressure, diabetes, elevated cholesterol, e.g, monitoring, self management skills, etc
- Periodic screening to prevent or at least minimize disease.
- Immunizations
- Early detection and intervention of disease processes
http://www.nlm.nih.gov/medlineplus/ency/article/001921.htm

Functional Medicine is a patient-centered approach that goes beyond a typical holistic model to balance core functional processes in the body such as cellular metabolism, digestive function, detoxification, and control of oxidative stress. A combination of elements comes together in the functional medicine model:
- A thorough understanding of physiological and biochemical function, from cellular to organ levels;
- Knowledge of well-established interventions for altering gene expression; and
- An intensive study of the fundamental biological processes that can cut across organ systems and medical specialties.
- Produces a unique approach to health care that focuses on achieving health through optimizing physiological function.
http://www.carolinacenter.com/services.html

C. LIFESTYLE MEDICINE – COMPARE AND CONTRAST

Similarities to others:
- Similar to Complementary in that it is used with conventional medicine.

- Similar to Alternative in that it can be an alternative treatment – as in the Ornish program for CAD, or a lifestyle approach to treating low back pain, hypertension, dyslipidemia, etc
- Similar to Integrative in that there is evidence to support its use with conventional medicine for many conditions, and it is integrated into conventional medicine
- Similar to Preventive in the attention to good health habits, the role of lifestyle behaviors in controlling disease, and the application to every person

Differences between LM approach and the others:
- Seems to fit between alternative medicine and conventional medicine
- It is more specific (i.e., prescriptive) in its use of lifestyle interventions
- Stronger evidence base than most alternative therapies
- Includes fewer treatment options; does not include the vast array of therapies that are used in alternative therapy
- It is not used in place of conventional medicine as is alternative medicine
- Some aspect of LM is almost always appropriate with conventional treatment
- LM does not include the screening, immunizations, and preventive medical therapies that are part of preventive medicine
- Better defined than integrative or functional medicine; the interventions that make up these approaches are not specified; these approaches seem more nebulous

Unique role of Lifestyle Medicine:
- Strict focus on lifestyle behaviors
- Success depends on patient motivation – must include "coaching"
- Name describes the approach better than any other type of non-conventional medicine
- Applies to every practice, every patient
- Emphasizes the use of a collaborative care model because of incorporation of allied health care professionals to provide much of the direct counseling
- Limited number of intervention approaches – more conducive to staff training
- Involves more prescriptive lifestyle interventions for specific diseases or risk conditions
- Recommended in many national guidelines for use in both prevention and treatment
- The inclusion of cognitive behavioral therapies in lifestyle change, motivational counseling, coaching patients to become more involved and responsible for their own outcomes

Questions:
- Application to primary prevention
- If not, where do you draw the line, as "pre-diabetes" or "pre-hypertension" or other high risk conditions?

D. DIFFERENCES BETWEEN CONVENTIONAL AND LIFESTYLE MEDICINE

Conventional	Lifestyle
Treats individual risk factors	Treats lifestyle causes
Patient is often passive recipient of care	Patient is active partner in care
Patient is not required to make big changes	Patient is required to make big changes
Treatment is often short term	Treatment is always long term
Responsibility falls mostly on the clinician	Responsibility falls mostly on the patient
Medication is often the "end" treatment	Medication may be needed but as an adjunct to lifestyle change
Emphasis is on diagnosis and prescription	Emphasis is on motivation and compliance
Goal is disease management	Goal is primary, secondary and tertiary disease prevention
Little consideration of the environment	Consideration of the environment
Side effects are balanced by the benefits	Side effects are seen as part of the outcome
Referral to other medical specialties	Referral to allied health professionals as well
Doctor generally operates independently on a one-to-one basis	Doctor is coordinator of a team of health professionals

From Egger et al. Lifestyle Medicine. Sydney: McGraw-Hill, 2008: p 4

II. REIMBURSEMENT TRENDS

A. THE BIG QUESTION – HOW TO MAKE IT REIMBURSEABLE?

CPT codes are already available for tobacco and alcohol counseling.
- Some CPT codes are available for physical activity, such as:
  - Pulmonary rehab exercise (4033F), therapeutic exercise for osteoarthritis (4018F), exercise counseling for osteoporosis (4019F), and cardiac rehab (93797).
  - Generally don't include non-physician services.
- According to the AMA, codes are available for diet change and preventive counseling, but are seldom used and not reimbursed; can bill these services as part of extended visit for chronic disease
- No CPT codes for diet or stress management

The case needs to be made for specific lifestyle interventions (i.e., prescriptions for exercise, diet, stress, etc) for specific medical conditions (i.e., diagnoses) – so coverage can be defined.
- AMA is actively advocating for adequate compensation for health behavior counseling.
http://www.ama-assn.org/ama1/pub/upload/mm/433/hl_physician_guide.pdf

Use smoking as an example: Build the evidence base to make the case
Indisputable evidence has had an effect on coverage, has led to a greater frequency of identifying and discussing tobacco use, and providing interventions. [1]
- Smoking rates have dropped from about 44% in the 1960s to about 21% today. [2,3] Today, there are more former smokers than current smokers. [4]

In the dozen years since the publication of the first Guideline, impressive changes have occurred. [1]
- In 1997, only 25% of managed health care plans covered any tobacco dependence treatment -- By 2003, this figure approached 90%. [5]
- Numerous states added Medicaid coverage for tobacco dependence treatment since the publication of the first Guideline so that, by 2005, 72% offered coverage for at least one Guideline-recommended treatment. [5-7]
- In 2002, The Joint Commission (formerly JCAHO), which accredits some 15 000 hospitals and health care programs, instituted an accreditation requirement for the delivery of evidence-based tobacco dependence interventions for patients with diagnoses of acute myocardial infarction, congestive heart failure, or pneumonia (www.coreoptions.com/new_site/jcahocore.html; hospital-specific results: www.hospitalcompare.hhs.gov).
- Finally, Medicare, the Veterans Health Administration, and the U.S. Military now provide coverage for tobacco dependence treatment. Such policies and systems changes are paying off in terms of increased rates of assessment and treatment of tobacco use.
- The rate at which smokers report being advised to quit smoking has approximately doubled since the early 1990s. [8-11]
- Recent data also suggest a substantial increase in the proportion of smokers receiving more intensive cessation interventions.[12,13]
- The National Committee for Quality Assurance (NCQA) reports steady increases for both commercial insurers and Medicaid in the discussion of both medications and strategies for smoking cessation.[14]
- Finally, since the first Guideline was published in 1996, smoking prevalence among adults in the United States has declined from about 25% to about 21%. [15]

The 2008 Guideline update emphasizes that clinicians and health care delivery systems consistently identify and document tobacco use status and treat **every** tobacco user seen in a health care setting.
- It also documents the considerable progress made in tobacco research over the brief period separating these two works.
- A key recommendation of the updated Guideline is that health care systems, insurers, and purchasers assist clinicians in making the established effective treatments available.
- Making tobacco dependence a benefit covered by insurance plans increases the likelihood that a tobacco user will receive treatment and quit successfully.

The fifth chapter of the updated guidelines (Systems Interventions), targets health care administrators, insurers, and purchasers, and offers a blueprint to changes in health care delivery and coverage such that tobacco assessment and intervention become a standard of care in health care delivery.
- The authors explain that changes in health policy make a difference in curbing smoking. Some helpful policy steps include:

- ▪ Providing tobacco dependence treatment as a covered insurance benefit
- ▪ Offering training to physicians and nurses to encourage them to counsel patients
- ▪ Improving the ability of physicians to document and receive reimbursement for tobacco interventions.

The same thing needs to be done for: 1) exercise interventions, 2) diet interventions, and 3) stress management interventions.
- ▪ May need to break down evidence to specific evidence-based practices for diagnosed conditions, such as:
  - o Exercise: Reduce time in sedentary activity, Walking 3x/week for 30 minutes,
  - o Diet: Increase fiber consumption to 20 g/day, Reduce saturated fats to 10% of kcals
  - o Stress: Use relaxation response for anxiety attacks

B. MEDICARE COVERAGE
http://www.medicare.gov/Coverage/Home.asp

Lifestyle Medicine covered:
It is a quite narrow range of indications:
- ▪ Cardiac rehab following an MI, heart surgery, or diagnosed stable angina for 3-4 mos
- ▪ Diabetes self management – 10 hrs of self management training following the diagnosis
- ▪ Medical nutrition therapy for people with diabetes, kidney disease (not on dialysis), or have a kidney transplant.
- ▪ Smoking cessation if diagnosed with a smoking-related disease -- 8 visits over a 12-month period.
- ▪ Individual has to pay 20% of covered amount.

Medicare covers screening tests for cholesterol, lipid, and triglyceride levels every five years, BUT does not cover health and wellness education, OR alternative therapies.

CARDIAC REHAB
Effective March 22, 2006, Medicare covers comprehensive cardiac rehabilitation programs that include exercise, education, and counseling for patients referred by their doctor who meet one of the following conditions:
1. had a heart attack in the last 12 months,
2. had coronary bypass surgery,
3. have stable angina,
4. had heart valve repair/replacement,
5. had angioplasty or coronary stenting, or
6. had a heart or heart-lung transplant.

Program Requirements
- ▪ Duration: 2 to 3 sessions per week for 12 to 18 weeks.
- ▪ Components: Programs must be comprehensive, including a medical evaluation, a program to modify cardiac risk factors (e.g., nutritional counseling), prescribed exercise, education, and counseling.
- ▪ Facility: Must have the necessary cardio-pulmonary, emergency, diagnostic, and therapeutic life-saving equipment accepted by the medical community as medically necessary, e.g., oxygen, cardiopulmonary resuscitation equipment, or defibrillator.
- ▪ Staff: Must be under the direct supervision of a physician; personnel trained in both basic and advanced life support techniques and in exercise therapy for coronary disease.

DIABETES SELF MGMT
Includes education about self-monitoring of blood glucose, diet, exercise, and insulin.
- ▪ 10 hours of initial diabetes self-management training; may qualify for 2 hours of follow-up training each year if
  - o it is provided in a group of 2 to 20 people,
  - o it lasts for at least 30 minutes,
  - o it takes place in a calendar year following the year you got your initial training, and

o your doctor or a qualified non-physician practitioner ordered it as part of your plan of care.

MENTAL HEALTH
Medicare covers mental health services on an outpatient basis by a doctor, clinical psychologist, clinical social worker, clinical nurse specialist, or physician assistant in an office setting, clinic, or hospital outpatient department.

- Medicare covers substance abuse treatment in an outpatient treatment center if they have agreed to participate in the Medicare program; patients usually pay 50% of the Medicare-approved amount.

MEDICAL NUTRITION THERAPY
Medicare covers medical nutrition therapy services when it is ordered by a doctor for people:

- with kidney disease who are not on dialysis or
- who have a kidney transplant or
- who have diabetes.

Services can be given by a registered dietician or Medicare-approved nutrition professional and include nutritional assessment and counseling.

- Dietary foods, drinks and vitamins are not covered.

SMOKING CESSATION
People with Medicare who are diagnosed with a smoking-related disease, including heart disease, cerebrovascular disease (stroke), multiple cancers, lung disease, weak bones, blood clots, and cataracts can get coverage for smoking and tobacco use cessation counseling.

- Medicare will cover 8 face-to-face visits during a 12-month period. These visits must be ordered by your doctor and provided by a qualified doctor or other Medicare-recognized practitioner.

NOT COVERED
Medicare generally does not cover health and wellness education, OR alternative therapies.

III. CURRENT STATUS OF LIFESTYLE MEDICINE

An enormous body of evidence supports the effectiveness of lifestyle interventions for lowering the risk of developing chronic disease, as well as for assisting in the management of existing disease. As a result of the accumulating evidence, national guidelines emphasize lifestyle interventions for general health, as well as most disease or high risk conditions. [1-10]

The general consensus of these recommendations includes:
- Get about 30 minutes of moderately intense physical activity at least 5 days a week, preferably every day,
- Quit smoking, if a smoker,
- Use alcohol only in moderation, if at all - limit to 2 servings/day for men, 1 for women,
- Lose 5% to 10% of body weight, if overweight or obese,
- Achieve weight loss by reducing kcal intake by about 500 kcal per day and gradually increase physical activity to 60 minutes per day,
- Consume a diet rich in vegetables and fruits, at least 2 fruits, 3 vegetables per day,
- Choose whole-grain, high-fiber foods (at least half of grains as whole grains),
- Limit intake of saturated fat to <10% of energy, *trans* fat to <1% of energy, and cholesterol to <300 mg/day by choosing lean meats and vegetable alternatives, fat-free (skim) or low-fat (1% fat) dairy products and minimize intake of partially hydrogenated fats,
- Consume fish, especially oily fish, at least twice a week,
- Minimize intake of beverages and foods with added sugars.

Other recommendations, or some variations of these, are made for specific medical conditions, but there are two key points:

1) Healthy lifestyle behaviors are included in virtually every practice guideline for chronic disease prevention or management, and
2) Relatively small lifestyle improvements (e.g., 30 min of moderate exercise a day, 100 kcal reduction in daily intake, a weight loss of 5%) if maintained over time can reduce the risk of developing, as well as the progression of, chronic disease. [see evidence section]

The USPSTF recommends that clinicians screen all adult patients for obesity, tobacco use and alcohol use, and offer cessation interventions for smokers, and intensive counseling and behavioral interventions to promote sustained weight loss for obese, reduced alcohol consumption in excessive users, and diet changes for all who have hyperlipidemia or other known risk factors for cardiovascular and diet-related chronic disease.
http://www.ahrq.gov/clinic/pocketgd08/pocketgd08.pdf
- USPSTF recommendations are notable in their lack of endorsement of behavioral counseling in primary care for physical activity or for dietary improvements in otherwise healthy people.
- They note the benefits of activity and a healthy diet, but the lack of RCT evidence precludes recommendations.

The Challenge
According to Greenstone, the challenge is no longer proving that lifestyle interventions work, but rather in enhancing clinicians' and the health care system's commitment to learning how to incorporate the interventions into their practices and to deliver specific and compelling messages and strategies to patients. The *risks of not changing* must be clearly articulated, and a specific plan outlined. [11]

Physician Responsibility
According to the AMA Council on Scientific Affairs, health professionals have a key responsibility to:
- promote preventive measures and encourage positive lifestyle behaviors relating to obesity,
- counsel patients about safe and effective weight loss and weight maintenance programs, and
- identify and treat obesity-related co-morbidities. [12]

Several studies have demonstrated the enormous potential of physician recommendations to influence patients' lifestyle behaviors, such as stopping smoking and improving diet. [13-18]

The primary care setting is a natural fit for lifestyle medicine. [19-21]
- PCPs manage the majority of patients with chronic conditions; see 3 out of 4 adults at least once a year; average is 2-3 times per year. [22]
- The public perceives physicians as extremely credible and reliable sources of information regarding health behaviors. [23,24]

Advice from a physician has consistently been shown to lead to attempts to improve lifestyle. [25-31]
- Powerful motivator to increase physical activity [33,41], or make a serious attempt to lose weight. [34-40]

Furthermore, some evidence suggests an association between physicians' personal health behaviors and their counseling of lifestyle interventions
- Women Physicians' Health Study was a Cross-sectional survey of 4501 female doctors
  • An early publication showed correlations between a physician's personal health behaviors and her likelihood of counseling patients on lifestyle interventions related to that behavior. This held true, when controlling for other variables, for low fat consumption and cholesterol counseling, physical activity and exercise counseling, alcohol moderation and alcohol counseling and not smoking and smoking cessation counseling. Authors did not report odds ratios. [116]
  • It revealed an association between women physicians placing a high priority on exercising more and counseling patients on exercise at least once a year (OR 1.7). [117]

- It also revealed an association between a physician vegetarian diet and her counseling patients on weight loss and nutrition (OR 2.0 and 2.1, respectively) at least once a year. [118].
  - A cross sectional survey of 298 primary care physicians showed that doctors who exercised were more likely to counsel their patients to exercise. [119]
  - A cross section survey of 1349 internists showed that among men internists, personal health practices were associated with counseling patients for each behavior except alcohol use. Among women, high physical activity was associated with counseling more patients about exercise and alcohol use [120]

A particularly important time to encourage lifestyle change is after a cardiovascular event or upon the discovery of existing CVD or diagnosis of some other chronic disease. [42]
  - Unfortunately, physicians often underestimate the importance and power of their role as health behavior change counselors. [42]

A. PREVALENCE OF LIFESTYLE-RELATED CONDITIONS

The predominant lifestyle-related medical conditions seen in primary care include obesity, hypertension, dyslipidemia, diabetes, metabolic syndrome, cardiovascular disease, arthritis and osteoporosis.
  - 2 out of 3 overweight or obese (1 in 3 obese) [43]
  - 1 out of 2 with abdominal obesity (waist circumference ≥ 40" in men or ≥ 35" in women) [44]
  - 1 in 3 with one or more types of CVD [45]
  - 1 in 14 with CHD [7], 1 in 17 with PVD [46]
  - 1 in 3 with hypertension (half over age 55, 2 in 3 over age 65); another 1 in 3 with pre-hypertension [47-49,49a]
  - 1 in 4 with high "bad" cholesterol [50]
  - 1 in 3 with low "good" cholesterol [51]
  - 1 in 8 with diabetes (another 1 in 3 with pre-diabetes) [52]
  - 1 in 3 with metabolic syndrome; approaching half over age 60 [53-55]
  - 1 in 5 with arthritis; approaching half over age 55 [56-58]
  - 1 in 5 women over 50 with osteoporosis [59]

Patient awareness and control are inadequate:
  - Fewer than half of women aware of healthy levels of risk factors for CVD. [60]
  - Nearly 1 in 3 hypertensives unaware, 2 in 5 not actively treated, and nearly 2 in 3 not adequately controlled. [49,61]
  - Between 1988-1994 and 1999-2004, awareness of high cholesterol increased from 39% to 63%, use of lipid-lowering drugs increased from 12% to 41%, LDL control among hyperlipidemics increased from 4% to 25% [62].
  - Less than half who should be treated for high LDL are being treated, only 1 in 3 of treated achieving goal level (1 in 5 with CHD) [63]
  - Pre-diabetes is seldom identified – only 1 in 100 told they have pre- or borderline diabetes [64]
  - Less than half with diagnosed diabetes achieving adequate control [65-67]
  - Fewer than 1 in 7 aware of the metabolic syndrome [68]

B. PREVALENCE OF LIFESTYLE-RELATED BEHAVIORS

Summary of adult lifestyle behaviors:
  - 1 in 5 smokes [69]
  - 2 in 5 exposed to second-hand smoke [70]
  - 3 in 4 do not get enough physical activity [71,72]
  - 4 in 5 need to significantly improve their diet [73-76]
  - 2 in 3 need to lose weight [77]
  - < 1 in 4 uses the recommended combination of caloric restriction and physical activity to lose weight. [78]
  - 1 in 3 exceeds the daily or weekly alcohol recommendation, 1 in 5 binge drinks at least occasionally. [79]

- 1 in 33 are at healthy weight, non-smoking, physically active and consume ≥ 5 fruits and vegetables per day [80]
- 1 in 3 adults 30 to 64 years old averages ≤6 hours of sleep per day. [81]

Few with multiple healthy behaviors:
In the 2000 BRFSS, only 1 in 33 (3%) had healthy levels of all 4 lifestyle behaviors (non smoking, healthy weight, 5 fruits and vegetables per day, and regular physical activity. [80]

Many with multiple CVD risk factors:
Greater than 1 in 3 adults had at least 2 major CVD risk factors in the 2003 BRFSS (36% of women, 38% of men, nearly half of blacks and American Indians/Alaska Natives). [82,83]

Diet Behaviors:
Between 1971 and 2002 caloric intake increased by 200 kcals in men, 330 in women; energy density of foods and energy intake per meal increased, frequency of breakfast declined. [84]
- Americans average 16 grams of fiber per day vs. the recommended 20-35 grams per day. [85]
- Few meet the guidelines for fruit (≥ 2 servings) and vegetable (≥ 3 servings) consumption; < 1 in 3 adults achieves the fruit recommendation and < 1 in 4 meets the vegetable standard. [86,87]
- Even fewer (1-2 in 10) achieves both standards on a regular basis. [86,88,89]
- Intake of added sugars (sucrose, corn syrup, and high-fructose corn syrup) increased from 13% of energy in 1978 to 17% in 2002. [90,91]
- Nearly 2 in 3 adults consumes sugar-sweetened beverages (SSB); per capita consumption has increased by 46 kcal/day (6 oz) from 1994-2004 [92].
- Only 1 in 6 adults 19-50, and 1 in 10 over 50, consume the recommended dairy servings per day. [93]
- 1 in 3 adults average < 1 whole-grain serving per day and only 1 in 12 consumes 3 or more. [94]
- From 1977 to 1996, food eaten away from home increased from 18% to 32% of calories. [95]
- Fewer than 1 in 5 older adults (≥ 60 yrs) consumed a "good" quality diet, based on intakes of fruit, vegetables, low fat dairy, total and saturated fat, whole grains, and lean protein. [96]
- Fewer than 1 in 5 hypertensive patients who were advised to follow the DASH diet were following it. [97]
- Only 1 in 12 people with diabetes were adhering to the ADA dietary recommendations for saturated fat and fiber. [98]

Physical Activity Behaviors
- About half are somewhat active but not enough to lower health risks, and 1 in 4 are completely sedentary. [72]
- 2 in 5 spend most of their working day sitting. [72]
- Total inactivity increases with age -- over 60% at age 75. [72]
- Over half over age 60 report no leisure time physical activity. [99]
- Only 1 in 6 adults have a high level of physical activity. [72]
- Data obtained with accelerometers (NHANES 2003-2004) showed even fewer adults (1 in 20) were actually achieving 30 min/day of physical activity. [100]

Even CVD patients are not taking advantage of lifestyle interventions:
Data from the Medical Expenditure Panel Survey (MEPS) 2004 showed that:
- Half (54%) not engaging in moderate physical activity 3 times per week,
- 2 out of 3 (66%) overweight,
- Nearly 1 in 5 (18%) continuing to smoke,
- Fewer than 1 in 5 (18%) engage in all 3 positive behaviors (active, non-smoking, at a healthy weight), and 1 in 15 (6.5%) are not engaging in any of the recommended behaviors.

Soni A. Personal Health Behaviors for Heart Disease Prevention Among the U.S. Adult Civilian Noninstitutionalized Population, 2004. MEPS Statistical Brief No. 165. Rockville, Md: Agency for Healthcare Research and Quality; March 2007. Available at:
http://www.meps.ahrq.gov/mepsweb/data_files/publications/st165/stat165.pdf.

Accessed April 2, 2009.

C. IMPACT OF HEALTHY LIFESTYLE AND LOW RISK FACTOR LEVELS

Four main causes – excess weight, poor diet, physical inactivity, and smoking – account for most of the mortality and morbidity of the major diseases of modern society, including heart disease and stroke, diabetes, osteoarthritis, osteoporosis, colorectal cancer, depression, and kidney disease. [Egger, 2008, p 13]
- A number of studies have shown the benefits of a healthy lifestyle and lower CVD risk factor burden on CVD outcomes and longevity.

The Interheart Study, which analyzed more than 11,000 myocardial infarctions, showed that 8 factors -- abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, inactivity, lack of consumption of fruits and vegetables, and alcohol -- accounted for more than 80% of the risk for an MI. [101]

The Chicago Heart Association Detection Project in Industry has followed people from a young age (18-39 yrs) for over 30 years. Key findings include:
- Incidence of CHD and CVD was rare in those with favorable levels of 5 major risk factors (BP, cholesterol, BMI, diabetes, and smoking) at a young age. [102]
- Mortality rates were much higher in those who had elevated risk factors in early adulthood. [103]
- Compared with participants with ≥ 3 risk factors, those with favorable profiles had substantially lower lifetime risks for CVD death (20% vs. 35% in men, 7% vs. 32% in women) and markedly longer median survival at middle age (>35 vs. 26 years in men, >35 vs. 28 years in women). [104]
- After age 60, the impact of the risk factor burden increases rapidly both men and women. [104]
- Lower risk factor burden in middle age was associated with better QOL at older ages, along with lower Medicare costs. [105]
- Having more risk factors at middle age was associated with poorer social functioning, mental health, walking ability, and health perception at older ages. [106]
- A key finding was that the CVD risk factor burden was an important prognostic indicator for other major diseases besides CVD; remaining lifetime risk for non-CVD death increased dramatically with increasing risk factor burden. [107]

The Framingham Heart Study has also shown that the lifetime risk for CVD, as well as longevity, is highly associated with risk factor burden at age 50. [108]
- Remaining lifetime risk for atherosclerotic CVD events was 5 % in men and 8% in women with optimal risk factors at age 50, compared with 69% in men and 50% in women with ≥2 major risk factors at age 50. [108]
- Men and women with optimal risk factors had a median life expectancy 10 years longer than those with ≥2 major risk factors at age 50. [108]
- 36% of the cohort survived to age 85, 22% survived to that age free of major morbidities. [109]
- But, with adverse levels of 4 risk factors at middle age, fewer than 5% of men and 15% of women survived to 85 years of age. [109]

The Atherosclerosis Risk in Communities Study showed that >90% of CVD events in black subjects, and > 70% in white subjects, were explained by elevated risk factors. [110]

The Multiple Risk Factor Intervention Trial (MRFIT) Study and Chicago Heart Association Detection Project cohorts found that those with low risk factor status had a 73- 85% lower risk for CVD mortality, a 40-60% lower total mortality rate, and 6 to 10 years' greater life expectancy than those who were not low risk status. [111]

The Nurses' Health Study showed that with 3 of 5 healthy lifestyle factors, risk for CHD over a 14-year period was reduced by 57%; with 4, risk was reduced 66%; and with all 5 factors, risk was reduced by 83%. [112]

In the Health Professionals Follow-up Study, low risk was defined as (1) absence of smoking, (2) BMI <25 kg/m2, (3) physical activity ≥30 min/d, (4) moderate alcohol consumption (5 to 30 g/d), and (5) top 40% of a healthy diet score.
- Over 16 years, men who met all 5 lifestyle factors had only 87% lower risk for CHD as men whose lifestyle achieved no lifestyle factors.
- 62% of coronary events in this cohort may have been prevented with better adherence to these 5 healthy lifestyle practices.
- Among men taking medication for hypertension or hypercholesterolemia, 57% of all coronary events may have been prevented with a low-risk lifestyle.
- Compared with men who did not make lifestyle changes during follow-up, those who adopted ≥2 additional low-risk lifestyle factors had a 27% lower risk of CHD.
- A majority of CHD events among US men may be preventable through adherence to healthy lifestyle practices, even among those taking medications for hypertension or hypercholesterolemia

Among individuals 70-90 years of age, adherence to a Mediterranean-style diet and greater PA have been associated with 65% to 73% lower rates of all-cause mortality, as well as lower mortality rates due to CHD, CVD, and cancer. [113]

The NHANES II Mortality Follow-Up Study showed that, over 17 years, the risk for CHD mortality was 51% lower for men and 71% lower for women with none of 3 major risk factors (hypertension, smoking, and elevated total cholesterol) than for those with 1 or more risk factors. [114]
- They estimated that 64% of all CHD deaths among women and 45% of CHD deaths in men could have been avoided if these 3 risk factors were not present.

The need for early lifestyle intervention:
- Individuals with a low 10-year risk for CHD, but a high lifetime risk, have a greater subclinical disease burden and a greater rate of atherosclerotic progression than individuals with low 10-year and low lifetime risk, even at younger ages. [115]

D. BEHAVIORAL SCIENCE METHODS TO CHANGE RISK FACTORS

Physician discussion of healthy behaviors can be associated with behavior change.
- For instance, a cross sectional study revealed that patients whose doctors asked about diet were more likely to have changed fat or fiber intake (64% vs 48%). [121]

Improving patient care will likely require better patient education and use of behavioral science methods to influence patient behavior. [122]

Behavioral methods for lifestyle interventions may involve: patient assessment, setting goals, raising awareness, confronting barriers, managing stress, cognitive restructuring, Preventing relapse, providing support, contracting, and adding pharmacotherapy as appropriate. The 5A protocol is one such counseling framework: [123]
1. **Assess** current practices and related risk factors.
2. **Advise** what to change.
3. **Agree** on individual change goals.
4. **Assist** change strategies and motivational barriers.
5. **Arrange** regular follow-up and support or refer to specialists if needed.

   Because patients could be in different stages of readiness [124], these counseling frameworks can help the clinician assess their readiness and adjust the sounseling appropriately.

IV. EVIDENCE FOR LIFESTYLE INTERVENTIONS – TREATING CHRONIC DISEASE

Lifestyle interventions have the potential to improve the entire risk factor profile and most underlying causes of chronic conditions. For many, the diagnosed condition is only the tip of the iceberg. This is the great advantage of lifestyle medicine over conventional medical therapy.

Exercise and increasing physical activity are the foundation of lifestyle medicine based on supporting evidence.

- A systematic review of the benefits of exercise therapy in the treatment/rehabilitation of specific chronic disease found the most consistent finding to be that aerobic capacity and muscular strength can be improved without causing detrimental effects on disease progression. Severe complications are rare. [1]
- Unfortunately, treatment periods and follow-up times are often not long enough to document group differences in disease progression. However, exercise reduces disease-related symptoms in many diseases, such as osteoarthritis, asthma and chronic obstructive pulmonary disorder.
- Also, RCTs of patients with coronary heart disease and heart failure show that all-cause mortality is lower in exercisers than in controls.
- Quality of life and physical performance can be improved for many conditions.

The following diseases are addressed in this review:
A. Obesity
B. Hypertension
C. Dyslipidemia
D. Impaired Glucose Tolerance/Metabolic Syndrome
E. Type 2 Diabetes
F. Cardiovascular Disease
G. Stroke
H. Heart Failure
I.   Peripheral Artery Disease
J. Chronic Obstructive Pulmonary Disease
K. Osteoarthritis
L. Rheumatoid arthritis
M. Cancer – All
N. Breast Cancer
O. Osteoporosis
P. Depression
Q. Fibromyalgia
R. Chronic Fatigue Syndrome
S.   Type 1 diabetes
T.   Non-alcoholic fatty liver disease
U.   Multiple Sclerosis
V. Parkinson's
W.   Cognitive Impairment/Dementia
X.   Chronic Low Back Pain

A. OBESITY
It is well established that obesity results from a chronic imbalance between caloric intake and expenditure. Reducing stored energy in fat cells requires creating a deficit by cutting calories consumed and increasing calories expended. Consumption is the key because it is much easier to cut calories than to expend calories.

Lifestyle Modification
A review of the evidence base of weight loss strategies showed that treatments with good evidence include counseling and behavioral approaches, exercise based programs, pre-prepared low energy

meals, meal replacement, and bariatric surgery (the most effective for long term weight loss in morbid obesity). [2]
- Limited data supports commercial diets and self help strategies.
- Over-the-counter medications or treatments (with the exception of orlistat) have no convincing evidence of efficacy.
- All successful strategies include some form of lifestyle change resulting in a reduction in energy consumed versus energy expended. The most effective treatments involve combining and matching strategies to the characteristics of the patient.

Lifestyle Modification – All
Intensive counseling can promote modest sustained weight loss.
- A Cochrane review of 32 longitudinal analyses and 17 RCTs showed that intensive counseling strategies incorporating behavioral, dietary, and exercise components resulted in a weight loss of 3 to 4 kg over 1 to 3.3 years. [3]
- The loss was linked with improved glucose tolerance, improved physical functioning, reduced incidence of diabetes, hypertension and CVD, and reduced bone density.

Another systematic review of the long-term effects of obesity treatments showed that low-fat diets were associated with continuing weight loss for 3 years and improvements in risk factors, as well as prevention of type 2 diabetes and improved control of hypertension. [4]
- The addition of an exercise or behavior program to diet was associated with improved weight loss and risk factors for at least 1 year.
- The combination of low-fat diets, exercise and behavior therapy reduced the risk of developing hypertension and CVD.

A third systematic review of RCTs of interventions for weight loss in obese found that adding exercise to diet, or to diet and behavior therapy, was associated with improved weight loss for up to 36 months and improvements in HDL, TGs and blood pressure. [5]
- Adding behavior therapy to diet, or to diet and sibutramine together, was associated with improved weight loss for up to 18 months.
- Adding drugs, exercise or behavior therapy to dietary advice was each associated with similar weight change.

Lifestyle Modification – Women
A 6-month lifestyle change intervention in obese, sedentary, postmenopausal women showed that women significantly increased their physical activity (+39.6%) and cardiorespiratory fitness (+13.5%) and reduced their body weight (-6.5%), fat mass (-7.4%), body fat (-2.4%), BP (SBP -6.2%, DBP -9.2%), total cholesterol (-7.4%), triglycerides (-16.5%), and low-density lipoprotein (LDL) cholesterol (9.1%) and improved their diet ($p < 0.05$). [6]

Diet:
A meta-analysis of 32 RCTs involving obese patients showed that moderate and well-balanced calorie restriction is more effective than any other diet, resulting in an average weight loss of about 5 kg after one year. [7]
- A caloric deficit of about 500 kcals per day is the optimal goal for most. [8]

Strategies to reduce energy intake:
- Reduce Portion Sizes: Several well-controlled, laboratory-based studies have shown that larger food portions leads to increases in energy intake. Large portion sizes have been shown to override hunger and satiety signals. [9]
- A Lower Energy Density Diet: Studies show that we eat a fairly consistent volume of food day-to-day, rather than a consistent number of calories; the number of calories in a particular volume or weight of food is its energy density; a higher energy density means more calories consumed. [10]
- Several studies have demonstrated that eating low-energy-dense foods (e.g., fruits, vegetables, and soups) maintains satiety while reducing energy intake. [9]

Dietary Counseling:

- A meta-analysis of 46 trials of dietary counseling for long-term weight loss in overweight adults revealed a maximum net treatment effect of -1.9 BMI units (approximately -6%) at 12 months. [11]
- Providing calorie recommendations, frequency of support meetings, and inclusion of exercise were independent predictors of weight change.
- Compared with usual care, dietary counseling interventions produce modest weight losses that diminish over time.

Mediterranean Diet:
A 3-year prospective study showed that the adoption of a Mediterranean diet pattern reduced the likelihood of overweight people becoming obese. [12]
- Adherence to this pattern is inversely associated with BMI and obesity, and the risk for becoming obese. [13,14]

Whole Grains:
A significant inverse relation between whole grain intake and BMI has been consistently observed in NHANES outcomes. [15]
- There is strong evidence that replacing refined grains with whole grains helps reduce weight gain and can lead to significant weight loss. [16]
- Weight gain has been inversely associated with the intake of high-fiber, whole-grain foods and positively related to the intake of refined-grain foods. [17]
- The Nurses' Health Study showed that women in the highest quintile of dietary fiber intake had a 49% lower risk of major weight gain than women in the lowest quintile.

Fruit and Vegetables:
- The Nurses' Health Study also showed that those with highest fruit and vegetable intake had a 24% lower risk of becoming obese than those with lowest intake, after controlling for other dietary factors. [18]

Legumes:
NHANES 1999-2002 data showed that greater consumption of legumes (beans) led to higher intakes of dietary fiber, potassium, magnesium, iron, and copper, and a lower body weight and a smaller waist circumference relative to those who did not consume legumes. [19]
- It also led to a 22% reduced risk of being obese, along with a lower systolic blood pressure.

Low Glycemic Load:
A Cochrane review of 6 RCTs that compared a low glycemic index or load diet (LGI) with higher glycemic index or load diets or other diets (Cdiet) in overweight or obese people showed that those on LGI diets lost more weight and had more improvement in lipid profiles than those on other diets. [20]
- Body mass, total fat mass, BMI, total cholesterol and LDL-cholesterol all decreased significantly more in the LGI group.
- Lowering the glycemic load of the diet appears to be more effective in promoting weight loss and improving lipid profiles in obese than nonobese.

Fat intake:
Diets high in fat have been proposed as a cause of obesity, primarily because fat is more energy-dense than other macronutrients. In the Prostate Cancer Prevention Trial, BMI increased by 0.53 for every 500 kcal of fat consumed daily. [21]
- Many studies suggest that the capacity of the body to oxidize dietary fat is a major risk factor for a positive energy balance. Most fat consumed is stored before oxidized. [22]

Exercise/Physical Activity:
Exercise is important when trying to lose weight, but is even more important when it comes to maintaining weight loss.
- Most relevant RCTs show only modest weight loss with exercise alone, and slight increases in weight loss when exercise is added to dietary restriction. [23]

- A meta-analysis of 43 studies (3476 participants) found that, compared with no treatment, exercise resulted in small weight losses across studies, but was associated with improved CVD risk factors, even when no weight was lost. [24]
- Increasing exercise intensity increased the magnitude of weight loss (WMD -1.5 kg).
- Exercise as a sole weight loss intervention resulted in significant reductions in diastolic blood pressure (WMD -2 mmHg), triglycerides (WMD -0.2 mmol/L) and fasting glucose (WMD -0.2 mmol/L). Higher intensity exercise resulted in greater reduction in fasting serum glucose than lower intensity exercise (WMD -0.3 mmol/L).

The energy deficit produced by exercise is far smaller than that produced by dietary restriction. But, studies consistently show the essential role of physical activity in maintaining weight-loss; prospective trials show a clear dose-response relationship between physical activity and weight maintenance. [23]
- Weight regain following weight loss is clearly associated with not getting the recommended physical activity, and having a more sedentary lifestyle, especially more screen time (i.e., TV and computer). [23]

Exercise prevents the loss of muscle tissue with weight loss and increases visceral fat loss. [25]
- The amount of training is more important than training intensity for reducing fat.
- A systematic review of 9 RCTs and 7 non-RCTs of the dose-response relationship between aerobic exercise and visceral fat reduction found that at least 10 METs of aerobic exercise, such as brisk walking, light jogging or stationary cycling, is required for visceral fat reduction; there is a dose-response relationship between aerobic exercise and visceral fat reduction in obese subjects without metabolic-related disorders, but not in those with such disorders. [26]

The specific amount of physical activity needed to lose weight differs from person to person, but in general the more activity, the greater the weight loss. [27]
- When 3 doses of exercise were compared the dose response relation of weight loss was apparent:

o < 150 min/wk	at 6 mos – 7 lbs	at 18 mos – 3 lbs
o 150-200 min/wk	at 6 mos – 11 lbs	at 18 mos – 9 lbs
o 200+ min/wk	at 6 mos – 13 lbs	at 18 mos – 14 lbs

28. Jakicic et al., JAMA 1999

The preferred form of activity for most obese patients is walking, if they can do it, with 30-60 minutes on most, if not all, days the recommended goal to work up to. [29]
- 60 minutes per day is recommended for weight loss. But, health benefits occur with only 30 minutes of daily moderate activity. [30]
- Adding some resistance training does not help with fat loss, but does increase muscle mass.
- Cross-sectional studies show that individuals who walk more are thinner than those who walk less. Pedometer-based walking programs result in a modest amount of weight loss. Longer programs lead to more weight loss than shorter programs. [31]

Diet Plus Exercise:
Many studies have shown that the best approach involves changes in both eating and activity behaviors to shift the balance in favor of expenditure.
- A Cochrane review concluded that diet combined with exercise produced a 20% greater initial weight loss than diet alone, and a greater likelihood that the weight loss would be sustained. [32]
- Numerous studies have shown that regular exercise in conjunction with diet results in an average weight loss of 5% to 10%. [33]
- Exercise with no change in diet results in a consistent small weight loss across studies, but must be combined with diet to yield satisfactory results. [34,35]

Another systematic review of 80 RCTs with ≥1-year follow-up showed that weight-loss interventions utilizing a reduced-energy diet with exercise are associated with moderate weight loss of 5 to 8.5 kg (5% to 9%) at 6 months. [36]
- In studies extending to 4 years, a mean 3 to 6 kg (3% to 6%) of weight loss was maintained.

- Advice-only and exercise-alone groups experienced minimal weight loss at any time point.

A meta-analysis of 35 RCTs showed that a combination of dieting and increased exercise is more effective than either measure alone. Increasing physical activity was also shown to help maintain weight loss. [7]

Behavior Therapy
Behavior therapy is essential for treating obesity because eating and activity habits are behaviors that need to be changed. [10]

The most effective behavioral interventions combine nutrition education with diet and exercise counseling involving behavioral strategies to help patients build the skills needed to change eating and activity patterns.
- USPSTF recommends high-intensity counseling and behavioral interventions with at least 2 individual or group sessions per month for at least the first 3 months. [37]
- The 5-A framework (Assess, Advise, Agree, Assist, and Arrange) may be useful in helping clinicians guide interventions for weight loss. [37]

A meta-analysis of 19 RCTs showed that the addition of active support, such as behavioral therapy, increases the effectiveness of weight loss in obese patients. [7]
- Having spouses involved increases the likelihood of success; half of participants lost about 7 kg after one year.
- Interventions that do not involve assistance from healthcare professionals have been shown to be no more effective than dieting alone.

A Cochrane review of 32 longitudinal analyses and 17 RCTs showed that intensive counseling strategies incorporating behavioral, dietary, and exercise components promote a weight loss of 3 to 4 kg over 1 to 3.3 years. [38]

A meta-analysis of 19 RCTs showed that the addition of active support makes dietary weight loss measures more effective in obese. [7]
- Behavioral therapy has been shown to be more effective when spouses are involved; half of trial participants lost about 7 kg after one year.
- Assistance from a healthcare professional was also shown to increase the likelihood of success.

The National Weight Control Registry has shown that the following are keys to long-term weight loss success in obese patients: [39,40]
1) A serious, long-term commitment to changes in eating habits and exercise,
2) A low fat diet (around 24% of calories, compared to the generally recommended 30%),
3) Eat breakfast regularly, and eat 5 smaller meals a day, on average
4) Be dedicated to exercise, such as walking 60-90 minutes per day,
5) Do not rely on weight loss drugs,
6) View past failures as learning experiences,
7) Focus on doable, process oriented goals,
8) Monitor body weight regularly (at least weekly) to catch weight gain quickly,
9) Monitor food intake if begin to gain.

A Primary Care Lifestyle Intervention:
- The Counterweight Program is an obesity management program based on the model of Evidence-Based Quality Assessment. It consists of four phases: (1) practice audit and needs assessment, (2) practice support and training, (3) practice nurse-led patient intervention, and (4) evaluation. [41]
- Patient intervention consisted of screening and treatment pathways incorporating evidence-based approaches, including patient-centered goal setting, prescribed eating plans, a group program, physical activity and behavioral approaches, anti-obesity medication and weight maintenance strategies.
- Eighty practices were recruited of which 18 practices were randomized to act as controls and receive deferred intervention 2 years after the initial audit.

- At 12 month follow-up, 34% overall achieved a clinical meaningful weight loss of 5% or more. Full compliance to the program increased the success rate to 43%.
- The Counterweight Program is an evidence-based weight management model which is feasible to implement in primary care.

B. HYPERTENSION

The relationship of BP to CVD risk is continuous, consistent, and independent of other risk factors. Each increase of 20/10 mmHg doubles risk of CVD across the entire BP range starting from 115/75 mmHg. [42]
- Prehypertension signals the need for increased education to reduce BP to prevent hypertension.

The Blood Pressure Lowering Treatment Trialists Collaboration meta-analysis of 29 RCTs showed that lowering BP reduces risk of cardiovascular events and death by around 20%. [43]
- Larger reductions in BP produce larger reductions in risk

Lifestyle Approach:
The JNC-7 recommends as the first line treatment for hypertension the following: weight loss in overweight, the DASH diet with limited salt intake, regular physical activity, quitting smoking and moderate, if any, alcohol consumption. [44]

The 2008 Canadian Hypertension Education Program Evidence-Based Recommendations Task Force assessed RCTs and systematic reviews of the impact of lifestyle interventions on blood pressure (BP) lowering and concluded that lifestyle modifications to prevent and/or treat hypertension include the following: [45]
- Restrict dietary sodium intake to 65 mmol/day to 100 mmol/day;
- 30 to 60 min of aerobic exercise 4-7 days per week;
- Maintain a healthy body weight (BMI of 18.5 - 24.9 kg/m2) and waist circumference (< 102 cm for men and < 88 cm for women);
- Limit alcohol consumption to ≤14 units per week in men or ≤ 9 units per week in women;
- Follow a diet reduced in saturated fat and cholesterol, that emphasizes fruits, vegetables and low-fat dairy products, dietary and soluble fiber, whole grains and protein from plant sources;

Lifestyle interventions:
A substantial body of evidence supports the effectiveness of lifestyle modifications for lowering BP [46].
- Increasing physical activity, reducing sodium intake, losing weight if overweight, moderating alcohol intake, and following the Dietary Approaches to Stop Hypertension (DASH) diet, can lower BP at least as well as pharmacologic monotherapy.

A meta-analysis 105 RCTs (6805 participants) of lifestyle interventions for hypertension found robust statistically significant effects for: diet (-5.0 mmHg), aerobic exercise (-4.6 mmHg), alcohol restriction (-3.8 mmHg), sodium restriction (- 3.6 mmHg), and fish oil supplements (-2.3 mmHg). [47]
- The reductions were similar for systolic and diastolic pressure.
- Relaxation significantly reduced blood pressure only when compared with non-intervention controls.
- No robust evidence for potassium, magnesium or calcium supplements.

A multifactorial lifestyle modification in treated hypertensive patients over 4 months resulted in a mean 24-h ABP reduction of -4.1/-2.1 mmHg. At 4 months, drug withdrawal improved in men (control 44%; program 66%) but was no different in women (65 and 64%). [48]

Lifestyle Modification – The PREMIER Trial
The NHLBI PREMIER trial investigated the effects of multiple lifestyle changes in adults with stage 1 hypertension. [49,50]

- Three groups were compared: 1) Established recommendations group (EST) - weight loss if overweight, increased physical activity, limited alcohol intake, and reduced sodium, 2) Same lifestyle recommendations plus the DASH diet (EST + DASH), and 3) Advice only control (CON).
- PREMIER demonstrated that people with above-optimal BP and stage 1 hypertension can gain better control of BP with simple lifestyle changes.
- At 6 months, SBP was reduced by 3.7 mm Hg and 4.3 mm Hg more in the two intervention groups than the advice only group.
- At 6 months, the prevalence of optimal BP (< 120/80) was 19% with advice only, 30% and 35% with the two interventions.

At 18-month follow-up, relative to the advice only group, the OR for hypertension was 0.83 for the EST group and 0.77 for the EST + DASH group. [51]
- The EST + DASH intervention lowered BP in both younger and older groups, but significantly more so in older individuals. Changes were consistently greater the higher the baseline pressure. [52]
- Both EST and EST+DASH reduced systolic blood pressure, but in patients with the metabolic syndrome only those on the DASH diet were able to lower their BP. [53]

Lifestyle – The Diet, Exercise, and Weight Loss Intervention Trial (DEW-IT)
- A comprehensive lifestyle intervention substantially lowered blood pressure in hypertensive overweight adults already on antihypertensive medication. At the end of the intervention, mean weight loss in the lifestyle group, net of control, was 4.9 kg. Net reductions in 24-hour ambulatory systolic and diastolic blood pressures were 9.5 mm Hg and 5.3 mm Hg, respectively. Corresponding changes in daytime systolic and diastolic blood pressures were 12.1 mm Hg and 6.6 mm Hg. [54]
- The lifestyle group also experienced mean net reductions in total cholesterol (-25 mg/dL), LDL cholesterol (-18 mg/dL), high-density lipoprotein cholesterol (-5 mg/dL).

Weight Loss:
Weight loss in overweight hypertensives is a reliable way to lower BP, and reduce antihypertensive medication dosage requirements. [55].
- Most studies show about a 1 mm/Hg drop in both systolic and diastolic pressure with each 2-3 pounds of weight loss. More weight loss, greater drop in BP. [56]
- A meta-analysis of 25 RCTs showed that a weight loss of 11 pounds (5 kg) reduced systolic blood pressure by 4.4 mmHg and diastolic pressure by 3.6 mmHg or about 1 mmHg per kg of weight loss. [57]

Diet:
The DASH eating plan has been shown to be an effective first-line therapy for stage 1 hypertension. It contains < 2 mg of sodium per day, and an overall pattern that is lower in total and saturated fat and higher in fiber. [58] It includes:
- lots of fruits and vegetables (4-5 servings of each),
- 2-3 servings of low fat dairy,
- 7-8 servings of mostly whole grains,
- 1 serving of nuts, seeds, and legumes, and
- limiting meats, poultry and fish to 2 or fewer servings per day.

Diet - The Dietary Approaches to Stop Hypertension Trial
The Dietary Approaches to Stop Hypertension multicenter trial showed that a diet that emphasized fruits, vegetables, and low-fat dairy products with body weight, sodium intake, and physical activity held constant could reduce blood pressure by a net of 11.4 and 5.5 mm Hg systolic and diastolic, respectively in patients with hypertension. [59]
- In another 8-week RCT, blood pressure fell from 146/85 to 134/82 mm Hg in the DASH group; 18 of 23 participants (78%) reduced their systolic blood pressure to <140 mm Hg, compared with 24% with the control (typical) diet and 50% with a diet high in fruits/vegetables groups. [60]
- A key to the DASH diet is that it is made up of regular foods that are available at most grocery stores. Additionally, the DASH diet is consistent with many of the recommendations made by

organizations in the United States: the Dietary Guidelines for Americans, the National Cholesterol Education Program's Step 2 Diet, and the National Cancer Institute. [61]

Most DASH studies have been tightly controlled, with food provided to participants. The only large-scale study in which patients bought and prepared their own food is the PREMIER study. [62]

- The blood pressure changes observed were smaller, largely explained by participants rarely achieving their food intake goals. It points out the challenge of dietary interventions – they work but can people do them on their own.
- However, a surprising finding in this study was that the "Advice Only" group showed almost as big a blood pressure drop as the group that received intensive counseling on the diet.
- Blacks are especially sensitive to the BP-lowering effects of reduced salt intake, increased potassium intake, and the DASH diet.

Diet - Sodium Intake
- An extensive analysis of the effects on blood pressure (BP) of changes in sodium intake found that a sodium reduction from 100 to 50 mmol/2,100 kcal generally had twice the effect on BP as reduction from 150 to 100 mmol/2,100 kcal. [63]
- Age had a strong and graded influence on the effect of sodium within the typical and DASH diets, respectively:
    - -4.8 and -1.0 mm Hg systolic for 23 to 41 years,
    - -5.9 and -1.8 mm Hg for 42 to 47 years,
    - -7.5 and -4.3 mm Hg for 48 to 54 years, and
    - -8.1 and -6.0 mm Hg for 55 to 76 years.
- The benefits of reduced sodium intake and the DASH diet strengthen as subjects enter middle age, when the rate of cardiovascular disease increases sharply.

An analysis of the effects of sodium restriction and DASH diet showed that both improve BP control. Among subjects with stage 1 hypertension at baseline: [64]
    - At a higher sodium intake, the DASH diet increased BP control two-fold over controls (63% vs. 32%).
    - Reducing sodium intake alone increased BP control 2.3-fold (74% vs. 32%).
    - Combining lower sodium with DASH resulted in the maximum BP control rate (84%).
    - BP became normal or optimal in 71% of persons consuming the control diet with lower sodium and 77% of persons consuming the DASH/lower sodium diet.

Another study analyzed the separate effects of the diet and the effects of reducing sodium intake.
- DASH was compared with a control (typical) diet at 3 levels of sodium intake (high, which was U.S. average, intermediate and low). [58]
- The DASH diet significantly lowered systolic pressure at every sodium level and diastolic pressure at the high and intermediate sodium levels.
- Reducing sodium from the high to low level also reduced systolic pressure with either diet.
- The greatest effect occurred when the DASH diet was combined with the lowest sodium intake (-12 mm Hg in SBP in those with hypertension).

Increased potassium intake has also emerged as a strategy to lower BP. [65]
- Other dietary factors, such as a greater intake of protein or monounsaturated fatty acids, may also reduce BP but evidence is inconsistent.

Exercise/Physical activity:
Moderate intensity endurance type physical activity for 30-45 minutes per day on most days of the week can lower BP in people with hypertension by an average of about 5-10 mm/Hg over several months. [66]
- A meta-analyses of RCTs involving either dynamic aerobic endurance training or resistance training showed that in 30 hypertensive study groups, aerobic training resulted in a net reduction of BP of 7/5 mmHg. [67]
- Endurance training also reduced vascular resistance by 7%, plasma noradrenaline by 29% and plasma renin activity by 20%. Bodyweight decreased by 1.2 kg, waist circumference by 2.8 cm, body fat by 1.4% and insulin resistance by 0.31 units.

- Meta-analysis of 9 resistance training studies (mostly dynamic resistance training) showed a net reduction in BP of 3/4.

Exercise – Tai Chi and Qigong
- A systematic review of the effect of tai chi exercise on blood pressure (BP) yielded 26 studies, of which 22 reported reductions in BP with tai chi (3-32 mm Hg systolic and 2-18 mm Hg diastolic BP reductions). [68]
- A systematic review of the evidence of qigong for hypertension found 12 RCTs, of which 7 tested qigong combined with drug therapy compared with drug therapy alone. The quality of studies was low, but some encouraging evidence of qigong for lowering SBP. [69]
- A meta-analysis of two trials with adequate data suggested beneficial effects of qigong [WMD, SBP -12.1 mmHg; DBP -8.5 mmHg]; 5 other RCTs reported positive results in some outcomes.

Moderation of alcohol consumption:
Reducing alcohol intake can significantly lower BP in those with hypertension who drink excessively. [70]
- A meta-analysis of 15 RCTs showed that systolic and diastolic blood pressures can be reduced by an average of 3.3 mm Hg and 2.0 mm Hg, respectively, by reducing excessive alcohol intake to a moderate level. [71]
- A dose-response relationship was observed between alcohol reduction and blood pressure reduction in this analysis; greater reductions were seen in those with higher baseline blood pressure.

Smoking Cessation:
Smoking has been consistently shown to increase BP; quitting can help lower it. [72,73]

Stress Reduction:
Can play an important role if excessive stress and poor response to it are a problem. [74]

A Cochrane review evaluated the effects of relaxation therapies on blood pressure in people with hypertension. [75]
- Relaxation resulted in small, but statistically significant reductions in SBP (-5.5 mmHg) and DBP (-3.5 mmHg) compared to control groups, but most studies were of relatively poor quality.

C. DYSLIPIDEMIA
Lifestyle Interventions:
Lipid profiles improve when:
- saturated fat and cholesterol intake are reduced,
- weight loss occurs in overweight,
- dietary fiber is increased, and
- physical activity is increased. [76,77]

The ATP III has an extensive section on non-pharmacologic therapy for abnormal blood lipids. [78]
- ATP III cites the high-saturated fat atherogenic diet, obesity, and sedentary lifestyle as the underlying issues to address in a lifestyle approach
- Recommends a program of therapeutic lifestyle change (TLC) including:
  - keeping trans fatty acid intake as low as possible,
  - increasing viscous fiber and plant stanol/sterol esters to reduce LDL-C
  - de-emphasizing total fat and focusing on the kinds of fat
  - increasing physical activity,
  - weight loss in overweight,
  - increasing fish and omega-3 fatty acids,
  - referral to RD or other qualified nutritionist for medical nutrition therapy.

In the Women's Health Study, lower levels of physical activity and higher levels of BMI were independently associated with adverse levels of nearly all lipid and inflammatory biomarkers. A high

BMI was more strongly related to adverse cardiovascular biomarker levels than physical inactivity. However, within BMI categories, physical activity was generally associated with more favorable cardiovascular biomarker levels than inactivity. [79]

Lifestyle Interventions:
A Cochrane review of 31 RCTs of treatments targeting HDL cholesterol showed that currently available therapeutic and lifestyle strategies, when optimized, can increase HDL-C levels by 20% to 30%. [80]

Diet:
Saturated and *trans* fatty acid intakes are directly related to LDL cholesterol levels. [81,82]
- Replacing saturated fat intake with good fats such as omega-3 fatty acids and monounsaturated fatty acids can lower LDL while raising HDL levels. [82]

The DASH diet, developed for blood pressure control, also improves lipid levels. [83]
- An 8 week RCT of patients with elevated cholesterol levels, reduced total cholesterol relative to controls by 13.7 mg/dL, LDL by 10.7 mg/dL, and HDL by 3.7 mg/dL (all $P < 0.0001$), with no change in triglycerides. Weight was maintained.
- Changes were greater in men than women, no differences by race.

A RCT of the ATP-III recommended diet (low saturated fat with plant sterols and viscous fibers) against a statin drug and control group in hyperlipidemic adults showed that LDL was reduced by 29% in the diet group vs. 31% with drug therapy and 8% in control. [84]

Plant stanols/sterol intakes of ≥2 g per day can lower LDL cholesterol levels by up to 15% in addition to diet and lifestyle modification. [85]
- Soluble or viscous fibers (notably ß-glucan and pectin) modestly reduce LDL cholesterol levels beyond those achieved by a diet low in saturated and *trans* fatty acids and cholesterol alone. [86]

Whole-grain intake has been shown to be inversely associated with total and LDL cholesterol in the Framingham Offspring Study. [87]

For High Triglycerides:
A meta-analysis showed that low-carbohydrate diets resulted in greater improvements in triglyceride and HDL cholesterol concentrations than low-fat diets; however, LDL cholesterol was significantly higher on the low-carbohydrate diets [88].
- Reducing simple and refined sugars and alcohol can also reduce triglycerides.

Weight loss:
A meta-analysis of 65 RCTs showed that weight loss resulted in an average reduction in LDL cholesterol level of 15 mg/dL and triglyceride level of 26 mg/dL. [89]
- A meta-analysis of 47 RCTs showed that weight loss resulted in an average increase in HDL cholesterol of 1 mg/dL.
- For every 7 pounds of weight loss in overweight, an increase in HDL of 1 mg/dL has been shown. [90,91]

Exercise -- All
Dose-response relationships between exercise volume and blood lipid changes suggest that exercise can favorably alter blood lipids at training volumes of 15 to 20 miles per week of brisk walking or jogging that expend between 1200 to 2200 kcal/wk. This range of weekly energy expenditure is associated with 2 to 3 mg/dl increases in HDL-C and triglyceride reductions of 8 to 20 mg/dl. [92]
- Evidence from cross-sectional studies indicates that greater changes in HDL-C levels can be expected with additional increases in exercise training volume.
- Exercise training has little effect on total or LDL cholesterol.

Exercise - Type 2 diabetes

A meta-analysis of RCTs that examined the effects of 8 weeks or more of aerobic exercise on lipids and lipoproteins in adults with Type 2 diabetes yielded 7 studies. [93]
- A statistically significant reduction of about 5% was found for LDL-C, whereas no statistically significant improvements were found for TC, HDL-C, TC/HDL-C or TG.

Exercise – Metabolic Syndrome
Systematic review and meta-analysis evidence indicates that long-term, moderate to moderately vigorous intensity exercise training, even in the absence of weight loss, improves the dyslipidemic profile by raising HDL-cholesterol and lowering triglycerides in overweight and obese adults with characteristics of the metabolic syndrome. [94]

Exercise - CVD
A meta-analysis to examine the effects of aerobic exercise on lipids and lipoproteins in adults with cardiovascular disease (CVD) included 10 studies representing 1,260 subjects (580 exercise, 680 control). [95]
- There was a statistically significant increase of 9% in HDL-C (+3.7 mg/dL) and a statistically significant decrease of 11% in TG (-19.3 mg/dL), but no significant decreases in TC or LDL-C (TC, -8.8 mg/dL; LDL-C, -7.7 mg/dL).

Exercise – Women
A meta-analysis of the effects of aerobic exercise on lipids and lipoproteins in women showed significant improvements in all lipids and lipoproteins (TC, -4.3 mg/dl; HDL-C, +1.8 mg/d; LDL-C, -4.4 mg/dl, TG, -4.2 mg/dl). [96]
- Reductions of approximately 2%, 3%, and 5%, respectively, were observed for TC, LDL-C, and TG, whereas an increase of 3% was observed for HDL-C. Aerobic exercise is efficacious for increasing HDL-C and decreasing TC, LDL-C, and TG in women.

Smoking Cessation:
- Quitting smoking has been shown to raise HDL by as much as 7-20 mg/dL. [97,98]

D. METABOLIC SYNDROME / IMPAIRED GLUCOSE TOLERANCE
The most indisputable fact about the Metabolic Syndrome is the importance of lifestyle changes in managing it. According to the NCEP ATP III – the presence of the syndrome is an indication for intensive lifestyle modification. [99]
- Weight loss, increased physical activity, and an anti-atherogenic diet can improve all of the metabolic abnormalities without pharmaceutical intervention. [100]

Lifestyle Intervention
The initial therapeutic approach for the MetS is to reverse the root causes - atherogenic diet, sedentary lifestyle, and overweight or obesity. [101]
- A review of RCTs with at least 6 months follow-up yielded 3 studies based on lifestyle interventions, 5 studies based on drug therapy, and 3 studies based on laparoscopic weight-reduction surgery.
- The striking resolution of the metabolic syndrome with weight-reduction surgery (93%) compared with lifestyle (25%) and drugs (19%) strongly suggests that obesity is the driving force.

There is abundant evidence that a lifestyle approach can reduce the likelihood of developing type 2 diabetes, along with a modest reduction in cardiovascular disease risk factors. [102]
- This has led the ADA to support lifestyle modification as the best method of treating prediabetes. [103]

A meta-analysis of lifestyle interventions reduced diabetes by approximately one-half vs. pharmacologic interventions by approximately one-third. [104]
- The two largest studies, Finnish Diabetes Prevention Study (DPS) [105] and the U.S. Diabetes Prevention Program (DPP) [106], both reduced development of diabetes by 58%.
- DPP evaluated a lifestyle approach to prevent Type 2 diabetes in obese -- was stopped early because results were indisputable: [106]

- o 2 years -- 5% of lifestyle group vs. 22% of control developed diabetes,
- o 4 years -- 20% (lifestyle) vs. 37% (control) developed diabetes.
- Finnish DPS evaluated diet and exercise intervention in people with IGT.
- After 6 years, fewer than 20% of diet/exercise group vs. greater than 40% of control developed type 2 diabetes. [105]

A Cochrane review of the effects of exercise or exercise plus diet for preventing type 2 diabetes mellitus in patients with IGT or MetS included 8 trials of exercise plus diet, and 2 studies of diet only or exercise only. [107]
- Exercise plus diet interventions reduced the risk of diabetes compared with standard recommendations by 37% over a follow-up of one to six years.
- Exercise and diet interventions had a modest effect on blood lipids, but improved systolic and diastolic blood pressure levels (-4 mmHg and -2 mmHg, respectively).
- No significant effects on diabetes incidence were observed with exercise or diet only.

Another analysis found that moderate-intensity lifestyle interventions can delay type 2 diabetes by an average of 11 years and reduce the number of new cases by 20%. This is much greater than what can be achieved with pharmacotherapy (delayed onset by 3 years, reduced cases by 8%). [108]

There is growing evidence of the impact on the clinical status of patients with the syndrome.
- A significant reduction in prevalence of metabolic syndrome (OR 0.6) and abdominal obesity (0.5) were observed in the Finnish Diabetes Prevention Study. [109]
- A focused lifestyle intervention carried out by trained professionals was compared to standard unstructured information given by family physicians. The result: after one year, the lifestyle intervention significantly reduced the MetS (OR = 0.3), as well as central obesity (OR = 0.3), hypertriglyceridemia (OR = 0.5), and diabetes (OR = 0.2). [110]
- The combination of diet and exercise interventions was significantly more effective than either diet or exercise alone in the treatment of the metabolic syndrome after a one year study. Two out three cases were reversed with the combination vs. only about 1 in 3 in each of the other groups. [111]

The power of a lifestyle intervention was seen in a small study from the Pritikin Longevity Center. [112]
- Obese men were placed on a highly controlled low-fat (12-15%), high-unrefined carbohydrate, high-fiber, (> 40 gm) diet with daily aerobic exercise (45-60 min) for 3 weeks.
- After 3 wk, there were significant reductions in BMI, all serum lipids and lipid ratios, fasting glucose, insulin, insulin resistance, oxidative stress, inflammation, chemotaxis, and cell adhesion.
- There was a 50% reduction in the metabolic syndrome post-intervention.

Analysis of published data along with Kaiser Permanente administrative data has shown that, compared with no prevention program, the DPP lifestyle approach can reduce a high-risk person's 30-year likelihood of developing diabetes from about 72% to 61%, the chance of a serious complication from about 38% to 30%, and the chance of dying of a complication of diabetes from about 14% to 11%. [113]
- Metformin would deliver about a third of the long-term benefits achievable by lifestyle.

Exercise, Physical Activity and Fitness
Low cardiorespiratory fitness is a strong and independent predictor of incident metabolic syndrome in women and men. Age-adjusted incidence rates were significantly lower (linear trend, P<0.001) across incremental thirds of fitness in men and women -- 1.0, 0.74, and 0.47 in men; and 1.0, 0.80, and 0.37 in women. [114]

Exercise has many positive effects in people with MetS – improved insulin action, glucose metabolism, aerobic metabolism, mitochondrial density, and respiratory chain proteins. [115]

RCT evidence shows that exercise training in people with the MS or IGT: [116,117]
- Increases insulin sensitivity,

- Decreases blood pressure, if elevated,
- Reduces triglycerides, increases HDL,
- Reduces inflammation,
- Improves endothelial function [117]

Almost all physical activity has a positive effect on insulin action, but moderate intensity, daily activity seems best. A significant part of the positive effect comes from the last bout of activity. [118] This is because the effect on insulin sensitivity lasts 24 to 48 hours.
- 30 minutes brisk walking 3-7 times per week over 6 months reversed insulin resistance in sedentary insulin resistant individuals with no change in diet or weight. [119]
- Small increases in activity and fitness improved clustered metabolic risk in the ProActive cohort of at-risk individuals. [120]
- Both an increase in overall physical activity and an increase in cardiorespiratory fitness have been shown to improve the entire cluster of metabolic abnormalities. [116]
- Adding some resistance exercise to aerobic exercise can provide additional benefits. [121]
  o A modest amount of moderate-intensity exercise, with no change in diet, significantly improved the MetS; increasing the volume of exercise, i.e., more than 30 minutes per day, had greater benefits than increasing the intensity of exercise. [122]

Just becoming less sedentary has a positive effect on the syndrome.
- The Australian Diabetes, Obesity and Lifestyle study showed that avoiding prolonged periods of sedentary time, especially sitting, has a favorable effect on waist circumference, BMI, triglycerides, and 2-h plasma glucose. [123]
- The Nurses' Health Study showed the importance of both reducing sedentary activity and increasing physical activity. Sedentary behaviors, especially TV watching, were associated with significantly elevated risk of obesity and type 2 diabetes, whereas even light to moderate activity was associated with substantially lower risk. [124]

Diet Changes
The epidemic of the Metabolic Syndrome has been seen by some as the unwanted result of the dietary low fat crusade that has dominated the past 50 years. [125]
- Fat intake has dropped but obesity and the metabolic syndrome have risen.
- The problem is that low fat diets tend to be high in carbohydrates, and there is evidence that such diets may increase triglycerides and reduce HDL in susceptible people. [126]
- The 2006 AHA scientific statement on diet and lifestyle recommendations recommends a moderate fat intake for the metabolic syndrome. [127]

There is no single diet currently recommended for people with the Metabolic Syndrome, BUT there is evidence to support a Mediterranean style diet as the best approach. [101]
- A systematic review of 35 studies of the effects of the Mediterranean diet showed favorable effects on lipoprotein levels, endothelial vasodilatation, insulin resistance, metabolic syndrome, antioxidant capacity, myocardial and cardiovascular mortality, and cancer incidence in obese patients and in those with previous myocardial infarction. [128]
- Analyses from the Nurses' Health Study suggest that over 80% of coronary heart disease, 70% of stroke, and 90% of type 2 diabetes can be avoided by healthy food choices that are consistent with the traditional Mediterranean diet, along with regular physical activity and not smoking. [129]
- A Mediterranean style diet reduced the prevalence of the syndrome by nearly 50% over a low fat diet. [130]
- The Dietary Approach to Stop Hypertension (DASH) diet, which is similar to a Mediterranean diet, reduced the prevalence of the metabolic syndrome by 35% compared with a control diet. [131]
- A dietary pattern that included frequent intake of vegetables, fruits, fish, pasta and rice and low intake of fried foods, sausages, fried fish, and potatoes was associated with a better metabolic profile. [132]

There is growing evidence that the type of fat in the diet plays an important role in the development of insulin resistance. [133]

- Higher levels of saturated fats impair the action of insulin, while polyunsaturated fatty acids, especially omega-3 and -6, improve insulin sensitivity, hence the beneficial effects of adding a fish oil supplement.
- Omega-3 fatty acids in fish oils help reduce triglycerides and increase HDL, and have the added benefit of antioxidant properties.

Substituting whole grains for refined grains in the same hypocaloric diet in people with metabolic syndrome resulted in a significantly greater decrease in percentage body fat in the abdominal region, and a significantly greater reduction in inflammation. [134]
- Increased whole grain and cereal fiber intake was also associated with a reduced risk of developing the metabolic syndrome in the Framingham Offspring Study. [135]

In middle-aged adults, soft drink consumption is associated with a higher prevalence and incidence of multiple metabolic risk factors. Consumption of ≥1 soft drink per day was associated with nearly 1.5 times the risk of developing metabolic syndrome. [136]
- Emerging evidence also suggests that increased consumption of fructose may also be a factor in the growing rates of obesity and the metabolic syndrome. [137]

The Atherosclerosis Risk in Communities (ARIC) study found that long term consumption of a Western dietary pattern, especially including meat, fried foods, and diet soda, increased the risk of developing the Metabolic Syndrome. [138]
- The Whitehall II study confirmed this -- a dietary pattern with high consumption of diet soft drinks, onions, sugar-sweetened beverages, burgers and sausages, crisps and other snacks, and white bread and low consumption of high-fiber breakfast cereals, jam, French dressing/vinaigrette, and whole wheat bread was associated with the development of insulin resistance and type 2 diabetes. [139]

Weight Loss:
Weight loss has a huge impact in improving the risk factors of the metabolic syndrome. Several studies have shown that losing just 7% to 10% of initial body weight is sufficient to improve waist circumference, elevated triglycerides and low HDL-cholesterol, trunk fat, and plasma glucose. [140]

E. TYPE 2 DIABETES
A growing body of evidence shows that lifestyle interventions are a critical adjunct to the management of type 2 diabetes – improves glycemic control, slows progression of the disease, and minimizes the risk of developing complications. [141,142]
- With the high risk for CVD, aggressive management of CVD risk factors is imperative. [143]

Lifestyle Intervention:
The Look AHEAD (Action for Health in Diabetes) trial involved an intensive lifestyle intervention in type 2 diabetics, most also with the MetS. [144]
- Intervention involved group and individual counseling to achieve weight loss through decreased caloric intake and increased physical activity.
- 1-year outcomes included 8.6% weight loss, 21% improvement in fitness, and 0.7% reduction in A1C (from a baseline of 7.3%), as well as improvements in blood pressure, triglycerides and HDL cholesterol.

A short-term (3 wk) lifestyle intervention showed how quickly metabolic changes can occur with lifestyle modifications. [145]
- However, it was in a tightly controlled environment (the Pritikin Longevity Center).
- A high-fiber (> 40 gm), low-fat diet with daily aerobic exercise led to significant improvements in total cholesterol (- 40 mg/dL), LDL (- 27 mg/dL), fasting glucose (- 31 mg/dL), fasting insulin (- 10 mcU/ml), insulin resistance, as well as indicators of oxidative stress, inflammation, and endothelial function in men with type 2 diabetes and the metabolic syndrome.

Exercise, Physical Activity and Fitness:

Low cardiorespiratory fitness has been shown to be a powerful and independent predictor of mortality in people with diabetes. The Aerobics Center Longitudinal Study showed that low fit men with T2DM have twice the mortality risk of moderately fit men. [146]
- The Nurse's Health Study found an inverse relation between hours per week of moderate to vigorous activity and risk for CVD events in women with T2DM (> 4 hrs/wk, nearly half the risk). [147]
- Walking at least 2 hours a week was shown to reduce the chance of premature death from all causes or cardiovascular disease in diabetics by 34% to 54%. [148]

A systematic review of the effects of exercise on fitness in Type 2 diabetics found a 12% increase in VO_2max in exercise groups vs. a 1% decrease in control groups. [149]
- Higher exercise intensities produced larger improvements in VO(2max) and greater improvement in HbA1c compared to interventions that tested larger exercise volume.

Effect on Control:
A 2001 meta-analysis of 12 aerobic exercise studies with no changes in diet in people with Type 2 diabetes found a modest reduction in A1c of 0.7%, independent of any change in body weight. [150]
- Increasing exercise intensity had a greater effect than increasing duration or frequency of exercise.
- This led the ADA to recommend including some vigorous exercise in interventions for glycemic control in those without contraindications. [151]
- Adding some resistance exercise to an aerobic program has been shown to significantly improve glucose control and insulin sensitivity over an aerobic program alone. [152]

A later meta-analysis (2006) of the effects of different modes of exercise training on glucose control and risk factors for complications in Type 2 diabetics found trivial differences among aerobic, resistance, and combined training on HbA(1c); for training lasting ≥12 weeks, the overall effect was a modest reduction of 0.8, similar to dietary, drug, and insulin treatment. [153]
- Combined training was generally superior to either aerobic or resistance training alone.

A 2006 Cochrane review of 14 RCTs of the effects of exercise in type 2 diabetes mellitus found that the exercise interventions significantly improved glycemic control (decrease in hemoglobin A1c levels of 0.6%). [154]
- Exercise significantly increased insulin response, and decreased plasma triglycerides. This was associated with a reduction in visceral and subcutaneous adipose tissue. No adverse effects were reported.

A significant correlation has been observed between insulin sensitivity and the average number of steps taken in a day. The improved effectiveness of insulin is attributable, at least in part, to increases in GLUT4 protein, IRS1 and PI3-kinase protein in skeletal muscle. [155]

Diet
NHANES 1999-2002 data showed that diabetic patients treated by diet alone had the best glycemic control (66% in good control vs. 39% overall). [156]

In terms of diet changes: [157]
- No single diet best for all diabetic patients.
- High protein diets (> 20%) are not recommended.
- A moderate carbohydrate intake (45-65% of caloric intake) is recommended, no less than 130 grams daily.

For glucose control, a focus on total carbohydrates, whatever the source, is most effective; however, emphasis should be on carbohydrates from vegetables, legumes, whole grains, and fruits for fiber and nutrient density; foods high in sugar are usually nutritionally weak. [158,159]

The strongest evidence supports an increased intake of whole grains and dietary fiber to improve insulin sensitivity and reduce the risk of complications. [160-165]

- While there is insufficient evidence to recommend a low GI or GL diet for primary prevention, there is evidence that it may assist the management of type 2 diabetes; low GI foods with high nutrient densities are encouraged. [166-168]
- Includes legumes, whole oats, apples, pumpernickel bread, low fat dairy, whole grain pasta, grapefruit and yams.
- Replacing saturated fats with monounsaturated fats, polyunsaturated fats or carbohydrates has been shown to improve lipid profiles in diabetic patients. [168]
    - Emphasis on MUFA is particularly beneficial in those who respond to higher carbohydrate intakes with increased triglycerides

F. CARDIOVASCULAR DISEASE

A systematic review found that 4 lifestyle changes can affect mortality risk in CVD patients: [169]
- smoking cessation -- a 36% reduction (RR, 0.64; 95% CI, 0.58 to 0.71),
- increased physical activity -- a 24% reduction in mortality risk (RR, 0.76; 95% CI, 0.59 to 0.98),
- moderate alcohol use -- a 20% reduction in mortality risk (RR, 0.80; 95% CI, 0.78 to 0.83), and
- dietary changes -- a 44% reduction in mortality risk (RR, 0.56; 95% CI, 0.42 to 0.74).

A Cochrane review of 63 RCT of the effectiveness of secondary cardiac prevention programs with and without exercise components showed that a wide variety of secondary prevention programs improve health outcomes in patients with coronary disease. [170]
- The summary risk ratio for all-cause mortality was 0.97 at 12 months, but 0.53 at 24 months.
- For recurrent MI, it was 0.83 at 12 months. Effects were similar for programs that included risk factor education or counseling with or without a structured exercise component, and for programs that were solely exercise-based.

A review of literature examining interventions to assist patients in achieving risk factor reductions through lifestyle change after myocardial infarction or coronary artery revascularization found that evidence supports: frequent follow-up, intensive diet changes, individualized and group exercise, coaching, group meetings, education on lifestyle modification and behavior change, and formal cardiac rehabilitation programs. [171]

Lifestyle Interventions:
The Lifestyle Heart Trial (Ornish) provided conclusive evidence that intensive lifestyle changes can regress coronary atherosclerosis. [172]
- Program included a 10% fat - whole food - vegetarian diet, aerobic exercise, stress management training, smoking cessation, and group psychosocial support.
- At one year, 23 of 28 patients experienced regression. [172]
- At 5 year follow-up of 48 patients with moderate to severe CAD randomized to lifestyle change or usual-care: [173]
    - Average stenosis diameter decreased by 8% in lifestyle group vs. a 28% increase with usual care.
    - 25 new events occurred in lifestyle group vs. 45 in usual care group (with 8 fewer patients).

The Multicenter Lifestyle Demonstration Project showed that significant improvements in diet (low fat, whole foods, plant-based), exercise, stress management, and social support can be achieved and maintained in heart disease patients, especially with spousal participation. [174]
- The program resulted in significant improvements in medical (e.g., plasma lipids, blood pressure, body weight, exercise capacity) and psychosocial (e.g., quality of life) outcomes.

Diet Changes:
A Mediterranean diet pattern has been shown to be an effective adjunct to pharmacotherapy for secondary prevention. The focus on good fats has been suggested to be more effective than simply reducing total fat intake. [175,176]
- The Lyon Diet Heart Study compared a Mediterranean-type diet with a "Western" diet following an initial MI. [177]

- At 4 year follow-up, there was a 32% reduction in cardiac death and nonfatal MI in the Mediterranean diet group:
  o Cardiac death/nonfatal MI - 14 events vs. 44 in the Western diet group,
  o Unstable angina, stroke, heart failure, pulmonary or peripheral embolism - 27 events vs. 90, and
  o Hospital admissions - 95 events vs. 180

Omega-3 fatty acids found primarily in certain cold water fish and flax are good fats and found to be protect against CHD events, including sudden death, in those with CHD. [178]
- Modest fish consumption of 1-2 servings per week of species rich in omega-3 fatty acids can reduce CHD death by 36% and total mortality by 17%. [179]
- The consumption of 2 servings (about 8 oz) per week of fish high in EPA and DHA is associated with a reduced risk of both sudden death and death from coronary artery disease in adults. [180,181]

Smoking Cessation:
Smoking promotes the progression of CVD and, in CAD patients, is an important predictor of future CV events. [182]

Several studies have shown that quitting improves longevity and reduces recurrent events. [183]
- A systematic review of cohort studies found that smoking cessation was associated with a 36% reduction in mortality risk in CAD patients. [169]
- Estimated to increase life expectancy by 2.8 years for men, 2.3 years for women. [184]
- Risk declines rapidly, approaching that of a nonsmoker in about 3 years. [185]
- According to the USPSTF, a combination of long-term behavioral support and pharmacologic therapy with bupropion, with or without NRT, should be offered to all CVD patients. [186]

A systematic review of the effects of individual counseling on smoking cessation showed that individual counseling for 6 months or longer resulted in a 1.6 times greater likelihood of successful cessation. [187]

Weight Loss:
Although the association between obesity and CVD is well established, there have been no large scale RCTs of the effects of weight loss on cardiovascular outcomes. [188,189]
- Most of the evidence on the CV benefits of weight reduction has been obtained from observational studies where weight loss was a secondary end point.
- Several studies show that weight loss in overweight or obese reduces CVD risk factors.

Caloric reduction of 500 kcal/d or more is recommended for most overweight patients with CVD until they reach their ideal body weight. [190]

Exercise:
Several systematic reviews have shown the importance of exercise for patients with CVD. [191]
- An energy expenditure of about 1600 kcals per week has been found to be effective in halting the progression of CAD, and 2200 kcals per week has been shown to be associated with plaque reduction in patients with atherosclerotic heart disease. [192,193]

A systematic review of 48 RCTs (8940 patients) investigating the effectiveness of exercise-based cardiac rehabilitation showed that, compared with usual care, exercise rehab was associated with reduced all-cause mortality (OR = 0.80) and cardiac mortality (OR = 0.74), greater reductions in total cholesterol level (WMD, -14.3 mg/dL), triglyceride level (WMD, -20.4 mg/dL]), and systolic blood pressure (WMD, -3.2 mm Hg); and lower rates of self-reported smoking (OR = 0.64). [194]
- No significant differences in the rates of nonfatal myocardial infarction and revascularization, or changes in high- and LDL cholesterol levels and diastolic pressure, or health-related quality of life were observed.

A prospective study of 773 men with known CAD followed for 5 years showed that those who engaged in light and moderate levels of activity had 58% and 53% lower mortality risks than those who engaged in minimal or no activity. [195]

A RCT involving 62 patients with angiographically proven CAD randomized to regular physical exercise or usual care showed that after 1 year, atherosclerosis progressed in those who exercised the least (mean energy expended, 1000 kcal/wk), while it modestly regressed in those who exercised the most (mean, 2200 kcal/wk). [196]

Exercise Recommendations: [197]
- An Expert Working Group of the National Heart Foundation of Australia reviewed the evidence for exercise with CVD since the US Surgeon General's Report on Physical Activity and Health in 1996. The Expert Working Group recommended that: people with established clinically stable cardiovascular disease should aim to achieve 30 minutes or more of moderate intensity physical activity on most, if not all, days of the week; less intense and even shorter bouts of activity with more rest periods for those with advanced CVD; and regular low-to-moderate level resistance activity, initially under the supervision of an exercise professional, is encouraged.
- Benefits for people with CVD include augmented physiological functioning, lessening of cardiovascular symptoms, enhanced quality of life, improved coronary risk profile, superior muscular fitness and, for survivors of acute MI, lower mortality.
- The greatest potential for benefit is in those people who were least active before beginning regular physical activity, and this benefit may be achieved even at relatively low levels of physical activity.

Excessive Alcohol Consumption:
A number of studies have shown that reducing excessive alcohol consumption to a moderate level reduces the risk of a variety of vascular diseases, including MI, PVD, and sudden cardiac death. [198]

Psychosocial Risk:
A number of psychological factors, including chronic hostility, social isolation, and lack of social support have been linked to poorer outcomes in patients with CHD.
- A meta-analysis of 37 smaller studies showed that stress management and health education in patients with CHD may reduce both recurrent MI and cardiac death by up to a third. [199]
- But, this evidence is far from conclusive. [200]

G. STROKE
Exercise - Strengthening
High-intensity resistance training has traditionally been excluded from stroke rehabilitation programs because of concern that high-exertion activity will increase spasticity.
- A systematic review of 11 studies that met the criteria to determine the effects of resistance training on functional outcomes and spasticity post-stroke found that resistance training can increase strength, gait speed, and functional outcomes and improve quality of life without exacerbating the risk of spasticity. [201]
- Another systematic review of 15 RCTs found that strengthening interventions had a small positive effect on both strength and activity in stroke patients with no increase in spasticity. [202]

Exercise - Aerobic
A Cochrane review of aerobic exercise in stroke patients showed a consistent positive effect on aerobic capacity, regardless of the stage of recovery. [203]
- Peak VO2, peak workload, walking velocity and walking endurance were all significantly improved. Authors concluded that aerobic exercise should be an important component of rehabilitation in people with mild and moderate stroke.

H. HEART FAILURE
Exercise

A systematic review of 69 RCTs of exercise interventions for HF suggested that exercise might slow the progression of HF. [204]

Another systematic review of home-based exercise programs for people with chronic heart failure produced 10 RCTs with 648 participants. [205]
- Programs increased 6-min walking distance by an average of 41 m and peak VO2 by 2.71 ml/kg/min more than usual activity.
- It could be valuable for those without access to hospital-based exercise.

A modified Philadelphia Panel rating method to evaluate the evidence supporting exercise interventions in patients with congestive heart failure (CHF) used a systematic review of RCTs and CCTs. [206]
- Aerobic exercise was shown to improve VO2 max, dyspnea, work capacity, and left ventricular function. Resistance exercise was shown to improve left ventricular function, peak lactate levels, muscle strength, and muscle endurance.

A meta-analysis (14 RCTs) of the effect of exercise training on left ventricular (LV) remodeling in heart failure found that aerobic training reverses LV remodeling in clinically stable individuals. [207]
- Ejection fraction significantly improved (WMD = 2.59%), as did end-diastolic volume (WMD = -11.49 ml) and end-systolic volume (WMD = -12.87 ml).
- Adding strength training did not improve outcomes further.

Another systematic review (35 RCTs) of the effect of exercise training on cardiac outcomes with CHF found significant improvements in systolic blood pressure, heart rate, cardiac output, peak oxygen uptake, anaerobic threshold, and 6-min walking test. [208]
- The Minnesota Living with Heart Failure Questionnaire improved by an average of 9.7 points.
- Exercise training has clinically important effects on exercise capacity and HRQL, and may have small positive effects on cardiac performance during exercise.

A 2004 Cochrane review (29 RCTs) investigated the effectiveness of exercise-based interventions compared with usual medical care on the mortality, morbidity, exercise capacity and health related quality of life, of patients with heart failure found that exercise training significantly increased VO_2max by 2.16 ml/kg/min, exercise duration increased by 2.38 minutes, work capacity by 15.1 Watts and distance on the six minute walk by 41 meters. [209]
- HRQoL improved in 7 of 9 trials that measured this outcome.

A larger systematic review of 81 studies (30 RCTs, 9 crossover, 37 longitudinal cohort, and 5 nonrandomized controlled trials) found an average 17% increase in peak oxygen consumption in 40 aerobic training studies, 15% in 13 studies of combined aerobic and strength training, and 16% in the one study of inspiratory training. [210]
- Exercise training was shown to be safe and effective in patients with heart failure; there were no reports of deaths directly related to exercise during more than 60,000 patient-hours of exercise training.

A meta-analysis of the effect of exercise training on survival in HF patients (9 datasets with 801 patients) found that during a mean follow up of nearly 2 years there was an overall reduction in mortality: 88 (22%) deaths in the exercise arm vs. 105 (26%) in the control arm. [211]
- Exercise training significantly reduced mortality (hazard ratio 0.65).
- The secondary end point of death or admission to hospital was also reduced (0.72).

I. PERIPHERAL ARTERIAL DISEASE (PAD)
Exercise
A Cochrane review yielded 22 trials of exercise therapy for leg pain on walking associated with intermittent claudication. [212]
- Compared with usual care or placebo, exercise significantly improved maximal walking time: mean difference (MD) 5.12 minutes; with an overall improvement in walking ability of approximately 50% to 200%.

- Walking distances significantly improved: pain-free walking distance by 82 meters and maximum walking distance by 113 meters. Improvements persisted for up to two years.

An earlier Cochrane review (8 trials) of supervised versus non-supervised exercise therapy for people with intermittent claudication found that supervised exercise therapy was more effective, with approximately 150 meters greater increase in walking distance. [213]

Lifestyle Modification
A systematic review of the effects of life-style modification on mortality and cardiovascular events in patients with PAD found that despite the lack of RCT data, there is sufficient evidence to recommend some life-style modification as part of the overall approach to risk reduction in these patients. [214]
- There is compelling evidence to support smoking cessation, increased exercise and improved diet.

J. CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)
Inspiratory Muscle Training and Exercise
- A summary of 16 meta-analyses of the effect of inspiratory muscle training (IMT) in patients with stable COPD showed that targeted inspiratory muscle training significantly improves inspiratory muscle strength, peak inspiratory flow rate, inspiratory muscle endurance, exercise capacity, Borg Score for Respiratory Effort, dyspnea, and quality of life. [215]
- Combining targeted inspiratory muscle training with exercise and/or pulmonary rehabilitation led to greater improvements in inspiratory muscle strength and exercise tolerance than exercise alone. [216]

Comprehensive Pulmonary Rehabilitation
A systematic review of the effectiveness of disease-management programs for COPD showed that the disease-management programs significantly improved exercise capacity (32.2 m), decreased risk of hospitalization, and moderately improved health-related quality of life. All-cause mortality did not differ. [217]

A systematic review of 31 RCTs of the impact of pulmonary rehabilitation programs on health-related quality of life (QoL) and exercise capacity in patients with COPD showed significant improvements in dyspnea and fatigue, emotional function and patients' control over their condition; improvements were moderately large and clinically significant. [218]
- The effect on exercise capacity was small and slightly below the threshold of clinical significance for the six-minute walking distance (WMD: 48 m; n = 16 trials).

Another systematic review (6 RCTs) of the effect of pulmonary rehabilitation (with or without education) on anxiety and depression in patients with COPD found that rehab programs with up to three sessions per week of supervised exercise, along with education and psychosocial support, significantly reduced anxiety and depression more than standard care. [219]
- Education alone and exercise training alone were not associated with significant reductions in either anxiety or depression.
- Comprehensive pulmonary rehabilitation was also associated with short-term gains in both disease-specific and generic HRQOL, not sustained at 12 months.

Self Management
Self-management of COPD is aimed at teaching skills needed to carry out medical regimens specific to the disease, guide health behavior change, and provide emotional support for patients to control their disease and live functional lives.
- A Cochrane review of self-management programs for COPD combined 14 trials and showed a significant reduction in the probability of at least one hospital admission in patients receiving self-management education compared to usual care (OR 0.64). The one year NNT was 10 for patients with a 51% risk of exacerbation, to 24 for patients with a 13% risk of exacerbation. [220]
- A small but significant reduction was seen for dyspnea, but no significant effects were found for exacerbations, ER visits, lung function, exercise capacity, or days lost from work.

K. OSTEOARTHRITIS
Osteoarthritis is generally undertreated, and functional consequences ignored. [221]
- Undertreatment contributes to poor QOL, can lead to other serious co-morbidities, including depression, sleep disturbances, anxiety, fatigue, impaired ambulation, dementia, aphasia, and decreased socialization. [221]
- Patient misperceptions that prescribed activity will exacerbate symptoms may lead to a cycle of inactivity, depression and anxiety and worsening symptoms. [222]
- Addressing knowledge and skill deficits, perceived lack of self efficacy, and social support may mitigate perceived distress and improve QOL. [222]

Non-Pharmacological Approaches
In developing evidence-based recommendations for the management of hip and knee osteoarthritis (OA) an expert panel concluded that there is no statistically significant difference between non-pharmacological therapies and pharmacological therapies. [223]
- Optimal management requires a combination of both.
- 12 non-pharmacological modalities had sufficient evidence to be recommended: education and self-management, regular telephone contact, referral to a physical therapist, aerobic, muscle strengthening and water-based exercises, weight reduction, walking aids, knee braces, footwear and insoles, thermal modalities, transcutaneous electrical nerve stimulation and acupuncture.

Lifestyle interventions:
Weight loss, appropriate exercise, and avoidance of repetitive joint stress all have a positive role in management; may even decrease rate of progression. [221,224]
- Growing body of evidence supports this approach. [225]
- Pharmacotherapy does not tackle the underlying disease process, and may miss the mark in as many as half of patients, and concerns about safety are common. [226]
- An individualized approach based on each patient's unique biopsychosocial needs is crucial for successful management [227]

Exercise:
Is a "powerful mainstay in the armamentarium of physicians" [228]
- Optimal prescription not identified, but consensus is that any increase in lifestyle activity is good; a variety of activities ranging from aerobics to resistance to those emphasizing balance and ROM can reduce pain, improve mobility and QOL. [222]
- Low impact exercise is more effective in reducing pain. [229,230]
- Stretching without strengthening, as well as isometric exercise is less effective.

Adults with arthritis experience significant disability and co-morbidities due to reduced physical activity.
- A meta-analysis of physical activity interventions in arthritis patients included 28 studies and showed moderate positive effects on physical activity behavior and small positive effects on pain and physical function outcomes. [231]
- Another systematic review of 6 scientific reviews and 10 RCTs on the effect of exercise on OA management concluded that the weight of the evidence supports the effectiveness of structured exercise programs (either strength training or aerobic exercise) in the management of in middle-aged and elderly subjects with OA. [232]

Another systematic review of RCTs and CCTs on the long-term effectiveness of exercise therapy for osteoarthritis yielded 5 high-quality and 6 low-quality RCTs. [233]
- The positive post-treatment effects of exercise therapy on pain and physical function are not sustained in the long term.
- However, when additional booster sessions are included after the treatment period the beneficial effects on pain and physical function are more likely to be maintained.
- Benefits are transient – need to be performed regularly, 1-3 times/week; some evidence supports a minimum of 3 days per week for about 35 min [234]
- Group programs have been shown to enhance motivation, support, and compliance over home-based programs [235], but a meta-analysis found both to be effective. [236]

Exercise – Aquatic
Group-based water exercise has been shown to result in significant improvement in pain and physical function with knee or hip OA [237]

A Cochrane review of the effectiveness and safety of aquatic-exercise in the treatment of knee and hip osteoarthritis yielded only 6 trials (800 participants). [238]
- For combined knee and hip osteoarthritis, there was a small-to-moderate effect on function and a small-to-moderate effect on quality of life; no evidence of effect on walking ability or stiffness immediately after end of treatment.
- Aquatic exercise appears to have some beneficial short-term effects for patients with hip and/or knee OA while no long-term effects have been documented.
- May be useful as the first part of a longer exercise program for OA patients.

A 1 year RCT found that group-based water exercise can produce significant reduction in pain and improvement in physical function in older adults with lower limb OA, and may be a useful adjunct in the management of hip and/or knee OA. [239]

Exercise – Knee OA
A Cochrane review and meta-analysis of 32 RCTs examining the effectiveness of land-based exercise (as opposed to water exercise) for OA of the knee found a beneficial effect on both pain and physical function. [240]
- Results were better with more direct supervision, but remained significant and clinically relevant at lower levels of supervision; authors concluded that there is platinum level evidence that land-based therapeutic exercise has at least short term benefit in terms of reduced knee pain and improved physical function for people with knee OA. The magnitude of the treatment effect is comparable to estimates for NSAIDs.

A review of 23 systematic reviews published between 2000 and 2007 on physical therapy interventions for patients with knee osteoarthritis concluded that there is high-quality evidence that exercise and weight reduction reduce pain and improve physical function in patients with osteoarthritis of the knee. [241]

A meta-analysis of 16 studies reporting exercise and/or self-management interventions for patients with knee OA found that exercise regimens can improve physical health and lessen the overall impact of OA. [242]
- Self-management programs significantly improved psychological outcomes only; the overall effect of OA was not significantly improved.

Exercise – Hip OA
A systematic review of evidence for the efficacy of exercise for hip OA from 9 RCTs that met the inclusion criteria found a beneficial effect of exercise with an effect size (ES) of -0.38. [243]
- The exercise benefit remained significant when only the better quality studies were included (ES of -0.46).
- Therapeutic exercise, especially with an element of strengthening, is an efficacious treatment for hip OA.

Exercise – Tai Chi
- A systematic review of controlled clinical trials that investigated the effectiveness of tai chi for osteoarthritis found 5 RCTs and 7 non-RCTs. [244]
- Two RCTs suggested improvement of physical function, while two other RCTs failed to do so.
- There is some encouraging evidence that tai chi may assist in pain control with knee OA. However, the evidence is not convincing for pain reduction or improvement of physical function.

Activity Recommendations
- A Cochrane review of 72 reports arrived at the following evidence-based conclusions: [245]
  - OA patients in general can pursue a high level of physical activity, provided the activity is not painful and does not predispose to trauma (grade B).

o Radiographic or clinical OA is not a contraindication to promoting activity in patients who have a sedentary lifestyle (grade C).
o Exercises and other structured activities for health improvement have a favorable effect on pain and function in the sedentary knee OA patient, when performed at a frequency of one and three times per week (grade B).
o There is no scientific argument to support halting exercise in case of an OA flare-up (grade C).
o The OA patient can continue to engage in recreational sports as long as the activity does not cause pain (Grade C).
o The OA patient who practices a sport at risk for joint trauma should be encouraged to change sport (Grade C).
o Factors such as high loads on the joint, unnatural body position, heavy lifting, climbing and jumping may contribute to knee and hip OA.
o An occupational history should always be part of managing the OA patient (Grade B).

Diet:
No single diet prescription has been shown to be best for OA; however, higher intakes of fruits and vegetables have been associated with reduced risk, thus should be recommended due to multiple other benefits to health. [246]

Weight Loss:
Weight loss in overweight patients is a key goal; 10 pounds of extra weight increases the force on the knee by 30-60 pounds each step; excess weight has also been associated with higher rates of hand OA (suggesting a systemic factor as well). [221]
- Meta-analysis found that a 5% or greater weight reduction is associated with a significant reduction of pain and disability [247]
- The Arthritis, Diet, and Activity Promotion Trail (ADAPT) showed that modest weight loss (5%) combined with exercise is best approach [248]
- The combination improved functioning, pain, performance, and endurance relative to either weight loss or exercise alone.
- Weight loss must include exercise to build strength, mobility, confidence, joint stability, and muscle endurance
- Weight loss through exercise, with or without a hypocaloric diet, improved symptoms and functioning in programs from 8 weeks to 6 months. [249-251]

Unloading and Alignment Correction
- Reasonable evidence from RCTs suggests that therapies to correct alignment across knee joint can improve pain and function [252]

L. RHEUMATOID ARTHRITIS
Overall
A review of the effectiveness of non-pharmacological treatment modalities for RA found that the evidence of effectiveness varies among the different modalities, with relatively strong support for exercise and self-management interventions, and modest support for joint protection programs, specific orthoses and comprehensive care interventions. [253]
- However, few studies have compared different attributes of non-pharmacological modalities or comprehensive care models for early RA, so the optimal timing, intensity, duration and mode of delivery remain unclear.

A Cochrane review of RCTs evaluating rehabilitation interventions for people with rheumatoid arthritis found that patient education and joint protection training using behavioral approaches; dynamic exercise therapy, hand exercises and hydrotherapy; and cognitive-behavioral therapy (in people with poorer psychological status) are effective in reducing pain and maintaining function over at least a one-year period. [254]

A scientific committee evaluated the evidence from 198 publications, and arrived at four recommendations for nonpharmacological treatment of early RA: [255]

(1) physical exercise and sports can be recommended; muscle strength exercises are advisable;
(2) metatarsal pain and/or foot alignment abnormalities should be looked for regularly, and appropriate insoles prescribed if needed;
(3) specific dietary measures and nutritional supplements are **not** indicated for early RA;
(4) elimination diets, particularly with low intakes of dairy products, should be discouraged.

Exercise -- All
A systematic review of the effectiveness of exercise interventions in improving disease-related characteristics in patients with rheumatoid arthritis (RA) included 40 studies and found strong evidence that various types of exercise from low to high intensity are effective in improving disease-related characteristics and functional ability in RA patients. [256]

Exercise – Tai Chi
The major goals of treatment are to relieve pain, reduce inflammation, slow down or stop joint damage, prevent disability, and preserve or improve the person's sense of well-being and ability to function.
▪ Tai Chi has been recognized in China as an effective arthritis therapy for centuries.
▪ A Cochrane systematic review of the effectiveness and safety of Tai Chi for people with RA found significant benefits on lower extremity range of motion, in particular ankle range of motion. The effect on pain was not reported. [257]

M. CANCER – ALL
Multi-component programs:
Can reduce fatigue and associated symptoms.
▪ A systematic review of 57 RCTs investigating multi-component interventions for cancer-related fatigue and associated symptoms (vigor/vitality) found that exercise and psychological interventions both reduced fatigue, with no significant differences between them. [258]
▪ Specifically, multimodal exercise and walking programs, restorative approaches, supportive-expressive, and cognitive-behavioral psychosocial interventions were most promising.
Some evidence supports the positive effects of self-management programs and self-efficacy enhancing programs on health outcomes, exercise adherence and later exercise behavior in cancer patients. [259]

Exercise:
Has many benefits for cancer patients.
▪ A 2007 review of the evidence of the effects of exercise on risk factors for adverse outcomes of cancer and its treatment showed that there is mounting evidence that exercise improves fatigue, physical functioning, and cardio-respiratory fitness. [260]
▪ Preliminary evidence suggests that exercise also contributes to improvements in body weight and composition, metabolic risk factors, and immune function, and may even influence disease-free and overall survival in selected populations.

A meta-analysis of exercise interventions for people treated for cancer showed that exercise interventions resulted in small positive effects on health and well-being outcomes, including physical function, for symptoms other than fatigue, and for body composition. [261]
▪ More modest positive effect sizes were documented for mood, quality of life, and fatigue.

Can help reduce fatigue.
▪ The strength of the evidence supporting exercise in managing cancer-related fatigue is growing. [262]
▪ All patients with cancer should be encouraged to maintain an optimum level of physical activity during and following cancer treatment. Patients with breast cancer and other selected patients should receive recommendations for moderate exercise programs.

A Cochrane review of 28 studies of the effects of physical activity in reducing cancer-related fatigue found that exercise was statistically more effective than control interventions both during and following therapy. [263]

- Other reviews found more limited support for reducing fatigue, citing lack of research with heightened fatigue as an eligibility criterion. [264,265]

Improves fitness and capacity.
Evidence supports the positive effects of exercise on exercise capacity during and after completion of cancer treatment. [265]
- Evidence for the effectiveness of progressive resistance training on muscle strength is also promising.
- A systematic review of physical activity interventions in cancer survivors during and after treatment found 22 high-quality studies that provided evidence of a small to moderate effect of physical activity interventions on cardiorespiratory fitness during and after treatment, physiologic outcomes and symptoms during treatment, and vigor post-treatment. [266]
- Regular physical activity has also been shown to be associated with improved QOL and health status in cancer patients. [267]

N. BREAST CANCER
Exercise
May improve survival.
- In breast cancer patients, physical activity equivalent to walking at least an hour a week has been associated with improved survival compared with no exercise. [268]
- Greatest benefit was seen with 3-5 hours per week.

Can improve function and quality of life.
- In women with breast cancer, a meta-analysis of 10 studies (N = 588) that met inclusion criteria, found that aerobic exercise significantly improved cardiopulmonary function and body composition. [269]

A Cochrane review of 14 studies on the effects of exercise on quality of life in women with breast cancer found that exercise significantly improved quality of life. [270]
- It also led to significant improvements in physical functioning, peak oxygen consumption and fatigue.

Diet and weight control
Can help improve breast cancer prognosis. [271]
- Several nutritional factors, notably vegetable/fruit intake and fat intake may modify the progression of disease and prognosis after the diagnosis of breast cancer.
- The majority of studies of vegetable and fruit intake show a direct relationship with survival.
- On the other hand, nearly half of studies of dietary fat intake found an inverse association with survival.
- Overweight or obesity is associated with poorer prognosis in most studies.
- Treatment-related weight gain may also reduce disease-free survival and quality of life, while increasing the risk for co-morbidities.
- Healthy weight control with an emphasis on exercise and a diet with adequate vegetables, fruit, whole grains, and low-fat dairy and low in saturated fat may lower overall disease risk in breast ca patients.

O. OSTEOPOROSIS
Greatest known modifiable risk factor is excess weight; weight gain associated with development and progression of OA; can create a vicious cycle of pain, inactivity and weight gain. An update of the evidence-based position statement of The North American Menopause Society (NAMS) in 2002 regarding the management of osteoporosis in postmenopausal women found that: [272]
- The primary goal of therapy is to prevent fractures by slowing or stopping bone loss, maintaining bone strength, and minimizing or eliminating factors that contribute to fractures.
- The most common risk factors for osteoporotic fracture are advanced age, low bone mineral density, and previous fracture as an adult.

- ▪ Management focuses first on nonpharmacologic measures, such as a balanced diet, adequate calcium and vitamin D intake, adequate exercise, smoking cessation, avoidance of excessive alcohol intake, and fall prevention.
- ▪ Management strategies involve identifying those at risk of fracture, followed by reducing modifiable risk factors through lifestyle changes and, if indicated, pharmacologic therapy.

Exercise:
Resistance exercise can stimulate an increase in bone formation in younger adults and can slow bone loss in middle age. [273]

A 6-month RCT showed that exercise training was effective in improving bone density in older women with low bone density. [274]
- ▪ A 2-year training program was also shown to be effective in attenuating the rate of bone loss in osteopenic women. [275]

A systematic review of 28 RCTs of the effects of exercise on health related fitness in postmenopausal women included 16 trials that reported the effects of exercise on BMD. [276]
- ▪ Based on these studies, early postmenopausal women would benefit from 30 minutes of daily moderate walking in one to three bouts combined with a resistance training program twice a week to preserve BMD and increase muscle strength.

A Cochrane review of the effectiveness of exercise therapy at preventing bone loss and fractures in postmenopausal women yielded 18 RCTs. [277]
- ▪ Aerobics, weight bearing and resistance exercises were all effective on the BMD of the spine.
- ▪ The analyzed results showed walking to be effective on both BMD of the spine and the hip.
- ▪ Aerobic exercise was effective in increasing BMD of the wrist.

Exercise – Walking
A systematic review of 8 RCTs and non-RCTs of the effects of walking programs on bone mineral density (BMD) at the hip and spine in postmenopausal women found no significant effect on lumbar spine bone density but significant positive effects at femoral neck. [278]

Another meta-analysis of walking interventions in postmenopausal women and men and women aged 50 years and older found that walking had a significant positive effect on lumbar BMD but not on the femur or the calcaneus. [279]
- ▪ Suggests that other forms of exercise be combined with walking for patients at risk for osteoporotic fracture.

High Intensity Resistance Training – Postmenopausal Women
A systematic review of the effects of progressive, high-intensity resistance training on bone mineral density (BMD) in postmenopausal women found that: [280]
- ▪ At the lumbar spine (LS), 14 RCT study groups were homogenous in demonstrating a significant increase in BMD of 0.006 g/cm(2).
- ▪ At the femoral neck (FN), in contrast, there was marked heterogeneity within 11 RCT study groups, but still a positive change in BMD of 0.010 g/cm(2).
- ▪ Subgroup analyses showed variability of BMD responses to resistance training based on participants' hormone therapy use.
- ▪ Treatment effects for study groups increasing all participants' calcium intake showed significant positive BMD changes at hip (P=0.007).

Another systematic review of resistance exercise programs in postmenopausal women yielded 20 studies and showed that weight training exercises were effective at increasing BMD of the spine and hip in postmenopausal women with osteoporosis. [281]
- ▪ The increases are site-specific and require high loading with a training intensity of 70% to 90% of 1 RM for 8 to 12 repetitions of 2 to 3 sets performed over one year duration.

High Intensity Resistance Training – Premenopausal Women

A similar analysis in premenopausal women found that high-intensity progressive resistance training was effective in increasing absolute BMD at the lumbar spine but not the femoral neck. [282]
- The weighted mean difference (WMD) for six controlled trials investigating the lumbar spine BMD change was 0.014 g/cm(2).
- In contrast, studies evaluating femoral neck BMD changes showed no significant BMD change (WMD 0.001 g/cm(2).
- The quality of included studies was quite low, so the modest treatment effects in premenopausal women may be biased and should be interpreted with caution.

Women with functional hypothalamic amenorrhea
- Women with functional hypothalamic amenorrhea (FHA) may not achieve peak bone mass (PBM), which increases the risk of stress fractures, and may increase the risk of osteoporotic fractures.
- A systematic review of RCTs, cross-sectional studies, and case studies of the effects of pharmacological and non-pharmacological interventions on bone mineral density (BMD) or bone turnover in women with FHA showed that the most successful, and indeed essential strategy for improving BMD in women with FHA is to increase caloric intake such that body mass is increased and there is a resumption of menses. [283]

P. DEPRESSION
Exercise
- Exercise seems to improve depressive symptoms in people with depression, to a similar degree as cognitive therapy.
- A Cochrane review of exercise interventions for depression yielded 25 RCTs that together showed a large clinical effect. However, when just the 3 highest quality trials were included the effect was only moderate. [284]
- A meta-analysis of the effects of exercise on depression in the elderly found that exercise was effective in treating depression and reducing depressive symptoms in the short-term. [285]
- An earlier systematic review and meta-regression analysis of the effectiveness of exercise as an intervention for depression concluded that, when compared with no treatment, exercise reduced symptoms of depression (-7.3 points on the Beck scale); the effect was greater with shorter follow up. [286]

Self Help
A number of self-help interventions have promising evidence for reducing subthreshold depression.
- The evidence was evaluated in a systematic review of 38 interventions; the best evidence was for relaxation training, exercise, and pleasant activities (along with S-adenosylmethionine, St John's wort, bibliotherapy, computerized interventions, distraction, sleep deprivation, and light therapy). [287]
- A survey of patients found that many self-help strategies rated as strongly as professionally recommended strategies, with exercise being rated extremely highly. [288]
- For patients who do not respond to initial medication treatment, treatments such as exercise, light therapy, alternative medicines, and counseling have demonstrated benefits over placebo and may enhance remission rates when used in combination with antidepressants. [289]

Q. FIBROMYLAGIA
Multi-Component Lifestyle Therapy
There is growing evidence that a combination of interventions (i.e., exercise combined with education and psychologically-based interventions) is the most promising means of managing patients with fibromyalgia (FM). [290]

A systematic review of the efficacy of multicomponent treatments (at least 1 educational or other psychological therapy with at least 1 exercise therapy) yielded 9 RCTs (1,119 subjects) and found "strong" evidence for beneficial short-term effects on the key symptoms including reducing pain, fatigue, depressive symptoms, and limitations to health-related quality of life (HRQOL) and improved self-efficacy for pain control and physical fitness. [291]

- But only the positive effects on fitness were maintained in the long term (median follow-up 7 months).

Exercise

Most authors report a beneficial effect of aerobic exercise training for fibromyalgia patients with chronic pain or fatigue. [292]
- Muscular rehabilitation is useful for preventing deconditioning and the vicious cycle of pain, avoidance and inactivity behaviors, kinesiophobia, and psychological distress.

A 2003 systematic review of exercise in patients with fibromyalgia found that low-intensity aerobic exercise, such as walking or pool exercise, can improve function, distress and symptoms. [293]
- Strength training can improve strength without exacerbating symptoms.
- Patients tolerated low-intensity exercise well, but high-intensity exercise requires caution.

In 2007 a Cochrane Review Group published a systematic review of 34 studies found "strong" evidence for supervised aerobic exercise training on physical capacity and FMS symptoms. [294]
- Strength training had benefits on some FMS symptoms, but too few studies

- A subsequent 2008 review of 6 aerobic studies provided "moderate" evidence that aerobic-only exercise training at ACSM-recommended intensities has positive effects on global well-being and physical function and possibly on pain and tender points. [295]

The Ottawa Panel recommends both aerobic and strengthening exercises for the management of fibromyalgia as a result of the emerging evidence from their synthesis of evidence from 13 RCTs/3 CCTs for aerobic exercise and 5 RCTs for strengthening exercises in the management of fibromyalgia. [296,297]

R. CHRONIC FATIGUE SYNDROME (CFS)

Debate exists among health care professionals and patients about appropriate strategies for managing chronic fatigue syndrome (CFS). A systematic review of interventions for the treatment or management of CFS found 44 studies meeting inclusion criteria, including 36 RCTs. [298]
- Studies were grouped into 6 categories. Graded exercise therapy and cognitive behavioral therapy showed the most promising results with high quality evidence. There was insufficient evidence for pharmacological, supplements, immunological, complementary/alternative, and other interventions.

Exercise:

A Cochrane review of 5 studies that that investigated exercise therapy for CFS found that, at 12 weeks, those receiving exercise therapy were less fatigued than the control participants (SMD -0.77). [299]
- Physical functioning was also significantly improved with exercise therapy (SMD -0.64), and depression was also improved (although non-significantly) (WMD -0.58).
- Authors concluded that there is encouraging evidence that some patients may benefit from exercise therapy and no evidence that exercise therapy may worsen outcomes.
- Using evidence from both the biological and clinical sciences, they found that graded exercise therapy is safe in people with CFS with no detrimental effects on the immune system.
- Exercise programs should be designed for individual physical capabilities and should take into account the fluctuating nature of symptoms.

Self Management:
- Self-management for people with chronic fatigue syndrome involves encouraging patients to pace their activities and respect their physical and mental limitations, with the ultimate aim of improving their everyday functioning. [300]

S. DIABETES TYPE 1
Behavior Change

A meta-analysis of interventions designed to improve health behaviors including exercise among adults with type 1 diabetes included data from 1435 subjects showed that behavior change interventions improve metabolic control in type 1 diabetes. [301]
- There was an overall reduction of 0.33 in mean HbA1c levels between treatment (8.47%) and control (8.80%) groups.

T. NON ALCOHOLIC FATTY LIVER DISEASE (NAFLD)
Lifestyle Modifications
A review of studies testing weight loss and lifestyle modifications for the treatment of NAFLD yielded only 14 studies that met entry criteria. [302]
- Only 3 studies included treatment that was consistent with the guidelines of behavior therapy to reduce excess nutrition and increase exercise; in these studies, a remarkable effect on weight loss and an improvement in liver histology were reported, but the quality of evidence was weak.

U. MULTIPLE SCLEROSIS (MS)
Exercise
A meta-analysis of the effect of exercise training on quality of life (QOL) among people with MS yielded 13 studies meeting inclusion criteria. [303]
- The cumulative evidence supports that exercise training is associated with a small improvement in QOL in individuals with MS.

V. PARKINSONS DISEASE (PD)
Exercise
- A Cochrane systematic review of 7 studies evaluating the effectiveness of physical exercise on mortality, strength, balance, mobility, and activities of daily living (ADL) for sufferers of Parkinson's disease (PD) showed that exercise improves physical performance and activities of daily living in PD patients. [304]

W. COGNITVE IMPAIRMENT/DEMENTIA
Exercise
- A meta-analysis of 30 trials investigating exercise for people with dementia and related cognitive impairments found that exercise training can increase fitness, physical function, cognitive function, and positive behaviors in people with dementia and related cognitive impairments. [305]

X. CHRONIC LOW BACK PAIN
Exercise
A systematic review of the effectiveness of exercises in decreasing LBP incidence, intensity and impact yielded 15 studies that provided strong evidence that exercise was effective in reducing the severity and activity interference from LBP. [306]
- Another systematic review of the effectiveness of therapeutic aquatic exercise in the treatment of low back pain included 37 studies. There was sufficient evidence to suggest that therapeutic aquatic exercise is potentially beneficial to patients suffering from chronic low back pain and pregnancy-related low back pain. [307]

A Cochrane review of the effect of unloaded movement facilitation exercises on outcomes for people with nonspecific chronic low back pain yielded 6 high-quality RCTs. [308]
- There was strong evidence that unloaded movement facilitation exercise, compared to no exercise, improves pain and function. Effects are comparable to other types of exercise, including effort-intensive strengthening and time-intensive stabilization exercise.
- McKenzie therapy, a form of unloaded movement facilitation exercises, was favored over intensive trunk strengthening for pain.
- Yoga produced comparable effects for pain as trunk strengthening and function.
- This challenges the role of strengthening for NSCLBP.

A synthesis of systematic reviews of nonpharmacologic therapies for chronic low back pain concluded that there is good evidence that cognitive-behavioral therapy, exercise, spinal manipulation, and interdisciplinary rehabilitation are all moderately effective for chronic or subacute (>4 weeks' duration) low back pain. [309]

V. PRACTICE PATTERNS RELATED TO LIFESTYLE MEDICINE

Despite consistent recommendations from the most respected medical associations over the last decade, clinician practices regarding lifestyle medicine have not improved much. [1,2]
- Research has consistently reported that the majority of clinicians do not routinely screen or assist patients in modifying their health damaging behaviors. [3-13]
- Only 1 in 8 primary care physicians was even aware of the ACSM recommendations for physical activity. [14]

ADVICE AND COUNSELING
Smoking
- About half (48%) of smokers reported that healthcare professionals had advised them to quit in the past 12 months but only about 1 in 4 were offered assistance in quitting. [15]

Diet and Exercise
- Only 1 in 3 patients indicated that they had ever received even simple advice to increase activity. [16,17]
- The same proportion of hypertensive patients (1 in 3) was counseled about physical activity to help manage their hypertension. [17a]
- The 2000 National Health Interview Survey (NHIS) showed that fewer than 1 in 4 respondents received any physician advice on diet and exercise (21.3% and 24.5% respectively). [18]
- Even in higher risk, rates are low -- from 1992-2000, diet and physical activity counseling took place in < 45% and 30%, respectively, of primary care visits by adults with hyperlipidemia, hypertension, obesity, or diabetes mellitus. [8]
- A review of general practitioner records form 42 practices showed that only half of patients with PAD received advice about exercise or had their body mass index checked. [18a]
- A chart review of 105 randomly selected patients with knee OA showed that fewer than 3 out of 5 had been advised to do any kind of exercise, only half of overweight had been advised to lose weight, and only 2 in 5 had been told about the benefits of strengthening exercise. [18b]
- Likelihood of receiving exercise counseling decreases with age. Of adults > 45 years, men aged 45-54 were most likely to receive exercise counseling from their PCP, but still just over 1 in 5 received such assistance. [19]
- Women >75 years were least likely -- fewer than 1 in 10 received exercise counseling.
- Low rates of counseling were substantiated by observations of patient visits in 38 primary care practices by trained medical students -- physicians counseled on dietary habits in 1 in 4 visits and exercise in 1 in 5 visits; new patients were counseled more often than established ones; counseling was more frequent when there were diet and exercise brochures in the office. [20]
- 9 in 10 internal medicine residents were confident in their knowledge of exercise, but only 1 in 4 was confident in counseling patients. [21]
- Physicians counsel diabetic patients more frequently than those in a pre-diabetic state. Among Swiss primary care physicians, 91% of their diabetic patients received counseling for dietary changes and 79% for physicial activity. However, the rates for pre-diabetic patients was 66% and 60%, respectively. [40]

Weight Loss
- Only 2 of every 5 obese patients are advised to lose weight in regular exams, even when they have chronic conditions made worse by their weight. [22-29]

- Even fewer (< 1 in 4) overweight (not yet obese) had discussed weight with their physician. [30]
- Even when they advise patients to lose weight, physicians often provide insufficient guidance on weight management strategies, possibly because of inadequate counseling skills and confidence. [31]
- Patients were more likely to receive information on the benefits of weight loss, but only 1 in 3 received specific weight control advice, and 1 in 4 were advised to increase physical activity. [32]
- Women more likely than men to be counseled – only 1 in 4 men vs. 2 in 5 women. [33]
- Even with obesity-related co-morbidities, weight loss counseling occurred in only half of visits. [34]

Advice alone is not enough.
- It takes more than simple advice to change behaviors. The challenge remains converting awareness into behavior change. [16]
- Simple advice to increase physical activity was not enough to produce long term changes in activity patterns. [35]

Adequacy of Counseling
Counseling is most effective when physicians present counseling as a plan or prescription and follow up with the patient on it.
- Overweight adults who were advised to exercise, and provided a plan, were nearly 5 times as likely to meet physical activity recommendations. [36]
- Patients who recalled being counseled to lose weight were more likely to understand the risks of obesity, the benefits of weight loss, and were at a higher stage of readiness for weight loss. [31]

But when counseling is given, it often does not include a specific plan.
- Only 1 to 5 of every 20 obese patients was given specific fat loss counseling, especially a plan that includes an increase in physical activity. [31,32,37]

Patients want more counseling
Most patients (especially overweight or obese) want more help than they are getting. [38]
- Obese women report much less satisfaction with obesity care than general health care.
- Almost half reported that they had not been given a weight loss strategy, and 3 out of 4 indicated they expected only a "slight amount of help" or "none at all" when it came to weight control. [39]

VI. THE NEED FOR COMPETENCE IN LIFESTYLE MEDICINE

Greater physician competence in lifestyle medicine might carry with it a number of positive downstream effects. It could:

Change the image of lifestyle medicine – a central role in managing chronic disease.
- A culturally competent, patient-centered approach with interventions tailored to each patient's unique medical, psychological, and socio-cultural situation.
- Change the orientation to a chronic care perspective -- a long term, on-going process; the Chronic Care model presents a guide for making this change. [1]
- Treatment plans focused on entire risk factor profile rather than on isolated risk conditions.
- The use of registries, multidisciplinary teams, community outreach, interventions that address care transitions, and telephonic outreach have all been shown to improve the quality of care for conditions such as hypertension, hyperlipidemia, diabetes, and coronary artery disease. [2]

Enable the practitioner to develop a profitable practice using lifestyle medicine for some or all patients.

Increase demand for training in delivering lifestyle interventions.
- The scientific foundation for using diet and lifestyle as a preventive and curative tool.
- Writing lifestyle prescriptions tailored to the unique needs of individual patients and conditions.
- Provide training to address common misconceptions and questions about exercise, diet, weight loss, stress management, sleep and so on.
- Overcome time barriers by providing guidelines for brief consults, such as the use of the 5A protocol. [3]
- The kinds of support, coaching, and education required to affect meaningful patient change can be accomplished in as little as a few minutes per visit. [4-6]
- Address the vital role of negative emotions that undermine changing behaviors and adhering to regimens. [7-13]
- How to assess and address health literacy issues that affect nearly half of U.S. adults. [14]
- Few physicians systematically assess health literacy and psychological co-morbidities. [15-17]

Help overcome clinician biases. [18,19]
- For the clinician: biases against obese, minorities, etc.; misconceptions regarding interventions, patient motivation and ability to change if given the proper program and support, etc.
- Help overcome prevailing cynicism regarding the average patient's readiness and ability to change well established behavior patterns. [20,21]
- Physicians typically more pessimistic, often underestimate patient motivation. [22]

Address patient misconceptions
- Tendency to underrate vulnerability (i.e., optimistic bias) that lowers readiness to change. [23]
- Tendency to overestimate degree of change needed (e.g., amount of weight loss or exercise).
- Emphasize a sense of partnership between clinicians and patients; better relationships and more intensive support helps change patient perceptions. [24]

Promote proven behavior change strategies.
- The art of patient counseling and coaching, the use of motivational interviewing, counseling based on stage of readiness, dealing with barriers, relapses.
- Time, effort and resources necessary for behavior change are often overestimated. [21]
- Physicians' poor self efficacy and lack of training in behavior change has been shown to obstruct the implementation of lifestyle interventions in primary care. [25-29]
- Many studies have reported the lack of preparation and confidence to manage obese patients. [30-33]
- Communication -- how to discuss issues (e.g., weight) in a way that makes patients feel comfortable and increases confidence and motivation to make changes. [34]
- Assessing psychological comorbidities, address health literacy skills, and clarify patient's understanding of messages. [35]
- Re-defining successful outcomes in terms of healthier behaviors. [36]
- Interrupting a "quitting is not an option" attitude in patients, how to use relapses to increase commitment. [4-6]

Increase the use of office systems that integrate lifestyle interventions into routine practice.
- A useful model provides a 4-step plan, beginning with diagnosis and assessment, followed by a series of patient centered counseling sessions in 3-5 minute segments, to guide patients through the behavior change process. [37,38]
- Considerable effort has gone into developing and testing systems that prompt communications, screening, interventions and follow-up to improve the delivery of appropriate counseling. [39,40]
- Develop leadership for integrating these systems in a step by step plan.
- Assessing current practice needs, as well as ongoing needs (e.g., additional training)

- Developing a coordinated care system that involves a team approach, with staff training to carry out interventions.
- Development of patient roadmaps for assessment, monitoring lifestyle changes, facilitating off site care, delivery of tailored advice, follow-up, and linking to support and assistance at home.
- Staff training protocols that support the practice by teaching necessary skills for diet and lifestyle improvement.

Lead to practitioners better informed of the latest guidelines and evidence.
- Keeping up with clinical information on LM is an insurmountable task for the average clinician; evidence is overwhelming. [41]
- Providing continuing education opportunities, such as offered by the ILM to keep abreast of best practices. [http://www.institutelifestylemedicine.net/home.html]

Build stronger ties between physician and community.
- Establishing community partnerships, teams with other health professionals in the community
- Becoming a community advocate for LM
- Linking to community resources and programs to offer additional opportunities to receive support and reinforce healthy lifestyle messages.

Provide a bridge for extending clinical trial findings into every day clinical practice.
- A perception that rigorous studies, e.g. Ornish program, do not reflect real world practice has been cited as part of the resistance to implementing evidence-based strategies. [42-45]
- Provide a foundation for instituting trials in actual practice settings. [46,47]
- Integrating evidence-based lifestyle interventions into individual practices requires a process for incorporating and maintaining the strategies and interventions over time. [38,48,49]

Sets the stage for advocacy, on issues such as reimbursement.
- Lack of reimbursement is a huge barrier. Lifestyle change is a long, time consuming process that is much less likely to happen if services are not reimbursed. [50-52]
- Make behavior change the focus of visits. Relate the lifestyle issue to a specific risk factor or chronic disease. Counseling is more likely to occur when patients make the issue the reason for the visit or explicitly ask for help, OR clinicians view the lifestyle issue (e.g., excess weight) as an exacerbating factor, i.e., "medicalizing" the issue. [53-55]

In order to achieve greater competence among physicians, interested parties must work together to establish a set of competencies against which practitioners of lifestyle medicine can be measured.

VII. ORGANIZATIONS AND INITIATIVES

ORGANIZATIONS INVOLVED IN LIFESTYLE MEDICINE

This list is not meant to be all-encompassing. However it includes organizations' lifestyle medicine-related activities such as quality improvement programs, patient education campaigns, office-level interventions, public awareness campaigns and research to evaluate efficacy of these projects.

American Academy of Family Physicians (AAFP)
http://www.aafp.org/
Physician specialty society representing Family Physicians
Activities include:
- *Americans in Motion*
  - Multifaceted program that encourages increased physical activity
    - Patient educational materials
    - Physician office tools
    - Cluster randomized controlled evaluation trial of AIM's efficacy

American College of Preventive Medicine   46

- In-school educational program
  - *Ask and Act*
    - Comprehensive smoking cessation support program featuring patient and physician tools
  - *Tar Wars*
    - Tobacco-free education program and poster contest targeted at fourth- and fifth-grade students.

American Academy of Pediatrics (AAP)

http://www.aap.org
Physician specialty society representing pediatricians. Activities include:
- The AAP has set a high priority on addressing overweight and obesity among children.
  - Grant programs
    - AAP administers numerous grant programs such as the *Mentorship and Technical Assistance Program*, *Community Access to Child Health*, *Healthy Tomorrows*, and the *Healthy People 2010 Chapter Grant Program*. Many grants have supported nutrition and exercise initiatives to prevent and treat childhood overweight/obesity.
  - Research
    - *Healthy Lifestyles Pilot Study*, designed to evaluate an office-based intervention's efficacy at improving eating and activity patterns and stabilizing weight gain of children at risk for obesity.
    - *Brief Motivational Interviewing to Reduce Body Mass Index*, a 2-year randomized controlled trial to evaluate the efficacy of an intensive counseling program to improve diet and exercise among overweight children
    - *Periodic survey* of clinical practice in overweight/obesity management
  - *Healthy Grandfamilies*
    - AAP serves as consultant on community programs that work with grandparents to reinforce healthy nutrition and physical activity among their grandchildren
- *Children, teens and resiliency*
  - Website provides educational resources for parents and an interactive application that allows teens to design their own stress management plan.

American College of Osteopathic Family Physicians

http://www.acofp.org
Physician professional society representing osteopathic family practitioners
- Based in Arlington Heights, IL

American College of Physicians (ACP)

http://www.acponline.org
Physician specialty society representing internists. Activities include:
- *Diabetes Portal*
  - Online repository of diabetes treatment and prevention resources including those on diet, physical activity and smoking cessation
  - Materials include patient educational materials, workbooks, checklists and physiologic calculators; and Physician Information and Education Resource, a decision support system that provides recommendations on non-Drug therapy.

American College of Preventive Medicine (ACPM)

http://www.acpm.org
Specialty society representing preventive medicine physicians
- *Health and Fitness Institute*
  - Day-long consumer education events designed to promote healthy eating, physical activity and healthy responses to stress.

American Medical Association (AMA)

http://www.ama-assn.org

Physician professional society whose membership includes all physician specialties. The Promoting Healthier Lifestyles initiative comprises related activities.

- *Healthier Life Steps™*
    - *Program promotes healthy behaviors regarding diet, physical activity, alcohol consumption, and tobacco use.*
    - *Features a toolkit with patient assessment questionnaire, action plans, and progress tracking calendars.*
- *Program on Aging and Community Health*
    - *Features office tools to guide physicians and older patients on making lifestyle-related behavioral changes*
- *Roadmaps for Clinical Practice: Assessment and Management of Adult Obesity*
    - *Tools to address obesity including office decision support tools and checklists*
- *Secondhand Smoke Performance Improvement*
    - *Offers grants to practices for implementing Performance Improvement measures to increase* counseling related to second-hand smoke

American Osteopathic Association (AOA)

http://www.osteopathic.org/

Physician professional society of practitioners of osteopathic medicine – a discipline devoted to a "whole person" approach to medical care.

- Founded in 1897, now based in Chicago, IL

American Osteopathic College of Occupational and Preventive Medicine

http://www.aocopm.org/mc/page.do

Physician professional society representing osteopathic occupational and preventive medicine physicians

- Founded 1979 based in Jackson, MI
- Its goal is "to create better understanding of the relationship of health and prevention in regard to the wellness of the population."

American College of Lifestyle Medicine (ACLM)

http://lifestylemedicine.org/

The first national medical specialty society for healthcare professionals who utilize lifestyle interventions as the primary therapeutic tool in the treatment and management of disease.

- Members engaged in practice, teaching, and research on all levels and in various areas of healthcare.
- Seeks to get better, more effective healthcare by developing the emerging medical specialty of Lifestyle Medicine.
- The organization is based at Loma Linda University

American Society of Nutrion (ASN)

http://www.nutrition.org/

Professional society representing nutrition researchers

- Its goals include promoting nutrition research, education and practice.

American College of Sports Medicine (ACSM)

http://www.acsm.org

Interdisciplinary professional society devoted to advancing healthy lifestyles through sports medicine and exercise science.

- World's largest sports medicine and exercise science organization
- Founded in 1954, based in Indianapolis, IN
- *Exercise is Medicine*
    - Initiative that aims to make physical activity a standard part disease prevention and medical care
    - Offers toolkits for providers, fitness professionals, the public, and public service announcement campaigners

Institute of Lifestyle Medicine (ILM)

http://www.institutelifestylemedicine.net/home.html
Mission is to reduce lifestyle-related disease and mortality through physician-directed interventions.
- Part of the Department of Physical Medicine & Rehabilitation at Harvard Medical School
- Has established partnerships with several organizations including the American College of Sports Medicine, WellCoaches, Apollo Hospital Group (WellnessRx), and others.
- Teaches health professionals how to deliver health promotion messages in an effective and efficient manner and how to improve their personal lifestyle choices so that they can be optimally effective role models for their patients.
- Provides educational materials, educational tools, coaching and training services and CME courses
- Consults with major hospitals and corporations providing exercise and wellness prescription tools in clinical settings.

Lifestyle Center of America (LCA)
http://www.lifestylecenter.org
Nonprofit organization that helps diabetes patients with lifestyle interventions involving plant-based nutrition, physical activity, and individualized action plans.
- Founded in 1996 by the nonprofit Ardmore Institute of Health, based in Sulphur, OK
- Activities include multiple patient self-management and empowerment programs including telephone health coaching and a 5-day residential program

Note: Lifestyle Center of America has provided funding for this literature review.

Lifestyle Medicine Association (LMA)
http://lifestylemedicineassociation.com
http://www.lifestylemedicineinitiative.com/partners.php
A national membership organization healthcare professionals and members of the public. Its mission is to advance the field of Lifestyle Medicine and to promote these practices throughout the healthcare system.
- A partnership between SAGE Publications and Dr. James Rippe and his research and clinical organization, Rippe Health.
- Offers a variety of educational opportunities including its journal, the American Journal of Lifestyle Medicine, as well as an annual conference for members.

Rippe Lifestyle Institute (RLI)
http://www.rippehealth.com/rippelifestyle/index.html
http://www.lifestylemedicineinitiative.com/what_is_lifestyle_medicine.php
- Founded with the vision of becoming not only the leading organization performing research but also the leading organization communicating the ways daily lifestyle habits and practices affect health.
- The Lifestyle Medicine Initiative from Rippe Lifestyle Institute offers evidence based protocols and guidelines to assist physicians in the application of Lifestyle Medicine principles into both prevention and management of many of the common chronic conditions seen in a modern medical practice.

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IV. EVIDENCE FOR LIFESTYLE INTERVENTIONS – TREATING CHRONIC DISEASE

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Appendix: Evidence Chart (Added July 24, 2009)

Target patient behaviors	Evidence supports a positive effect on health outcomes																									Evidence supports physicians can affect behavioral changes
	A. Obesity	B. Hypertension	C. Dyslipidemia	D. Impaired Glucose Tolerance Metabolic Syndrome	E. Type 2 Diabetes	F. Cardiovascular Disease	G. Stroke	H. Heart Failure	I. Peripheral Artery Disease	J. Chronic Obstructive Pulmonary Disease	K. Osteoarthritis	L. Rheumatoid arthritis	M. Cancer – All	N. Breast Cancer	Prostate Cancer	O. Osteoporosis	P. Depression	Q. Fibromyalgia	R. Chronic Fatigue Syndrome	S. Type 1 Diabetes	T. Non-alcoholic fatty	U. Multiple Sclerosis	V. Parkinson's	W. Cognitive Impairment /Dementia	X. Chronic Low Back Pain	
Exercise	X	X	O	X	X	X	X	X	X	O	X	O	X	O		X	X	X	O	X	O	O	O	X	X	X[3]
Diet/nutrition	X	X	X	O	X	X					O					O										
Stress reduction		X[1]			O																					
Smoking cessation		O	O			O																				X
Alcohol moderation		X				O																				
Multiple Behaviors	X	X	X	X	X				O	X	O		X	O	O[2]									O		

X = Evidence includes randomized controlled trials support.

O = Evidence is limited to observational studies.

X/O = Evidence based on literature not cited in literature review.

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