Chapter 11: Lifestyle Medicine

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INTRODUCTION

Lifestyle Medicine focuses on empowering people to adopt and sustain healthful habits in order to reach their optimal level of health. The World Health Organization (WHO) defines health as, "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."[1,2] As defined by the Merriam Webster Dictionary, *lifestyle* means "the typical way of life of an individual, group, or culture," and *medicine* means "the science and art dealing with the maintenance of health and the prevention, alleviation, or cure of disease."[3] Together, the two words, *lifestyle medicine*, form a burgeoning domain in healthcare that seeks to not only add years to people's lives, but also life to their years.

The American College of Lifestyle Medicine (ACLM) states, "Lifestyle Medicine is the use of evidence-based lifestyle therapeutic approaches, such as a plant-predominant dietary lifestyle, regular physical activity, adequate sleep, stress management, avoidance of risky substance use, and other non-drug modalities to treat, often reverse, and prevent lifestyle-related, chronic disease."[4] By examining a person's daily activities; how they move, what they eat, when they sleep, how they manage stress, with whom they connect and spend time, and if they abstain from toxic substances (e.g., smoking), a healthcare practitioner is working with a patient's lifestyle to optimize their physical, mental, and social well-being.

Hippocrates expressed some of the main tenets of this field with his words, "Let food be thy medicine and medicine be thy food," "Walking is man's best medicine," and, "If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health."[5] Although the basic principles of lifestyle medicine have been discussed for centuries, their adaptation into a modern medical discipline is relatively new, as the ACLM was founded in 2004, and is actively evolving.

An Evidence-Based Practice

Research published in the past three decades demonstrates the impact that lifestyle practices can have on health with a focus on routine exercise, a healthful diet, not smoking, and maintaining a weight within a healthy BMI range.[6–9] In 1993, a landmark paper in JAMA posited that the "actual," or root causes of death were not the diseases cited on death certificates (e.g., heart disease, cancer, and stroke), but instead the underlying behaviors and exposures largely responsible for the development of these diseases, including smoking, poor diet, lack of physical activity, and excessive alcohol consumption. In fact, the authors estimated that approximately 80% of premature death in the United States was due to poor lifestyle.[6] In 2004, another JAMA review revealed similar results.[10]

The evidence that unhealthy lifestyles not only cause disease but that healthful lifestyles could, in fact, *prevent* disease was demonstrated in Germany, where researchers estimated that 80% of chronic disease could be avoided by (1) not smoking, (2) maintaining a body mass index (BMI) in the healthy range, (3) being physically active, and (4) adhering to a healthful diet consisting of high intake of fruits, vegetables, whole-grain bread, and low consumption of meat.[7] Over the years, research studies have revealed the importance of maintaining a weight within the healthy BMI range,[11] exercising regularly,[12] eating nutritious foods,[13,14] reducing stress,[15,16] not smoking,[17] and cultivating meaningful social connections.[18] It is on the basis of such evidence that healthful lifestyle practices have been equated to "medicine," and a modern medical discipline devoted to their application has developed.

The growing body of research behind lifestyle medicine spans from cell to culture. Understanding how diets influence endothelial cell function,[19] serotonin levels,[20] glucose control,[21] inflammation,[22] prostate cancer,[23] breast cancer,[24] multiple sclerosis,[25] and many other conditions informs how lifestyle medicine practitioners prescribe dietary patterns to patients. Research on exercise describes how it influences myocytes and insulin sensitivity.[21] In addition, research has helped to better understand sleep and its impact on the levels of appetite hormones, including ghrelin and

leptin,[26] how caffeine competes with the same receptor as adenosine which is a natural chemical that helps promote sleep,[27] how blue wavelength light from devices like cell phones, computers, and tablets interrupts the release of melatonin from the pineal gland[28] that can delay the onset of sleep.[29]

Evidential support for lifestyle medicine at the cultural level have been exhibited by the work of the Blue Zones group examining different cultures around the globe that have the highest number of centenarians, such as Okinawa (Japan), Sardinia (Italy), Nicoya (Costa Rica), Icaria (Greece), and among the Seventh-day Adventists in Loma Linda, California,[30] and by migration and community-wide studies, such as the North Karelia Project[31] and Shape Up in Somerville, Massachusetts.[32]

Physician "core competencies" for prescribing lifestyle medicine were introduced in 2010 through a collaboration of ACLM and the American College of Preventive Medicine (ACPM).[33–36] These competencies revolved around five main domains of practice: leadership, knowledge, assessment skills, management skills, and the use of office and community support. These competencies help guide physicians in the capable practice of lifestyle medicine, including understanding the impact that healthful habits can have on the prevention, treatment, and reversal of disease, the importance of practicing these healthful habits themselves, and performing assessments to evaluate the lifestyle "vital signs," such as tobacco use, alcohol consumption, diet, physical activity, body mass index, stress level, sleep, and emotional well-being.

In October 2017, the first Board Examination created and administered by the American Board of Lifestyle Medicine was held to certify physicians and allied healthcare providers in lifestyle medicine. Physicians can be certified as lifestyle medicine physicians and those with PhDs, Masters Degrees, and other allied healthcare providers can be certified as lifestyle medicine specialists. Those who adhere to the tenets of lifestyle medicine and practice them with their patients are generally referred to as lifestyle medicine practitioners, but this does not imply certification in the field. The American Board of Medical Specialties (ABMS) does not offer general certificates or subspecialty certificates in lifestyle medicine,[35] but is a long-term goal for the field.

The interest in lifestyle medicine is international, and there is a Lifestyle Medicine Global Alliance (LMGA) in collaboration with the ACLM.[36] The clinical interest in lifestyle medicine is paralleled with an academic interest. A growing number of medical schools are incorporating lifestyle medicine into their education in a parallel format with lifestyle medicine interest groups (LMIG), elective courses on lifestyle medicine,[37] embedding the lifestyle medicine concepts into current core courses, and offering full core courses on the topic.[38]

Comparing Lifestyle Medicine to Conventional Medicine and Other Areas of Medicine

Lifestyle medicine is different from conventional medicine, in that its core principles and tenets are to use daily healthful habits to prevent, treat, and reverse disease. The field places a unique emphasis on the importance of a healthy lifestyle. Medication is sometimes used by some lifestyle medicine physicians, but the goal is to reduce the amount of medication whenever possible. Lifestyle medicine practitioners use exercise prescriptions, nutrition prescription, sleep prescriptions, stress resiliency prescriptions, and social connection prescriptions. Lifestyle medicine practitioners use exercise, diet, sleep, stress resiliency, social connection, and smoking cessation as methods not just to prevent pathology, but also to treat, and even reverse, diseases such as diabetes, heart disease, and stroke. The evidence of efficacy is discussed in section "Evidence of Efficacy for Lifestyle Medicine." They may also prescribe cessation or modification of substance use. Other nonconventional areas in medicine also use lifestyle as medicine, including integrative medicine, functional medicine, and preventive medicine. What sets lifestyle medicine apart is its devotion to lifestyle as medicine, and its sole focus on it as a specialty. Figure 11-1 demonstrates the differences between these areas.

Figure 11-1

A Venn diagram showing the overlap and distinctions of lifestyle medicine, conventional medicine, preventive medicine, integrative medicine, and functional medicine. Disciplines are characterized by (1) the modalities they include, exclude, and emphasize; (2) their focus on treatment versus prevention and health promotion; and (3) their focus on individual clinical care versus population health.

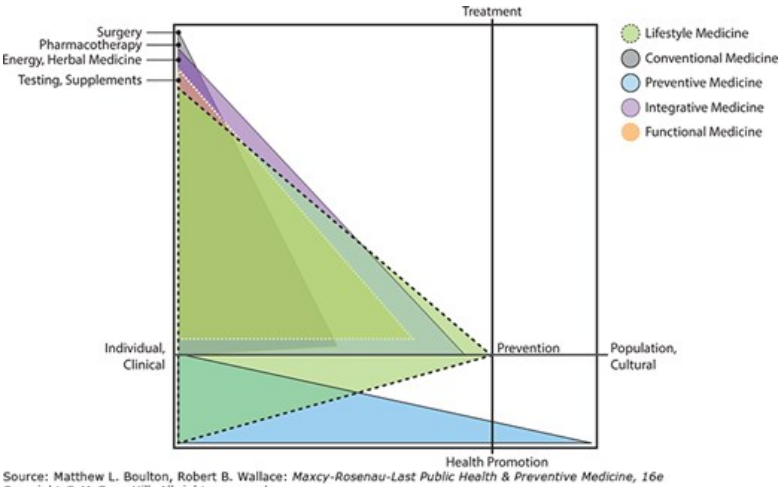
Lifestyle medicine, represented in light green, is unique in its exclusive emphasis of nutrition, exercise, sleep, stress management, social connections, and substance use cessation or modification for clinical benefit. Lifestyle medicine encompasses both treatment and prevention, with a preferential emphasis on individual patient care rather than population health.

Conventional medicine, represented in gray, uses the modalities of lifestyle medicine, but relies preferentially on pharmacotherapy, technology, and surgery to treat patients. The emphasis is on treatment over prevention, and individuals over population health.

Preventive medicine, represented in light blue, uses the modalities of lifestyle medicine and conventional medicine to treat individual patients, but with a primary focus on prevention and health promotion. Preventive medicine is also the only discipline in this group with a major emphasis on population health.

Integrative medicine, represented in purple, uses the modalities of lifestyle and conventional medicine to treat individual patients, and extends to other modalities as well, including but not limited to supplements, herbs, and energy medicine. The discipline extends to prevention, but the primary focus is on treatment of the individual patient.

Functional medicine, represented in brown/orange, uses the modalities of lifestyle and conventional medicine. The preferential focus is on identifying biochemical imbalances through blood, stool, and skin testing and then correcting those imbalances with targeted supplements. The discipline is primarily devoted to treatment rather than prevention, and to individual patient care rather than population health.



Source: Matthew L. Boulton, Robert B. Wallace: *Maxcy-Rosenau-Last Public Health & Preventive Medicine, 16e*

Integrative medicine uses lifestyle counseling when working with patients. The National Institutes of Health (NIH) defines integrative healthcare as bringing "conventional and complementary approaches together in a coordinated way. It emphasizes a holistic, patient-focused approach to healthcare and wellness—often including mental, emotional, functional, spiritual, social, and community aspects—and treating the whole person rather than, for example, one organ system. It aims for well-coordinated care between different providers and institutions."[39] Therapies, not routinely utilized by conventional physicians but used by some integrative medicine practitioners, include acupuncture, Ayurveda, homeopathy, naturopathy, Chinese or Oriental medicine, massage, body movement therapies, Tai Chi, yoga, dietary supplements, herbal therapy, electromagnetic therapy, Reiki, Qigong, meditation, biofeedback, hypnosis, art therapy, dance therapy, music therapy, visualization, and guided imagery.[40] Integrative medicine encompasses most of conventional medicine and adds to it. Surgery is the one area that does not play a large role in routine integrative medicine, although integrative medicine practitioners can be surgeons.

Functional medicine practitioners work with diet, exercise, sleep, stress reduction, and social connection. In addition, they have a focus on key common system pathways from health to disease (e.g., inflammation, oxidative stress); the role of diet, stress, and physical activity; the emerging sciences of genomics, proteomics, and metabolomics; and the effects of environmental toxins (in the air, water, soil, etc.) on health.[41] The use of blood, stool, and skin testing as well as treatment with prescriptive food plans, nutritional supplements, and herbs in addition to lifestyle changes is routine. The focus is on defining the biology and biochemistry of the problem and fixing any imbalance. The emphasis on genomics, proteomics, and metabolomics from preconception through pregnancy and the entire lifespan is a unique feature of functional medicine.

Preventive medicine is described as "focuses on the health of individuals, communities, and defined populations. Its goal is to protect, promote, and maintain health and well-being and to prevent disease, disability, and death."[34]

Preventive medicine has three main areas: aerospace medicine, occupational medicine, and public health and general preventive medicine. Preventive medicine practitioners "combine population-based public health skills with knowledge of primary, secondary, and tertiary prevention-oriented clinical

practice in a wide variety of settings." Preventive medicine physicians use conventional medicines and interventions. However, the focus is on prevention, and lifestyle changes are used routinely as are conventional medicines. There is a greater focus on public health in the practice of preventive medicine than any other area of medicine. Lifestyle medicine also encompasses the area of public health but not to the same extent.

CORE COMPONENTS OF LIFESTYLE MEDICINE

The core components or "six pillars" of lifestyle medicine are typically catalogued as follows: (1) nutrition, (2) exercise, (3) stress, (4) sleep, (5) social connections, and (6) substance use cessation or modification (e.g., tobacco and alcohol). These appear under different but related names; in association with various mnemonics; and with the list slightly expanded through "splitting," or attenuated through "lumping"; the fundamental components, however, are subject to little dissent.

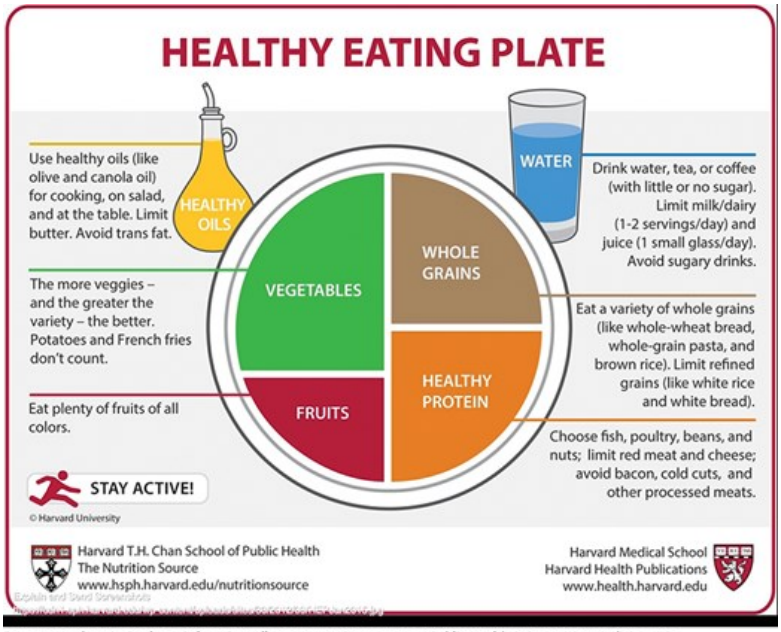
Nutrition

Diet is recognized as one of the leading contributors to chronic disease and premature death in the United States.[42] Poor diet is estimated to cause approximately 678,000 deaths every year, because of the significant role nutrition plays in heart disease, cancer, and type 2 diabetes.[43]

The most recent dietary guidelines for Americans focus on a healthy eating pattern that consists of a variety of nutrient dense whole foods including vegetables from all subgroups, legumes, fruits, whole grains, and a variety of protein foods.[44] In plate form (i.e., MyPlate), the recommendations emphasize 50% of the plate be vegetables and fruit, while 75–100% of the plate be whole, plant-based foods, depending on how healthy proteins are varied. Similarly, the Harvard Healthy Plate created by nutrition experts at the Harvard School of Health (Fig. 11-2) also emphasizes that plant-based choices make up at least three quarters of the plate.[45] The mechanisms of the healthful benefits of whole plants are likely diverse, and relate, in part, to the rich array of nutrient compounds native to plants, such as phytonutrients and antioxidants,[46–51] fiber content, volume, satiation, and the displacement of alternatives from the diet, including highly processed foods made from plants, and animal foods.

Figure 11-2

Harvard Healthy Eating Plate. (*Source*: Used with permission from Harvard University. Copyright © 2011 Harvard University. For more information about The Healthy Eating Plate, please see The Nutrition Source, Department of Nutrition, Harvard T.H. Chan School of Public Health, thenutritionsource.org, and Harvard Health Publications, health.harvard.edu.)



Source: Matthew L. Boulton, Robert B. Wallace: *Maxcy-Rosenau-Last Public Health & Preventive Medicine, 16e*

When the major diets (Table 11-1), including the low carb, low fat/vegetarian/vegan, low glycemic, Mediterranean, mixed/balanced diets, and

Paleolithic, were compared, and the healthy components were identified and compared, more similarities among them than differences were found.[52] For example, they all limited refined starches, added sugars, processed foods, and certain fats including trans fats, while emphasizing whole, plant foods with or without lean meats, fish, poultry, or seafood. In addition, a diet rich in vegetables, fruit, and other whole, plant foods has been recommended for its potential environmental impacts.[53]

TABLE 11-1

BASIC VARIETIES OF DIETARY PATTERNS, PROPOSED HEALTH BENEFITS, AND THEIR COMPATIBLE ELEMENTS

Diet	Description[a]	Health Benefits Relate to:
DASH[b]	Focus is on lowering blood pressure. Includes vegetables, fruits, whole grains, nuts/seeds, legumes, mostly nonfat dairy products, lean meats, poultry and fish, nontropical vegetable oils, and low-sodium foods.	Whole plant foods; low-sodium foods; low-fat dairy
Flexitarian	Focus is on allowing for a varied, "flexible" diet plan. Mostly a whole food, vegetarian diet that sometimes includes meat, fish, and/or poultry.	Whole plant foods
Low carb	Focus is on the restriction of total carbohydrate intake from all sources below some threshold (e.g., 45% of daily calories). Includes lean meats, poultry, seafood, eggs, mostly nonstarchy vegetables, whole fruits, nuts and seeds, variety of fats, with or without dairy/nondairy products. Limits grains, legumes, and added sugars.	Whole plant foods; avoids refined starches and added sugars
Low fat	Focus is on the restriction of total fat intake from all sources below some threshold (e.g., 20% of daily calories). Includes lean meats, poultry and fish, fruits and vegetables, grains, legumes, and low-fat dairy products. May include limited amounts of nuts, seeds, nut butters, olives, avocado, cooking oils, fatty fish, and eggs.	Whole plant foods; avoids harmful fats
Mediterranean	Focus is on mimicking the common themes of the traditional dietary pattern that prevails in Mediterranean countries. Includes vegetables, fruits, nuts and seeds, whole grains, legumes, low-fat dairy products, seafood and lean poultry. Emphasis on olive oil, herbs, spices, and red wine (in moderation).	Whole plant foods; emphasis on healthful fats (monounsaturates)
Ornish[c]	Focus is on a whole, plant-based, limited sugar, and low-fat approach derived from prior research with heart disease reversal. Includes vegetables, fruits, whole grains, legumes, nonfat dairy products, egg whites, and limited nuts and seeds.	Whole plant foods; avoids harmful fats
Paleo	Focus is on emulating the dietary pattern of our Stone Age ancestors. Includes a variety of meats (e.g., grass-fed, game), wild fish and seafood, free-range eggs, whole fruits and vegetables, nuts and seeds, with or without nondairy milk. Limits legumes, grains, dairy products, refined sugars, added salt, and processed foods.	Whole plant foods; minimizes processed foods; free range meats
Pescatarian	Focus is on healthy whole food diet that includes seafood (fin fish and shellfish), vegetables, fruits, grains, legumes, nuts, seeds, dairy products, and eggs. May include highly processed dairy and plant-based foods. Excludes all other animal products.	Whole plant foods; avoids harmful fats
Vegan	Focus is on 100% plant-based foods, and excluding all animal products. Includes vegetables, fruits, grains, legumes, nuts, and seeds.	Whole plant foods; avoids harmful fats

Vegetarian	Focus is on healthy whole food diet that includes vegetables, fruits, grains, legumes, nuts, seeds, dairy products, and eggs.	Whole plant foods; avoids harmful fats
	Excludes all other animal products.	
Whole food Plant based	Focus is on consuming only whole foods, from nature. A subtype of a vegan diet that includes vegetables, fruits, intact whole grains, nuts, seeds, and legumes, with minimal processed foods. Excludes added oils, sugars, or concentrated fats.	Whole plant foods; avoids harmful fats; minimizes processed foods; avoids refined starches and added sugars
Compatible Elements		
Limited refined starches, added sugars, processed foods; limited intake of certain fats; emphasis on whole plant foods, with or without lean meats, fish, poultry, and seafood.		

[a]Descriptions emphasize a balanced, healthful version of each diet, and are not meant to accommodate all possible healthy or unhealthy variations of each diet.

[b]Dietary Approaches to Stop Hypertension.

[c]Ornish Plan for Reversing Heart Disease.

Sources: Katz & Meller, 2014; Diet ID, Inc (dietid.com).

Lifestyle medicine practitioners seek to empower patients to adopt a whole foods plant-based diet. In many cases, they need to work with patients to transition them away from the Standard American Diet (SAD) of processed foods and limited whole foods,[54] to a prescription that has been summarized as, "Eat food [whole food], not too much, mostly plants."[55] Moving people closer to the dietary pattern that is best for health takes time and collaboration with the patient.[56] With some patients, the lifestyle medicine practitioner might refer the patient to a licensed nutrition professional for more in-depth analysis and counseling about dietary patterns.

Exercise

Physical activity has been shown to lower blood pressure, help control blood sugars, control weight, help prevent obesity, and help prevent bone loss.[57] In addition, there is evidence that it can improve sleep, reduce stress, and increase endurance, energy, and stamina.[58] Physical activity guidelines have been established for aerobic activity, strength training, flexibility, and balance training.

For aerobic activity, the United States Health and Human Services Department (USHHS) recommends accumulating at least 150 minutes of moderate-intensity physical activity per week, and/or at least 75 minutes of vigorous-intensity physical activity, with the goal of reaching 300 minutes of moderate-intensity or 150 minutes of vigorous-intensity physical activity per week.[59] Increased fitness levels in middle-age are associated with lower risk for morbidity and mortality.[60] At the cellular level, aerobic activity has been shown to promote a positive effect on oxidative stress, if performed at least three times a week for ≥2 months.[48] In terms of benefits to the brain, routine aerobic activity has been shown to increase the volume of the hippocampus, which is the area of the limbic system in the brain that is intricately involved with consolidating memory.[61]

The United States Health and Human Services Department recommends strength training twice a week on nonconsecutive days. Since adults begin to lose muscle mass at age 30, approximately 3–5% per decade, it is essential that patients work strength training into their routine as early as possible.[62] If they do not do so, then by age 50, some patients might lose 10% of their muscle mass.

Flexibility is critical for maintaining the full range of motion around the joints and for avoiding injury. Stretching is recommended to be performed when the muscles are warm, in a period of at least 5–10 minutes. Both *static* stretching, held for 30–60 seconds per stretch[63] and *dynamic* stretching can be a part of a healthy activity prescription.

Balance exercises are recommended to help people function optimally, avoid falls, and prevent injury, especially in the elderly. The recommendations are to perform balance training three times a week for 20- to 30-minute sessions.[64,65] Exercises that incorporate balance training include Tai Chi, yoga, or work with equipment that challenges stability such as a balance and stability board or Bosu ball.

Lifestyle medicine practitioners might write a specific physical activity plan or exercise prescription for the patient to achieve various health outcomes, or refer the patient to an exercise physiologist, disease- or disability-specific exercise specialist (e.g., cancer exercise specialist, adapted exercise specialist), physical therapist, or fitness professional for more detailed prescriptions and/or one-on-one training. Patients are encouraged to check with their primary care physician prior to engaging in any new physical activity or exercise routine.

Stress

Lifestyle medicine practitioners work with patients to help them better manage stress. Too much stress leads to physical and emotional complaints. It is estimated that 60–80% of visits to medical doctors are stress related.[66] Excessive stress is associated with many different medical conditions, including obesity,[67] heart disease and elevated blood pressure,[68] depression and anxiety,[69] thyroid dysfunction and lower immune function,[70] decreased bone density,[71] disrupted sleep,[72] and impaired wound healing.[73] Research demonstrates that chronic stress can have a negative impact on the brain, specifically the hippocampus.[74]

Some stress that is manageable may increase productivity and create the state of flow, defined as "being completely involved in an activity for its own sake. The ego falls away. Time flies. Every action, movement, and thought follows inevitably from the previous one, like playing jazz. Your whole being is involved, and you're using your skills to the utmost."[75] To be in flow, a person's skill level must meet the challenge at hand. There is some stress leading to flow. It is eustress defined as "a positive form of stress having a beneficial effect on health, motivation, performance, and emotional well-being."[3] Eustress may occur when there is a job to complete or a deadline to meet. When the challenge is too great for a person's skill level, they can experience anxiety and experience increased stress or even distress. Distress is defined as "pain or suffering affecting the body, a bodily part, or the mind."[3] If the challenge is too simple, they can experience boredom. Knowing how to match a task to a person's skill level will allow people to experience more flow. People who experience flow more often may have a greater sense of fulfillment and satisfaction.[76,77] Lifestyle medicine practitioners work with patients to help them achieve flow and avoid distress.

Stress resiliency techniques, including the relaxation response,[78] mindfulness-based stress reduction (MBSR)[79] meditation, and deep breathing, can all help to reduce the sympathetic response and increase the parasympathetic response, allowing for relaxation.[80] Also, other theoretical approaches can be employed, such as training in productive appraisals of stressors (e.g., cognitive flexibility, positive reframing), as well as improving both emotional and problem-focused forms of coping with stress.[81] Each patient requires a different approach depending on their situation. In some cases, the lifestyle medicine practitioner may recommend local classes for meditation, relaxation, MBSR, or yoga for patients to attend on their own, and in other cases they may refer the patient to a social worker, therapist, psychologist, or psychiatrist for individual work.

Sleep

The National Sleep Foundation recommends 7–9 hours of sleep per night for adults. It is estimated that one-third of the population gets less than the recommended amount of sleep.[82] A systematic review and meta-analysis of 16 prospective studies suggests that sleeping less than 6–8 hours a night is associated with approximately a 12% increase in their risk of premature death.[83] Lack of sleep is associated with depression, anxiety, heart disease, stroke, metabolic dysfunction, impaired immunity, substance use, decreased cognition, decreased performance and decreased memory, impaired decision making, fatigue, work-related accidents, suicide risk, and car accidents.[84] Behavioral determinants for poor sleep include shift work, travel to a new time zone, and simply skimping on sleep by going to bed too late. Different sleep disorders can include circadian rhythm disorders, sleep apnea, insomnia, and restless leg syndrome.

Routine practices that help people get sound sleep include going to bed and waking up at the same time each day, reserving the bedroom for sleep and sex only, keeping the temperature in the bedroom cool in the range of 60–70 degrees, and keeping the bedroom quiet and completely dark.[85,86] One of the signals for sleep is a drop in core body temperature. Thus, keeping the bedroom cool helps as does wearing socks at bedtime, which will allow for peripheral vasodilation.[87–89] Another signal for sleep is the release of melatonin from the pineal gland in the brain. Blue wavelength light interferes

with the release of melatonin,[90,91] and electronic devices emit this spectrum of light. Thus, it is recommended that patients turn off all screens including computer, tablet, phone, and television at least 1 hour prior to bedtime.[92] If people need to use an electrical device, there are apps that can diminish the emission of blue light. Other lifestyle tips for good sleep are to avoid alcohol before bed. Alcohol may aid in the initiation of sleep, but it can disrupt sleep and lead to poor-quality sleep.[93,94] Another chemical that disrupts sleep is caffeine. Coffee, tea, diet sodas, chocolate, and some medications have caffeine in them. Caffeine competes with the same receptor as adenosine. Adenosine builds up throughout the day, and high levels are a signal for sleep. This signal is transmitted when adenosine binds with its receptor. When caffeine binds to the same receptor, there is an opposite effect, because the adrenal glands receive the signal to release adrenaline to "rev up" the sympathetic system.[95] Since the half-life for caffeine is about 5 hours, the recommendations are to limit the intake of caffeine to the morning and avoid it after 12 o'clock pm.[95]

A lifestyle medicine practitioner assesses patients' sleep by asking them routine questions like time of sleep and time of awakening, requesting they fill out a sleep log that tracks the number of hours they sleep, how they feel when they wake up. Adjustments in lifestyle can often cure sleep problems. However, a sleep specialist can help identify the specific sleep condition a patient is experiencing, and help find successful strategies to address the problem. For example, restless leg syndrome may require a neurological workup (NIH, RLS) and snoring might be caused by sleep apnea, which is a risk factor for stroke and requires specific interventions like a continuous positive airway pressure (CPAP) machine.[96] The lifestyle medicine practitioner needs to have a deep understanding of sleep, be able to perform a routine sleep evaluation, and know when to send the patient elsewhere for further evaluation.

Social Connections

Social connections constitute the fifth pillar of lifestyle medicine. Maslow's Hierarchy of Needs reveals love and a sense of belongingness are key needs for humans to satisfy. Absence of a feeling of connection can lead to isolation and loneliness. *Loneliness* is a risk factor for increased morbidity and mortality, and an independent risk factor for heart disease.[97] It is defined as, "the discrepancy between a person's desired and actual social relationships."[98] In contrast to *isolation*, which is a measure of one's lack of social connections/interactions, loneliness is an emotional response to social isolation.[98]

One of the first studies to examine impact of social connections on rate of death was completed in 1979.[99] Researchers used the 1965 Human Population Laboratory survey of a random sample of 6928 adults in Alameda County, California and then examined mortality rates at a 9-year follow-up. They found that people with the highest number of connections were the least likely to die of any cause in the 9-year span of the study. Calculating mortality risk in a community and correlating it to level of social engagement in 10,720 subjects who were patients in 53 family practices in the United Kingdom revealed that mortality risk was greater in the medium and low social engagement groups than it was in those with the highest level of social engagement.[100] Low social connectivity is associated with development and progression of cardiovascular disease, recurrent heart attack, atherosclerosis, high blood pressure, cancer, delayed cancer recovery, and slower wound healing.[18] It is not just the number, but also the quality of these connections that matters. In a meta-analysis of 148 studies, including 308,849 participants, the results indicated that there was a 50% increased likelihood of survival for participants with stronger social relationships.[101]

High-quality connections are defined as relationships that are mutually supportive and have emotional carrying capacity, can handle the expression of both positive and negative emotions, and involve people who feel comfortable expressing themselves.[102] These types of relationships are resilient, and if there is a disagreement or problem they can learn and grow from them.

Lifestyle medicine practitioners work to identify those patients who are experiencing loneliness by asking open-ended questions and creating a strong sense of connection that allows for open communication between practitioner and patient. Also, they can help patients identify opportunities to make connections as well as identify ways to cultivate high-quality connections.

Substance Abuse

Substance use and the area of addictions is its own specialty in medicine; however, lifestyle medicine practitioners need to be familiar with the diagnosis and treatment of substance use disorders. Smoking and alcohol are the areas where the lifestyle medicine practitioner will most likely be involved with counseling, provided that alcohol consumption is part of diet and lifestyle, and smoking is a lifestyle practice, albeit an unhealthful one. Counseling patients in these areas relies heavily on motivational interviewing (MI) and behavior change techniques, which are discussed later in the

chapter (see section “Lifestyle in Medicine Limitations”).

Research on the Mediterranean diet indicates that some alcohol can be cardioprotective,[103] and The American Heart Association (AHA) recommends limiting alcohol to one serving a night for women and two for men.[104] One drink is considered 12 ounces of beer, 5 ounces of wine, and 1.5 ounces of distilled spirits.[105] Serving sizes are reviewed with patients for a basic understanding of the recommendations, since restaurants and bars do not often comply with these guidelines. The AHA and the Center for Disease Control both recommend, “If you don’t drink, don’t start,”[82,104] due to the risk of alcohol use disorder. If cancer prevention is the goal, then abstaining from alcohol is the recommendation.[106]

Lifestyle medicine practitioners routinely ask patients about smoking and alcohol use, and identifying difficulty with these substances is an important part of the practice. They counsel patients on smoking cessation, using alcohol in moderation or alcohol cessation. Some patients will require a referral to an addictions specialist, an alcohol rehabilitation center, or other organizations specializing in treatment of addictions like Alcoholics Anonymous. The holistic focus of lifestyle medicine is germane to the opioid crisis salient in the United States as this is being written,[107] as the dangers of opioid addiction warrant an urgent response that should not involve the neglect of pain.[108,109]

EVIDENCE OF EFFICACY FOR LIFESTYLE MEDICINE

This section highlights the evidence that provides a foundation for lifestyle *in* medicine (clinical models of care) and lifestyle *as* medicine (cultural models). More in-depth reviews of the evidence can be found elsewhere.[110]

Lifestyle *in* Medicine

Cardiovascular Disease

While the role of healthy lifestyles in the *prevention* of cardiovascular disease and mortality is promoted through current physical activity and dietary recommendations, public health and medical practitioners might be less aware of the role of lifestyle medicine in the *treatment* and possible *reversal* of cardiovascular disease. To highlight, the Lifestyle Heart Trial was an early catalyst for the heightened attention to the ability of comprehensive lifestyle changes (low-fat vegetarian diet, no smoking, stress management, moderate exercise) to promote the regression of severe coronary atherosclerosis (i.e., heart disease reversal) within 1 year, without the use of lipid-lowering drugs.[111]

Researchers utilizing a very low-fat, plant-based diet in combination with cholesterol-lowering drugs were able to clinically arrest or “reverse” coronary artery disease in patients with severe coronary artery disease.[112] The original cohort was followed for 12 years (1 woman, 23 men), being asked to maintain the plant-based diet and individualized cholesterol-lowering medication. By 1998, 6 nonadherent patients had sustained 13 new cardiac events, while 11 of the adherent patients experienced angiographic confirmation of disease arrest and regression, no coronary events or interventions.[113]

On a larger scale, the Lyon Diet Heart Study was a randomized controlled trial (RCT) that tested the effectiveness of a Mediterranean-type diet on composite measures of coronary recurrence rate after a first myocardial infarction in free-living participants.[114] After 46 months, those following the Mediterranean-style diet had a 50–70% lower risk of recurrent heart disease, including cardiac death and nonfatal heart attacks, angina, stroke, heart failure, and pulmonary embolism.

While current evidence supports the use of lifestyle in prevention, treatment, and possible reversal of cardiovascular disease, especially as Centers for Medicare and Medicaid Services now cover intensive lifestyle therapies as an alternative to coronary artery bypass grafting (CABG). The evidence also highlights the need for more research, including RCTs, on optimal intensity, duration, mode, and long-term follow-up, alongside innovations of measurement and intervention.[115–117]

Type 2 Diabetes

Lifestyle interventions have support for both the prevention and treatment of type 2 diabetes, including physical activity and various dietary patterns (e.g., Mediterranean-type, vegetarian, vegan).[118] The evidence is strong enough, at present, for promotion of lifestyle change as standard for medical

care for diabetes.[119]

A landmark RCT from the Diabetes Prevention Program Research Group compared a lifestyle-modification intervention (healthy low-calorie, low-fat diet, moderate-intensity physical activity, behavior modification education) to a Metformin prescription group and placebo group in over 3000 nondiabetic persons from 1996 to 2001. The results suggest that the lifestyle intervention was more effective than Metformin in reducing the incidence of diabetes after 4 years.[120]

For treatment (beyond self-management), the evidence is weaker than that for prevention of type 2 diabetes. However, it is interesting to note that lifestyle, particularly dietary modification, was the primary therapy for diabetes before exogenous insulin became available. There is now evidence to suggest a possibility of type 2 diabetes remission. A 4-year RCT found an intensive lifestyle intervention to be associated with a partial remission of diabetes, compared to a control group who received diabetes support and education.[121] While more research is needed, it is an exciting possibility that the traditional concern of irreversibility of insulin-dependent diabetes mellitus could be challenged with intensive lifestyle interventions.

Stroke

Evidence from scientific reviews of multiple research designs have highlighted the association of lifestyle behaviors, including a healthy diet, not smoking, and an active lifestyle with the reduced risk of stroke, dementia, and cognitive decline.[122–124] In a prospective study, nearly 50% of all stroke cases and 54% of ischemic stroke cases were attributable to low-risk lifestyle, including not smoking, a healthy weight, modest alcohol consumption, achieving moderate physical activity, and a healthy diet score.[125] These same modifiable lifestyle predictors were compiled into quintiles of a "Healthy Heart Score," finding that poorer scores were related with a 2.9-fold higher risk of total mortality from cardiovascular disease, including a greater risk of death due to stroke.[126]

From a treatment perspective, prospective trials and RCTs have found an important role of lifestyle interventions on secondary stroke prevention, while also highlighting the need for emphasis on longer interventions that target multiple behavior change techniques.[115,127,128] Evidence also supports the use of physical activity, exercise, and nutrition for enhanced physical and cognitive benefits during stroke recovery, as well as unique challenges of adopting lifestyle changes.[129]

Cancer

Observable cancer risk cannot be sufficiently accounted for by accumulation of intrinsic processes, such as rates of endogenous mutation, being heavily influenced by extrinsic factors.[130] Over 40% of both the incidence of and deaths from cancer have been attributed to modifiable risk factors, including cigarette smoking, excess body weight, alcohol intake, consumption of red and processed meat, low consumption of fruits and vegetables, dietary fiber and dietary calcium, physical inactivity, ultraviolet radiation, and cancer-related infections.[131–133] As a result, the American Cancer Society (ACS) and the American Institute for Cancer Research (AICR) support lifestyle recommendations for cancer prevention.[134,135]

Modifiable lifestyle factors have also been implicated in the survivorship and treatment of cancer. For survivorship, the ACS provides lifestyle changes, highlighted by healthy nutrition and physical activity.[136] The efficacy of physical activity, especially aerobic exercise, is positive on the progression of cancer; however, considerable methodological heterogeneity precludes meaningful conclusions at this time.[137] Advantages of lifestyle modification following treatment have also been implicated across bladder,[138] breast,[139] colon,[140,141] and prostate cancers.[142,143] For possible cancer reversal, low-risk prostate cancer patients receiving comprehensive lifestyle changes have exhibited reduced PSA levels, cancer cell growth, and need for conventional cancer treatment, alongside increased relative telomere length within 5 years.[142–144] Like type 2 diabetes, the possibility of cancer reversal provides an exciting new frontier for future research, exhibited by advancements in epigenetics.[145]

LIFESTYLE *IN* MEDICINE LIMITATIONS

Despite the growing evidence, the best practices for clinical implementation strategies are unknown, which highlight methodological difficulties in lifestyle medicine research. There is the general concern that RCTs, the "gold standard," are incapable, ethically at least, to test how lifestyle behaviors influence morbidity and mortality.[146] While RCTs often can be applied to lifestyle medicine, they cannot be the source of information about lifetime

effects on longevity and vitality. Lifestyle medicine calls for advances in evidence gathering. In response, at the writing of this chapter, a taskforce is underway to develop an easy, more effective tool for evaluating the evidence related to lifestyle medicine clinical questions, called Hierarchies of Evidence Applied to Lifestyle Medicine.[147]

As with any medication prescription, dose-response should also be considered. A strong dose-response effect has been found with physical activity, or perhaps more appropriately "physical fitness," where plateauing increases in activity volume and fitness produce increased reduction in mortality risk.[148–151] Any lifestyle intervention will presumably produce a similar dose-response effect. For example, can one conclude that three, individualized lifestyle counseling session of 15–45 minutes each, spread over the first 3 years of a 10-year study period is enough to produce a change in healthy lifestyles to the point of reducing risk and incidence of a chronic disease?[152] Studies of lifestyle interventions in clinical practice settings can lead to negative outcomes for doing too little. By way of analogy, a study of parachutes would prove them ineffective if the parachutes were too small to slow a free-fall, or deployed too late.[153] That would not disprove the utility of parachutes; it would only disprove the utility of inadequate parachutes.

Intensive therapeutic lifestyle change programs, such as the Lifestyle Heart Trial[154] and the Comprehensive Health Improvement Program,[155] can provide insight for clinical models, including dose-response and successful intervention qualities, alongside methodological difficulties that are applicable to all lifestyle intervention research. Dietary intake, for instance, is a well-known challenge, with measures of self-report serving as a convenient proxy for the costly inconvenience of metabolic ward studies. Physical activity levels and sleep are easier to measure objectively but still can contribute to substantial measurement error. Assessing the number and quality of social connections relies on the patient's opinion and self-reporting, which has its limitations as a research tool due to social desirability bias, misinterpretation of questions, recall bias, and limited responses, which can encourage participants to select an answer even if it might not accurately reflect their situation.[156]

Currently, the clinical setting is not optimally designed to support the multifactorial and synergistic practice of lifestyle medicine, as shared within a similar set of issues and concerns for lifestyle interventions in the workplace.[157] There are also concerns of practitioner competencies,[33,158] practice constraints (e.g., billing/reimbursement models, shared medical appointments, time to consult with patients, etc.), lack of patient referral options or practices, patient follow-up, and patient-provider interaction characteristics that influence patient adoption of lifestyle prescriptions (e.g., message framing, stigmatization, medical triggers, barriers to lifestyle prescriptions, practitioner's own health and lifestyle choices, etc.). These concerns must be elucidated to better understand the shortcomings of lifestyle medicine interventions in the clinical setting, and to establish models of best practice.

These challenges are greatly compounded by modern cultures that conspire directly against the lifestyle medicine guidance a clinician may provide. Counseling about physical activity is confronted by a world of labor-saving technologies right outside the clinic door. Counseling about diet is even more emphatically undermined by the ubiquity of fast-food outlets and the aggressive marketing of food all but engineered to undermine clinical goals.[159] Hectic schedules and stress conspire against recommendation for both stress management and sleep. The notion that clinical counseling might overcome direct confrontations with cultural defaults is at best an unconfirmed hypothesis, and at worst—not merely unproved, but also unlikely.

These difficulties should not preclude innovations and adaptations to clinical practice, however, as clinicians have an opportunity both to (a) compensate to the extent possible for toxic effects of cultural defaults and (b) to lead and champion efforts to change those defaults. Structures supportive of these roles include alternative fee and/or reimbursement models, new tools for assessing and prescribing lifestyle medicine, team-based approaches, and other tools to deliver lifestyle medicine digitally. The goal, in the end, is to make the clinical setting optimally effective at delivering lifestyle medicine, and thus maximize its contributions.

LIFESTYLE *AS* MEDICINE

Despite any advances in the clinical concept that lifestyle *is* medicine, there will be limitations of a clinical remedy for a cultural malady. The current progression of culture and society that encourages people to be sedentary and eat poorly provides an unreasonable task for clinical interventions, alone, to solve.

Thus, consideration can be made for the "lifestyle *as* medicine" approach, emphasizing the environmental accessibility and cultural influence on lifestyles that either increase or decrease the risk of disease, as illustrated by the Blue Zone Project,[160] North Karelia Project,[161] Stanford 5 City Project,[162,163] and Shape Up Somerville.[164] These efforts might be the most conducive for larger public health impact than clinical interventions alone.

Such approaches will not be without challenges, encouraging people to navigate physical and social environments, tradition, public policy, industry, and media. However, these challenges provide an opportunity to inspire innovation for cooperative effort (e.g., True Health Initiative, One Health, Cooperative Extension), alongside future solutions for cultural influence and change.[165] Until or unless culture promotes health, there is a lot more work for clinicians to do. By guiding people to healthful choices, clinicians raise awareness and pave the way for culture-wide change. Over time, there could (and should) be a shift from a clinical emphasis that is directed at overcoming and changing cultural obstacles, to a cultural emphasis, where the defaults become health-promoting.

IMPLEMENTATION OF LIFESTYLE MEDICINE

Individual Care

The Patient

With any medication, there is the concern of adherence. This concern in lifestyle medicine is perhaps more pronounced, due to the complexities of adopting behaviors required to precipitate the prevention, treatment, and reversal of disease.[166,167] For example, the European Potsdam Study found achieving four healthy lifestyle factors (not smoking; BMI < 30 kg/m^2; ≥ 3.5 hours/week of physical activity; adherence to a diet high in fruits, vegetables, and whole grain, and low meat consumption) had nearly an 80% lower risk of developing a chronic disease.[168] However, only 9% of these participants achieved all four factors, while only 3% of Americans were estimated to achieve four similar factors.[169]

With the vast literature on factors that influence health behavior initiation and maintenance, the present review will focus on common settings for lifestyle medicine (e.g., primary care). More specifically, the patient, with consideration for any healthy lifestyle change, engages a "patient path" that is initiated with a triggering event (e.g., screening, diagnosis), followed by an individualized response or reaction, and then a level of engagement in a behavior change process to stay in line with a lifestyle medicine prescription.

The Trigger

Screenings and/or diagnoses in primary care, public health, and fitness settings are aimed at providing awareness and motivation for change in behavior. According to the Feedback-Processing Model of Self-Regulation, a desire to change is initiated with a perceived discrepancy about oneself in relation to a standard or goal.[170] For example, during a body weight screening, a patient finds she weighs more than an ideal body weight. The perceived discrepancy can act as "trigger" or spark for efforts to reduce the discrepancy. Much of the research in this area has focused on weight control, revealing that the response to the triggering experience is complex; able to enhance motivation for a myriad of reasons, from appearance to health risk (i.e., medical trigger),[171–174] or diminish motivation and inspire avoidance.[175–180] For example, being diagnosed as overweight, told to lose weight, or even being weighed is a self-reported reason for avoiding healthcare and other medical triggers, such as cancer screenings.[181–183]

The Response

Medical triggers are not benign in their impact on patient experience, suggesting that an emotional response from the patient provides a glimpse into a theorized level of effort to initiate change,[170] as well as behavioral choices to cope or "deal with" the experience.[180,184] The motivational response is similarly complex, so the inclination to dichotomize patients as motivated or not can mask a more comprehensive understanding. It is possible that certain types of motivation are more beneficial for sustainable lifestyle change, especially those that emphasize autonomy or *self*-determined sources of motivation versus *other*-determined sources (e.g., motivated due to pressure from the practitioner).[185–188]

Motivation, itself, is influenced by other factors. For example, a patient's attitude about a behavior, subjective norms of those most important to the patient, and perception of behavioral control can influence one's intention to change.[189] There is possibility that patients' progress or digress (i.e., relapse) through "stages of change," all of which vary in their presumption of motivation, as well as the tactics to influence movement through the stages (i.e., processes of change).[190] Such theoretical perspectives, which are foundational to public health, can be also utilized in lifestyle medicine contexts, or combined to create novel approaches to clinical care (e.g., The Pressure System Model).[191]

The Process

Patients must then enact the process of monitoring and changing their behavior to stay in line with a lifestyle medicine prescription (i.e., self-regulation). For example, a patient discovers he is diabetic, is frustrated, thus motivated to reduce blood sugar via a prescribed diet. However, he quickly realizes the complexities of monitoring and changing his dietary behavior, alongside the social and physical environments that tempt and test inadequacies in his self-regulatory abilities, such as awareness, self-control, self-confidence, goal shaping, cognitive flexibility, transcendence, and planning skills, leading to self-regulatory failure.[166,167,192–196] Early in the change process, living within an environment that works against health, as we experience today, mandates the patient garner and maintain self-regulatory proficiency, while the environment that encourages health allows the dependence on self-regulation to wane. Thus, efforts to improve the "patient path" for behavior change must align with systemic and cultural changes, alongside a team care approach to positively influence medication adherence, when lifestyle is the medicine.

The Practitioner

Lifestyle medicine practitioners can employ a number of approaches to help patients in their behavior change process. On one end of the spectrum, the practitioner can simply provide awareness and advice on lifestyle change. On the other end, the practitioner can engage in individualized prescriptions, counseling, and health and wellness coaching, aimed at "self-directed, lasting changes, aligned with their values, which promote health and wellness and, thereby, enhance well-being."[197] The practitioner can also function as a change agent at the community and cultural level, advocating for systemic modifications that enable the adoption of lifestyle as medicine.[198]

There are randomized controlled, prospective, retrospective, and qualitative research studies that demonstrate the value of health and wellness coaching for behavior change.[199,200] Common coaching strategies include helping the patient set goals, creating a mechanism for accountability, educating the patient in areas of importance and interest to the particular patient, and encouraging self-discovery.[201] When lifestyle medicine practitioners are using the coach approach, they are focused on sharing information that is appropriate for the patient, listening to more than the patient's words, including listening to body language, tone of voice, and facial expressions, asking open-ended questions which allow the patient to share important information as well as potentially uncover obstacles and motivators for change, and allowing the patient to find their own answers to problems that are getting in the way of their progress.[200]

Most lifestyle medicine practitioners who are physicians, nurses, and other allied healthcare providers are accustomed to being the experts, as they are trained to diagnose and treat medical problems. They are used to telling patients what to do, as they are the experts in medical diagnosis and treatment. With behavior change, the patient is the expert in his or her own life and lifestyle: knowing what has worked in the past, knowing the obstacles in the way, and understanding the motivations for change. In this way, the lifestyle medicine practitioner needs to be more like a coach and let the patient be the expert. In many cases, the practitioner learns important information by asking specific questions, which elucidate the patient's barriers to change, called impediment profiling. Patients may not immediately recognize their barriers but when asked relevant questions, their obstacles become more obvious.[202] After identifying the impediments, the practitioner can work with the patient on a tailored intervention.[203] Listening to the patient and using their prior experiences to help them be successful with a new attempt at lifestyle modification is an important part of behavior change counselling.[204] Spending 20 minutes asking the patients questions and holding a discussion about how to incorporate physical activity into the week is more effective for increasing minutes spent exercising than a routine visit where physical activity is not a focus, but spending 20 minutes telling the patients why they should exercise and that they should exercise does not increase minutes spent exercising compared to a routine visit.[205]

Motivational interviewing, defined as "a client-centered, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence," can also be utilized in lifestyle medicine practice.[206] It is a style of interviewing that encourages the patient to do most of the talking, focused on the advantages of changing (i.e., "change talk").

There are four strategies that are commonly used in motivational interviewing, also called the OARS (Open-ended questions; Affirmations; Reflections; Summaries). Open-ended questions invite the patient to take time to reflect and craft an extensive answer to a question, whereas closed-ended questions invite the patient to answers with one word, usually yes or no. Affirmations are statements that acknowledge and appreciate any positive movement toward a healthy change. Reflections are statements that reflect the sentiments of the patient, often paraphrases of what the patient said. Summaries synthesize conversations, and state the main points in a clear concise manner.

One of the main goals in behavior change counseling is to make a solid connection with the patient, so that even if the patient is not ready for change,

when they are ready, they will be open to discussing it with the practitioner. One simple way to make a connection with a patient is to express empathy. In a correlational study, primary care physicians scoring higher in self-reported empathy were more likely to have patients with good control of hemoglobin A1c and good LDL control.[207]

One of the core competencies in lifestyle medicine is to practice healthy lifestyle behaviors.[33] A correlational study revealed that physicians who exercised were more likely to counsel their patients on exercise. And, specifically physicians who strength trained counseled on strength training. Physicians who performed aerobic exercises counseled on aerobic exercise. However, if a physician did not perform strength training exercises, then they did not counsel on it.[208] One study in which subjects watched videos of physicians counseling patients demonstrated that physicians who disclosed information about their own healthy habits such as taking an apple to work for a snack or walking to work for exercise were rated as more motivating and believable than those who simply gave advice on exercise and diet.[209]

Team Care

A key feature of lifestyle medicine is the dedication to a team-approach in interdisciplinary healthcare.[33] The practitioner cannot do it all, and will likely minimize effectiveness in lifestyle adoption without assistance from team members who are internal and/or external to their practice. Commonly, the team care approach includes more traditional members, such as cooperating physicians of various specialties, nurses, physician assistants, and administrative support. Although less common in traditional medicine, lifestyle medicine practitioners find great benefit in exercise specialists, therapists, coaches and nutrition specialists, registered dieticians, and chefs (e.g., culinary medicine) who emphasize compatible lifestyle prescriptions.

Community Care

Lifestyle medicine practitioners extend the notion of team care beyond the clinical setting to the community. The physical and social aspects of communities that span the social ecological spectrum, including their social, governmental, educational, industrial, environmental, public health, and Cooperative Extension, provide a framework and strong influence on patients' access and abilities to adopt healthy lifestyle prescriptions. Physical environments can improve access, and help make health the "easy" choice, thus minimizing the need for strong self-regulatory abilities. The social environment, including a supportive culture of health and wellness, also provides a strong influence on lifestyle adoption and maintenance. Such an influence is exhibited by the Blue Zones, which represent the cultures throughout the world who have the highest percentage of centenarians, at ten times greater rates than the United States.[30] Of the nine common denominators of a healthy lifestyle, these populations belonged to faith-based communities, put families first, and had strong social circles and networks (i.e., the "right tribe").

In addition, when adequate education aimed at increasing knowledge, skills, and abilities to adopt a healthy lifestyle is unavailable within the clinical setting, the lifestyle medicine practitioner must depend on such offerings within the community across the prevention spectrum. For example, public health entities, such as state health services and local healthcare systems, can provide health screening opportunities and education in secondary prevention, such as diabetes self-management and classes. Also, the state's Cooperative Extension Service provides a network of local family and community health personnel and educational programs focused on the primary prevention of chronic disease by teaching people how to apply the results of scientific research.[210] Further, full prevention spectrum efforts might also include nonprofit organizations, faith-based organizations, local churches, and fitness centers to extend the possibilities for coordinated, community care.

THE FUTURE OF LIFESTYLE MEDICINE

Within the "lifestyle *is* medicine" approach, there are opportunities to develop new clinical models, reimbursement mechanisms, technologies, and digital platforms to support them. Innovations can also include team care approaches, not only in the clinical setting, but also within the community, leveraging existing resources such as Cooperative Extension and public health entities and services. With respect to the aforementioned "patient path," there is much to be learned and done to expand provider knowledge, confidence, and abilities in lifestyle prescription, including their patient interactions that maximize motivation and adherence to the prescriptions, as well as the processes that maximize patient involvement in clinical interventions or community-based programs found to be effective in healthy lifestyle adoption. Put another way, there is a bright future for innovations in medication adherence, with lifestyle as the medicine.

While the current limitations and potential future of lifestyle medicine encourage the clinical advancement of "lifestyle *is* medicine" approach, all

evidence to date reinforces a strong emphasis on the "lifestyle *as* medicine" approach. Where healthy living prevails, it is because culture makes healthful choices the default choices—either by design (e.g., North Karelia Project) or by fortuitous, historical happenstance (e.g., the world's Blue Zone populations). The cultural malady of poor health highlights the limits to clinical solutions, while also emphasizing the spectrum of need from individual to family to community to public policy at local, state, and national levels to achieve a culture of health.

In addition, acknowledgment is made that a healthful lifestyle cannot occur absent of a healthy, thriving, and sustainable planet, which encourages multidisciplinary frameworks and systematic approaches to the conjoined challenge of public and planetary health. The One Health Initiative can serve as a guide to unite professionals from medicine, veterinary medicine, public health, environmental specialists, public policy experts, and others working to improve the health of the population and the sustainability of the planet.[211] However, with an original emphasis on infectious disease, there is no current model or consensus of a One Health approach to chronic disease prevention, although the dots are being connected. An unhealthy eating pattern is the leading risk factor for premature death in the United States; food systems accommodating the demand for such patterns are a main contributor to adverse environmental effects and changes as well.[212] The effect of eating patterns of the Dietary Guidelines for Americans (DGA) to environmental sustainability has been highlighted, including room for much improvement.[213] The EAT–*Lancet* Commission recently addressed the need to feed a growing global population through a universal healthy reference diet that also achieves environmentally sustainable food system while also defining sustainable food systems that will minimize damage to our planet.[214] Yet, dietary transitions to healthier lifestyle patterns also provide downstream challenges, such as enhanced production of healthier foods, increased availability, and impact on industry innovation, revenue, and jobs.

Advances and successes to date in lifestyle medicine have spurred current enthusiasm, rapid growth of the field, and the establishment of lifestyle medicine as a valued discipline with individual and public health implications. Lifestyle medicine positively impacts humans, animals, and the planet. This discipline sets itself apart by promoting prescriptions for six specific pillars: exercise, healthful eating, stress resiliency, sleep, social connection, smoking cessation, and alcohol moderation or elimination. These prescriptions place lifestyle medicine in a pivotal position to help transition the current state of healthcare in the United States. The future poses the challenges of addressing the planet as a marquee patient, and achieving health-promoting culture change at scale. The future is also bright with opportunity, as there is ever more innovation taking this best of medicine from research to practice, from cell to culture, from individual health to public health, and from disease care to healthcare.

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