Lifestyle Medicine: the Roadmap to Our Best Possible Health

IVANA KOLČIĆ & TANJA DRAGUN

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Title:
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Language editor:
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Publisher:
University of Split School of Medicine

ISBN: 978-953-7524-30-2

Printed by: Redak d. o.o., Split

Cover design
Redak (source: freepik, ID: 42C4C5FC-F44E-4209-AD41-A489B6D746F7)

www.esf.hr

Projekt je sufinancirala Europska unija iz Europskog socijalnog fonda.

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Split, 2021.

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PREFACE

It was hard for me to learn about numbers during my medical studies. No, I am not talking about statistics. I love statistics and its power to summarize and inform. I talk about numbers that say how many people are ill and how many people die each year. Very similar numbers can be found in my country, in other countries, in the world. As I got older, I started hearing the news that some people I know have died. Not only was their death sudden but it was also premature, but they were way too young. Yes, they were smoking, they were overweight, and they ate a lot of meat and processed foods or drank too much. Sometimes, it was all of the above. They had a handful of pills to take each day. They had suffered in pain, and they felt miserable. Then I started asking my colleagues if it was just me, with such disease burden running in my family, or among friends and friends of friends. Unfortunately, I was not alone in this. There was not a single person who did not experience a heavy load of disease in their environment. The thing is that those colleagues of mine were doctors, scientists, medical students. They were equipped with biomedical knowledge, and they should have known how to maintain good health - both their own health, and the health of their families and friends. But then I started thinking, what have I learned about maintaining health during my medical studies? I was primarily taught how to recognize, diagnose diseases and how to apply treatment, most commonly pharmacological or surgical treatment. I was also taught that chronic diseases are for life. Once a person gets the diagnosis, the only way to move forward is to use medications for the rest of their lives. Whatever the treatment, it is expected that they will die with it. Or because of it. Of course, there were guidelines saying that patients needed to change their habits, but it was more of a one-sentence-thing. In clinical practice it would turn into something like "You have to improve your diet", "You have to reduce your salt intake", "You have to exercise more", and similar catchphrases. Patients were not offered much more, not a single word about what a healthy diet actually is, or how to improve a patient's diet or how to motivate them to actually do it. As expected, I was passing this on to my students. All until recently, when I discovered something new, something different: lifestyle medicine. Based on what I have learned about it so far, I firmly believe that the principles and practice of lifestyle medicine is our strongest and the last line of defense against the global wave of illness and death due to the

chronic diseases. These diseases are the leading causes of morbidity, disability, mortality and associated costs to society worldwide. The majority of them are caused by the environmental and behavioral factors, and as such, they are largely preventable, and their course is oftentimes reversible. The key to success is the application of the health behavior change in the domains of healthy nutrition, adequate sleep, appropriate physical activity, suitable stress management and avoidance of risky behaviors, such as smoking and other substance dependences. These approaches form the pillars of lifestyle medicine. Lifestyle medicine treats lifestyle causes of diseases, through forming active partnership with patients and involving allied professionals, aiming at both long-term health benefits and improved quality of life. Lifestyle medicine incorporates evidence-based knowledge, a set of skills, tools and procedures with the goal of preventing, treating and reversing chronic lifestyle-related diseases.

We all know that changing ourselves is difficult. In a way people are like express trains, if you fail to change lanes, the locomotive will just keep going in its current position. Changing habits takes time and sometimes it can make one feel deprived. Making a change also takes a good amount of courage and determination, and it may even cost money. However, losing health eventually costs more. Disease costs people more money, and more of everything else; more time, more effort, it costs you your comfort, joy, and pleasure. Ultimately, disease may cost you your life. There is no price tag for that, yet.

Medical doctors, nurses and other health care practitioners are healers of others. Unfortunately, by being focused on other people's health, it may become easier to forget about their own. Working long hours, night shifts and on-calls, responsibility for people's lives, constant need for keeping up with the new, administrative workload, demanding 'know-it-all' patients, and so on, it all adds up in a stress basket. This is a fruitful ground for the establishment of not so good habits. Unfortunately, a doctor with unhealthy habits advising a patient about changing their habits seems a bit frivolous. It would be as if a hairdresser with the bad haircut advised a bride on her hairstyle for the 'big day'. It is hard to expect that their advice would be taken seriously. Hence, when a physician is practicing unhealthy behaviors a double harm is done, both to physicians' and patient's health.

I believe we can do better. We have the evidence that lifestyle modifications work, and sometimes they work wonders. We also know how to apply them. We just have to start, staring with ourselves, our families and friends, and, of course our patients.

So, let us start putting an end to the chronic disease era and eventually place them in the history of medicine, with the help from lifestyle medicine.

We hope you will find this book helpful, informing and motivating. Enjoy reading and enjoy practicing lifestyle medicine!

Ivana Kolčić

CHAPTER 1: WHAT IS LIFESTYLE MEDICINE AND WHY DO WE NEED IT?

Ivana Kolčić

"The idea is that your body has the remarkable capacity to undo a lot of the damage if you simply stop doing what's causing the problem."

Dean Ornish

1.1. Lifestyle medicine: definitions, goals and scope

Lifestyle medicine is a new paradigm in medicine. Our usual, conventional approach in Western medicine most commonly focuses on just treating symptoms of chronic diseases for the rest of the patients' lives. Unlike this approach, lifestyle medicine is addressing the true and underlying causes of the leading health problems in our modern societies. These root causes of non-communicable diseases are our daily habits, embedded in our environments and social circumstances. Lifestyle medicine momentum is growing and it is quickly gathering supporters among medical doctors and allied biomedical professionals. One of the reasons lies in the health picture of the populations worldwide, since epidemiological data demonstrate the strong need for an approach different than 'business as usual'. Respectable body of scientific studies published until now make a solid foundation of this evidence-based field. Lifestyle medicine is even on its way of becoming a new specialty, which is a rare occurrence in contemporary medicine (1).

There are several definitions of lifestyle medicine currently in use. All of the definitions put emphasis on the use of lifestyle modification in order to prevent, treat and even reverse non-communicable diseases (Box 1.1.).

Box 1.1. Currently used definitions of lifestyle medicine

Lifestyle Medicine Global Alliance (LMGA):
Lifestyle medicine is "the evidence-based medical specialty that uses lifestyle therapeutic approaches, such as a predominantly whole food, plant-based diet, regular physical activity, adequate sleep, stress management, avoidance of risky substance use, and other non-drug modalities, to prevent, treat, and, oftentimes, reverse non-communicable disease, sometimes referred to as degenerative chronic disease" (2).

The American College of Lifestyle Medicine (ACLM):
Lifestyle medicine is "the therapeutic use of evidence-based lifestyle interventions to treat and prevent lifestyle related diseases in a clinical setting. It empowers individuals with the knowledge and life skills to make effective behavior changes that address the underlying causes of disease" (3).

The European Lifestyle Medicine Organization (ELMO):
"Lifestyle medicine is an evidence-based branch of medicine in which comprehensive lifestyle changes (including nutrition, physical activity, stress management, social support and environmental exposures) are used to prevent, treat and reverse the progression of chronic diseases by addressing their underlying causes. Lifestyle medicine interventions include health risk assessment, health behavior change counseling and clinical application of lifestyle modifications. Lifestyle medicine is often prescribed in conjunction with pharmacotherapy and other forms of therapy" (4).

Garry Egger and associates proposed the following definition in 2017:
Lifestyle medicine can be defined as "the application of environmental, behavioral, medical and motivational principles to the management of lifestyle-related health problems in a clinical setting, including self-care and self-management" (5).

James Rippe and associates used the following definition in the first edition of the book about lifestyle medicine, which is still one of the most comprehensive books on lifestyle medicine (1999):
"Lifestyle medicine is the integration of lifestyle practices into the modern practice of medicine both to lower the risk factors for chronic disease and/or, if disease is already present, serve as an adjunct in its therapy. Lifestyle medicine brings together sound, scientific evidence in diverse health related fields to assist the clinician in the process of not only treating disease, but also promoting good health" (6).

These definitions say a lot, describing the aims and approaches of lifestyle medicine. What is lifestyle, anyway? It is the sum of all of our daily habits, which are stemming from our knowledge and attitudes toward health and life in general. Some of our habits are passed down from our families, our friends introduce some, and some come along with personal experience. The thing with habits it that they tend to take 'roots'. Some habits have very deep roots, which are not so easy to pull out in order to change behavior. Unfortunately, most of those 'rooted' habits in our modern societies seem to be unhealthy, such as smoking, indulging in junk food and soft drinks, sedentary behaviors like TV binge-watching, cutting down on sleep, stressful jobs and many more. This is the major challenge in lifestyle medicine, to get people to change and, even more so, to maintain the change. For good. Not only for a specific event, like getting the perfect "beach" body for summer or to squeeze into the dress or tuxedo for the wedding coming up, but for a lifetime. We keep sticking to some of our unhealthy habits because they provide comfort, bring pleasure, or alleviate negative emotions. Those are powerful drivers of behavior and practitioners need to understand this. Patients do not disregard doctor's instructions to lose weight or to take medications because they are disobedient, rebellious people. They have their reasons. We need to get to the bottom of those reasons and also help patients become aware of them, to become truly aware that these

habits are hurting them. Only then, we can undertake the next step and motivate patients to start the process of health behavior change.

Another interesting thing about our habits is that they are connected and oftentimes interdependent. Hence the term lifestyle, which is "the set of behaviors that reflect an individual's beliefs and values" (3). For example, a person who does not sleep long enough or lacks quality sleep is prone to more intense stress response during daytime. This in turn may influence her/his choice of dinner towards 'comfort' foods high in sugar, fat and salt and low in nutrients, pushes her/him towards one more cigarette or one more glass of wine. Of course, she/he will feel tired, both from lack of sleep and from lack of nutrients, and consequently she/he will move less or even just sit and watch TV or other screens. This will then have a detrimental effect on her/his sleep at night. Hence, the vicious cycle closes this loop of poor habits and unhealthy choices, one leading to another and, as a result, magnifying the negative consequences on ones' both physical and mental health. To put it in a nutshell, the main goal of lifestyle medicine is to break this kind of pattern. In doing so, lifestyle medicine tries to cure and prevent, applying teamwork and systematic approach. Garry Egger and associates pointed out the main differences between conventional medicine and lifestyle medicine in one of the essential books on lifestyle medicine (5). In summary, conventional medicine treats individual risk factors, patients are passive in receiving healthcare by professionals, and clinicians bear responsibility for delivering cure, the emphasis is put on diagnosis and prescribing medications in order to manage disease, while the environment and other circumstances of the patients are mostly neglected (5). In contrast to this approach, lifestyle medicine treats faulty lifestyle and environmental causes of health problems, patients have to be active partners, who also need to take responsibility for their own health, while the emphasis is placed on motivation and patient's compliance in order to prevent chronic diseases and their consequences (5). The unique features of lifestyle medicine include the importance of motivating the patients to take an active role in restoring and maintaining their health, which can be applied to every patient in every medical practice, and it includes allied health care professionals in a collaborative care model (7).

1.2. Why do we need lifestyle medicine?

Lifestyle medicine is a new movement in the field of medicine and it rose from the evident need to change our ways. More specifically, lifestyle medicine

developed in order to adapt medical practice so as to address contemporary challenges related to ill health of the population. Most of the conventional medicine practices, approaches and organizational structures in health care were introduced many decades ago, mostly for the management of communicable, infectious diseases. Due to the immense progress in sanitation and advancement of medicine in the 20th century, epidemiological transition and the shift in the burden of disease have happened (Figure 1.1.) (8). Infectious diseases no longer plague humankind as much as they used to throughout most of our human history. This is primarily due to the vaccination success and antibiotics development, all driven by technological advances. At the population level, this resulted in an increase in life expectancy as a direct consequence of increased survival in childhood. Figure 1.1. denotes the leading causes of death in the USA at the beginning and at the end of 20th century, showing a shift in leading causes of death. Namely, in 1900, pneumonia, tuberculosis and diarrhea were the leading causes of death and they jointly contributed with around 30% of all deaths. In 1997, the single leading cause of death was heart disease, accounting for 33% of all deaths, followed by cancer with 25% (Figure 1.1.). Mortality due to the heart disease was also present in 1900, but most of these deaths were caused by infectious or valvular conditions, rather than atherosclerotic events (9).

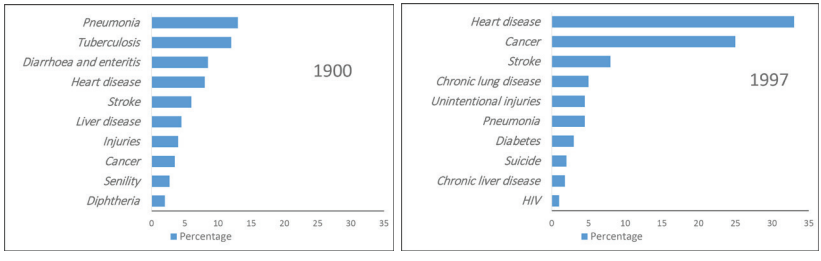

Figure 1.1. The leading causes of death in the USA in 1900 and 1997 (8)

The World Health Organization (WHO) estimated that there were 56.4 million deaths worldwide in 2015, and as much as 70% of them were due to the non-communicable diseases (NCDs) (10). These include cardiovascular diseases, cancer, chronic respiratory diseases, diabetes and mental disorders. An estimate for 2017 was even worse, with 41.07 million of deaths due to chronic diseases, 73.4% out of 55.95 million in total, based on the data from the Institute of Health Metrics (Figure 1.2.) (11, 12). Out of the top 10 leading global causes of death in 2016, ischemic heart disease was considered the top cause (crude death rate of 126/100.000 people) (13). It was followed by stroke (77/100.000) and chronic obstructive pulmonary disease (41/100.000), while Alzheimer's disease

and other dementias were high on the list, taking fifth place (27/100.000), just slightly ahead of lung cancer (23/100.000) (Figure 1.3.) (13).

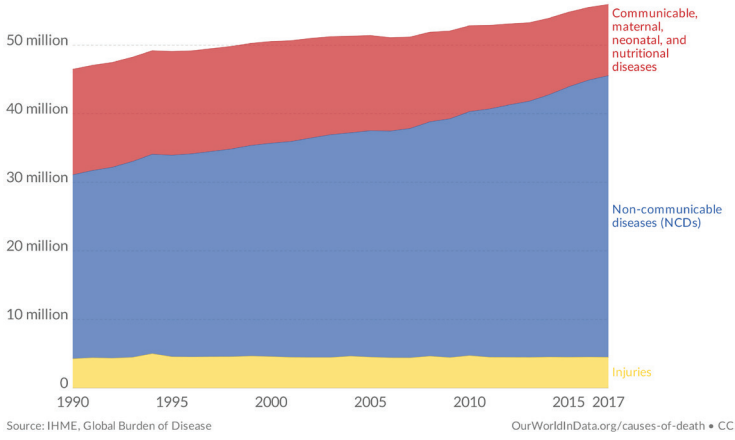

Figure 1.2. Number of global deaths due to broad groups of diseases, where non-communicable diseases include cardiovascular disease, cancer, diabetes, and respiratory disease (12)

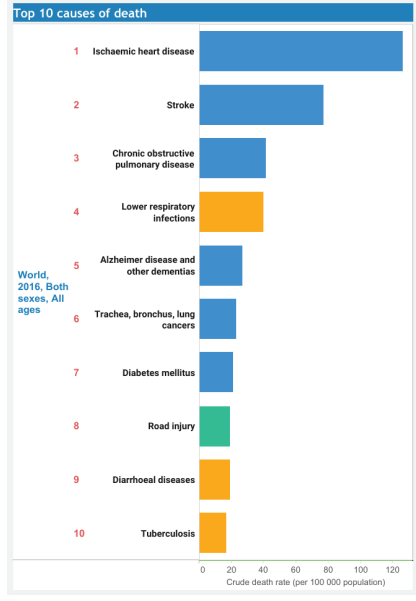

Figure 1.3. Estimates of the crude death rates for top 10 causes of death by the Global Health Observatory (WHO) in 2016 (13)

The true extent of this burden can be seen from the fact that more than 80% of all deaths in most developed countries in 2016 were due to the NCDs, countries such as Japan (82%), Norway (87%), the USA (88%), the UK (89%), Switzerland (90%), Germany (91%), Croatia (92%), Finland (93%), Hungary (94%), and so on (14). The figures look even more frightening when we take into consideration that as many as 47% of NCD deaths in lower-middle-income and 43% in low-income countries in 2016 occurred prematurely, in people aged between 30 and 69, compared to 25% in people in high-income countries (14). Both morbidity and mortality are associated with the socio-economic factors, starting with country income levels. Unfortunately, this really is a vicious circle, because NCDs are costly to treat and may push many people into poverty, while undercutting their productivity at the same time (15). Since as many as 78% of all NCD deaths, and 85% of premature adult NCD deaths, occurred in low- and middle-income countries in 2016 (14), these countries need urgent solution for this massive burden. Ultimately, we all do. The budgets of all health care systems also need urgent solution, lingering on the edge of bankruptcy in both less affluent and rich countries. We need a solution both globally and locally, to stop squandering our resources as if supplies were limitless: our health, our money and, eventually, our lives. According to the WHO, this is possible. The WHO estimates that as much as 75-80% of heart disease, stroke and type 2 diabetes would be prevented, as well as 40% of cancer, if we eliminated major risk factors for non-communicable diseases (15). The question is how to achieve that? What are those major risk factors? It comes down to four modifiable lifestyle-related behaviors: tobacco use, physical inactivity, unhealthy diet, and harmful use of alcohol, which lead to four key metabolic/physiological changes: high blood pressure, overweight/obesity, high blood glucose and high cholesterol (16). These risk factors and their metabolic consequences are exactly the targets of lifestyle medicine. The extent of the need is outlined in the Lifestyle Medicine Review by the American College of Preventive Medicine (7). Based on the literature, this document summarizes that as many as 3 in 4 Americans do not get enough physical activity, 4 in 5 need to significantly improve their diet and 2 in 3 Americans need to lose weight, 1 in 5 smokes, while 1 in 3 American adults aged 30 to 64 sleeps less than 6 hours per day (7). The health-related situation in Croatia is quite similar. For instance, 33% of Croatian adults were physically inactive in 2016, and 33% of people older than 15 smoked (38% in men and 29% in women) (17). Mean population salt intake in adults was 9 g per day, the prevalence of high blood pressure was 41%, 10% of people had high blood glucose, while the prevalence of adult obesity was 27%, and 9% of adolescents aged 10-19 were obese (17). These numbers are extremely worrisome in regard of the health prognosis of the population.

On the other hand, the extent of the possible effects of living a life characterized with healthy habits was depicted in a large population-based study, which included more than 123,000 people from the USA (18). Li and colleagues showed that women who had five beneficial lifestyle characteristics, which authors referred to as low-risk factors, could have expected to live for another 43 years after they reach the age of 50, compared to 29 years of life expectancy in women who had none of the positive characteristics (Figure 1.4.) (18). This translates to 14 extra years of life for women who have a healthy lifestyle. In men, the figures were quite similar; men living healthily could hope for 12 extra years of life, estimated to be able to reach 87th birthday, compared to 75th birthday for those men who didn't follow a healthy lifestyle (18). I do not know what other people think about those numbers, but they are quite impressive to me. Plus, the quality of life is surely going be on the side of those having a healthy lifestyle. There must be something really special and expensive that those people predicted to live longer are doing in their lives, doesn't it? Well, no, there is nothing extra special about their lifestyle. The characteristics that put them ahead in life expectancy included five basic, down-to-earth, low-risk factors (18):

- never smoking cigarettes,
- being physically active for at least half an hour per day (moderate to vigorous intensity activity),
- having a healthy diet,
- moderate intake of alcohol (5 to 15 g/d for women or 5 to 30 g/d for men), and
- having a normal weight (body mass index <25 kg/m2)

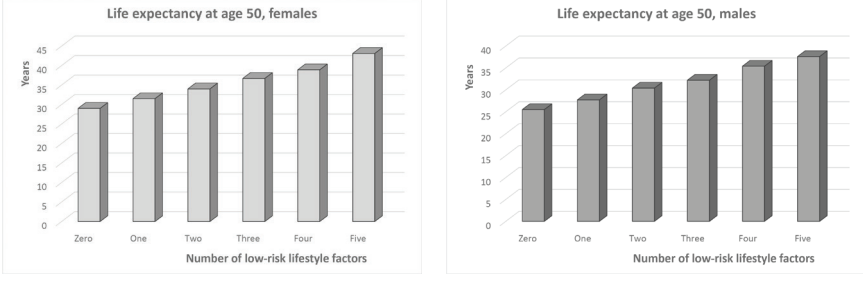

Figure 1.4. Life expectancy of Americans at the age of 50, depending on the number of 5 observed low-risk lifestyle factors present (never smoking, having ≥3.5 h/week of moderate to vigorous intensity physical activity, having high diet quality, moderate alcohol intake of 5 to 15 g/d for females or 5 to 30 g/d for males, and body mass index <25 kg/m^2). Adapted from Li et al. (18).

A similar prospective study was done in 23,153 people from Germany aged 35 to 65, with results pointing to the same direction (19). People with all of the beneficial investigated factors had a 78% lower risk of developing a chronic disease after the eight-year follow-up period (19). The factors included (never) smoking, a body mass index <30 kg/m^2, being physically active for at least 3.5 h/week and a healthy diet with high intake of fruit, vegetables, and wholegrain bread and low meat consumption. Namely, people with those characteristics had 93% lower risk of developing type 2 diabetes, 81% for myocardial infarction, 50% for stroke, and 36% for cancer, compared to people who had none of the healthy behaviors (19).

This sounds simple enough. But, we live in a real world, where a lot of people still smoke, even though they know it's hurting them. Many people survive on eating processed and fast food, even though they know that type of food is not nurturing them properly. They rather choose to drive their car even if their destination is just one block away in order to avoid walking, even though they know they should eventually go to the gym. They try to unwind from a stressful day using alcohol or they just sit around watching TV or other screens, while cutting down on their sleeping hours, despite the fact that they know they will feel sleepy and miserable the next day. So, are there any people left in this world who practice daily all those healthy behaviors that are beneficial for their health and well-being? The answer is yes, and we should all follow their example. Where are they and who are they - the healthiest, happiest and longest-living people in the world? Dan Buettner and his team presented them to the broader audience through a National Geographic expedition (20). There are five places in the world where people consistently live past 100 years (at 10 times greater rates than in the United States), called the Blue Zones (20). Those places are Loma Linda (USA), Nicoya (Costa Rica), Sardinia (Italy), Ikaria (Greece), and Okinawa (Japan). The Blue Zones project detected nine common denominators in people living in those areas, which are believed to contribute to the increase in longevity by slowing down the aging process, that they called the Power 9 (20).

The principles of life practiced by the people from the Blue Zones are (20):

1. Move naturally (physical activity)
2. Purpose (of life)
3. Downshift (stress relief)
4. 80% rule (stop eating when your stomach is 80% full)
5. Plant slant (legumes instead of meat)
6. Wine at 5 (with friends and/or with food)

7. Belong (faith)
8. Loved ones first (family, friends)
9. Right tribe (social networks that support favorable health behaviors)

The blueprint is there, and all of the behaviors and attitudes listed here are targeted by the lifestyle medicine interventions. The idea is to lead a life that makes a person belong to oneself, other people, and to be part of the natural environment.

1.3. Short history of lifestyle medicine

The term "lifestyle medicine" was first coined 30 years ago. Ernst Wynder, American epidemiologist and cancer scientist, mentioned it for the first time at a congress held in Brussels in 1989 (21, 22). Wynder also wrote one of the first papers indexed in PubMed in 1991 on the challenges of lifestyle medicine, stating that "today's illness and death are most often caused by non-communicable diseases that have the special characteristics of resulting largely from one's own lifestyle, especially tobacco use and nutritional excesses" (23).

James Rippe edited the first book describing this emerging field of medicine in 1999 (24), and the third edition of the book was published in 2019, still being the most extensive overview of the lifestyle medicine. In the preface to the second edition published in 2013, Rippe wrote that "the need to summarize the evidence behind lifestyle and health into one comprehensive textbook that spans the field of lifestyle medicine has become clearer as the evidence has become deeper and more persuasive" (6). Indeed, the scientific literature is growing by the day, but there is a long way ahead before lifestyle medicine is incorporated in the clinical practice, even if it is dearly needed. The first step is to introduce it to the curriculum of the undergraduate, graduate and professional education programs. For example, we should teach students about the results of some of the groundbreaking studies, which laid the foundation for the evidence-based lifestyle medicine and health care. Let's mention just some of those. For example, medical students and doctors should know about the China study, led by T. Colin Campbell, which started in 1983 and is regarded as "one of the most comprehensive nutritional studies ever undertaken" (25). They should also hear and read the paper published in Lancet in 1990 by Dean Ornish and colleagues (26), in which 28 patients with severe coronary atherosclerosis were entered in the experimental group, which received the

intervention of "low-fat vegetarian diet, stopping smoking, stress management training, and moderate exercise" but without the use of lipid-lowering drugs. The conclusion of the study was that "comprehensive lifestyle changes may be able to bring about regression of even severe coronary atherosclerosis after only 1 year, without the use of lipid-lowering drugs" (26). There is abundance of other examples in the literature, but introducing more of them is well beyond the scope of this textbook. The list of important recent publications within the field of lifestyle medicine can be found on the website of the American College of Lifestyle Medicine (https://www.lifestylemedicine.org). Other textbooks, online courses, and useful materials are listed at the end of this chapter.

Development of lifestyle medicine responded to the rise in the global burden of non-communicable diseases, using a different approach than just treating symptoms for the rest of patients' lives. This lifestyle medicine 'movement' started in countries that were the first to 'introduce' the unhealthy behaviors, which came along with economic and technological development. These countries are rich, developed countries, such as the USA, the UK and Australia. The first professional society for physicians was the American College of Lifestyle Medicine (ACLM), which was intended for "clinicians specializing in the use of lifestyle interventions in the treatment and management of disease" (22). This society is very active in leading the field of lifestyle medicine forward, organizing annual meetings (since 2011), publishing the official letter (since 2008), providing educational programs and helping with certification (22). They also started the American Journal of Lifestyle Medicine, which is the official journal of the American College of Lifestyle Medicine. There is another scientific journal being published, called Journal of Lifestyle Medicine, which was started in 2011 in Korea.

Other leading professional societies in the world are Australasian Society of Lifestyle Medicine (https://www.lifestylemedicine.org.au/), and British Society of Lifestyle Medicine (https://bslm.org.uk/). Organization with members from Europe and beyond is the European Lifestyle Medicine Organization (ELMO), which provides leadership in research, prevention and treatment of lifestyle-related diseases through nutrition, physical activity, psychology and public health.

Additionally, the American College of Lifestyle Medicine initiated Lifestyle Medicine Global Alliance in 2015 "in response to the increasing need for lifestyle medicine solutions in low and middle income countries and for communication and coordination between Lifestyle Medicine medical professional organizations around the world" (27).

1.4. The need for education

In 1991 Ernst Wynder "recommended that every medical school should have a department of preventive medicine with emphasis on epidemiology and health promotion, and all schools beginning in first grade should have a comprehensive school health education program coordinated by a full-time health education teacher" (23). The need for education in lifestyle medicine (LM) is self-evident from the epidemiological data. There are several organizations, which provide systematic approach to creating educational materials and structured courses. Some of the groundbreaking books, written by the pioneers and leaders in lifestyle medicine, are listed at the end of this chapter.

Since a growing number of studies are being published on the effects of lifestyle change intervention, the interest in lifestyle medicine is growing, driving the need for evidence-based clinical LM training on how to effectively provide intensive LM interventions that can arrest and reverse disease (28). Lifestyle modifications are part of all contemporary disease management guidelines, such as guideline for the treatment of hypertension, chronic coronary syndrome, diabetes type 2, obesity, metabolic syndrome, hyperlipidemia, and so forth, oftentimes being the 'first line of defense'. Unfortunately, physicians rarely provide behavioral change counseling to their patients (29). That surely represents a missed opportunity, since the scientific literature is showing that physicians' advice is effective in encouraging patients to change behaviors (29, 30). One view of this practice of not utilizing lifestyle intervention by physicians is that by "neglecting to prioritize lifestyle measures for prevention, the medical community is placing people at harm" (31). Marie-France Hivert and colleagues identified some of the reasons why physicians do not utilize lifestyle modification (29):

- the lack of knowledge about how various diet and physical activity regimens affect specific medical conditions,
- the lack of competencies needed to perform lifestyle counseling effectively,
- the lack of confidence to provide adequate lifestyle counseling in the domains of physical activity, nutrition, weight management, and tobacco use,
- often being skeptical about their patients' receptivity to such advice, believing that "patients won't change anyway,"
- limitations in time during clinical encounters
- low or nonexistent reimbursement for lifestyle counseling

Another possible reason may lie in the fact that they are not practicing a healthy lifestyle themselves. Some studies have found that physicians who have healthy habits tend to counsel their patients on those habits too. For example, among the predictors of Canadian physicians' prevention counseling practices, physicians who were non-smokers were significantly more likely to counsel their patients on smoking cessation (32). Additionally, physicians "who drank alcohol less frequently, drank lower quantities or binged less often were more likely to counsel on alcohol, those exercising more tended to counsel patients more about the importance of regular physical activity, those eating more fruit and vegetables tended to counsel patients more often about nutrition, and those with lower weight were more likely to counsel about nutrition, weight or exercise" (32).

The good news is that this situation of infrequent behavioral change counseling by physicians can be influenced and positively changed. There is a way forward from this situation, as demonstrated by the example of a training program in lifestyle medicine for general practitioners, which appeared feasible and was shown to have a positive impact on physicians' attitudes and confidence in prescribing LM (33). The need for education in lifestyle medicine is certainly broad, allowing "all health providers to learn how to effectively and efficiently counsel their patients toward adopting and sustaining healthier behaviors" (34).

Institution that leads the way in education of the next generation of physicians is the Lifestyle Medicine Education Collaborative (LMEd). They "offer leadership, guidance and resources to advance the adoption and implementation of lifestyle medicine curricula throughout medical education. This organization is focused on expanding access to lifestyle medicine education in U.S. medical schools with a concentration on subjects specifically tailored for medical students. These subjects include: exercise/physical activity, nutrition, behavior change, and self-care" (35). People working within LMEd have set up several databases of various documents, which they gladly share with anyone who might be interested in starting education in lifestyle medicine (https://lifestylemedicineeducation.org/curricular-resources/). These include MedEdPORTAL LMEd Lifestyle Medicine Collection, which contains evidence-based curricular resources with the purpose of "providing opportunities for the lifestyle medicine evidence-based discipline to be formalized and integrated as a standard practice of care in medical education, clerkships, residencies, and hospital/clinic practice". LMEd Mentoring Toolkit Dropbox is another free database of various documents, alongside with additional curricular resources (https://lifestylemedicineeducation.org/curricular-resources/).

Additionally, there are several comprehensive proposals of curriculums and/or guidelines for developing curriculum for lifestyle medicine

graduate-level education, such as the Guideline for Lifestyle Medicine Curriculum (https://eulm.org/guidelines) and the ACLM Syllabus (https://lifestylemedicine.org/Lifestyle-Medicine-Course-Syllabus).

Physicians and allied health professionals who are already lifestyle medicine specialists can practice lifestyle medicine within the primary care. Most commonly, lifestyle medicine is the subspecialty of general/family medicine. Physicians and other health professionals can be certified as lifestyle medicine practitioners. The certification was introduced in 2016, in order to standardize the field and distinguish the evidence-based lifestyle medicine practitioners from charlatans. This is of special interest from the patients' perspective, since lifestyle medicine is a new and emerging field, and is therefore vulnerable to the infiltration of people who do not see their patients' health as their best interest. There is a global certification program available, offered by the International Board of Lifestyle Medicine. The American Board of Lifestyle Medicine also started the certification in lifestyle medicine since 2017, and some of the societies are organizing certification in collaboration with the International Board of Lifestyle Medicine, such as The Australasian Society of Lifestyle Medicine (https://www.lifestylemedicine.org.au/certification) and The British Society of Lifestyle Medicine (https://bslm.org.uk/certification/).

1.5. Skills, tools and procedures used in lifestyle medicine practice

Each medical specialty has a distinct set of skills, tools and procedures used by the practitioners in order to prevent, diagnose and treat health problems within their scope. In 2012, ACLM and its Task Force issued the Official Standards for ACLM and of the field of Lifestyle Medicine (3). This document puts down the foundation for lifestyle medicine practice. It brings the definition, description of the levels for lifestyle medicine practice with recommendations, points out and nominates team members needed to provide effective medical care, describes lifestyle medicine interventions and practices, and provides basic intervention guidelines, guidelines on nutrition, exercise, stress management, tobacco use cessation, and guidelines on improving interpersonal/group/community relationships (3).

Another crucially important work is the commentary entitled Physician Competencies for Prescribing Lifestyle Medicine, published in JAMA (36). Liana Lianov and Mark Johnson have proposed lifestyle medicine competencies for primary care physicians, in the domain of leadership (2 competencies),

knowledge (2 competencies), assessment (3 competencies), management skills (4 competencies), and office and community support (4 competencies) (36), which are listed in Table 1.1.

Table 1.1. Suggested Lifestyle Medicine Competencies for Primary Care Physicians (36)

Leadership	Promote healthy behaviors as foundational to medical care, disease prevention, and health promotion.
	Seek to practice healthy behaviors and create school, work, and home environments that support healthy behaviors.
Knowledge	Demonstrate knowledge of the evidence that specific lifestyle changes can have a positive effect on patients' health outcomes.
	Describe ways that physician engagement with patients and families can have a positive effect on patients' health behaviors.
Assessment skills	Assess the social, psychological, and biological predispositions of patients' behaviors and the resulting health outcomes.
	Assess patient and family readiness, willingness, and ability to make health behavior changes.
	Perform a history and physical examination specific to lifestyle-related health status, including lifestyle "vital signs" such as tobacco use, alcohol consumption, diet, physical activity, body mass index, stress level, sleep, and emotional well-being. Based on this assessment, obtain and interpret appropriate tests to screen, diagnose, and monitor lifestyle-related diseases.
Management skills	Use nationally recognized practice guidelines (such as those for hypertension and smoking cessation) to assist patients in self-managing their health behaviors and lifestyles.
	Establish effective relationships with patients and their families to effect and sustain behavioral change using evidence-based counseling methods and tools and follow-up.
	Collaborate with patients and their families to develop evidence-based, achievable, specific, written action plans such as lifestyle prescriptions.
	Help patients manage and sustain healthy lifestyle practices, and refer patients to other health care professionals as needed for lifestyle-related conditions.
Office and community support	Have the ability to practice as an interdisciplinary team of health care professionals and support a team approach.
	Develop and apply office systems and practices to support lifestyle medical care including decision support technology.
	Measure processes and outcomes to improve quality of lifestyle interventions in individuals and groups of patients.
	Use appropriate community referral resources that support the implementation of healthy lifestyles.

In addition, Wayne S. Dysinger proposes specific customized lifestyle prescription, such as exercise and dietary prescription, as well as the intensive, group-based support, which can be offered in a community, office, or residential setting (37).

Most prominently used tools by lifestyle medicine practitioners include motivational interviewing, cognitive behavioral therapy, and shared medical appointments (SMAs). There are others, which are being developed to complement the practice of lifestyle medicine, such as culinary medicine, medical fitness, resilience training, yoga and meditation, and so on.

The biggest challenge in the lifestyle medicine is to get people to want to change their behaviors, which revolves around the question of motivation. How to get started when you want to talk to people about a lifestyle change? How to get people to think about changing, and then to do the steps within the process? The next challenge is to ensure adherence or behavior change maintenance. How to maintain the progress that has been achieved? The short answer is to use the principles of motivational interviewing, described in the next chapter. In order to maximize lifestyle change and adherence, a practitioner should take into account the importance of psychological determinants and patient values (38).

Another approach, which can help with both motivating and maintaining the accomplished progress, is the application of the shared medical appointments or group visits. They can be defined as "… a series of individual office visits sequentially attending to each patient's unique medical needs individually, but in a supportive group setting where all can listen, interact, and learn" (39). This approach involves a team of professionals. The core team usually consists of the physician, nurse and group facilitator, and ideally a documenter (for recording comprehensive chart notes in real time) (40). Additional and valuable team members are a pharmacist, dietician/nutritionist, physical therapist/exercise specialist, psychologist/behavioral specialist, health educator and social worker (41). A typical SMA session lasts for 60 to 120 minutes (compared to 5-10 minutes of usual individual medical consultation), plus the added time for introduction with social integration, additional interactive education, and finally medication management (41). SMA is not a new approach and it has been studied extensively. The effectiveness of SMAs in practice was demonstrated for the clinical management of various chronic diseases, such as type 2 diabetes, coronary artery disease, hypertension, metabolic syndrome, cancer, COPD, obesity and arthritis (40). There are many advantages of SMAs for both patients and practitioners, compared to usual 1-on-1 medical consultations, and these are shown in Table 1.2. (40).

Table 1.2. Advantages of shared medical appointments (SMAs) in a lifestyle medicine approach to chronic disease management (40)

For patients	For clinicians
Improved quality of care and access to care	Increased physician productivity and cost/time effectiveness
Extra time with own doctor and more relaxed pace of care	Better management of waiting lists
Peer support and feedback from patients with similar conditions	Reduced repetition of information/advice
Multi-disciplinary care from a range of (2–4) providers	An opportunity to get off the fast-paced treadmill of individual visits
Answers to questions they might not have thought to ask (because others in the group ask such questions)	Improved clinical income through cost containment
An additional health care choice	A chance to get to know patients better in an interactive setting
Greater self-management education and attention to psychosocial issues	Real help from the multi-disciplinary team

Lifestyle medicine practice, whether performed by a family medicine or any other practitioner or accredited lifestyle medicine practitioner, has two distinctive features. One of them is that in order to succeed, physicians need to cooperate with other experts, such as nutritionists, exercise physiologists/exercise coaches/personal trainers, psychologists/licensed therapists/health coaches, nurse practitioners/physician's assistants/nurses/medical assistants, and possibly other professionals (3). Even more importantly, the collaborative, partner-based relationship with the patient has to be formed. Another distinctive feature is that by tackling one of the lifestyle behaviors, you instantly affect many different health outcomes. For example, with the intervention in the dietary habits of the patient in order for the patient to lose excessive weight, the positive health outcomes will be visible for blood pressure, lipids and glucose levels, sleep quality, mood improvement, and possibly less pain in the joints, just to mention some of the outcomes that are normally more visible, measurable and detectable by the patient. How good is that? The old saying of "killing two birds with one stone" truly applies in lifestyle medicine. Or even more birds, in due time. Sorry, birds.

1.6. Conclusion

Instead of a lengthy conclusion, let us finish this chapter with the paragraph from the paper published in one of the most prestigious medical journals, The New England Journal of Medicine, about the ever-changing needs and emerging solutions in the field of medicine:

"And disease is never static. Just as organisms evolve to keep up with changing environmental conditions, medicine struggles to keep up with the changing burden of disease. Since therapeutic innovation takes time, the burden shifts even as solutions appear. By the time antibiotics and vaccines began combating infectious diseases, mortality had shifted toward heart disease, cancer, and stroke. Great progress has been made to meet these challenges, but the burden of disease will surely shift again. We already face an increasing burden of neuropsychiatric disease for which satisfying treatments do not yet exist.

In many respects, our medical systems are best suited to diseases of the past, not those of the present or future. We must continue to adapt health systems and health policy as the burden of disease evolves. But we must also do more. Diseases can never be reduced to molecular pathways, mere technical problems requiring treatments or cures. Disease is a complex domain of human experience, involving explanation, expectation, and meaning. Doctors must acknowledge this complexity and formulate theories, practices, and systems that fully address the breadth and subtlety of disease" (9).

Physicians will continue to diagnose and treat diseases, but in the future "they will have to solve them focusing on the lifestyles. Therefore, lifestyle medicine will be an important field in future medicine" (22). NCDs are not our destiny, they are avoidable (preventable), treatable (ideally their causes, rather than symptoms) and reversible with the adoption of appropriate lifestyle. Lifestyle medicine may be the way forward to get there. We believe that it is time to introduce the practice of lifestyle medicine into the mainstream health care, in order to respond appropriately to the health needs of our modern populations. It was some time ago since Thomas Edison's proposed his prophecy: "The doctor of the future will give no medication, but will interest his patients in the care of the human frame, diet and in the cause and prevention of disease." So, let's get it started!

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1.9. Recommended online-courses, materials and useful links:

- NextGenU.org Lifestyle Medicine course: http://nextgenu.org/course/view.php?id=205#0
- The Lifestyle Medicine Education Collaborative (LMEd): https://lifestylemedicineeducation.org/
- Lifestyle Medicine Global Alliance: https://lifestylemedicineglobal.org/lifestyle-medicine/
- https://lifestylemedicineglobal.org/online-education/8
- European Lifestyle Medicine Organization: https://eulm.org/
- American College of Lifestyle Medicine: https://lifestylemedicine.org/
- https://www.lifestylemedicine.org/ACLM/ACLM/Education/Web_Based_Resources_.aspx

- The Australasian Society of Lifestyle Medicine: https://www.lifestylemedicine.org.au/lifestyle-medicine/
- Motivational Interviewing Network of Trainers: https://motivationalinterviewing.org/
- Motivational interviewing in brief consultations: role-play focusing on engaging (video): https://www.youtube.com/watch?v=bTRRNWrwRCo
- Introduction to Shared Medical Appointments: https://www.lifestylemedicine.org.au/content/introduction-to-shared-medical-appointments-webinar/#Webinar
- American Journal of Lifestyle Medicine: https://journals.sagepub.com/home/ajl
- Ornish Lifestyle medicine: https://www.ornish.com/
- Health and nutrition topics: https://nutritionfacts.org
- A marketplace of resources for medical students and healthcare professionals: https://nutritank.com/toolbox/

CHAPTER 2: HEALTH BEHAVIOR CHANGE AND MOTIVATIONAL INTERVIEWING

Tanja Dragun and Antonia Peroš

"I keep telling them what they need to do, but they just won't do it."
Anonymous physician

2.1. Introduction

Today's young adults may be the first generation in modern history to be less healthy than their parents, mainly due to causes that are all strongly linked to health behavior and lifestyle (1). Health behavior change is a crucial step in preventing or remedying most of these causes. The public has access to a wealth of information regarding the basic principles of exercise, good nutrition, weight management, the power of medications, and so forth. The physician has plenty of material to choose from and share with the patients. So why don't people change once they know what they should do, especially in life-threatening situations?

A common assumption, mistakenly made in behavior change, is that information drives behavior (2). Nevertheless, knowledge alone is not enough to change behavior. If it was, no one would ever smoke or overeat to the point of becoming obese, and everyone would always wear seatbelts and exercise regularly. Still, knowledge, particularly certain types of knowledge, is quite important. Knowledge can be general, in the form of information, or it can be the kind of knowledge that carries personal value, increases personal awareness and increases skills. It is critical to explain to patients why behavioral changes need to be made, and it needs to be done in a way that makes sense and that is endowed with personal significance. Although education is important, for it to raise personal awareness, it must provide an individual with better insight into the personal relevance of the information. Patients need to understand why a change has to be made and how to make that change (2). People change because their values support it, they think this new change will be worth it, they

think they can make it, they think it is important, they are ready for it, they believe that they need to take charge of their health, and they have a good plan and adequate social support. Motivation seems to be the key element in efforts to change behavior.

Regardless of the fact that the majority of the diseases that cause people to consult health care professionals are preventable and treatable through behavior change, only 40% of chronic disease visits (e.g. diabetes, hypertension) involve actual lifestyle counseling (3). Even if they do, the focus is usually on short general information or advice (e.g. lose weight, limit salt, exercise), given in preachy and instructive format, instead of discussing and forming a partnership with the patient (3). The entire practice of lifestyle medicine relies on the health care provider's ability to evoke behavior change in their patients, regardless of the target behavior. There are many reasons why patients may have problems in adhering to medical recommendations. Health outcomes are influenced by individual behavior, environment, social factors, health care and genetics (4). Attention has to be given to these factors in order to gain a better appreciation of all the barriers that patients face when trying to implement behavior change.

2.2. Traditional doctor-patient relationship

Despite the fact that today's health care is increasingly focused on long-term condition management and health behavior change, patients that come to the doctor's office still seem to be looking for a quick fix. They expect the "expert" approach: being asked straightforward questions followed by being prescribed a treatment or a drug that will alleviate their condition. More often than not, regardless of how the patients may be mistreating themselves, they often believe that the responsibility for fixing them is in the health care provider's hands. Traditional medical model, or the "expert" approach, is extremely valuable in administering life-saving care to patients in acute situations. This model enables physicians to be autonomous in making complex decisions in order to provide the best care possible in urgent circumstances, when patients cannot fully comprehend various treatment options. The physician sets the agenda, defines the health objectives and makes all the medical decisions, while the patient is expected to comply. This model neglects patient's desires and beliefs, and ignores all the multiple reasons why patients may ultimately decide not to follow a certain treatment program. The "expert" approach is crucial in life-threatening circumstances, but it is quite ineffective when dealing with complex behavior change required for lifestyle modification.

It is quite apparent that knowing what to do and putting this knowledge into action are very different matters. When a health care provider encounters resistance from patients, it seems natural to provide good arguments to support the recommendations for the specified treatment or behavior. Therefore, the provider repeats the advice and appropriate information or instructions. This evokes a natural response in the patient to present reasons why they can't, won't, aren't able to, or can't see why they should follow their advice. The most current behavior change research indicates that not only is this type of exchange ineffective in evoking change, but it predicts negative clinical outcomes (5). Still, communication behaviors learned in medical school and during the internship are strongly reinforced and are not easily changed. Just as patients struggle to carry out and maintain a health behavior change, physicians struggle to change their communication skills. There are several possibilities and approaches for effective communication with patients. They are described in the next section.

2.3. The coach approach

Opposing to the "expert" approach, stands the "coach" approach, based on several psychological theories and strategies, such as motivational interviewing, the transtheoretical model of change, self-determination theory, goal setting theory and the social ecological model of change. In each of those strategies the patient is placed at the center.

To assess what stage of change the patient is in, the physician can use the transtheoretical model of change (TTM) (5, 6). James O. Prochaska and Carlo C. DiClemente developed this model to define five possible stages of change: precontemplation, contemplation, preparation, action and maintenance (6). The idea is that each stage is a preparation for the following one, so you must not hurry through or skip stages. Each person may take different amount of time to progress from one stage to the next. The stages of change and processes within are shown in Table 1 (7).

Table 2.1. Stages of change and most emphasized processes (7). *Available from: Prochaska JO, Velicer WF. The Transtheoretical Model of Health Behavior Change. American Journal of Health Promotion. 1997;12:38-48. https://pdfs.semanticscholar.org/d8d1/915aa556ec4ff962efe2a99295dd2e8bda89.pdf*

	Stages of change				
	Precontemplation	Contemplation	Preparation	Action	Maintenance
Processes	1. Consciousness raising 2. Dramatic relief 3. Environmental reevaluation				
		Self-reevaluation			
			Self-liberation		
				1. Contingency management 2. Helping relationship 3. Counterconditioning	Stimulus control

Precontemplation. People in Precontemplation stage (not thinking about change or not willing to change) do not plan to take action in the near future, usually measured as the next six months. They are not sure if they need or want to change, because either they lack awareness and information, or because they have failed in the past and feel demoralized. They tend to avoid situations where they would be reminded of and confronted with the need to change their unhealthy behaviors. Precontemplators are sometimes uninformed or underinformed and they are seen as resistant, unmotivated and unready to get help. The natural tendency is to try to convince them, which often provokes resistance. To move past the precontemplation phase, patients need to feel that the "unhealthy behavior is blocking their access to important personal goals, such as being healthy enough to travel or enjoy the time with their children or grandchildren" (8).

- Primary task for the physician: raise awareness
- Examples of the questions for the patient:

  "What would need to happen for you to know that this is a problem?"

  "What warning signs would let you know that this is a problem?"

  "Have you tried to change in the past?"

  "On a scale of 1 – 10, how serious is your ____?"

  "What would it take for you to see your situation as a ___?"

Contemplation. Contemplation (thinking about changing, getting ready for change) is the stage in which people intend to change in the foreseeable future. They are aware of the pros and cons of change, which can generate

intense ambivalence and cause people to remain in this stage for a very long time. People in this stage are still not ready for action-oriented programs. Ambivalence is the inability or reluctance to commit to a particular course of action. Contemplators often feel "stuck". One approach toward resolving this situation is to make a list of the advantages and disadvantages (pros and cons), identify the barriers and think about means and steps needed to get across and overcome them (8).

- Primary task for the physician: resolve ambivalence, help patients choose to change
- Examples of the questions for the patient:

  "Why do you want to change at this time?"

  "What were your reasons for not changing?"

  "What would keep you from changing at this time?"

  "What are the obstacles today that keep you from change?"

  "What might help you with that aspect?"

  "What (people, programs and behaviors) has helped you in the past?"

  "What do you think you need to learn about changing?"

Preparation. A person in the preparation stage (planning to change, ready for it) is seriously considering and planning to change a behavior within 30 days and has taken steps toward change. These are the people who should be recruited for action-oriented programs. At this stage, it is important to anticipate obstacles (8). If the patient is preparing to cut down on junk food, for example, they have to be aware of situations that trigger unhealthy eating, and plan ways around them. Meanwhile, it is important to create an action plan with realistic goals (8).

- Primary task for the physician: help identify appropriate change strategies, praise the decision to change behavior, prioritize behavior change opportunities, identify and assist in obstacles to problem solving, encourage small and initial steps

Action. Action is the stage where people have made specific modification in their lifestyles. For example, they are practicing the healthy behavior for less than 6 months. They have begun facing the challenges of life without the old behavior and they need to practice those alternatives they have identified during the preparation stage (8).

- Primary task for the physician: help implement change strategies in order for the patient to learn how to eliminate potential relapses

Maintenance. During the maintenance stage (regularly practicing the healthy behavior for more than 6 months) people are less tempted to relapse and increasingly more confident that they can continue with their changes. It is estimated that maintenance lasts from 6 months to 5 years. The focus now shifts to integrating the change into patient's life and preventing relapse. That may require other changes, especially avoiding situations or triggers associated with the old habit.

- Primary task for the physician: develop new skills for maintaining recovery

Relapse. Research has shown that an individual will rarely progress through the stages of change in a straightforward, linear way. Relapse and recycling are common, even if a person usually does not go back to square one. Relapse is common, perhaps even inevitable, and it should be regarded as an integral part of the process (8). It is also the opportunity to learn and reflect.

- Primary task for the physician: ask about lessons learned from the previous stage of change, reformulate failure into partial success, remind the patient that relapse is a normal part of the process of change

By knowing what stage the patient is in, the coach can thus tailor their approach to certain behavior change. Clinicians who feel overwhelmed because a patient is not changing should ask themselves if their assessment of the patient's stage of change was correct and if their intervention was appropriate to the stage of change they are in. However, we must be aware that people remain stuck in the early stages of change without planned intervention, which should be considered by public health officials. The cycle of change is shown in Figure 1, which can serve as a reminder of the stages of change.

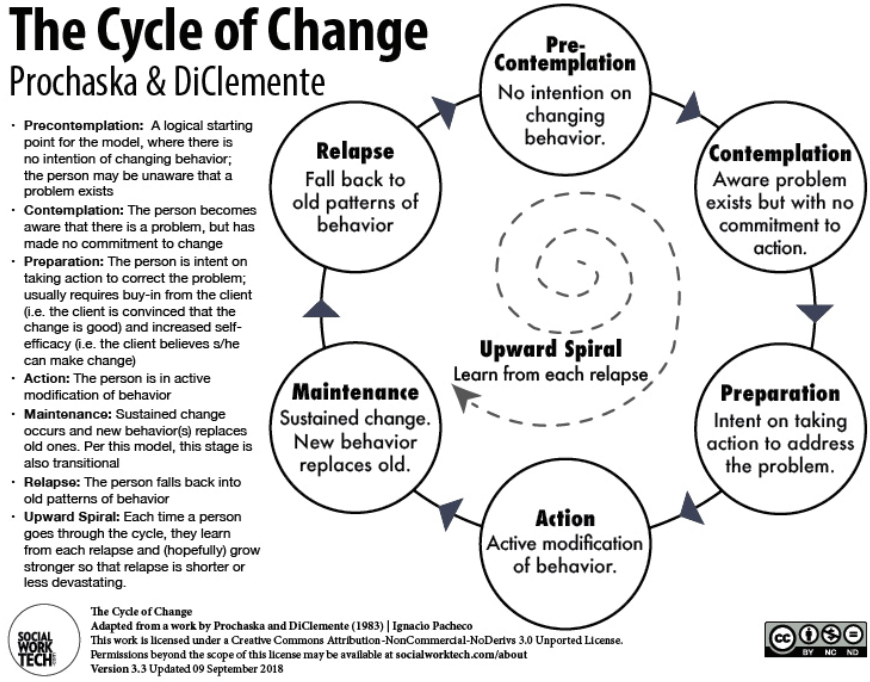

Figure 2.1. The stages and the cycle of health behavior change.

Prepared by Ignacio Pacheco, adapted from: Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. J Consult Clin Psychol. 1983;51:390-5., *Available from:* http://socialworktech.com/wp-content/uploads/2018/09/Social-Work-Tech-CoC-en-bw-v3.4.jpg

2.4. Motivational interviewing

Motivational interviewing is "…a client-centered, directive method for enhancing intrinsic motivation for change by exploring and resolving ambivalence" (1). Motivational interviewing is not based on the information model, it does not rely on information sharing, advice giving, or scare tactics, and it is not confrontational, forceful, guilt-ridden, or authoritarian. It is rather shaped by an understanding of what triggers change. Essentially, it is a method for steering the conversation in a different direction in order to stimulate the patient's desire to change and give him or her the confidence to do so. Long-lasting change is most likely when it is self-motivated and rooted in positive thinking. Motivation is highly individual and will often depend on the context

and differ both from person to person and within the same person at different times. There is evidence that very brief sessions, even just five minutes, have positive results, particularly when patients are highly resistant to change (1). Thus, motivational interviewing is a strategy with great potential for time-pressed family physicians and their team members.

The most important first step toward improving your health coaching skills is to embrace a client-centered approach. The objective of motivational interviewing is not to solve the patient's problem or even to develop a plan; the goal is to help the patient resolve his or her ambivalence, develop some momentum and believe that behavior change is possible. By respecting each patient's autonomy and resisting the urge to push against patient resistance, you will have a better chance to achieve treatment compliance. Ideally, by evoking reasons, desire, ability, and need for change, you strengthen the patient's motivation to change their lifestyle.

Patients present with chronic diseases directly associated with their lifestyle habits and choices, yet they feel unable to improve their conditions. Often, what patients "should do" is obvious to the physician. For example, they may need to lose weight, stop smoking or start exercising. What is not so obvious is where these patients stand on their journey toward change, and why they are so reluctant to take the next step. Patient behavior has been shaped by years of living their lives in a certain way, within a certain social circle, and changing it may have unpleasant consequences. For example, quitting smoking may mean they will need to change up their social activities and lose their "smoking buddies". Motivation is malleable and can be formed and improved through relationships. It is very important to remember that n*obody is completely unmotivated.*

Motivational interviewing is a skillful style for awakening the patient's own motivation to make changes in the best interest of their health. During a typical interaction, the proficient practitioner emphasizes the three underlying assumptions that describe the spirit of motivational interviewing: collaboration, evocation, and autonomy. These are needed in order to establish rapport, reduce resistance, support autonomy, and elicit "change talk" (i.e., one's own reasons and arguments for change).

Collaborative approach in motivational interviewing focuses on a joint decision-making. This is of crucial importance for health behavior change, because in the end it is only the patient who can make such a change happen.

Evocation means that the health care provider does not give patients what they lack, but awakens the potential that patients already have. Each person

has personal goals, values, aspirations and dreams. Health behavior change must connect and resonate with patients' own values and concerns. This can be done only by evoking individual reasons and arguments for change.

Honoring patient autonomy requires being somewhat detached from the outcomes. The health care provider has to accept that they may inform, advise and warn, but ultimately it is up to the patient to decide what to do. It is in human nature to resist being told what to do, and sometimes it is necessary to acknowledge the other person's right and freedom not to change in order to actually make change possible.

2.4.1. Guiding principles

The practice of motivational interviewing rests on four guiding principles. These are resisting the righting reflex, understanding the motivations of patients, listening and empowering.

1. *Resist the righting reflex*

People in 'helping' professions very often have a powerful urge to make things right, to prevent harm and to promote healthfulness, especially health care providers. They want to stop the person from making all the wrong choices and to help them choose a different path. Ironically, this laudable motivation can have quite the opposite effect. Especially if the person is ambivalent about a behavior change, the natural response to persuasion for change will be to argue the other side of the ambivalence. When the health practitioner makes 'pro change' arguments, a common patient response is to fill in the other side of the ambivalence, which ends up in them literally talking themselves out of change. You can recognize it in the sentences your patient says, starting with "Yes, but…". One of the principles of motivational interviewing is that we are likely to believe more of what we hear ourselves say. When a patient verbalizes all the disadvantages of change, they become even more reluctant to change. In fact, the patient should be expressing arguments for change. Motivational interviewing is all about evoking those arguments from the patient. Patients feel ambivalent about most of the health behavior changes. The health care provider's role is to guide them through the ambivalence. The physician's task is to elicit "change talk" from the patient, rather than resistance.

2. *Understand your patient's motivations*

Since the patient's own reasons for change are most likely to trigger behavior change, it is imperative to show a genuine interest in the patient's concerns, values and motivations. At this point it is a good idea to ask the patient why

they would want to make a change and how they might do it, as opposed to telling them that they should do something.

3. Listen to your patient

Many patients expect that the physician has all the answers. However, regarding behavior change, the answers usually lie somewhere within the patient and the physician has to listen carefully to find them. Listening is a complex clinical skill and it is a vital part of good medical care. Being a good listener is an active process that allows you to check if you understand correctly what the person is actually saying. The physicians should be able to recognize change talk once they hear it.

4. Empower your patient

Empowerment means helping patients explore how they can make a difference in their own health. The patient knows best how they can successfully incorporate a behavior change in their daily lives. The physician's role is to support their hope that change is possible and will make a difference in their lives.

2.4.2. Asking

Closed questions are those that require short answers such as yes/no, or a simple fact. For example:

Did you take your medication?

How often do you exercise?

Do you smoke?

How often do you drink?

Where does it hurt?

Asking open-ended questions is a better, more efficient way of gathering specific information from patients. Open-ended questions give the respondent more room to respond, they invite the respondent to say what they believe is important. They provide practitioners with useful information when it comes to behavior change, and serve as a good basis for developing a relationship. Furthermore, open-ended questions allow patients to say things they have not been asked to discuss, which may be very important. Open-ended questions are those to which there is no obvious short answer. For example:

How are you feeling today?

Can you tell me from the very beginning how the pain developed?

How can I help you today?

How do you fit exercise into your daily routine?

What worries you most?
How are you dealing with the diagnosis?
What worries you about this medication?
Tell me more about ...

2.4.3. Listening

Sometimes the most important thing a health care provider can do is to be there for the patient, to listen carefully and to try to understand. The next step after listening, hearing and understanding is to reflect back, with a short summary of how you understood what the patient was saying. This is called reflective listening and it is a skill that requires special practice. In order to do this kind of listening, the practitioner must listen to the patient and then form a hypothesis, reflect on what the patient means and say it back in more or less different words. Then the patient confirms or disconfirms the practitioner's hypothesis. In either way, the patient is likely to open up more. A good summary powerfully shows that the practitioner was listening carefully and that he/she remembered what the patient had said. A summary also allows the practitioner to highlight certain points. For example:

> *Let me see if I understand what you've been telling me, and please do let me know if I've missed anything…*

2.4.4. Informing

A commonly practiced guideline for informing is to be friendly and provide information in a clear and concise manner. Simply doing the basics, giving the patient the information they need sounds reasonable. However, patients may not be ready to hear what the practitioner has to say or may not agree about the importance of information. People differ greatly in what they want to know. Providing information that the patient wants to get means showing respect for patient autonomy and it is one of the crucial principles in motivational interviewing. The patient has to be ready and willing to receive information. Asking for permission emphasizes the collaborative nature of the relationship. For example:

> *May I make a suggestion?*
> *There are several things you can do about… Would you like to know what they are?*
> *Would it be all right if I tell you my concerns about that?*

When informing, it is best to offer a variety of options whenever possible, and then ask the person to choose among them. The goal is not to get too much information across, but to help the patient make sense of information and explore if he/she can apply any of it.

2.5. The 5A's model of behavior change

The 5A's stand for Assess, Advise, Agree, Assist, and Arrange. This entails the sequence a clinician can apply as a strategy for health behavior change counseling in primary care settings to address a broad range of behaviors and health conditions (9). It was originally designed to guide physicians who help patients in smoking cessation, developed by the National Cancer Institute (10). The 5A's can be used by clinicians as a guide to lead the patients during a clinical consultation, as well as for re-assessing the progress and meeting goals which were put forward collaboratively (9). A guiding sheet on how to use and deliver the 5As can be found in Appendix 2.1 (9). Short explanation behind each of the A's is shown in Table 2 (10).

Table 2.2. The 5A's framework for clinical counseling (10), *Adapted from: Whitlock EP, Orleans CT, Pender N, Allan J. Evaluating primary care behavioral counseling interventions: an evidence-based approach. Am J Prev Med. 2002;22:267-84.*

Assess	Ask about/assess behavioral health risk(s) and factors affecting choice of behavior change goals/methods (symptoms, attitudes, preferences)
Advise	Give clear, specific, and personalized behavior change advice, including information about personal health harms and benefits
Agree	Collaboratively select appropriate treatment goals and methods based on the patient's interest in and willingness to change the behavior
Assist	Using behavior change techniques (self-help and/or counseling), aid the patient in achieving agreed-upon goals by acquiring the skills, confidence, and social/environmental supports for behavior change, supplemented with adjunctive medical treatments when appropriate (e.g., pharmacotherapy for tobacco dependence)
Arrange	Schedule follow-up contacts (in person or by telephone) to provide ongoing assistance/support and to adjust the treatment plan as needed, including referral to more intensive or specialized treatment

In the following section, we will present four case-scenarios and examples of the conversation between the patient and the physician.

2.6. Case scenarios

2.6.1. Case scenario 1: Sleeping troubles

Mary (35) is complaining of sleep problems. It takes her a long time to fall asleep and she wakes up a lot during the night. This chronic lack of good sleep is making her irritable and ill-tempered, and is impairing her daily functioning. Mary adds that lately she has been dealing with a lot of stress at work and home.

Ask open questions. This will enable the patient to present the problem in detail.

Demonstrate a non-judgmental attitude and do not criticize. When patients feel accepted, they build trust in the health care provider, and are more likely to share information needed for quality insight. When people feel they are being judged by their emotions or actions, they tend to become defensive or withdrawn.

Physician: What do you do before you go to bed? What does your bedtime routine look like? Do you have some tricks that help you fall asleep? What do you think about before going to sleep? Can you tell me more about this?

Show understanding and empathy. A trusting relationship will decrease negative emotions. Empathy increases the probability that the patient will open up to advice. In order to verbalize empathy, you have to reflect on what the patient said to make sure you understood them properly. In other words, you try to verbalize what you think the patient is thinking and feeling.

Mary: I just can't relax in the evening. Once I'm in bed, I find myself lying awake, thinking about all the things I need to do tomorrow.

Physician: I understand you're feeling overwhelmed and quite stressed. In the evening you start analyzing all the responsibilities you need to deal with the next day, so I can understand that surfing on the Internet makes you forget your problems and you feel a bit more relaxed.

Pay attention to nonverbal communication. Show empathy with your body language too. You may want to lean toward the person, look them in the eye, nod your head or kindly smile.

Work together to find the best solutions. As opposed to giving universal advice, it is wise to try to find solutions that will fit nicely into the

patient's life. Solutions should be easily applicable and sustainable in the long term. The patient should feel that their wishes and needs are being acknowledged.

Physician: There is no foolproof formula for success, but we can try together and find the solution that will work best for you. What could you do instead of surfing the web on your phone?

If nothing springs to your patient's mind, you may offer some solutions.

Physician: A lot of people find it helpful if they take a nice bath before going to bed, or if they read something they enjoy. Some people take 15 minutes in the evening to write down everything they need to do tomorrow so they can clear their mind before going to bed. How does that sound to you? Can you imagine doing some of these things?

Providing additional information. With permission, you may add some arguments or research findings in order to support your patient's lifestyle change.

Physician: Recent research has shown that using electronic media immediately before going to bed makes it more difficult to fall asleep.

Set a timeline.

Physician: Maybe you can try experimenting on yourself over the next three weeks and try not to use your cell phone an hour before going to bed. How does that sound? Then we can talk about it again and comment on your experiment.

Summary. At the very end, it is crucial that the patient verbalizes the summary of the plan you have agreed on. The plan can be revised at the next appointment.

By following this pattern, the patient does not feel coerced into making a lifestyle change. Resistance is therefore decreased, and the probability that the actual change will happen is increasing.

2.6.2. Case scenario 2: All or nothing

Peter (23) decided to change his lifestyle at the beginning of the semester. He joined a gym, stopped smoking, and tried to eat a healthy, balanced diet. However, with exams soon approaching, he struggled to deal with stress and he slipped back into his old habits, the ones he used before to cope with stress. He stopped exercising, ate large amounts of sweets and started smoking again. When asked how come this big change in his life happened, it became clear that Peter was fostering the "all or nothing" mentality. Taking the conversation

further, we get to know that Peter has low self-esteem and that he sees his failure as an indicator that he is "just not good enough, so what is the point of trying".

Ask follow-up questions. It is important to show interest and participate in the conversation. In this way you may also direct the conversation a little bit, and help the patient express himself. Try to avoid starting the question with "why", as it can sometimes sound accusing.

Instead of asking: *Why did you start smoking again?, try: What's the reason you started smoking again?, or: You're smoking again. Do you want to tell me what happened?*

Show understanding and empathy. *Try to reflect the story you've heard back to the patient, in your own words.*

Physician: If I understood you correctly, you had a pretty stressful period during which you've gone back to your old habits. I can see how that happened. It must have been hard for you to go through all that stress.

Peter: Yes! It was really hard, I've been feeling so much pressure for more than two months.

Search for compromise. The patient should decide which habit to tackle first. By approaching behavior change one habit at a time, it is more likely that the new habit will stick.

Physician: What part of your life do you feel most comfortable changing right now? Is there a habit that you want to change because it's affecting negatively your life? What would be the easiest thing for you to change?

If you notice that the patient is showing resistance to change, you can offer a certain period of time after which you will go through it all again and decide what to do next (short-term and long-term goal). For example, you may suggest that the patient tries avoiding fast food for a couple of months. Perhaps the feeling of success and all the benefits that come from change will then serve as motivation for long-term goals.

Offer support in finding new solutions and strategies for coping with stress. Together with the patient, try to find a solution patient can reach for in stressful situations. The goal is to decrease automatic habitual patterns that endorse harmful behavior. People keep sticking to their harmful habits because they give them something they need (pleasure, entertainment, relaxation, and escaping boredom). When we break a bad habit, it is a good idea to be mindful of what we are losing, what was the underlying "need" that the habit was fulfilling. Being aware of that "need" is the first step to finding a good habit that could provide the same thing.

Physician: So what do you think you get from your unhealthy habits?

Peter: Well, I use fast food and sweets as a reward after a hard day of studying. I would walk to the store to get something sweet after I'd done everything for the school, and that would be the best part of my day. And a cigarette would help me relax during study breaks.

Physician: Can you think of anything else that could also serve as a reward after a hard day? Is there anything else that could help you relax while you're studying? Imagine using something like that instead of these bad habits.

Peter: I can imagine having a cup of tea and listening to my favorite music to relax. That really soothes me. Maybe I could go for a walk with a buddy in the evening. Or I could watch my favorite show. I think I'd look forward to that.

Relapse. You have to plan ahead to stop the patient from giving up or acting out of guilt. Low self-esteem can lead to withdrawal. Explain that relapse is a normal part of the process of change.

Physician: What would it mean for you if you started smoking again/fell back to your unhealthy eating habits? How did you feel in these situations before? Did you feel guilty? Let's try and remember your motivation for this lifestyle change. Relapse is just one episode, it's not a failure.

No delays. The start of a new habit should not be delayed until tomorrow, or Monday, or New Year. People usually fall into even worse habits while waiting for change. It is necessary to remember that change is a process and adopting new habits will take time and perseverance. The "all or nothing" approach simply does not work.

2.6.3. Case scenario 3: Binge eating

Eve (38) has been steadily gaining weight for years. She is very unhappy with the way she looks, and she is starting to feel that being overweight is negatively affecting her health. She's been dieting quite a lot, which is interrupted with episodes of binge eating. It is very hard for her to talk about this problem, even with family and friends, because she is feeling ashamed and is convinced that her problems are a proof of "weak character".

Be mindful of triggers and unconscious eating patterns.

Physician: When do these episodes of overeating happen? What usually happens on that day? How do you feel before overeating?

Ask open questions, and if the patient has trouble verbalizing his thoughts, offer some of the most common reasons for overeating: being angry, sad, in need of comfort.

Physician: Did something happen that day to upset you? What has been stressing you out lately? Could that be a trigger for binge episodes? Do you overeat in social setting or when you're alone?

Use pro-change talk.

Physician: What do you think you could do to prevent these episodes from happening again? What are your most important reasons for change? What would be the benefits of change?

Remind the patient of his/her strengths and capacities. This is especially important if the patient has low self-esteem.

Physician: What did it look like when you were successful in changing your habits before?

Eve: There was quite a long period of time last year when I didn't overeat. I felt so much more stable, like I finally had control.

Physician: So this is something that you're capable of doing. What traits do you have that help you be successful?

Eve: I can be quite persevering and responsible. Umm, you're right, I should use my strengths to tackle this.

Looking for support. Overeating is often associated with feeling lonely, although person might not even be aware of it. Friends and family help us deal with negative emotions.

Physician: Can you think of any ways your friends and family could help you?

Gaining control. Help your patient imagine a situation that leads to overeating and go through it step by step, this time avoiding the episode.

Physician: Let's imagine you're just about to have a "cheat meal". Is there anything you can do that would interrupt you? Can you imagine ways in which you can regain control?

Offer examples.

Physician: You can try using positive self-talk, and figure out a personal motto that will distract you, something you can tell yourself in difficult moments. Maybe something like "I got this".

2.6.4. Case scenario 4: Goal setting

Sarah (37) never did any sports, not even as a child since her parents never gave it much thought, putting a strong emphasis on academic success. Sarah just never thought of herself as an athletic type. In her thirties, she started

recognizing all the consequences of sedentary lifestyle, she felt devoid of energy, and her back and joints felt stiff and sometimes sore. She tried Pilates, but she found it boring and lost all the motivation. She even started running, which she enjoyed, however she did not manage to make the habit last.

Set goals. In order to make changes and develop new habits it is important to set appropriate and realistic goals. Goals can be short-term, medium and long-term. They should be realistic, achievable and measurable. It's a good idea to break down the goal into a subset of smaller goals.

Find the right reason for change. Using open questions, ask the patient what she wants to get from physical activity. Direct the conversation toward immediate benefits for the patient: feeling energized, sleeping better, feeling less anxious, feeling relaxed…

Physician: If you start running regularly, what kind of person do you think you'll become? Can you imagine that? Do you see yourself healthier, more organized, more efficient? What does that mean for you? How would you feel then?

Sarah: I think I would finally convince myself that I can be sporty. I'd finally start taking care of myself and I'd enjoy it every step of the way. Usually I feel like I'm neglecting my own needs because of all the responsibilities I have. I love having a routine, and running could be a part of that, it would make me feel organized.

Follow up. Depending on the goals you set, you can arrange a follow-up meeting, especially if the patient needs you to assess her progress, for example, by assessing the back pain.

2.7. Conclusion

Patient-centered methods require the clinician to step away from feeling responsible for the patients' changing behavior and help the patients realize and verbalize their own reasons and ways of making change work. The goal of a clinician is to help patients move from requiring extrinsic motivation to being intrinsically motivated to change their unhealthy behaviors. This is done by assessing readiness and willingness to change and helping them resolve ambivalence and set appropriate goals. A good guide asks where the person wants to go, informs the person about options to see what makes sense to them, and finally listens and respects what the person wants to do and offers help accordingly.

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2.9. Appendix

Delivery of 5A's self-management support. *Available from: Glasgow RE, Emont S, Miller DC. Assessing delivery of the five 'As' for patient-centered counseling. Health Promot Int. 2006;21:245-55.;* https://academic.oup.com/heapro/article/21/3/245/559789/

PATIENT NAME _____ **DATE** _____ **TYPE CONTACT:** _____

(Check ALL that apply)

___ ASSESS- Patient completed assessment and received feedback on health behaviors DATE: _____

Notes:

___ ADVISE- Personally relevant, specific recommendation for behavior change DATE: _____

Notes:

___ AGREE- Document collaboratively set, specific achievable behavioral goal with patient DATE: _____

Notes:

___ ASSIST- a. __ Worked with patient to develop action plan, strategies, or problem solve DATE:_____
b. __ Referred patient to resource, counselor, or group to work on above

Notes:

___ ARRANGE- a. __ Made follow-up contact within 2 weeks after setting behavioral goal DATE:_____
b. __ Checked to see that patient completed referral visit
c. __Obtained feedback on patient progress from referral party or directly from patient

Notes:

GENERAL NOTES: _____

CHAPTER 3: NATURE VS. NURTURE IN HEALTH AND DISEASE

Ozren Polašek

"A long healthy life is no accident. It begins with good genes, but it also depends on good habits."

Dan Buettner

3.1. Introduction

The question of whether traits or diseases are caused or driven mainly by nature (genetics) vs. nurture (environment in the broadest sense) goes back to the very beginnings of medicine. It was none other than Hippocrates himself, who first tried to disentangle the factors that predispose individuals toward specific diseases, by developing a four-fold approach, where he distinguished the yellow bile, black bile, blood and phlegm as the main drivers of health and disease (1). At the same time, he notes the substantial impact that our environment has towards the health and disease (Box 3.1).

Box 3.1. On Airs, Waters, and Places by Hippocrates (1)

Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces for they are not at all alike, but differ much from themselves in regard to their changes. Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality. We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner, when one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun; for its influence is not the same whether it lies to the north or the south, to the rising or to the setting sun.

These things one ought to consider most attentively, and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky situations, and then if saltish and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold; and the mode in which the inhabitants live, and what are their pursuits, whether they are fond of drinking and eating to excess, and given to indolence, or are fond of exercise and labor, and not given to excess in eating and drinking.

The ongoing discussions got a lot of support after the works of John Locke, who considered young humans to be blank slates in relation to our ability to learn and develop in psychological sense – *the tabula rasa* hypothesis (2), giving rise to a notion that majority of trait variance will be environmental, as opposed to the inherent, genetic factors. The idea quickly spread far and wide to suggest that most, if not all diseases might be environmentally driven. After considerable debate on the origin of disease, Sir Francis Eugene Galton coined the phrase nature vs. nurture in 1869, and set a stage for the discussion to follow (3).

In essence, the hypothesis assumes that a disease may have an internal, genetic, natural cause, or that it may be a result of the environment, nurture. While the dichotomy may appear to be reasonable, the enormous line of studies in the 20th century was often reluctant to fully support either of the opposing approaches and resonated nature *and* nurture as the main mechanism underlying the majority of diseases. The common study type that was utilized in this line of research included separated twins or adopted children, in order to control the effects of genetic factors, and therefore attribute the percentage of total variance to either genetics or the environment. Indeed, a theoretical assumption holds that if two genetically identical organisms (twins), raised in separate and independent environments, have similar disease profile, then disease risk can be attributed mostly to genetics. Such studies commonly reported various degrees of contribution of genetics or environment (4), failing to fully support either domain that defines the risk of disease.

The recent advances in the field of genetics contributed to this discussion, by developing a concept of heritability. It is defined as the proportion of a total variance of a trait or a disease that is attributable to genetic effects. Simply put, if we assume that all the variation of a trait or a disease in population is due to genetics and environment, then we can compare any given trait among the relatives and estimate the amount of shared variance, attributable to a fraction of the genetic material that is shared among them. Therefore, heritability is defined as the fraction of variance that is shared in genetically linked individuals. Everything that remains is therefore attributable to environmental factors. Interestingly, we can also define the shared (household) effect, which is a potentially misleading fraction of the apparently genetic variance, which can be shared among the members of the same household, who therefore live in more unified environment (exposure and lifestyle) than any two random members of the population. The problem arises again from the real-life situations, where heritabilities of the same trait are not directly comparable among various populations, since the heritability estimates reside in the environment

in which individuals live. If the environmental effects vary across studies, then the heritability estimates may vary too, making direct comparisons of heritability between studies almost completely meaningless.

The modern understanding of the problem derives from the recent studies in genetics, where the overall discovered contribution of genetic factors has been much lower than expected, giving rise to the idea of missing heritability. It was defined as the difference between high heritability estimates observed in many studies, as opposed to very low share of explained variance in the genetic studies that is attributable to genetic effects. It has been suggested that it may come up as the consequence of either epigenetic factors, or various interactions, which may be hard to detect and quantify in real-life conditions.

3.2. So, is it nature or nurture?

Despite long discussions about the nature of most of diseases, the reality seems to follow a common pattern in medicine. Nowadays, it is believed that most diseases have dual origin, where genetics defines susceptibility, which can cause the disease to develop in an unfavorable environment. Therefore, diseases are not solely environmental (except for possibly random trauma, but even this is not likely to be truly random, see Box 3.2).

Box 3.2. Is there such a thing as random injury?

In an attempt to elucidate this question, one must investigate the causes of the most common types of trauma.

If such cases would indeed happen across a random selection of a general population, we might assume that injuries happen randomly. However, most studies do not seem to show this, but tend to resonate a strong selection of traumatic events. If we look across the spectrum of road traffic accidents, the most common profile of the injured includes younger males (a), while other groups tend to be involved in such accidents to a much lesser extent. Similar findings of uneven distribution were also reported in suicide and homicide (b, c), suggesting that even these injuries might be more attributable to gender, socioeconomic status or psychosocial features.

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There might be some diseases that are caused solely by genetic factors, in terms of mutation in critical proteins that inevitably lead to the disease development or are simply not even compatible with life, and remain rare in population due to their detrimental effect, even in utero. However, a series of

papers challenged this hypothesis. While checking the whole genome sequences (the entire genetic information of a person), researchers managed to find people who had very deleterious mutations that were previously considered to be incompatible with survival, while in fact they were apparently healthy (5). This finding suggests that there are other compensatory mechanisms in place, which enable that the lost function is probably taken over and somehow regained, allowing that person to survive and even reproduce. This also means that there might be other, non-genetic mechanisms that govern this relationship. Additionally, unfavorable environment might provoke these people more, and that those living in the least favorable environments will not be able to compensate their innate lost function, and will consequently be less likely to survive.

3.3. Hormesis

Hugo Schulz, who reported in 1888 that yeasts grow faster if they are exposed to toxins, detected another mechanism of interest – hormesis (6). The series of papers following this finding reported similar results in various organisms and different environments. In essence, the hormesis describes favorable outcomes in an organism, after exposure to a specific dosage of otherwise harmful agents. The underlying principle is believed to be resilience, in which an organism manages to develop protective mechanisms after low-level exposures that, when applied properly, may have a positive overall effect on survival and health. Such effects were often reported in medicine, describing positive effects and conceptualizing across ten statements (7). In conclusion, one might assume that there will be multiple hormetic effects on human health, after exposure to harmful agents. This may include the positive effects of wine, subliminal dosage of various chemicals and may elicit many other positive health-related outcomes (8), although the conceptual framework for these associations remains rather elusive (9). Beneficial effects of moderate physical activity might be described in a similar way, where reports often describe bell-shaped or J-curve response (10, 11).

3.4. Don't blame your genes

A very unfavorable situation, giving rise due to numerous reports of newly discovered genes underlying our diseases, is the increasing blame of one's genetics in the course of illness (12). If we push this argument beyond reasonable

levels, then one might put all the blame on "bad genes", and completely cut the behavior and risk reduction attempts out of the equation. In contrast to usually only a few percent of a trait or a disease variance explained by the genes, behavior change can still have a more significant impact and help substantially in reducing the risk for many chronic diseases. For example, exercise accounted for 10-23% of risk reduction in myocardial infarction with non-obstructed coronary arteries (13), while current genetic markers explain just a few percent of variance, across numerous studies (14). It seems that at the current state of (bio)medical knowledge and technical expertise, we can still expect greater returns from behavior change than genetics alone.

3.5. Conclusion

The amount of evidence is constantly accumulating, allowing us to refine the ideas underlying nature vs. nurture hypothesis in terms of human diseases (15). The overall synthesis seems to point to joint effects in nearly all diseases, where the environment plays an important modifying role, while the DNA defines the range of possible biological variability. A critical component of this relationship is hormesis, a finding that low dosages of harmful stressors may elicit beneficial health effects. Implications of these findings in lifestyle medicine require a systematic integration of all the evidence in support of an attempt to reach the best level of health possible, while bearing in mind non-linear and hormetic effects that may be elicited by the low-dose exposure to the harmful environmental agents. Lastly, we must actively fight against the pseudo-deterministic view of genetics as a definitive disease risk, and demonstrate that most genetically-induced risks may be overturned by the favorable lifestyle and health-oriented activities. Until we manage to better understand and employ genetics in everyday medicine, behavior change remains the best course of action.

3.6. Literature

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CHAPTER 4: NUTRITION IN LIFESTYLE MEDICINE

Ivana Kolčić

"Let food be thy medicine and medicine be thy food."
Hippocrates

„Nutrition is a key determinant of healthier populations, and malnutrition in all its forms is a key risk factor, with serious impact on morbidity and human capital across the life course." WHO (1)

4.1. Introduction

Food plays an important role in our life. Food builds us, from the tiniest molecules to our strong bones and teeth. Our intake of foods and drinks provides all of our body's initial building blocks. People usually love to eat, on top of the fact that they need to in order to survive. For some of us, food is one of the greatest pleasures in life and some people literary live to eat. We celebrate food, and we celebrate with food. In all big (but also small) life events we like to celebrate, the food is the central point of the event, including our birthdays, weddings, graduation ceremonies, even funerals. Just try to imagine yourself hosting a New Year's Eve party and serving nothing but water.

These days food is literary everywhere. You see it daily in TV and Internet commercials, you see it on billboards while going to school or work, there are hundreds of cooking shows running as we speak, even entire food channels, not to mention the cookbooks. Yes, food is very important to us. Then how did we get ourselves into a situation that food, the substance of life, turned into a source of harm to us? People usually take good care of their pets, cars and other belongings. For instance, not many people will use the wrong fuel type for their car. So why do we put wrong food and drinks in our bellies? The explanation is far from simple. It involves factors such as our evolution, physiology and psychology, it involves our culture and our environment, especially the food industry, entire economy and our governments. Let us discuss some of them.

4.2. Nutritional transition and food we eat today

People are instinctively drawn to the foods that are salty, sweet and fatty, or any combination of those. A combination of salty and fatty is even better. One of the hypothesis behind this is the Neel's "thrifty" genotype hypothesis as our evolutionary legacy. According to this hypothesis, our genes and metabolism have adapted to the environment that was marked by continuous alterations between feast and famine (2). Namely, we have developed efficient fat storage mediated by insulin response (3). These conditions 'got' us through most of our evolutionary past, and were abruptly followed by a very recent jump into the Western-type diet. A mere few decades ago, we switched from scarce, but nutritious food into the abundance of energy-dense, fiber-depleted foods that are available 24/7 (3), without having to work hard to obtain them. This is what might be one of the driving forces behind the insulin resistance, a worldwide epidemic of obesity and type 2 diabetes. Another hypothesis, which actually complements the "thrifty" genotype hypothesis, is the "thrifty" phenotype hypothesis, proposed by Hales and Barker (4). This hypothesis proposes the fetal origins of coronary heart disease, programed by the "undernutrition in middle to late gestation, which leads to disproportionate fetal growth" (5). This in turn tunes the metabolism and paves the way for adverse metabolic consequences of unhealthy nutrition later in life, in which case cardiovascular diseases kick in, even during early adulthood.

Regardless of the hypotheses, the epidemiological data show us that we are in serious trouble. We experience the unimaginable – double burden of malnutrition. Double burden of malnutrition is characterized by simultaneous presence of undernutrition and overnutrition, be it in an individual over the life course, within a single family and household or within the subgroups of the population. The presence of a 'double burden of malnutrition' may also be an important driver of the double burden of disease in low- and middle-income countries, where both infectious and chronic diseases simultaneously take a high toll on people's lives (6). Indeed, while more than 820 million people in the world were hungry in 2018, 2 billion adults were overweight (7). "Food insecurity" is a new term introduced to describe both hungry people and inadequately nourished people, who may not necessarily suffer from hunger, but are at greater risk of various forms of malnutrition (7). This means that people lack regular access to nutritious and sufficient food, which is not reserved only for low-income countries in the world, since moderate or severe food insecurity affected as much as 8% of the population in Northern America and Europe (7). In total, 2 billion people, or 26% percent of the world population, experience moderate and severe levels of food insecurity (7). The

estimate for 2014 was that 462 million people were underweight (1). At the same time, the percentage of overweight and obese people continues to rise in all regions of the world, especially in school-aged children, with an estimate of 40 million children under five, 131 million children between the ages of 5 and 9, and 207 million adolescents being overweight (7). This situation is completely new and unprecedented in human history. The majority of these statistics happened in the last couple of decades. For example, a rate of overweight in adults had doubled between 1980 and 2014, and the prevalence of overweight children reached an increase of over 9 million children in 2018, compared to 1990 (1). How did we let this happen in the first place? It was mainly due to the nutritional transition (Figure 4.1.) (8), alongside with other lifestyle changes, such as decreasing levels of physical activity people engage in, urbanization, globalization of the food market and overall decrease of the food cost (9). These changes were driven by non-rational use of technological advancements. For example, new processing methods made the food much sweeter and much fattier (flour processing, sucrose and fructose extraction, palm oil and other vegetable oils turned into trans fats, etc.), not to mention the introduction of sugary drinks on a massive scale. This resulted in major shifts in dietary practices toward increased intake of refined carbohydrates, added sweeteners, edible oils, and animal source foods, at the cost of reduced intake of legumes, vegetables and fruits (9). All of these and many other factors resulted in the profound change of the food environment, which became almost toxic. It is within this environment that we add the mixture of our "thrifty" genotype and "thrifty" phenotype, resulting in a perfect storm setting.

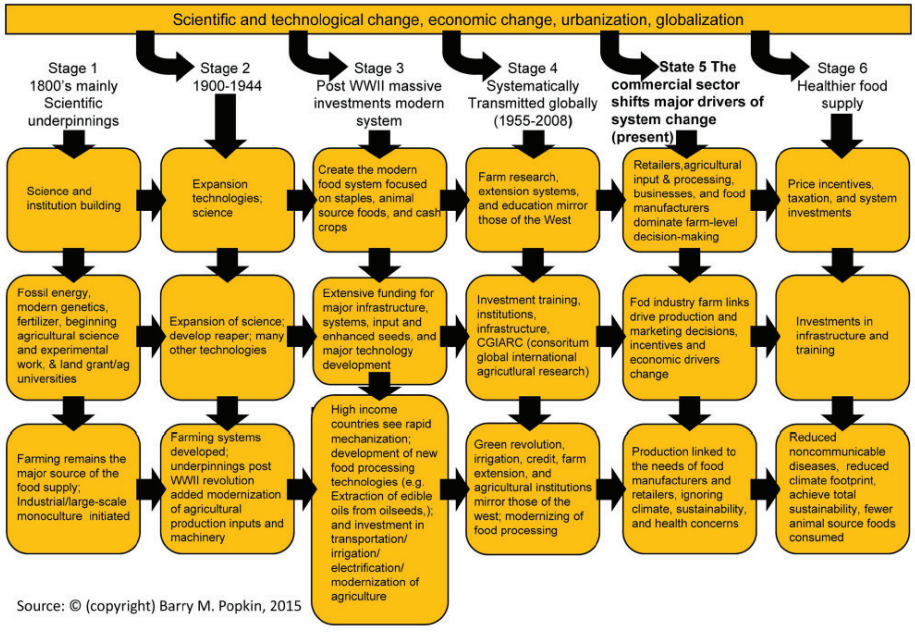

Figure 4.1. Stages of nutritional transition and Global Agricultural System's Development (8)*; Available from: Anand SS, Hawkes C, de Souza RJ, et al. Food Consumption and its Impact on Cardiovascular Disease: Importance of Solutions Focused on the Globalized Food System: A Report From the Workshop Convened by the World Heart Federation. J Am Coll Cardiol. 2015;66:1590-614. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4597475/*

Most countries in the world today, regardless of their economic development, have experienced both nutritional transition and widening of their population's waist. The result is evident in the massive burden of the non-communicable diseases around the globe. It was estimated within the Global Burden of Disease Study that as many as 11 million deaths (95% CI 10–12 million) and 255 million DALYs (95% CI 234–274 million) were attributable to dietary risk factors in 2017 (10). DALY stands for disability-adjusted life year, where one DALY represents one year of a healthy life lost due to either disability or mortality. The main globally distributed dietary risk factors included low intake of whole grains (3 million deaths and 82 million DALYs), high sodium intake (3 million deaths and 70 million DALYs [34–118]), and low intake of fruits (2 million deaths and 65 million DALYs) (10). Many of those deaths and diseases were probably associated with the estimated 4 million deaths globally, which can be attributed to obesity (7). Another estimate by World Bank states that, if we invested in the improvement of nutrition, we could save 3.7 million lives by 2025 (11).

The WHO recently pointed to some of the essential nutrition actions, across different stages of life, in the extensive publication (1). One of the most important areas where much more needs to be done is the nutrition in early life, staring with infancy, but also including childhood and adolescence. This period of life is the time when habits and food preferences are formed. In brief, exclusive breastfeeding for the first 6 months after birth is the way to feed all infants (12), whenever possible and taking into consideration both conditions of the mother and the baby. We have to widely promote and encourage breastfeeding, with appropriate professional and lay support readily available to all mothers. Breastfeeding benefits for infants include reduced risk of gastrointestinal and respiratory infection (12), reduced risk of atopic dermatitis and gastroenteritis, possibly a higher IQ later in life, even a possibility for reduced risk of childhood leukemia, hypertension, necrotizing enterocolitis, obesity, otitis media, asthma, severe lower respiratory infections, sudden infant death syndrome, and diabetes type 1 and 2 (13). Additionally, less than optimal duration of breastfeeding (<3 months) was found to affect the growth trajectory in the direction of rapid-growth pattern in early childhood, as well as body composition in young adulthood, demonstrating the link between early nutrition and risk of disease in adulthood (14).

Breastfeeding has positive impact on mothers too, such as decreased risk of breast cancer, ovarian cancer, postpartum depression, hypertension, cardiovascular disease, and type 2 diabetes mellitus (13).

As the baby grows, complementary solid foods are gradually introduced, and commercial baby foods are often used. Unfortunately, as reported by the WHO, these products are widely available and they tend to contain high amounts of total sugar, fats and salt, as recorded in Austria, Bulgaria, Hungary and Israel (15). Sugar content in the commercial baby foods is especially worrisome, as is the practice of adding free sugars to baby meals in general. The WHO defines free sugars as “monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates” (16). This translates into every type of sugar, other than those that are not naturally present in its natural form - within wholesome fruit, vegetable, grain, nut or seed. The WHO guideline for sugar intake for adults and older children recommends the intake of free sugars to amount to less than 10% of total daily energy intake, while it would be even better if it could be reduced to below 5% (16). This 5% of total daily energy intake via free sugars roughly translates to 25 grams or 6 teaspoons of sugar during the day (17). Furthermore, the appropriate food products for infants and young children are those without any

added free sugars and salt (18). Unfortunately, the analysis of commercially available baby foods in Austria, Bulgaria and Hungary found that in around half or more of these products, more than 30% of energy came from sugars, while more than 40% of products had 40% or more of energy from sugars (15).

As children grow, they enter the education system, which should prepare them for their adult life. In the context of promoting a healthy lifestyle, and especially healthy nutrition, kindergartens and school environments are extremely important. In case these environments are not oriented toward promoting healthy eating, they are actively paving a way to life-long unhealthy habits. School meals and vending machines should be free from highly processed snacks and sugary beverages, while actively ensuring access to healthy food options.

School environments are just one important part of the puzzle. Children and adolescents are immensely exposed to the media and food marketing. Unfortunately, they are also "more susceptible to food marketing than adults, which makes reducing children's exposure to obesogenic foods necessary to protect them from harm" (19). Indeed, the trends in childhood overweight and obesity in the world are overwhelming. Global age-standardized prevalence of obesity in children aged between 5 and 19 have increased from 0.7% in 1975 to 5.6% in 2016 in girls, and from 0.9% to 7.8% in boys, and as many as 50 million girls and 74 million boys worldwide were obese in 2016 (19). The rising trends in children's BMI have currently hit a plateau in many high-income countries, such as in northwestern Europe, the high-income English-speaking countries, and Asia-Pacific regions, but have accelerated in parts of Asia (19).

The insight on lifestyle habits in children in Europe are available from the results of the Health Behaviour in School-aged Children (HBSC) survey (20). This survey is performed every four years among children aged between 11 and 15, and the latest data on lifestyle-related behaviors, health outcomes and social environments in school-aged children are available for 2013/14. It was found that the prevalence of obesity increased between 2002 and 2014 in 16 out of the 27 examined countries, and it was higher in boys, younger children and those with lower affluence (20). Even though daily consumption of fruit and vegetables increased slightly between 2002 and 2014, nutritional habits were far less than ideal, with only 38% of children consuming fruit daily, while 36% of children consumed vegetables daily (20). On top of that, almost 20% of children consumed sugary drinks daily, and 25% of children ate sweets every day (20). Unfortunately, these habits were not accommodated with appropriate levels of physical activity. The proportion of young people achieving at least 60 minutes of daily moderate-to-vigorous-intensity physical activity was low

in all countries, with overall percentage of 25% in boys, and only 15% in girls, which was decreasing with age and reaching the lowest levels among 15-year-olds (20).

According to these statistics, there is still substantial room for improvement, and educational system is the environment where kids should learn more about the consequences of unhealthy behavior, as well as the ways to reduce and avoid them. How to get them pay attention? How to speak of health protection and health promotion to young healthy people? They are not interested in health; they have it and take it for granted. Lectures and warnings of negative consequences will surely not work on adolescents; they can even make things worse. We have to 'sell' our messages the way food industry does. We have to 'sell' them promotion of youth and happiness. There is hardly anyone doing this better than Coca-Cola. Let us learn from them, but with different agenda in mind.

Beverages with added sugar pose important challenge to both individual and population health. Sugar content in fizzy drinks is usually between 25 and 60 grams of sucrose in a half-liter bottle (most often closer to the upper limit than the lower one). That translates roughly into 6 to 15 sugar cubes in only one half-liter bottle of fizzy drink (one sugar cube, just like one teaspoon, contains 4 grams of sugar). It may take just a few minutes to drink half a liter of sugar-sweetened beverage. That is one serious mismatch to the free sugar intake guidelines! One fizzy drink literary reaches the limit of less than 25-50 grams of sugar for the whole day. In that case, is switching to artificially sweetened soft drink really a good idea? Apparently not. In a cohort study which included almost half a million people from 10 European countries followed on average for 16 years, the intake of both sugar-sweetened and artificially sweetened soft drinks was associated with increased all-cause mortality (21). The risk of death from all causes was about 8% higher for people who drank two or more glasses of sugar-sweetened soft drinks per day (21). On the other hand, the risk of death from all causes was 26% higher in people who drank ≥2 glasses of artificially sweetened soft drinks per day, and the risk of death from cardiovascular causes in the same group was 52% higher over the observed period (compared to people who drank <1 glass per month) (21). These findings refute the idea of replacing sugar with artificial sweeteners in our drinks. What to do instead? Just drink water, tea, or coffee, ideally without any added sugars or artificial sweeteners.

What do we eat and drink today? Imagine yourself going to the local supermarket. What is on the offer? Sometimes it gets quite overwhelming for me, when I enter the supermarket in search for groceries. There are so many

options. Even worse, there are so many packed, processed, ultra-processed and ready-to-use options, as well as so many fast food restaurants. Food and meals you find there are so convenient, super tasty, and very cheap. Much tastier and so much cheaper than if you would cook these meals by yourself. It is not a coincidence. They were specifically designed so that a sane person could not resist them. "The resistance is futile", one might say, as they do in Star Trek. The only way to fight back is to be fully armed with knowledge and positive attitude towards health protection and health promotion. By opting for the processed foods, we eat more sugar, salt and fat than we really need, and oftentimes they are hidden where we would not even expect them. The ultimate example for this is bread, a daily staple to most of the people, which almost everybody is outsourcing these days due to the fact that a lot of time and effort has to be put in a single loaf.

Unfortunately, it is not only the problem of too much sugar, salt and fat in processed foods, these foods are loaded with sugar, salt and fat at the expense of fiber, minerals and vitamins. By choosing processed and pre-cooked foods, we opt for less nutrition with more energy. We consume so much energy we cannot possibly spend in our very busy, but sedentary lives. Speaking of contradictions!

I would dare to say that these days there are more of 'pretending-to-be-foods' on the market than unprocessed, natural foods. As a long-term consequence of this toxic food environment, we suffer. Then we go and get to invent hundreds of fad diets, which by the way never work, at least not in the long run. So what is the solution? Michael Pollan has put the answer to this question in a very few, very wise and very simple words: "Eat food. Not too much. Mostly plants.", as well as "It's time we ate like our great-grandmas" (https://michaelpollan.com/reviews/how-to-eat/).

4.3. Nutrition and health outcomes

A lot has been said already about the link between nutrition and health. A lot has been written about healthy nutrition, with many available guidelines on what to eat. Some of these recommendations are listed at the end of this chapter. We will not go into details of how many protein a person needs per day or how much carbohydrates is OK. Instead, we will discuss the association between nutrition and body weight.

When we describe nutrition in regard of health outcomes, we face a serious challenge of measuring nutritional habits. They are hardly constant or predictable.

Ideally, they depend on the season and locally grown produce. Unfortunately, there is no one ideal approach for the assessment of nutrition to fit all the requirements, which would be both precise and reliable. Nutritional assessment can cover shorter or longer periods, depending on the goal of the assessment, time at hand and cooperation of the subject. Short-term dietary assessment methods include food records (diaries) and 24-hour dietary recalls, as the most common approaches. A food diary is a detailed list of all foods and beverages consumed within a specified period, possibly a week, while a 24-hour recall aims at recording individual's entire intake over the previous 24 hours (22). The food frequency questionnaire (FFQ) is a longer-term recall instrument, aimed at assessing intake and frequency of consumption of many food items over longer period of time. There is a long list of disadvantages of these approaches, including low accuracy of information on calories and nutrients, difficulties in judging the amounts of food eaten, the need to remember all the details (which people usually tend to forget, even those without memory or attention deficits), portraying socially acceptable behaviors by underestimating alcohol, fast food, snacks, and similar items intake, overestimation or underestimation of the quantity of food being consumed, and the use of external databases of food nutrients composition (22). Nevertheless, nutritional assessment is widely used as a proxy of dietary habits and nutritional status, and is less expensive compared to the sophisticated biochemical measurements. Appendix 4.1 displays a simple FFQ, which can be used for assessment of the Mediterranean diet adherence, according to the Mediterranean Diet Serving Score (MDSS) (23).

4.3.1. Nutrition, overweight, and obesity

You are what you eat (and drink), literary. It is as simple as that. There is a vast number of scientific papers trying to prove that concept, by assessing the association between nutrition and obesity, and many negative health outcomes are demonstrated as consequences of excess body fat. Obesity is associated with increased morbidity and mortality. To name just some of the most important outcomes, they include type 2 diabetes, coronary heart disease, stroke, hypertension, dyslipidemia, sleep apnea, gallbladder disease, osteoarthritis and some cancers such as endometrial, breast, prostate, and colon cancer (24). Obesity is also associated with psychological and psychiatric morbidities (25). For further details on obesity and type 2 diabetes, see Chapter 5. Guidelines for prevention, identification and recommended care for overweight and obese individuals are a bit too much to cover here, so they are listed at the end of this chapter. What I want to share next are some general guidelines on dealing with questions of nutrition and body weight in daily practice.

Overweight and obesity are undoubtedly caused by habits and lifestyle choices. These include poor dietary habits, such as eating large amounts of processed and fast foods, drinking too much alcohol, drinking too many sugary beverages, eating out a lot, larger than appropriate portions (what is frequently offered in fast food restaurants for a fraction of the price), and the habit of comfort eating (26). Additionally, the list of possible reasons includes sedentary level of physical activity, some medical conditions and medications (hypothyroidism, Cushing's syndrome, corticosteroids, antidepressants, antidiabetics, smoking cessation, etc.), while genetic reasons were hardly proven to be associated with overweight and obesity (26), and these days they may serve as mere excuses for all listed above.

When thinking about the association between food and body weight, we might get seduced by the simple idea that energy input must be equal to energy output, or 'energy in' equals 'energy out'. If this was so plain simple, there would not be so many people suffering from overweight and obesity. Anyone who tried to lose some weight knows that simple math approach just does not work. It is so much easier to gain weight than to lose it. If it were just about adding and subtracting, it would go smoothly both ways. Moreover, we all know at least one person who can eat anything at any time, and always remains slim. At least to the naked eye. Therefore, there must be more to it, and there really is. A study which included participants of "the Biggest Loser" competition in the USA demonstrated that people who try to lose a lot of weight in a short time experience a "metabolic adaptation" (27). Metabolic adaptation is marked by slowing or reducing of the resting metabolic rate, as if our bodies resist weight loss. For instance, resting metabolic rate decreased on average by 610 ± 483 kcal/day at the end of the 30-week competition period, compared to the starting point (27). Even six years after the competition, the resting metabolic rate in the same people did not 'recover' (it was still 704 ± 427 kcal/day below baseline), and people with greater initial weight loss experienced greater slowing of the metabolism (27). Interestingly, a lot of lost weight was regained (average 58 kg was lost and 41 kg of the lost weight was regained over the next 6 years), while the metabolic adaptation was large and persistent (27). This was a small study with only 14 participants included in the analysis, and it was challenged on the ground of the methodology (28), but it indicates the existence of the long-term metabolic adaptation to weight loss and caloric restriction (hunger), possibly serving as a mechanism protecting us against starvation and death.

Figure 4.2 shows different physiological mechanisms associated with diet and weight loss, which determine the metabolic adaptation and ultimately

result in so-called "energy gap". Based on these metabolic changes, several approaches were recommended, which may narrow the energy gap and attenuate weight regain (29):

- Eat food rich in protein and dietary fiber, and lower glycemic load, since they are associated with reduced hunger and greater satiation
- Maintain high levels of physical activity (that is the characteristic of most successful weight maintainers)
- Create a high-energy flux state, characterized by "high daily energy expenditure and matching energy intake, as it may attenuate the declines in resting metabolic rate and thermic effect of food, and may also result in more accurate regulation of energy intake to match daily energy expenditure"

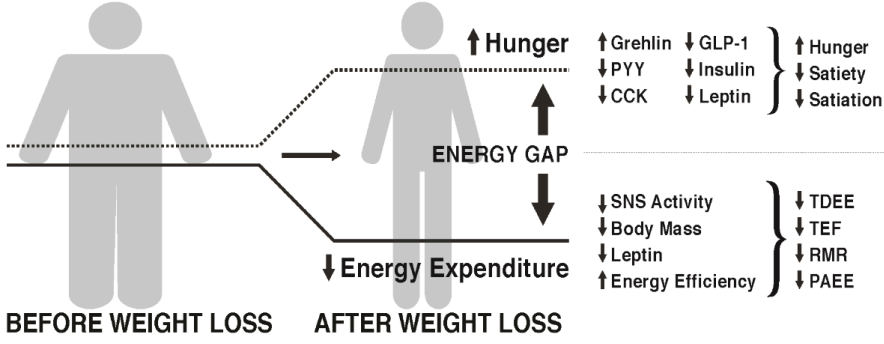

Figure 4.2. Energy gap in response to an energy-restricted diet. "The discordance between energy desired and energy required is termed the energy gap. Altered circulating peripheral factors (increased orexigenic and decreased anorexigenic peptides) communicate a state of nutrient deprivation to the brain, resulting in increased hunger and increased food cravings, as well as lower levels of satiation. On the expenditure side, diet-induced weight loss causes a significant reduction in total daily energy expenditure (TDEE) owing to reduced resting metabolic rate (RMR) and the thermic effect of food (TEF), and often decreases in exercise energy expenditure and non-exercise activity thermogenesis. The increased hunger and decreased energy expenditure can readily promote weight regain, especially in the face of an obesogenic environment characterized by an abundance of high-energy dense food and little need to engage in physical activity. PYY: peptide YY; CCK: cholecystokinin; GLP-1: glucagon-like peptide-1; PAEE: physical activity energy expenditure." (29) *Available from: Melby CL, Paris HL, Foright RM, Peth J. Attenuating the Biologic Drive for Weight Regain Following Weight Loss: Must What Goes Down Always Go Back Up? Nutrients. 2017;9:468.;* https://www.mdpi.com/2072-6643/9/5/468

To make things even more complicated, there are people who are obese, but they seem perfectly healthy otherwise. A new term of 'metabolically healthy obesity' was proposed for them. It was noted that some obese people do not have disturbed metabolic indices. Instead, they have preserved insulin

sensitivity and normal blood pressure and lipid concentrations, but the long-term health consequences of such condition still remain to be elucidated (30). Furthermore, there are people who are at a healthy weight for their height, but are metabolically unhealthy. They require special medical attention.

Another important question is the matter of the 'package' we use to deliver energy from food into our bodies. It makes all the difference if a person would drink a glass of freshly squeezed orange juice from four oranges for breakfast or if a person would actually eat (chew) four oranges for breakfast. Orange juice is almost totally deprived of fiber and the sugar is free to be absorbed instantly. Metabolically, there is no difference between freshly squeezed orange juice and any fizzy drink, both resulting in a spike in blood glucose level right after consumption. On the other hand, it might be a challenge to eat as many as four oranges to start with, and even if one could do it, the sugar in oranges would be released slowly and over longer period of time.

After all, calorie restriction is not such a bad idea. A randomized controlled trial in 218 healthy, lean, or slightly overweight young and middle-aged subjects, demonstrated that calorie restriction with adequate nutrition during a two-year period can be used for a substantial reduction in cardiometabolic risks and protection of cardiovascular health even in healthy people (31). People in the experimental group achieved a mean reduction in calorie intake of 11.9%, compared to 0.8% in the control group, which translated into a sustained mean weight reduction of 7.5 kg, while an increase of 0.1 kg was recorded in the control group (31). Additionally, calorie restriction caused a persistent and significant reduction of all measured cardiometabolic risk factors: LDL-cholesterol, total cholesterol to HDL cholesterol ratio, systolic and diastolic blood pressure, C-reactive protein, insulin sensitivity index, and metabolic syndrome score (31). This intervention, which translates into "a modest reduction in daily calorie consumption - the equivalent of an average-sized slice of cheese pizza, hold the pepperoni" as stated by Rita Rubin in JAMA Quick Uptakes (32), can serve as the proof behind the wisdom some populations have incorporated into their daily habits. For example, in Okinawa, Japan, the term "*hara hachi bu*", which is a 2500-year old Confucian mantra said before meals, reminds Okinawans to stop eating when their stomachs are 80% full. "The 20% gap between not being hungry and feeling full could be the difference between losing weight or gaining it" (https://www.bluezones.com/2016/11/power-9/).

As demonstrated, nutrition is a very important determinant of many health outcomes. Yes, we have a big fat problem on the global scale. But, there is still

hope. There is one nutritional pattern that supports both healthy people and a healthy planet. It is the Mediterranean diet.

4.3.2. Mediterranean diet

The Mediterranean diet is one of the most commonly examined nutritional patterns. Even if it has its origins in the Mediterranean basin, and is driven by the environmental characteristics of the region, it is now studied and practiced all around the world. The Mediterranean diet is a UNESCO-inscribed intangible cultural heritage.

A new, modern pyramid was proposed recently by the leading professionals and international entities, following the initiative by the Mediterranean Diet Foundation (33). As a general principle, the Mediterranean diet is mostly plant-based dietary pattern. Hence, plant-based foods are situated at the base of the pyramid (whole-grain cereals, vegetables and fruit), and they are the ones "providing key nutrients and health protective substances that contribute to the general well-being and help maintain a balanced diet, therefore, they should be consumed in high proportions and frequency" (33). Olive oil is the principal source of dietary fat and should be consumed daily, just like nuts and seeds. Foods of animal origins and processed foods (sweets and processed meats) are situated in the top part of the pyramid, indicating the need to use them sparingly and in special occasions (Figure 4.3). The middle of the pyramid contains dairy, legumes, fish and white meat, while potatoes are separated from the other vegetables, and are also found in the upper part of the pyramid. Additional characteristics of this modern Mediterranean pyramid include the display of frequencies in which we should consume different food groups, and proposal of water and herbal infusions as the main drinking options, alongside with a little wine during a meal. Unlike other dietary pyramids, this one also shows further Mediterranean lifestyle characteristics, such as regular physical activity and rest, culinary activities with emphasis on seasonality and biodiversity, tradition and use of local eco-friendly products, alongside with socializing during meals and conviviality in general (33). For more details, see Figure 4.3.

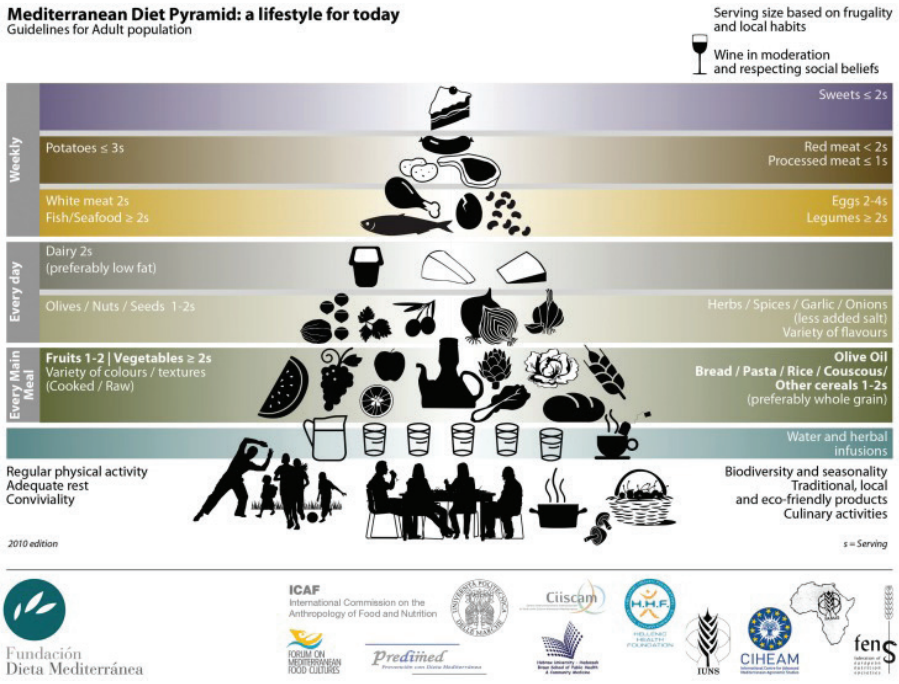

Figure 4.3. Modern Mediterranean diet pyramid (33)*, Available from:* https://www.cambridge.org/core/journals/public-health-nutrition/article/mediterranean-diet-pyramid-today-science-and-cultural-updates/70359644D12A038AC003B935AA04E120

Even though the Mediterranean diet pyramid looks fairly easy to understand and follow, things get a bit complicated by the fact that there is more than one variation of the Mediterranean diet. Each Mediterranean country has its own heritage and social norms, while each area may have a local variety of foods available. When scientists try to define the Mediterranean diet in order to estimate its impact on health, it only adds more confusion. For example, several papers tried to disentangle the matter of measuring the Mediterranean diet adherence. For instance, one systematic review included 27 studies on Mediterranean diet scoring systems and identified as many as 28 adherence scores, which clearly points to the need for improvement of the Mediterranean diet adherence measurement (34).

One recent, easy-to-follow, validated approach for the assessment of the Mediterranean diet adherence, which is based on the modern Mediterranean pyramid and proposed by Monteagudo and colleagues (23), is presented in the Appendix 4.2. This scoring system can also be used in the clinical practice. It can be useful as the guiding principle for patients, advising on how much they

should consume from each food group, putting more emphasis on four principal components of the Mediterranean diet, which need to be present in each of the three main meals during the day: cereals, vegetables, fruit, and olive oil. We present easy-to-follow advice on how to adhere to the Mediterranean diet in Appendix 4.3.

4.3.2.1. Health benefits of the Mediterranean diet

Many observational and experimental studies demonstrated the protective effects of the Mediterranean diet on different diseases, such as cardiovascular diseases, diabetes, some cancers, and even on total mortality, as well as on the aging indicators (35).

This can be due to the extreme nutritional and chemical complexity of the Mediterranean diet. It can be considered as "an exposome with thousands of nutrients", such as monounsaturated and polyunsaturated fatty acids, fiber, vitamins, minerals, and phytochemicals, which is a complex group of thousands of plant metabolites, such as phenolic compounds, alkaloids, carotenoids, anthocyanins, glycosides, and saponins (35). Alongside with other beneficial Mediterranean lifestyle characteristics, such as adequate physical activity, rest and enjoying strong and frequent social connections, it may be that this nutritional complexity is the driving force behind the observed protective effects for a large number of the most prevalent diseases and modern pathologies (35).

PREDIMED study (in Spanish *PREvención con DIeta MEDiterránea*) is one of the groundbreaking experimental studies examining health effects of the Mediterranean diet on cardiovascular health. The study involved as many as 7,447 participants who were at high cardiovascular risk, but without cardiovascular disease at baseline, and divided them randomly in three study arms (36). One experimental group received a Mediterranean diet supplemented with extra-virgin olive oil, second experimental group received a Mediterranean diet supplemented with mixed nuts (30 g per day), and the third experimental group received a control diet with the advice on how to follow a low-fat diet (36). The results were initially published in New England Journal of Medicine in 2013, but this paper was retracted due to some inconsistencies in the study protocol (37,38). The data were re-analyzed and republished in the same journal in 2018 (37). Results indicated that people who followed the Mediterranean diet supplemented with extra-virgin olive oil experienced a 31% reduction (HR=0.69; 95% CI 0.53 to 0.91) of the major cardiovascular events (myocardial infarction, stroke, or death from cardiovascular causes) after a median follow-up of 4.8 years, while subjects who followed the

Mediterranean diet supplemented with nuts had a 28% reduction for the same outcome (HR= 0.72; 95% CI, 0.54 to 0.95), as compared with the control diet (39).

PREDIMED study analyzed many other health outcomes in regards to the Mediterranean diet. For example, researchers found that people who followed the Mediterranean diet supplemented with extra-virgin olive oil during 4.8 years of follow-up had 40% reduction in risk for developing diabetes (HR=0.60; 95% CI 0.43, 0.85), compared to the control group, while the result was not significant for people who followed the Mediterranean diet supplemented with nuts (HR=0.82; 95% CI 0.61, 1.10) (40). The same analysis revealed that after just 1 year of exposure, people who followed the Mediterranean diet supplemented with nuts had a significant 13.7% reduction in the prevalence of metabolic syndrome (reversal of the disease!), compared with reductions of 6.7% in people who followed the Mediterranean diet supplemented with extra-virgin olive oil, and only 2.0% in the people from the control group (40). The potential for reversal of type 2 diabetes was also demonstrated in a much smaller experimental study with 215 participants (41). Researchers included overweight, middle-aged men and women with newly diagnosed type 2 diabetes, and found that patients who followed a low-carbohydrate Mediterranean diet experienced higher rate of diabetes remission, as well as delayed need for diabetes medication compared to the control group with low-fat diet (41). The remission rate was 15% during the first year and 5.0% during the sixth year in the Mediterranean diet group, while the control group had a remission rate of 4.1% in the first year and 0% in year 6 (41).

The results from the CORDIOPREV study revealed that the long-term consumption of the Mediterranean diet rich in olive oil improves postprandial lipemia and remnant cholesterol concentrations in patients with type 2 diabetes (42), as well as endothelial function in patients with both prediabetes and diabetes (43). Studies like these and many other have contributed to the following recommendation by the International Diabetes Federation in 2017:

"Overall, according to the latest research, emphasis for diet should move away from that on nutrients to consuming whole foods and instead following dietary patterns such as, but not limited to, the Mediterranean-type diet pattern and others" (44). It also says that "it is important to note that with regular check-ups and good management with lifestyle and medications when needed, it is possible for people with type 2 diabetes to lead long and healthy lives" (44).

Many studies have also investigated the association between the Mediterranean diet and cancer incidence and mortality. One of the systematic

reviews with meta-analysis included 83 experimental and observational studies, with the huge sample size of 2,130,753 people included in the analysis (45). The highest adherence to the Mediterranean diet was associated with lower risk of cancer mortality, as well as with a decreased risk in colorectal cancer, breast cancer, gastric cancer, liver cancer, head and neck cancer risk, while fruit, vegetables, and whole grains contributed the most to the observed beneficial effects (45).

As seen from these studies, the Mediterranean diet is a good choice for protection of physical health, but it also protects cognitive and mental health. A growing number of studies investigate the relationship between the Mediterranean diet and cognitive functions, pointing toward the cognitive improvement (46), or reduced cognitive decline (47) and decreased risk of dementia and even Alzheimer's disease (48). Similar promising results have been found for the efficacy of a modified Mediterranean diet model for the treatment of major depressive episodes (49). Additionally, the Mediterranean diet was associated with a decrease in mental distress in the general population (50), and was even shown to have the power to improve the mood (51). These are still early findings, and more studies are needed in order to confirm the initial results. One of the prevailing hypothesis in medical literature, which aims to explain the association between nutrition and mental health, is the existence of the gut-brain axis. Gut microbiota (all the microorganisms living in our intestines) are currently regarded as the key players involved in neurodevelopmental and neurodegenerative disorders, such as depression, autism and Parkinson's disease (52). Additional disorders have been linked with gut microbiota composition and functions, including respiratory, cardiovascular, gastrointestinal, hepatic, autoimmune, metabolic and oncologic diseases (53). Well, both good and bad news is that microbiota composition very much depends on dietary intake, which "appears to be a major short-term and long-term regulator of the structure and function of gut microbiota", where "diets rich in fiber and vegetables are associated with gut microbial changes that, in turn, are associated with a health benefit" (53). This is bad news for people following a typically Western diet poor in fiber, but it is certainly good news for people who follow the Mediterranean diet, which is abundant in vegetables and other sources of fiber.

There are also studies, which investigated the influence of the Mediterranean diet on many health outcomes at once. For example, a recent umbrella review of the evidence from meta-analyses of observational and experimental studies aimed to summarize the evidence on the effect of the Mediterranean diet adherence on 37 different health outcomes, including

a total sample of more than 12 800 000 subjects (54). Authors have included 13 meta-analyses of observational studies and 16 meta-analyses of randomized controlled trials, reaching the conclusion that greater adherence to the Mediterranean diet was associated with a reduced risk of overall mortality, cardiovascular diseases, coronary heart disease, myocardial infarction, overall cancer incidence, neurodegenerative diseases and diabetes (54). On the other hand, the evidence was only suggestive or weak for most of the site-specific cancers, as well as for inflammatory and metabolic parameters (54). The Cochrane review on the subject, which employs the highest level of scientific rigor, concluded that there are some "uncertainties regarding the effects of a Mediterranean-style diet on clinical endpoints and cardiovascular risk factors for both primary and secondary prevention" and calls for further studies (55). This means that scientists still have some issues to resolve, even though there is a plethora of evidence pointing to the beneficial effects of the Mediterranean diet.

In the meantime, we can do our best and try to adhere to the Mediterranean diet in order to improve our physical and mental health, as well as our quality of life. The bottom line is that everybody can try and see the results for themselves. There is really nothing to lose, because no side effects of the Mediterranean diet have ever been recorded, unlike for so many other pharmacological and surgical procedures currently used for the treatment of chronic diseases. The only setback is that you have to cook for yourself, using fresh, locally available seasonal ingredients, which also requires some physical activity and, ideally, sharing the food with the people you love.

Alongside all of the described benefits, one has to emphasize that Mediterranean diet meals are so diverse, tasty and full of flavor that there would hardly be a person who would not enjoy them. This can surely help with easier long-term compliance by patients who could benefit from healthier nutritional options. Advice on how to follow the Mediterranean diet, with sample meal plans and easy recipes are suggested in Chapter 5.

There is another good reason for adopting and sticking to the Mediterranean diet. We are in the state of food crisis, as we face a massive and global problem regarding nutrition. "We can no longer feed our population a healthy diet while balancing planetary resources. For the first time in 200 000 years of human history, we are severely out of synchronization with the planet and nature" (56). Not only are our current nutritional practices hurting humans, but they are also hurting our Planet, contributing to both climate change and loss of natural biodiversity (56). Many traditional eating patterns can be regarded as healthy, and they are either strict vegetarian diets or diets with modest consumption

of animal source foods, such as the Mediterranean diet, and other traditional diets, like those in Indonesia, Mexico, India, China, and West Africa (57). Additionally, plant-based foods generate fewer adverse environmental impacts per unit weight, per serving, per unit of energy, or per protein weight compared to the animal source foods (57). Hence, we need sustainable, healthy, delicious and affordable nutrition in order to preserve our natural resources and people's health (57). The Mediterranean diet could easily be that role model. Indeed, Dernini and colleagues argue that the Mediterranean diet is capable of conferring four major benefits: "major health and nutrition benefits, low environmental impacts and richness in biodiversity, high sociocultural food values, and positive local economic returns" (58). Additionally, the Mediterranean diet is highly adaptive to different cultures and it is taking "into account the identity and diversity of food cultures and systems, … across the Mediterranean region and in other parts of the world" (58).

4.4. Education of health professionals on healthy nutrition

Given that majority of chronic disease burden is associated with nutritional habits, medical doctors and allied professionals need to acquire basic knowledge of nutrition and skills for nutritional assessment and counseling during their undergraduate studies. Integrating systematic education on nutrition and its impact on health and disease in undergraduate medical curricula is strongly encouraged and needed (59). Some of the examples of detailed syllabuses incorporating nutrition and lifestyle medicine contents into undergraduate medical education can be found in the literature (60-62).

Proposed learning objectives needed to build appropriate knowledge and skills in nutrition during undergraduate medical training include nutrition assessment, nutrition diagnosis, nutrition intervention, nutrition monitoring and evaluation (59). Detailed learning objectives are shown in Table 4.1 (59).

Table 4.1. Learning objectives for nutritional assessment and counseling during undergraduate medical training. *Available from: Hivert MF, Arena R, Forman DE, Kris-Etherton PM, McBride PE, Pate RR, et al. Medical Training to Achieve Competency in Lifestyle Counseling: An Essential Foundation for Prevention and Treatment of Cardiovascular Diseases and Other Chronic Medical Conditions: A Scientific Statement From the American Heart Association. Circulation. 2016;134:e308-e27. (59)*

Training domain	Learning objective
Assessment	Describe health benefits of recommended dietary patterns and current dietary guidelines for maintenance of health and for the prevention and treatment of diverse medical conditions
	Assess dietary behaviors and evaluate patients' habitual food intake
	Recognize the need for detailed nutritional assessment and referral to nutritionist and other healthcare professionals with nutritional expertise when appropriate
Diagnosis	Describe pathogenesis of nutrition-related diagnoses
	Diagnose nutrition-related problems and prioritize them
	Recognize and use diagnostic labels for documentation in patients' medical records
	Communicate effectively with nutritionist, including understanding the information conveyed by the "problem, etiology, signs, and symptoms" statements commonly used by nutritionists
Intervention	Assess patients' confidence and readiness to change toward a healthy lifestyle behavior that includes good nutritional practices
	Counsel patients on the benefits of evidence-based recommended nutrition practices for the prevention and treatment of diverse medical conditions
	Use appropriate behavioral skills and tools to help patients initiate and maintain good nutritional practices
	Demonstrate effective communication skills with patients and other healthcare professionals with nutritional expertise
	Appropriately counsel patients according to age, sex, ethnicity, culture, and other personal characteristics
	Recognize the need and appropriate timing for referral to nutritionist or other healthcare professionals with nutrition expertise with the intent of modifying a nutrition-related behavior
	Support the implementation of the nutrition intervention with members of the healthcare team
Monitoring and evaluation	Facilitate goal setting and periodic evaluation of dietary recommendations
	Support behavioral changes by advising the use of monitoring tools in achieving nutrition-related goals
	Evaluate the health effects of nutrition modifications made by patients

Unfortunately, very few medical schools have modified their syllabuses accordingly. Medical students and residents surely recognized the unmet need. For example, two medical students wrote in BMJ that "medical schools should be prioritizing nutrition and lifestyle education, and students need

to understand the role of diet in health promotion and disease prevention", and that "knowing exactly what 'improving patients' diet and lifestyle' means would enable doctors to focus on how they counsel patients, offering personalized care according to comorbidities, individual cultures, and characters" (63).

A group of authors from the Indiana University School of Medicine, USA, conducted a qualitative study involving 48 medical students, 14 residents, and 10 physicians (64). They reported that "medical students felt nutrition was poorly integrated into the curriculum. They witnessed little nutrition counseling during shadowing experiences, and the nutrition information that was imparted was often outdated or incorrect. Residents stated they felt ill-prepared to offer nutrition counseling and desired further education in this area" (64).

Given that Hippocrates proposed that nutrition (and exercise) should be at the center of care more than two thousand years ago, it is about time to take this message seriously and start educating our future medical professionals accordingly. One of the possibilities to make it both fun and of high-impact could be a course in culinary medicine. It is another new discipline, a practical discipline, which integrates the "art of preparing, cooking, and presenting food with the science of medicine to achieve desired health outcomes" (65). Indeed, a recently published study assessed the feasibility, acceptability, and efficacy of the culinary medicine elective course in 21 medical students (66). The elective course included didactics, culinary sessions, and service learning, in which students had to translate nutrition and its association with health to elementary school children in at risk communities (66). As the result of the participation in the culinary medicine elective, students showed increased confidence in nutrition and obesity counseling, cooking abilities, and food preparation practices, as well as reporting themselves to have decreased meat consumption and increased fruit and vegetable intake (66). Additionally, after this elective, students reported an increased appreciation for the role of nutrition in health promotion and disease prevention and an intention to incorporate nutrition into patient care (66).

4.5. What can we do regarding nutrition in a clinical consultation (with the help from lifestyle medicine)?

There are many guidelines for clinical management of overweight and obesity. Some of them are listed at the end of this chapter. Many effective options are available, and these include dietary therapy, altering physical activity patterns, behavior therapy, pharmacotherapy, and surgery, alongside with the

combinations of these approaches (24, 25). They are scientifically tested and should be recommended as appropriate. Unfortunately, the real challenge is to get people into the 'change mode', especially in the domain of accepting lifestyle modifications. In other words, the key challenge is to turn motivation into action. This can be done using behavior change techniques, especially motivational interviewing. Additional challenge is the environment in which behavior change counseling in nutrition is delivered. This means that patients need to have favorable environmental conditions for nutrition improvement, such as healthy ingredients being available and affordable, alongside with appropriate support from family members and friends (67).

The use of the 5A's model is both appropriate and encouraged to be used in a nutritional clinical consultation. In general, this approach incorporates five counseling steps that a provider can complete in just a few minutes during each session: *assess* the behavior, *advise* the change, *agree* on goals and an action plan via shared decision making, *assist* with the treatment, and *arrange* the follow-up (59).

For example, during the obesity counseling intervention in primary care, 5A's translate into (68):

- Firstly, ask permission to discuss weight; be nonjudgmental and explore the patient's readiness for change
  - *Assess* body mass index, waist circumference, and obesity stage; explore drivers and complications of excess weight
- *Advise* the patient about the health risks associated with obesity, the benefits of even modest weight loss, the need for a long-term strategy, and treatment options
- *Agree* on realistic weight loss expectations, targets, behavioral changes, and specific details of the treatment plan, making the patient an equal partner
- *Assist* in identifying and addressing barriers; provide resources, assist in finding and consulting with appropriate providers, and
- *Arrange* regular follow-ups

The 'flow' of the nutritional consultation with an obese patient, including sample questions and comments to the patient is shown in Figure 4.4 (68).

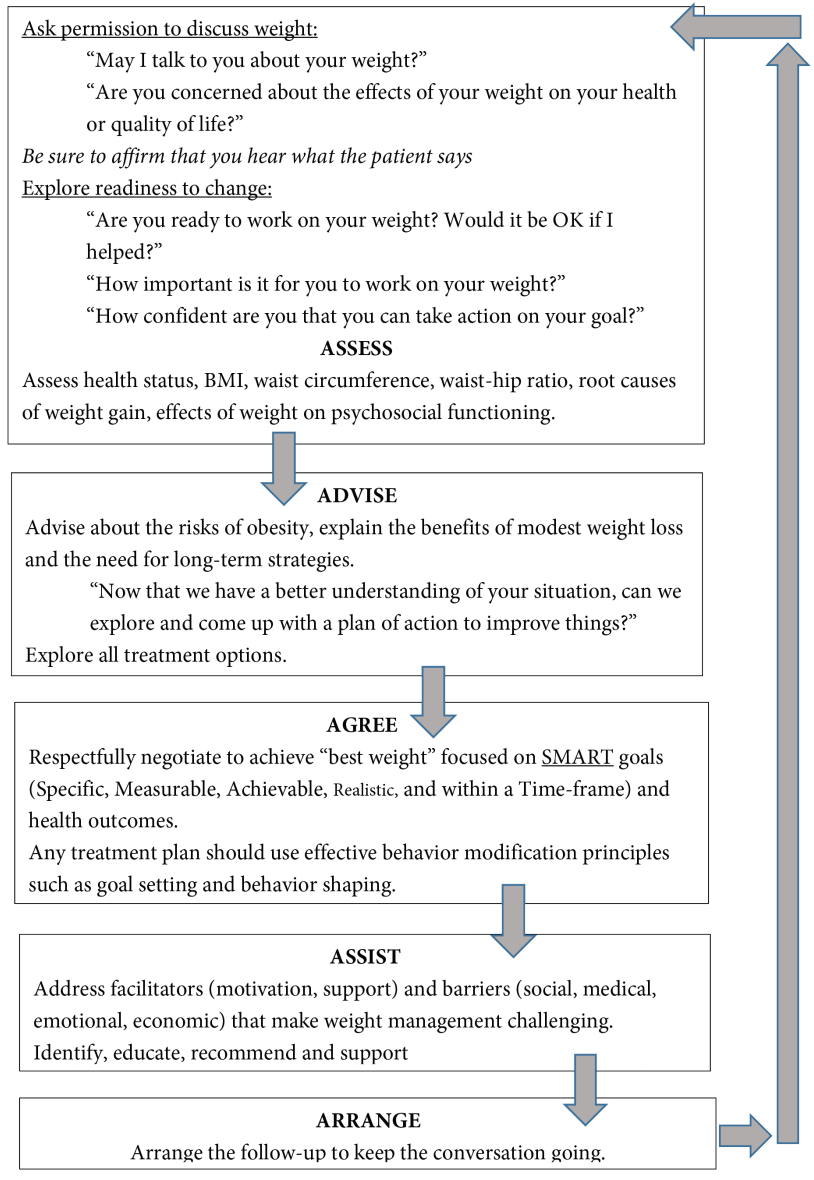

Figure 4.4. The 5A's for obesity counseling in primary care, with sample questions and comments to the patient. A*dapted from: Vallis M, Piccinini-Vallis H, Sharma AM, Freedhoff Y. Modified 5 As: Minimal intervention for obesity counseling in primary care. Can Fam Physician. 2013;59:27-31. (68)*

This approach is manageable and evidence-based, with the great potential to improve the success of weight management within primary care, even in a busy practice settings (68).

The key points to remember during the process of nutritional counseling are (67):

- Nutrition counseling involves more than just advising a patient on what to eat and what not to eat
- The health advice and recommendations for the patient must be evidence-based, clear and consistent, ideally individually tailored to the needs of the patient
- The most effective way for delivery of nutritional consultation is to create a collaborative atmosphere with the patient, ideally deciding on the SMART goals in order to focus energy and resources on the most important issues for the patient (SMART stands for Specific, Measurable, Achievable, Relevant, and Timely)
- Both health care practitioner and the patient have to accept that nutrition counseling is a long distance journey, made of many small steps. Many steps will lead forward, but some might make the patient take a step back. This has to be acknowledged and accepted, and not at all judged or scrutinized. Slip-ups, fallbacks or relapses should be used as the learning opportunities, in a friendly and encouraging atmosphere

The example of a template for writing a SMART goal is shown in the Appendix 4.4 (69).

4.6. Conclusion

No food should be forbidden, because it is hard to resist the 'forbidden fruit'. Everybody knows that. Everybody also knows that there are foods that are better in supporting our health, while the others definitely undermine it. We, health care workers and educators, have to work harder in order to turn the knowledge on nutrition into actions toward making better nutritional choices every day. Firstly, we have to train health professionals and students to apply nutritional assessment and counseling with their patients as a routine clinical practice. Fortunately, there are evidence-based, easy-to-apply and effective approaches, such as the 5A's model of behavior change.

Studies showed that no 'acute' weight-loss diet is ever effective in the long run, only long-term lifestyle change results in beneficial health outcomes.

Patients should be strongly discouraged from 'going on a (fad) diet', but instead they should be encouraged to change their attitudes, environment and ultimately, their meal plans to become rich in vegetables, fruit, and legumes, and other scientifically proven beneficial foods. Change can be scary, and health care providers have to accept and acknowledge that, by making their patients their collaborators and partners. Patients are the ones who need to identify their own SMART goals, and health care providers should guide them along the way, and help by offering advice and treatment options. Health care providers must resist the urge of being chief executives; they have to resist the need for telling others what to do, and the need for scaring the patients with adverse health outcomes in order to motivate them. This kind of approach will inevitably lead to the 'fight', followed with the 'flight' response by the patient. That will not help anybody. Instead, it will result in a frustrated health care provider and angry, unhealthy patient.

4.7. Literature

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4.8. Recommended further reading (guidelines and other useful resources):

- Food and Agriculture Organization of the United Nations. Food-based dietary guidelines. Available from: http://www.fao.org/nutrition/education/food-dietary-guidelines/en/
- Nutrition Science Team, Public Health England. Government Dietary Recommendations. London: 2016. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/618167/government_dietary_recommendations.pdf
- U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 8th Edition. 2015. Available from: https://health.gov/dietaryguidelines/2015/guidelines/
- National Institute for Health and Care Excellence (NICE). Obesity prevention. Clinical guideline [CG43], Published date: December 2006, Last updated: March 2015. Available from: https://www.nice.org.uk/guidance/cg43
- National Institute for Health and Care Excellence (NICE). Obesity: identification, assessment and management. Clinical guideline [CG189], 2014. Available from: https://www.nice.org.uk/guidance/cg189
- Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, Donato KA, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. Circulation. 2014;129:S102-38.
- Anand SS, Hawkes C, de Souza RJ, Mente A, Dehghan M, Nugent R, et al. Food Consumption and its Impact on Cardiovascular Disease: Importance of Solutions Focused on the Globalized Food

System: A Report From the Workshop Convened by the World Heart Federation. J Am Coll Cardiol. 2015;66:1590-614.

4.9. Useful materials that can be recommended for patients:

- Public Health England, Welsh Government, Food Standards Scotland, Food Standards Agency Northern Ireland. The Eatwell Guide. Helping you eat a healthy, balanced diet. London: 2018, Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742750/Eatwell_Guide_booklet_2018v4.pdf
- Michael Pollan. Food Rules: An Eater's Manual. New York; Penguin: 2009.
- NutritionValue.Org - Nutrition facts exposed. Available from: https://www.nutritionvalue.org/
- The George Mateljan Foundation. World's Healthiest Foods. Available from: http://whfoods.org/
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- U.S. News & World Report. Best Diets Overall. 2019. Available from: https://health.usnews.com/best-diet/best-diets-overall

4.10. Appendix

4.1. Mediterranean diet assessment food frequency questionnaire, assembled according to the Mediterranean Diet Serving Score (23)

For each of the following food groups, circle appropriate number, which indicates your usual consumption during the **last year or shorter period (as needed)**

FOOD GROUP	each day, twice or more a day	each day, once a day	3 times a week	2 times a week	once a week	once a month	rarely or never
Cereals (including bread, rice, pasta)	1	2	3	4	5	6	7
Potato	1	2	3	4	5	6	7
Olive oil (including food preparation)	1	2	3	4	5	6	7
Nuts (e.g. almond, walnut, hazelnut...)	1	2	3	4	5	6	7
Fresh fruit (excluding natural juices)	1	2	3	4	5	6	7
Vegetables	1	2	3	4	5	6	7
Milk and dairy products	1	2	3	4	5	6	7
Legumes (beans, lentils, broad beans, chickpeas, peas, etc.)	1	2	3	4	5	6	7
Eggs	1	2	3	4	5	6	7
Fish (both white and blue)	1	2	3	4	5	6	7
White meat (chicken and turkey)	1	2	3	4	5	6	7
Red meat (pork, veal, beef)	1	2	3	4	5	6	7
Sweets (sugar, candies, cakes, fruit juices, and soft drinks)	1	2	3	4	5	6	7
Wine (in the amount of 1 glass for women, 1-2 glasses for men)	1	2	3	4	5	6	7

Appendix 4.2. Mediterranean Diet Serving Score coding scheme

Adapted from: Monteagudo C, Mariscal-Arcas M, Rivas A, Lorenzo-Tovar ML, Tur JA, Olea-Serrano F. Proposal of a Mediterranean Diet Serving Score. PloS one. 2015;10:e0128594. (23)

	Recommendation	**Score**
Fruit	1-2 servings/main meal* (daily)	3
Vegetables	≥2 servings/main meal (daily)	3
Cereals (bread, breakfast cereals, rice, pasta)	1-2 servings/main meal (daily)	3
Olive oil (on salads or bread or for frying)	1 serving/main meal (daily)	3
Nuts	1-2 servings/day	2
Dairy products (milk, yoghurt, cheese)	2 servings/day	2
Legumes	≥2 servings/week	1
Eggs	2-4 servings/week	1
Fish	≥2 servings/week	1
Potatoes	≤3 servings/week	1
White meat (poultry)	2 servings/week	1
Red meat (pork, beef or lamb)	<2 servings/week	1
Sweets (sugar, candies, pastries, sweetened fruit juices and soft drinks)	≤2 servings/week	1
Fermented beverages (ideally wine)	1-2 glass/day	1
TOTAL SCORE		24

*main meals: breakfast, lunch and dinner

The score of 14 or more indicates good adherence to the Mediterranean diet pattern (23)**.**

Appendix 4.3. How to follow the Mediterranean diet as easily as possible?

Prepared by Dora Bučan Nenadić

- A good quality Mediterranean breakfast contains whole grains or whole grain products, dairy products and fruits.
- Have whole grain cereals as often as possible for breakfast, lunch or dinner. Try making homemade whole-grain wheat or rye bread and use less or even no salt.
- Make vegetables the main part of lunch and dinner that will make your plate colorful. As often as possible, use dark green leafy vegetables such as spinach, chard, kale, chicory and arugula.
- Prepare fresh salads of seasonal vegetables daily, season with olive oil, lemon juice or vinegar and herbs.
- Each day pick fresh seasonal fruits you like to eat.
- Most Mediterranean dishes include extra virgin olive oil, tomato sauce, garlic and onion.
- Prepare fish and seafood several times a week.
- Include legumes more than twice a week.
- Instead of salty and sweet snacks (processed food) between meals, choose fruits, nuts, and/or fermented dairy products.
- Instead of flour or cream, you can add millet, polenta, potatoes, or cereal flakes to vegetable soup to keep the meal thick
- Avoid red meat and meat products and eat white meat in moderation.
- When preparing eggs, give preference to boiled eggs, if you fry them, add vegetables.
- Prepare homemade cream cheese, fish, legumes or vegetables spreads whenever possible.
- Make sure to drink plenty of fluids throughout the day, giving preference to water, unsweetened teas and unsweetened lemonade. One glass of red wine is recommended at lunch or dinner.
- Don't forget that food preparation is very important. The characteristic of Mediterranean cuisine is its simplicity: steaming, blanching, cooking, roasting (using as little oil as possible) should be the main food preparation methods.
- Eat slowly and have at least one meal in a calm environment, i.e. at home with family and/or friends.

Use this checklist to help you follow the Mediterranean diet (70):

Have each of the three main meals include:

☐ 1-2 servings of whole grains (brown rice, couscous, oats, whole grain bread, ...)

☐ 1-2 servings of fruit

☐ 2 or more servings of cooked or raw vegetables (at least one serving of raw vegetables per day) for lunch and dinner

Every day include:

☐ 3-4 servings of extra virgin olive oil (for cooking and topping)

☐ At least 1.5 to 2.0 L (6-8 glasses) of liquids such as: water, unsweetened herbal tea

☐ 2-3 servings of dairy products: milk, yogurt, cheese and other fermented dairy products

☐ Mediterranean herbs (parsley, thyme, basil, …)

☐ 1-2 servings of nuts or seeds

Include weekly:

☐ 2 or more fish and seafood meals

☐ 2 servings of white meat

☐ 2-4 eggs

☐ 2 or more servings of legumes (beans, peas, chickpeas and lentils)

☐ 2 servings or less of red meat

☐ 3 or less servings of potatoes

Appendix 4.4. Template for writing a SMART goal (69)

Available from: https://www.ucop.edu/local-human-resources/_files/performance-appraisal/How%20to%20write%20SMART%20Goals%20v2.pdf

Crafting SMART Goals are designed to help you identify if what you want to achieve is realistic and determine a deadline. When writing SMART Goals use concise language, but include relevant information. These are designed to help you succeed, so be positive when answering the questions.

Initial Goal (Write the goal you have in mind):

_____

1. Specific (What do you want to accomplish? Who needs to be included? When do you want to do this? Why is this a goal?)_____

_____

_____

2. Measurable (How can you measure progress and know if you've successfully met your goal?):_____

_____

_____

3. Achievable (Do you have the skills required to achieve the goal? If not, can you obtain them? What is the motivation for this goal? Is the amount of effort required on par with what the goal to be achieved?):_____

_____

_____

4. Relevant (Why am I setting this goal now? Is it aligned with my overall objectives?):_____

_____

_____

5. Time-bound (What's the deadline and is it realistic?):_____

_____

_____

SMART Goal (Review what you have written, and craft a new goal statement based on what the answers to the questions above have revealed):_____

_____

_____

CHAPTER 5: MORE ON NUTRITION: OBESITY AND TYPE 2 DIABETES IN THE CONTEXT OF LIFESTYLE MEDICINE WITH A CASE SCENARIO OF NUTRITIONAL INTERVENTION

Josipa Radić and Dora Bučan Nenadić

"The whiter the bread, the sooner you'll be dead."
Michael Pollan

5.1. Obesity

Obesity, generally defined as an excess in body-fat mass, is a well-known global epidemic that can have very serious consequences, such as increased morbidity and reduced life expectancy (1-3). Recent estimates indicate that obesity currently affects more than 600 million people globally and is associated with more than 45 comorbidities, in addition to several atherogenic disorders that make up metabolic syndrome (1).

The Center for Disease Control (CDC) has identified that over 71% of the U.S. population is overweight, while 40% is obese (4,5). Obesity is usually classified using the body mass index (BMI). It is calculated as body weight in kilograms divided by the height in meters squared (kg/m^2). Other methods, including waist circumference (WC) and central and peripheral fat mass have also been used, but currently BMI continues to be used as the main indicator of nutritional status. However, BMI does not give us a precise idea about the body composition, such as the proportion of body fat or its distribution, which affects the health risks of the excess weight. According to the BMI, individuals can be divided into three (five) different categories:

- normal range: 18.5–24.9 kg/m^2
- overweight: 25.0–29.9 kg/m^2
- obesity: ≥30.0 kg/m^2
  - class 1-obesity: 30.0 – 34.9 kg/m^2
  - class 2-obesity: 35.0–39.9 kg/m^2
  - class 3-obesity: ≥40 kg/m^2

Morbid obesity is considered to be grade 3 obesity or grade 2 obesity plus significant obesity-related comorbidities (6, 7). The proportion of adults with a BMI of ≥25 kg/m^2 increased between 1980 and 2013 from 28.8% to 36.9% in men, and from 29.8% to 38.0% in women (8). Development of obesity is multifactorial, with some genetic, but mostly environmental and lifestyle causes, and it is extensively associated with comorbidities such as cardiovascular diseases, diabetes, hypertension, cancer, and sleep disorders (3, 9, 10). According to Keaver and associates, overweight and obesity are predicted to reach levels of 89% in males and 85% in females by 2030 (11). This will result in an increase in the obesity-related prevalence of coronary heart disease (CHD) by 97%, cancers by 61% and type 2 diabetes by 21% (11). Observed globally, type 2 diabetes and other obesity-associated diseases are also on the rise, and they are turning into a heavy global health burden. So far, no country has been successful in reversing obesity prevalence (8). This problem is complicated, highly prevalent, and not adequately addressed by current interventions (12, 13).

5.2. Obesity and lifestyle medicine

Lifestyle medicine is the non-pharmacologic, nonsurgical/procedural management of chronic diseases. Components of the lifestyle medicine with descriptions are summarized in Table 5.1 (14).

Table 5.1. Components of Lifestyle Medicine (14); A*vailable from: Mechanick JI, Hurley DL, Garvey WT. Adiposity-based chronic disease as a new diagnostic term: the American Association of Clinical Endocrinologists and American College of Endocrinology position statement. Endocr Pract. 2017;23:372-378.*

Component	Description
Healthy eating patterns	Aggregation of foods consumed over a specified time and associated with clinical benefit; addresses disordered eating with counseling, group therapy, cognitive-behavioral therapy, and stimulus management
Physical activity	Body movements (e.g., aerobic, strength training, sports, exercise, walking); can be employment-related and associated with reduced sedentary activity
Body composition	Target % of body fat mass and fat distribution; implicates muscle mass and intracellular lipid storage
Sleep hygiene	Amount and quality of sleep
Stress reduction	Relaxation, yoga, meditation, counseling, and cognitive-behavioral therapy
Tobacco cessation	Counseling and cognitive-behavioral therapy

Alcohol moderation	Spectrum of alcohol use disorder; counseling, and cognitive-behavioral therapy
Substance abuse	Counseling and cognitive-behavioral therapy
Behavior	Focus on healthy/unhealthy behaviors; cognitive-behavioral therapy
Community engagement	Provide local resources (e.g., houses of worship, schools, neighborhood centers)
Transculturalization	Adapt recommendations for different ethnicities/cultures

Since obesity is a large contributor to the accumulation and progression of chronic diseases, the treatment of obesity can decrease symptoms directly associated with excess weight gain, while simultaneously treating and preventing chronic diseases. As previously mentioned, the CDC reported that about 40% of the adult U.S. population was obese in 2015 (5). This indicates that current methods of preventing and treating excess weight gain are largely unsuccessful.

The American Association of Clinical Endocrinologists (AACE) and American College of Endocrinology (ACE) published a position statement introducing "ABCD," for Adiposity-Based Chronic Disease, as a new diagnostic term (14). According to the AACE/ACE Adiposity-Based Chronic Disease (ABCD) is a "new diagnostic term for obesity that explicitly identifies a chronic disease, alludes to a precise pathophysiologic basis, and avoids the stigmata and confusion related to the differential use and multiple meanings of the term 'obesity' " (14). They proposed four key elements crucial in the clinical care of patients with ABCD (14):

1) *positioning lifestyle medicine* in the promotion of overall health, as the central, pervasive action, not only as the first algorithmic step
2) *standardizing protocols* that comprehensively and durably address weight loss and management of adiposity-based complications
3) *approaching patient care through contextualization* (e.g., primordial prevention to decrease obesogenic environmental risk factors and transculturalization to adapt evidence-based recommendations for different ethnicities, cultures, and socio-economics)
4) *developing evidence-based strategies for successful implementation, monitoring, and optimization of patient care over time*

Furthermore, according to the AACE/ACE statement, the management of obesity, both for individuals and the population at large, can be approached by addressing three principal characteristics of obesity intervention (14):

a) *Impact on Health*: due to clinically relevant and progressive adiposity-based complications in many, but not all patients;
b) *Sustainability*: related to costly, disease-oriented, fragmented, and varying health care infrastructures and the high prevalence of obesity;
c) *Therapeutic Nihilism*: on the part of both health care professionals and the general public, based on beliefs that patients with obesity will poorly respond to current efforts because obesity is solely a lifestyle choice, rather than a chronic disease with important behavioral components

In their position statement, the authors suggest that the current treatment paradigm for obesity is to focus on weight loss (reducing BMI and/or WC) and identify and specifically treat adiposity based complications (14). This is done by modest attempts aimed at adopting the healthy eating patterns and increased physical activity, with inconsistent use of pharmacotherapy and poorly defined thresholds for bariatric procedures (14). Lifestyle changes and lifestyle medicine should be viewed as the central and essential approach in the clinical care of the ABCD (14).

5.3. Clinically prescribed lifestyle modifications for treating obesity

Lifestyle modifications used to change one's eating habits, exercise habits, or both should be a clinician's first choice for treating obesity (15, 16). These modifications are recommended to patients with a BMI ≥30 kg/m^2 or ≥25 kg/m^2 and for those with obesity-related chronic illnesses. In prescribed lifestyle modifications, patients periodically meet with a clinician to discuss their progress and help direct further lifestyle modifications as needed (16).

Physical activity, along with appropriate dietary intake, is an important part of maintaining healthy weight, losing weight, and keeping extra weight off once it has been lost. Also, physical activity helps reduce abdominal fat and preserve muscle mass during weight loss. Physical activity modifications are typically based on recognized guidelines for recommended weekly physical activity participation. The CDC recommends a minimum of 150 minutes per week of moderate intensity activity or 75 minutes per week of vigorous activity, or a combination of the two in bouts of 10 minutes or more (17).

It is important to note that most physical activity recommendations are typically informal advice from a clinician, rather than a formal prescription. This lack of standardized activity prescription is likely due to the absence of established clinical physical activity models, like those seen with recognized dietary plans (18).

Dietary prescription lifestyle modifications most commonly entail reducing the amount of total food and fat consumed daily in an effort to reduce one's caloric intake. This results in energy imbalance. Dietary modifications that restrict the intake of a particular macronutrient or group of macronutrients are recent developments (15). Such well-known dietary modifications include the Atkins diet (low carbohydrate intake), the Ornish diet (low fat intake), the Zone diet (even macronutrient distribution), and Weight Watchers diet (reduced overall caloric intake). These diets have been shown to yield an average of approximately 3.18 - 3.63 kg of weight loss across a two-month period (19). It is important to note that diet prescription efficacy appears to depend on the intensity with which the behavioral modification is promoted by the prescribing clinician. Previous studies have shown that the frequency of visits to a clinician and the topics discussed are directly related to the success of a particular diet plan (20). Foster and colleagues compared the Atkins and Ornish diets with intensive in-person behavioral treatment across two years, discovering similar, high diet efficacy as long as clinicians met regularly with their patients (20). Successful weight loss can be achieved with either a low-fat or low-carbohydrate diet when coupled with behavioral treatment. Also, weight regain occurred and increased to a greater extent if patients used behavioral treatment less often (20). These results suggest that specific diets alone do not produce weight loss, but what really matters is a clinician's active support in the patient's weight loss journey.

5.4. Type 2 diabetes mellitus and lifestyle medicine

The twin epidemic of obesity and diabetes is a major crisis globally. Several epidemiologic studies revealed the parallel escalation of obesity and diabetes. The term 'diabesity' expresses their close relationship, and both of these metabolic disorders are characterized by defects of insulin action (21).

Diabetes is a global health care problem that threatens to reach pandemic levels by 2030. Some 425 million people worldwide, or 8.8% of adults aged between 20 and 79, are estimated to have diabetes (22). Furthermore, type 2 diabetes mellitus represents approximately 90% of all cases of diabetes, and

its frequency is similar to that of obesity (23). The increase in the prevalence of type 2 diabetes is closely linked to the upsurge in obesity, and it is estimated that about 90% of type 2 diabetes is attributable to excess weight (24). The pathophysiology connecting obesity and diabetes is chiefly attributed to two factors: insulin resistance and insulin deficiency (25).

There are strong and consistent evidence that obesity management can delay the progression from prediabetes to type 2 diabetes (26-28) and it is beneficial in the treatment of type 2 diabetes (29-31). In patients with type 2 diabetes who are overweight or obese, modest and sustained weight loss has been proved to improve glycemic control and to reduce the need for glucose-lowering medications (32, 33).

The American Diabetes Association (ADA) Standards of Medical Care in Diabetes includes ADA's current clinical practice recommendations for obesity management for the treatment of type 2 diabetes. ADA clinical practice recommendations for obesity management used for the treatment of type 2 diabetes are (34):

- At each patient encounter, BMI should be calculated and documented in the medical record
- Diet, physical activity, and behavioral therapy designed to achieve and maintain 5% weight loss should be prescribed
- Such interventions should be of high intensity (≥16 sessions in 6 months) and focus on diet, physical activity, and behavioral strategies to achieve a 500–750 kcal/day energy deficit
- Diets should be individualized (those that provide the same caloric restriction but differ in protein, carbohydrate, and fat content are equally effective in achieving weight loss)
- Patients who achieve short-term weight-loss goals, should be prescribed with the long-term comprehensive weight maintenance programs (≥1 year), with at least monthly contact and ongoing monitoring of body weight (weekly or more frequently), including other self-monitoring strategies (such as tracking intake, steps, etc.), continued consumption of a reduced-calorie diet, and participation in high levels of physical activity (200–300 min/week)

5.5. Case scenario: nutritional intervention

Mia (51) visits an accredited dietitian for the first time, as referred by a physician. The physician diagnosed grade 2 obesity, unregulated blood

pressure, unregulated glycaemia, high cholesterol and triglyceride levels, high urate and creatinine levels, and identified weight loss as a mandatory part of therapy. Mia is diagnosed with type 2 diabetes.

Mia revealed that she has been repeatedly on different weight reduction diets. All of them were unsuccessful, which has also led to a slight decrease in her mood and lack of further motivation to lose weight. She also complains of irregular stools, as well as impaired movement due to weight gain. Table 5.2 shows the steps that need to be ideally taken during the first consultation by a dietitian.

Table 5.2. First dietitian check-up in 7 steps

Nutritional intervention	Nutritional tools	Example (patient Mia)
1st step: Introduction	Getting to know the patient's characteristics (where they live, their occupation, whether they have a family or not...)	Mia lives in the city, she is unemployed, but in her spare time, she makes and sells cakes. She lives with her husband and children and has great support from them to reduce weight and improve her health status.
2nd step: Anthropometric measurements	Determine: body weight, body height, BMI, body fat, muscle mass, visceral fat, waist circumference, upper arm circumference	Weight: 105.1 kg Height: 173 cm BMI: 35.1 kg/m^2 Waist circumference: 125 cm Upper arm circumference: 33 cm Body fat: 39.9 kg Muscle mass: 61.9 kg Visceral adipose tissue: 10 kg
3rd step: Dietary assessment questionnaires	FFQ (Food Frequency Questionnaire) and 24h recall	Mia doesn't have regular meals (only 2 meals per day), no adherence to a diabetic diet, consumes fluids poorly, consumes large amounts of white bread and sweet products, regardless of diabetes diagnosis.
4th step: Energy requirements	Determine energy requirements, type of diet and weight loss dynamics	Daily energy intake: 2200 kcal Type of diet: Mediterranean - reduction diet Reduction diet energy intake goal: 1400 kcal (reduce calorie intake by 800 kcal and lose 0.8 kg per week)

5th step: Nutritional Guidelines	Give a patient nutritional recommendations and diet plan	Introduce 5 meals a day, make sure to eliminate foods rich in simple carbohydrates (sweets, cakes, biscuits...) For breakfast: oatmeal without added sugars (try quinoa, amaranth), add fruit and yogurt. Increase vegetable intake (prepare vegetables every day for lunch, raw or lightly cooked, ideally green leafy vegetables), reduce white bread intake, pay attention to the amounts of food. Increased intake of legumes and nuts, olive oil should be main fat source for cooking and food dressing. Discard the high-salt food supplements and substitute it with different Mediterranean spices (basil, oregano, thyme, lemon, etc.) In order to regulate stools: introduce flaxseed (rich in fiber and omega 3 fatty acids) - 2 ground teaspoons daily (soak or mix with food before consumption).
6th step : Physical activity recommendations	Set up a light initial exercise	Mia should start walking every day for a minimum of 30 minutes (gradually increase) and include the indoor bike ride that Mia says she has at home.
7th step: Nutrition diary	Record daily the number of meals and the composition of the meals, as well as the amount of food consumed until the first check-up. Provide patient with meal composition recommendations.	Breakfast: 2 slices of whole-grain bread with fresh cheese + tea or coffee without sugar Snack: a handful of almonds Lunch: 1 plate of grilled anchovies + cooked mangold with olive oil + tomato salad Snack: 1 cup of probiotic yogurt + raspberries Dinner: 1 plate of cold chickpea and vegetable salad

Mia regularly turns up for check-ups and keeps a food diary, which shows that she has introduced regular meals, increased intake of legumes and green leafy vegetables, as well as increased fish intake. She also reduced the amount of food she has been consuming.

Mia is very satisfied with the dynamics of weight loss, which is in accordance with the recommendations. During the first two months, weight loss is more intensive, which increased her motivation. After the first few months, weight loss slowly stabilized to 2.5 kg per month, which indicates appropriate adjustment of eating habits and adequate physical activity (Table 5.3).

Table 5.3. Check-ups and dynamics of weight loss for Mia

	1st measurement September	2nd measurement October	3rd measurement November	4th measurement December	5th measurement February	6th measurement April
Body weight (kg)	105.1	101.0	97.3	94.7	92.0	89.4
Weight loss (kg)	-	-4kg	-3.7kg	-2.6kg	-2.7kg	-2.6kg
BMI (kg/m^2)	35.1	33.7	32.5	31.6	30.7	29.9
Waist circumference (cm)	125	122	120	117	114	110
Body fat (kg)	39.9	36.2	34.4	33.0	33.1	28.9
Muscle mass (kg)	61.9	61.5	59.7	58.6	55.9	57.4

Three months later, she had a new check-up, which showed a dramatic improvement in the values of total cholesterol, triglycerides, urate, creatinine and HbA1c. Each month, she is increasingly motivated to continue with weight loss and she is feeling much better.

Her bowel movement is not fully regulated, so the dietitian advised to include probiotics in capsules as a nutrition supplement to balance her intestinal microflora.

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CHAPTER 6: EXERCISE AND PHYSICAL ACTIVITY

Zoran Grgantov and Tanja Dragun

"All truly great thoughts are conceived while walking."
Friedrich Nietzsche

6.1. Introduction

Physical activity is known to provide a wide range of health benefits that can protect individuals from diseases and enhance their mental and physical health (1). On the other hand, physical inactivity contributes substantially to the global burden of disease, death and disability (2).

Physical activity is any movement that we do with our bodies, it is a broad umbrella term. Many people think of exercising when they speak of physical activity, but that is only one of the options. Exercise is actually very specific subset of physical activity. Basic terms and definitions about exercise are given in Textbox 6.1.

TEXTBOX 6.1. Basic terms and definitions about exercise (3)

Exercise is planned, structured and repetitive bodily movement, with an objective to improve physical fitness component(s). The content of exercise should be planned, as well as volume, intensity, density, duration and frequency. **Volume** is the sum of physical efforts performed during a given workout or a week of workouts or during any time interval. Intensity of activity or exercise is the amount of work per time it took to do it. **Intensity** refers to the rate at which the activity is being performed or the magnitude of the effort required to perform an activity or exercise. It can be regarded as "*how hard a person works to do the activity*". The intensity of different forms of physical activity may vary between people. The intensity of physical activity depends on an individual's previous exercise experience and their relative level of fitness. **Density** refers to the ratio of total work and duration of the resting part of the exercise. Generally, the greater the intensity, the lower the density of training, since it takes more time to rest and recover between specific high-intensity workouts. Activity **duration** is the total time of the activity, including the rest breaks between exercises and the time spent on organizational matters and the preparation of apparatus and equipment. **Frequency** is a number of workouts per defined period of time (e.g. day, week, month).

Physical fitness is a set of attributes that are either health- or skill-related. Measurable components of fitness and their definitions are shown in Table 6.1 (3).

Table 6.1. Components of physical fitness (3)

HEALTH-RELATED COMPONENTS	SKILL-RELATED COMPONENTS
Body composition – relative amounts of muscle, fat, bone and other vital parts of the body	Agility – ability to rapidly change the position of the entire body in space with speed and accuracy
Cardiorespiratory endurance – ability of the circulatory and respiratory systems to supply 'fuel' during sustained physical activity and to eliminate fatigue products after	Coordination – ability to use senses such as vision and hearing, together with body parts in performing motor tasks smoothly and accurately
Muscular endurance – ability of muscle groups to exert external force for many repetitions or successive exertions	Balance – maintenance of equilibrium while stationary or moving
Muscular strength – amount of force that a muscle can exert	Power – rate at which one can perform work
Flexibility – range of motion available at a joint	Reaction time – time elapsed between stimulation and the beginning of the reaction to it

Physical activity is important across all ages, and should be integrated into multiple daily settings. For many adults, the workplace is a key setting to be physically active and reduce sedentary behavior. The trip to and from work, activity breaks, workplace programs and incidental activity all offer opportunities for increased physical activity throughout the working day, and can contribute to increased productivity and reduction in injuries and absenteeism. Unfortunately, many people are giving up on walking and cycling and tend to use personal motorized transport (1). The use of personal motorized transport can be reduced by policies that promote compact urban design, prioritize access by pedestrians, cyclists and users of public transport, and prioritize development of public open green spaces, sports and leisure facilities. Subsequently, carbon emissions and traffic congestion, as well as health care costs would be reduced, while simultaneously boosting the micro-economies of local neighborhoods, improving community's health and quality of life (4). Given that the world is becoming increasingly urbanized, with more than 2/3 of the population now living in the cities, it is the responsibility of urban planning to improve urban design, create active environments and sustainable transport systems.

Nowadays, people live in an environment that offers fewer opportunities for physical activity. Considering the way we developed as humans, we may

state that the human life has become a mismatch with our evolutionary past, and our physically inactive lifestyle puts us at risk of developing a number of chronic non-communicable diseases (5). Such physical inactivity tracks from childhood, and it is a key risk factor in many chronic diseases in later life (6).

There are three types of determinants of physical activity. Firstly, individual factors, such as attitudes and beliefs, influence people's decisions about their lifestyles and their choices of healthy or unhealthy behavior. Secondly, the micro-environment, defined as the immediate environment in which people live and work, strongly influences the ability to be physically active. Additionally, many social trends support sedentary behavior, as manual jobs become rare and sedentary leisure pursuits (screen time) are on the rise. Labor-saving devices also discourage activity. Finally, the macro-environment, such as general socioeconomic, cultural and environmental conditions, greatly affect physical activity. Socioeconomic status tends to be directly related to participation in leisure-time physical activity.

Tackling issues of physical inactivity is not solely an individual responsibility. Society is responsible for creating conditions that facilitate active living. Action should be taken to change the environment so that it better supports active lifestyle. Physical activity is not just a public health issue. It addresses the well-being of communities, protection of the environment and investment in future generations (2).

6.2. Beneficial effects of physical activity

Physical activity has many beneficial effects, which can be divided in physical and mental health benefits. Additionally, when people engage in physical activity, positive consequences are yielded in the environment and within economy.

6.2.1. Physical health benefits (7, 8)

"Physically active individuals sleep better, feel better, and function better (8)." This statement is one of the major findings within the 2018 Physical Activity Guidelines Advisory Committee Scientific Report. Additionally, the authors also point to the strong evidence for many beneficial effects of physical activity. These benefits include (8):

- improvement of the quality of sleep, reducing the time needed for falling asleep
- improvement of physical functioning among individuals of all ages (in older adults physical activity reduces the risk of falling and also helps in maintaining their independence)
- improvement of bone health in very young children (3-5 years old)
- preventing or minimizing weight gain and helping with maintaining healthy weight
- preventing excessive weight gain during pregnancy, which results in reduction of the risk for gestational diabetes and postpartum depression
- reducing the risk of developing dementia and improving cognitive function
- reducing the risk of breast and colon cancer, as well as cancers of the bladder, endometrium, esophagus, kidney, lung, and stomach
- reducing the risk of developing a new chronic condition, reducing the risk of progression of the existing chronic conditions
- improvement of the quality of life

Another good news is that any length of physical activity during the day can "contribute to the health benefits associated with the accumulated volume of physical activity" (8). Even a "single bout of moderate-to-vigorous physical activity will reduce blood pressure, improve insulin sensitivity, improve sleep, reduce anxiety symptoms, and even improve cognition on the day that it is performed" (8).

6.2.2. Mental health benefits

Moderate levels of exercise often lead to pleasure and positive mood, but there is a possibility that more intense forms of exercise could lead to displeasure (9, 10). Many studies have investigated the effects of physical activity on mental health, both the effects of the single bouts and entire physical activities programs, with a wide variety of psychological outcomes, such as mood, self-esteem, cognitive functioning and decline, depression, and quality of life (9).

Depression is now the leading cause of global burden of disability (11). Exercise appears to be a promising adjunct treatment for major depressive disorder and bipolar disorder (12). It can also be useful as an effective measure for the prevention of anxiety disorders (13).

Our grasp of how exercise is sensed by the brain and how hippocampal neurogenesis, cognition and mood react to muscle activation is limited. Findings now suggest the existence of a muscle–brain endocrine loop (14). Physical activity leads to improvement in a variety of other aspects, such as self-esteem, stress, vitality, general well-being, and satisfaction with physical appearance (15-17). Although evidence indicates that physical activity has a protective effect on mental health, the possible explanation for this has not been demonstrated experimentally (15). Various psychological hypotheses have been proposed to explain the beneficial effects, the main being distraction, feeling of self-efficacy, and social interaction. Physiological hypotheses have also been raised to explain the effects of physical activity on mental health, the two most studied among them being based on monoamines and endorphins. The first hypothesis is supported by the fact that physical activity increases the synaptic transmission of monoamines, which supposedly function in the same manner as anti-depressive drugs (18). The second hypothesis is based on the observation that physical activity causes the release of endogenous opioids (19) that inhibit the communication of pain signals and produce a feeling of pleasure. A psychobiological model combining all of the above mentioned theories is likely the most probable (20).

Physical exercise has positive effects on learning, memory and attention, processing speed and executive functions, reaction time and language learning, motor skills, verbal and visual-spatial cognitive test results, and academic performance in children and intelligence in adolescents (21-24). A meta-analysis of randomized controlled trials (RCTs) examining exercise studies in adults aged 55-80 found that exercise was associated with enhanced cognitive functioning, especially for tasks involving more complex executive functioning (25).

Executive function includes the processes of the brain that help organize daily activities and plan for the future. Tasks such as one's ability to plan and organize, self-monitor and inhibit or facilitate behaviors, initiate tasks, and control emotions all are part of executive function. Physical activity improves executive function and other components of cognition, including memory, processing speed, attention, and academic performance. Furthermore, there is increasing evidence for a causal link between physical activity and reduced risk of cognitive decline (26). Physical activity decreases the risk of diseases such as dementia (27) and might also be useful in the treatment of this disease (28). Exercise can lower the rate of cognitive decline in patients with neurodegenerative disorders and in healthy people of all ages (21). Many intervention studies suggested that the positive effects of chronic exercise on cognition are preferentially observed in both older adults and children (29). The most

popular hypothesis explaining the positive effect of chronic exercise on cognition, called the "neurotrophic hypothesis", states that, while exercising, the organism releases several neurotrophic molecules that stimulate hippocampal neurogenesis, brain angiogenesis, and the synthesis of monoamines (30). In other words, exercise does not only help in development of muscles and physical performance, but it is also essential for activating and increasing the number of neuronal connections.

It has also been postulated that physical activity in nature, a practice also known as the green exercise, can provide additional health benefits and, thus, have greater value for preventing disease and enhancing population health (31). We know both exercise and nature can independently facilitate good health and well-being. The findings of recent research and practice suggest that the combination has an even more compelling effect. Being physically active in natural environments may confer additional health benefits, compared with those that would result from the equivalent activity in an urban, built or indoor environment (31). Evidence shows that exposure to natural environment can lead to positive mental health outcomes, whether a window view of nature, being within natural places, or exercising in these environments (32). Furthermore, people report grater enjoyment or satisfaction after green versus indoor exercise (33). This is associated with the notion that exposure to scenes of nature can elicit positive psychological states such as reduction of perceived stress (33). Possible explanations have included evolutionary perspectives and elicited feelings of connection with nature. Natural environments worldwide continue to come under pressure due to urban and transport development, climate change, and negative externalities of economic growth, such as air and water pollution. Having better access to natural environments, such as parks, playing fields, or woodlands, provides the space and facilities for physical activity, which may in turn foster a more active lifestyle (34).

Team-based sports are associated with the lowest mental health burden (35), which is in line with studies showing that social activity promotes resilience to stress and reduces depression (36). The nature of team sports in minimizing social withdrawal and feelings of isolation might provide an additional benefit for mental health over other forms of physical exercise.

6.2.3. Environmental benefits

The built environment influences human choices, which in turn affect health and the global climate. A significant proportion of car use is for short-distance trips, which could be easily replaced with active transportation

options, either walking or cycling, or with public transportation (37). This is increasingly recognized as important in carbon and energy reduction strategies (37, 38). Bicycle access is negatively correlated with CO_2 emissions from motorized travel (39). Individuals who live in more pedestrian-friendly neighborhoods will also make more walking trips. Spending less time in a car reduces exposure to busy traffic and "road rage" and decreases the likelihood of obesity, while simultaneously reducing greenhouse gas emissions (40, 41). Accessible, walkable, and safe neighborhoods with good connectivity, public transit options, and recreational facilities encourage people with limited mobility or special needs to stay physically active, independent, and involved in community activities (42, 43).

Active living offers people the opportunity to interact with others, the community and the environment. Sport and leisure activities give people a chance to develop new skills and meet new people. Supporting physical activity can be a positive force for the regeneration of an area, leading to creation of new parks and green spaces for walking or cycling (2).

6.2.4. Economic impact of physical inactivity

The economic burden of physical inactivity has been studied recently, with quite consistent results, regardless of different countries being analyzed with different methods. Results of 11 national level studies in 6 developed countries showed that total healthcare costs attributed to physical inactivity range from 1% to 2.6% (44). Systematic review from 2008 demonstrated that the proportion of direct medical costs of cardiovascular disease (CVD) due to inactivity was similar (1.5–3.0%) (45). Indirect costs due to premature death and decreased work ability are difficult to calculate and often cannot be included in analysis. It is estimated that these costs are just as large, if not larger, than direct costs. A recent study estimated the cost of 54 billion (INT$), attributable to physical inactivity within the health care systems worldwide in 2013 (46). It has been established that physical inactivity imposes economic costs of €80.4 billion per year in the EU, and costs a half a million lives, through the four major non-communicable diseases (coronary heart disease, type II diabetes, colorectal and breast cancer), and through the indirect costs of inactivity-related mood and anxiety disorders (47).

6.3. Frequency of exercise, playing sport and engaging in other forms of physical activity in Croatia compared to other EU countries

Eurobarometer survey is analyzing physical activity in 28 EU Member States and the results are released every four years. In this chapter, we will demonstrate the most relevant findings from 2009, 2013 and 2017, focusing on data for Croatia (48).

Analysis of the collected data revealed that two in five Europeans (40%) exercise or play sports at least once a week, including 7% who do so on a regular basis (at least five times per week). However, almost half of respondents (46%) never exercise or play sports. Levels of participation have not changed substantially since 2013. However, the proportion of those who never exercise or play sports has increased from 42% to 46%, and this is a continuation of a gradual trend since 2009. Less than half of respondents (44%) do some form of other physical activity (such as cycling, dancing or gardening) at least once a week, while 35% never do this kind of activity (increasing from 30% in 2013). Overall, in the EU, men exercise, play sport or engage in other physical activity more than women. This disparity is particularly marked in the 15-24 age group, with young men tending to exercise or play sports on a regular basis considerably more than young women. The amount of regular activity that people do tends to decrease with age. Engagement in sports and physical activity is also less prevalent among people with lower levels of education and among those with financial difficulties. The proportion of people who exercise or play sports regularly or with some regularity is the highest in Finland (69%), Sweden (67%) and Denmark (63%). Respondents are least likely to exercise or play sports in Bulgaria, Greece and Portugal (in each of these countries, 68% of respondents never exercise or play sports) (48).

Since 2013, the proportions of people in different countries that never exercise or play sport have seen significant changes. There is an increase in number of people who never exercise or play sports in the EU, and the largest increase is observed in Croatia (Table 6.2). Regarding evolution of this tendency since 2013, the proportion of people who never engage in other physical activities has seen an increase in most countries, most notably again in Croatia (Table 6.2). Simultaneously, the number of people who regularly and somewhat regularly engage in exercise, sports or other activities is decreasing (48).

Table 6.2. Frequency of exercising or playing sports and engaging in other types of physical activity in Europeans and Croatians, comparing 2013 and 2017**.** *Source: Eurobarometer (48)*

	Exercising or playing sports				**Engaging in other types of physical activity**			
	EU		**Croatia**		**EU**		**Croatia**	
	2013	2017	2013	2017	2013	2017	2013	2017
Regularly (%)	8	7	8	7	31	14	15	8
Somewhat regularly (%)	33	33	33	33	33	30	32	26
Rarely (%)	17	14	17	14	22	21	36	29
Never (%)	42	46	42	46	30	35	17	37

Compared to men, more women never or rarely exercise, play sports or engage in other physical activities in the EU (Table 6.3). On the other hand, in Croatia, men are more likely to never or rarely engage in other physical activities. Spanning across all age groups, compared to the EU, more men and women in Croatia never or rarely exercise, play sports or engage in other physical activities. As people age, they are less likely to exercise or play sports. In Croatia, this trend reaches peak in the 40-54 age group, where 88% of men never or rarely play sports. However, people continue to engage in other types of physical activity as their age increases (Table 4.3).

Table 6.3. The proportion of Europeans and Croatians that rarely or never exercised or played sports in 2017 (by sex and age groups)**.** *Source: Eurobarometer (48)*

	Rarely or never exercise or play sports		**Rarely or never engage in other physical activities**	
	EU (%)	**Croatia (%)**	**EU (%)**	**Croatia (%)**
Total population	60	76	56	66
Men	56	75	53	67
Women	64	78	59	65
Men (15-24)	29	44	43	55
Women (15-24)	47	62	53	65
Men (25-39)	49	68	52	72
Women (25-39)	59	67	59	68
Men (40-54)	59	88	55	75
Women (40-54)	64	74	56	57
Men (55+)	70	82	56	63
Women (55+)	72	90	63	66

In conclusion, there is a worrisome trend across all age groups in Croatia of large proportion of people who never or rarely exercise, play sports or engage in other physical activities. Systematic analysis of this trend is essential in order to strategically act on local, regional and national levels to increase the number of people who are adequately physically active.

6.4. Physical activity guidelines

There are many guidelines recommending appropriate amount and type of physical activity across different stages of life. Table 6.4 shows the guidelines for children under 5 years of age developed by the WHO (49), while Table 6.5 shows the Physical activity guidelines for Americans older than 3 years of age (7).

Table 6.4. WHO Guidelines on physical activity for children under 5 years of age (49)

Age	Recommendations (more is better)
Infants (less than 1 year)	should be physically active several times a day in a variety of ways, particularly through interactive floor-based play
	those who are not yet mobile should spend at least 30 minutes in prone position (tummy time) spread throughout the day while awake
Children 1–2 years of age	should spend at least 180 minutes in a variety of physical activities at any intensity, including moderate- to vigorous-intensity physical activity, spread throughout the day
Children 3–4 years of age	should spend at least 180 minutes in a variety of physical activities at any intensity, of which at least 60 minutes is moderate- to vigorous-intensity physical activity, spread throughout the day

Table 6.5. Guidelines for children and adults (7)

Age	Recommendation
Preschool-aged children (3 - 5 years)	A quantitative key guideline for daily physical activity is not well defined for this age group, a reasonable target may be 3 hours per day of activity of all intensities: light, moderate, or vigorous
Children and adolescents (6 - 17 years old)	60 minutes or more of moderate-to-vigorous physical activity daily
	Aerobic: Most of the 60 minutes or more per day should be either moderate- or vigorous-intensity aerobic physical activity and should include vigorous-intensity physical activity on at least 3 days a week
	Muscle-strengthening: As part of their 60 minutes or more of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days a week
	Bone-strengthening: As part of their 60 minutes or more of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days a week

Adults	Adults should move more and sit less throughout the day. Some physical activity is better than none
	Adults should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week
	Additional health benefits are gained by doing physical activity beyond the equivalent of 300 minutes (5 hours) of moderate-intensity physical activity a week
	Adults should also do muscle-strengthening activities of moderate or greater intensity that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits
Older adults	Key guidelines for adults also apply to older adults
	Older adults should do multicomponent physical activity that includes balance training as well as aerobic and muscle-strengthening activities
	When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow

6.5. How to build and keep new healthy habit of being physically active

6.5.1. Before starting exercise - Choosing the right reason for exercise

When trying to advise their patients to embrace lifestyle change, physicians keep in mind health-related reasons. However, those reasons may not align with what is most relevant and compelling to patients. Reasonable goals for lifestyle change, such as “preventing disease”, “better health” or “weight loss“ only exist in a vague future, which is why they are not very good motivators (50). People are more likely to sustain behaviors that are essential to their daily life, in a meaningful, immediate and noticeable ways (51). When physical activity is regarded as a gift, something that is personal, fun or meaningful, it is much more likely that one will continue to do it (52). Unfortunately, people often come to think of food and physical movement not as the joy and life essentials that they really are, but as “diet” and “exercise”, things we have to do in certain doses and repetitions to lose weight and prevent disease. When eating and moving become something we ‘should do’, instead of something we ‘want to do’, motivation is undermined. Meaning is at the root of motivation.

Negative, chore-based reason for exercise leads to poor motivation, while positive, gift-like reason for exercise leads to high quality motivation. The 'right why' motivates us because it is relevant to the daily life and it is personally meaningful (53). Exercising in order to achieve a goal outside of ourselves, like losing weight or lowering cholesterol, is an external motivation. In contrast, exercising because you've chosen an activity you enjoy and are looking forward to it, is an internal motivation that fuels your core needs and wants.

Regular exercise induces immense benefits and have a direct effect on daily life: more energy, better sleep, less stress, less anxiety, enhanced mood, better sex life, higher life satisfaction, more creativity, and better overall well-being (2). Unfortunately, people often give up on many types of activities because they believe these kind of activities "don't count". Movement intensity does not have to be vigorous in order to "count". Even small steps, as simple as sitting less, have health benefits. Life-centered activities such as house cleaning, gardening and walking "do count". Physical activity accumulates throughout the day, and one does not have to do it all at once. Finally, in order to accomplish a goal of maintaining physical activity over a lifetime, it is necessary to refocus and choose to move in ways that feel good. Programs aiming to create long-term change should abandon pressure and external incentives, and should instead foster autonomy and internal motivation by helping people find personal significance and learn how to become physically active in ways it feels good. When people focus on a specific goal like lowering cholesterol, it leads to tunnel vision, and just focus on reaching the goal, instead of acquiring the skills required to reach and sustain it. The goal should be learning how you can sustain life-enhancing daily movement in your everyday life (53).

Questions for boosting motivation to exercise:

What do you need more of?

- **Physical movement can enhance:** energy levels, mood, life satisfaction, sleep, productivity, sex life, creativity, executive functioning (problem solving, memory), strength for daily activities and feeling of self-worth.

What do you need less of?

- **Physical movement can reduce:** stress, anxiety, depression, cognitive decline, addictive behavior, getting sick all the time, menopausal symptoms, PMS and low self-esteem.

6.5.2. Planning - Current state analysis

In order to make a good exercise program with high chances for success, the first step is to analyze the current state, which means answering the question: *What are you doing **NOW**?*

Helpful adjunct questions:

What activities do you do now?

How often are you active during the week? (Once a week? Twice a week? Daily?)

How long does your usual physical activity session last? (Only a few minutes each time? 15 minutes or less? 30 minutes or more?)

Next, we have to ask: *What activities would you **LIKE** to do?*

Helpful adjunct questions:

What types of physical activity do you enjoy doing and find them fun?

Are there some activities that you would like to try?

This gives us a good idea for creating an exercise plan.

6.5.3. Goal setting and keeping up with them

Once we have settled on the program content, we have to set specific goals. Goals should align with SMART goals (Specific, Measurable, Attainable, Relevant and Timely), and be subdivided in a set of smaller goals, each of them realistic and with high probability of being accomplished. Small, realistic goals increase the likelihood of keeping up with the habit, but also enable gradual buildup of the workload, which is crucial in preventing injury.

SMART goal example for physical activity:

"In 6 months, I will be walking for 30 minutes/day, five days a week."

- By the end of the first month, I will be walking at least 10 minutes/day, 3 days a week.
- By the end of the second month, I will be walking at least 20 min/day, 3 days a week.
- By the end of the third month, I will be walking at least 30 min/day, 3 days a week.
- By the end of the fourth month, I will be walking at least 30 min/day, 4 days a week.
- By the end of the fifth month, I will be walking at least 30 min/day, 5 days a week.
- I will continue walking for at least 30 min/day, at least 5 days a week.

It is important to let the patient interested in starting to exercise know that the first few steps are the hardest, but it will get easier after that. It is helpful to start simple and then build up, for example, sitting less and walking more is a great way to start exercising. Going for a walk, taking the stairs, going for a bike ride, are all safe and easily accomplished steps. It is also important to emphasize the importance of doing things in an environment that person enjoys. Once a patient decides on a goal he/she would like to achieve, they should choose a simple action that will help them see a clear path toward the goal, and which they can do on a daily basis. It is crucial to plan when and where the action will be performed, in other words, picking a certain place and time, and doing the action whenever they are in that place and time. Some people find it helpful to keep a record while they are forming a new habit. They can use a diary or a check sheet until the new habit becomes automatic. Rating how automatic the habit feels at the end of each week and watch it get easier is very motivating.

6.5.4. How to talk to patients about exercise

When talking to patients, it is useful to focus on immediate benefits of exercise, such as the feeling of relaxation, happiness and vitality, as opposed to 'selling' the medical or health benefits of exercise. These benefits may not occur until weeks or months down the track. Raising the issue of physical activity can take as little as 30 seconds during medical consultation. The discussion begins with either the practitioner or the patient raising the issue of physical activity. The Scottish Physical Activity Screening Questionnaire can be used as a helpful tool on how to start and direct the conversation about exercise (54). It has only 3 questions, and the official website can be used with additional information and guidance (54):

1. How many days in the past week have you been physically active for a total of 30 minutes or more?
2. If four days or less, have you been physically active for at least two and a half hours (150 minutes) over the course of the past week?
3. Are you interested in being more physically active?

6.6. Measuring and monitoring physical activity

There are several techniques for monitoring physical activity. Training load can be described as being external or internal, depending on whether the measurable aspects occur internally or externally to the person (55). Methods

that focus on external training load analyze different components of physical activity such as volume, intensity, duration, density and frequency (Box 6.1). Variables such as duration of the exercise, number of repetitions, lifted weight, and speed of movement can be measured and analyzed. Internal training load can be checked against "objective" indicators, reflecting the physiological response to the external load, or estimated "subjectively" by the person's perception of the workload experienced. Specific modifiable and non-modifiable factors such as training status, nutrition, health, psychological status, and genetics may result in individuals experiencing different internal load for the same external load. Objective internal training load indicators can be identified as certain hormone levels (cortisol, testosterone, epinephrine, norepinephrine, prolactine, growth hormone, dopamine, etc.); red blood cell count, hematocrit and hemoglobin; immune system evaluation (white blood cell count, immunoglobulins A and G, oxidative stress level, creatine kinase, etc.); blood lactate, heart rate, blood pressure and maximum oxygen uptake. Subjective internal training load can be estimated by filling out various questionnaires like: Borg Scale of Perceived Exertion (Rating of Perceived Exertion, RPE), Profile of Mood States (POMS), Recovery Stress Questionnaire for Athletes (RESTQ-S), DALDA - Daily Analyses of Life Demands of Athletes; STAI - State-Trait Anxiety Inventory; MTDS - Multi-Component Training Distress Scale, etc.

A major limitation of physical activity research to date has been the lack of objective, practical and inexpensive tools to measure physical activity and energy expenditure on a large scale. Currently, doubly labeled water (DLW) is considered the 'gold standard' for the determination of total energy expenditure. However, it is less useful for wide scale population-based research due to the limitations of burdening the participant and its high cost. Methods such as direct observation are time-consuming and impractical on a large scale. Therefore, we use cheaper and less complicated methods for monitoring physical activity, even if they are less precise and reliable.

Metabolic equivalents (METs) can be used for measuring external training load (56). This method is commonly used to express the intensity of physical activity. One MET is defined as the energy cost of sitting quietly and it is equivalent to a caloric consumption of 1kcal/kg/hour. It is estimated that, compared with sitting quietly, a person's caloric consumption is up to three times higher when being lightly active (<3.0 METs), three to six times higher when being moderately active (3-6 METs) and more than six times higher when being vigorously active (>6 METs) (Table 6.6).

Table 6.6. Examples of light, moderate and vigorous activity types for healthy adults

Light (<3 METs)	Moderate (3-6 METs)	Vigorous (>6 METS)
Walking slowly Sitting using computer Light working in a standing position Fishing from a sitting position Playing most instruments	Brisk walking Demanding cleaning Mowing the lawn Cycling, light effort Badminton Tennis doubles	Hiking Jogging Shoveling Carrying heavy loads Cycling fast Basketball game Soccer game Tennis singles

One limitation to this way of measuring exercise intensity is that it does not consider the fact that some people have a higher level of fitness than others. Thus, walking at 3 to 4 miles-per-hour is considered to require 4 METs and to be a moderate-intensity activity, regardless of who is doing the activity.

Counting steps with a pedometer is another method for monitoring external training load (57). Walking still remains the most frequently reported leisure-time activity. Such locomotion is a fundamental part of daily life and a prominent focus of public health physical activity guidelines has been put on this activity. Steps can be measured intermittently or continuously throughout the day. Based on the pedometer-determined achieved activity, we can divide physical activity into:

< 2500 steps/day ('basal level activity')

2500-4999 steps/day ('limited activity')

5000-7499 steps/day ('low active')

7500-9999 steps/day ('somewhat active')

≥10000-12499 steps/day ('active')

≥12500 steps/day ('highly active')

Accelerometer is another device we can use for external load training monitoring (58). An accelerometer is a small device that can objectively measure "real time" minute-by-minute steps and activity counts by measuring acceleration over an axis. The raw activity counts from the accelerometer can be transformed to identify time spent in sedentary position and physical activity. A key feature of the accelerometer is the ability to distinguish between different intensities of movement, such as walking and running. Multi-axis accelerometers measure acceleration over multiple planes to assess movements such as stair climbing. Interpreting data from accelerometers can be challenging and varies according to age, gender, functional levels, health status and the type of accelerometer used. Given that accelerometers measure acceleration,

they cannot measure stationary physical activities (e.g., stationary bike riding, elliptical training) and underestimate upper body physical activities (e.g., housework).

In terms of free-living activity, using a GPS (global positioning system) can be quite promising in monitoring external load training, especially in augmenting accelerometer-based measurement of physical activity. This approach potentially provides greater insight into the nature of activity with both location and intensity information available. A better understanding of where the activity takes place or where people tend to sit the most would permit a more targeted approach to implementing physical activity initiatives and interventions (59).

There are also several approaches to monitoring internal training load. Heart rate is the most utilized method for monitoring internal training load. It is based on a positive correlation between oxygen uptake and heart rate (58). The method provides more reliable data when individual heart rate is expressed as a percentage of maximum heart rate.

The Borg Scale of Perceived Exertion is a popular way of subjectively monitoring internal training load (60). The Borg Scale takes into account individual fitness level and appoints a grade depending on exertion from 0 to 10. In order to make it easier to subjectively estimate exertion, people can use tables that additionally explain individual grades (Table 6.7) (61).

Table 6.7. The Borg 10 Point Scale of perceived exertion additionally explained with examples (61); *Available from: http://gr8running.com/training-intensity-borg-scale/*

Rate of Perceived Exertion	Description	What you'd think	Breathing	Talking
0	Doing nothing	Resting	Relaxed	Normal
1	Very easy	Really easy	Normal	Normal
2	Easy	Easy	Normal	Normal
3	Moderate	Moderate	Comfortable	Easy
4	Quite hard	Sort of hard	Noticeable	OK if necessary
5	Hard	Feeling this	Deep – steady	Conversation stops
6	Really hard	Hurting	Deep – rapid	Maximum few words
7	Really hard	Really hurts	Deep rapid	Utter 1 syllable
8	Very strong	Coach is killing us!	Very deep, very rapid	Incoherent
9	Near maximum	Can we stop!	Very deep, very rapid	No
10	Absolute maximum	OMG!	Breathlessness	Impossible

6.7. Literature

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CHAPTER 7: SLEEP HABITS AND LIFESTYLE MEDICINE

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"Laugh and the world laughs with you. Snore and you sleep alone."
Anthony Burgess

7.1. Introduction

Sleep is a physiological need and has an extremely important effect on an individual's health, regardless of age. During life, the amount of sleep varies as well as the proportion of specific sleep stages. For example, during puberty and adolescence, when the brain is still intensely developing, these significant changes affect sleep. Sleep is food for the brain, so it is not difficult to imagine that insufficient sleep or sleep deprivation, as well as poor quality of sleep, have detrimental effects on an individual's health. A sleep-hungry brain becomes restless in its pursuit of acquiring sleep and will therefore develop symptoms such as excessive daytime sleepiness, decreased alertness, attention and concentration, short-term memory deficits, irritability, and generally poor mood (1, 2). Good and efficient sleep is a prerequisite for good health, a better mood, reducing the risk of depression, improving the immune system and positively affecting cognitive and academic performance. If we, as a society, make an effort to help instill healthy sleep habits in children and youth, we will significantly improve the health of future adults and prevent, or at least delay, the development of some of the leading chronic diseases that affect morbidity in most cultures today (3).

How does the body know when to go to sleep? There is an internal clock in our body set at the period of time slightly longer than twenty-four hours, which tells us when to be awake and when to sleep. This intrinsic circadian rhythm, however, needs to be constantly adjusted to the 24 hours a day rhythm, which is regulated by precise bodily mechanisms including endogenous brain factors. It is also strongly influenced by exogenous factors such as daylight. The main neuroanatomical structure in the human brain related to the regulation of the circadian rhythm of wakefulness and sleep lies bilaterally

in the small nucleus in the hypothalamus called the suprachiasmatic nucleus (SCN) (3, 4). However, despite the fact that the clock is set at about twenty four hours, each individual's rhythm may differ. During the whole sleep-wake cycle, the peak levels of alertness and sleepiness throughout the day varies from one person to another. As much as the daylight affects the neurons in the SCN, many other factors can affect their activity such as ambient temperature, hunger and satiety, exercise, etc. (3, 4). Some people experience the peak alertness in the morning, when they function at their best. They feel drowsy in the early evening and are referred to as the 'morning types'. Some estimates indicate that approximately 40% of the population is the so-called morning type. The second large group in the general population is the so-called 'evening type'. Those individuals prefer to sleep longer in the morning, while they tend to stay up late and, in general, account for around 30% of the population, while the remaining 30% is considered the so-called 'transitional type'. The transitional type is somewhere between the morning and evening type of people, perhaps slightly inclined toward the evening type (3). Belonging to one of the three types is called a chronotype and is largely genetically determined. However, age strongly contributes to the morningness-eveningness. In short, young people tend to belong to the eveningness group type, whereas older people tend to belong to the morningness group type. Therefore, over the lifespan, the same person may belong to one and then to another chronotype group. The fact is that many cultures consider the evening types as lazy persons who like to sleep longer. Indeed, everyday life is more adapted to the morning types regardless of the profession. It is especially important in children, given that in most countries, the primary school, high school, and even university classes usually start at 8 a.m. Perhaps we can draw a parallel by comparing the right-handed and the left-handed people, since the world probably seems like an unfair place for the left-handed people. The left-handed people are forced to adapt to the society of dominantly right-handed people, and therefore are easily labeled as clumsy and awkward. A person with an evening chronotype, due to sleep deprivation and the lack of sleep will have poorer health, a higher incidence of depression, a weaker immune system, increased susceptibility to infections and a higher incidence of diabetes and cardiovascular disease (3).

To function properly, the suprachiasmatic nucleus (SCN) uses a chemical molecule, melatonin, to send a message to the body that it is getting dark. Melatonin secretion by pineal gland, a gland located deep in the brain, begins shortly after twilight and peaks around 4 a.m., after which its secretion drops sharply toward dawn to reach the lowest, almost immeasurable level, around noon. Other physiological mechanisms take control of wakefulness at dawn, so

the cycle is constantly restored and repeated over a twenty-four hour period. In addition to the circadian rhythm that determines the periods of wakefulness and sleep, there is another internal system, which is called sleep pressure. In this system, many neurotransmitters released by the brain neurons located in the hypothalamus contribute to control mechanisms of sleep and wakefulness, such as histamine, serotonin, dopamine, and norepinephrine, promoting wakefulness together with the recently found neuromodulator hypocretine on one side, and the sleep-promoting GABA on the other side. Another molecule, called adenosine, also plays an important role in promoting sleep. The concentration of adenosine in the body increases with alertness. This will directly increase the need for sleep, which happens to most people when they are awake for twelve to sixteen hours. Caffeine is the best-known substance used on a daily basis to work against adenosine. Caffeine competes for the same receptors in the brain that bind adenosine, but has the opposite effect and blocks drowsiness. In addition to coffee, caffeine is also found in many energy drinks, teas, ice creams and dark chocolate, and it is also found in many drugs, so the consumption of such substances can often negatively affect the quality of sleep, making it difficult to fall asleep, even when the person is really sleepy. Caffeine can lead to insomnia. The fact is that the two systems act independently of each other, the circadian rhythm or so-called Process-C and the other system creating the need for sleep and sleep homeostasis or so-called Process-S. Simply put, sleep promotes wakefulness and vice versa. The longer someone is awake, the pressure to sleep increases (3-5).

7.2. Stages and architecture of sleep

There are two main sleep phases: non-rapid eye movement (non-REM) and rapid eye movement (REM) sleep, which alternate every night in the cycles of about ninety minutes (Figure 7.1). During the night, two phases alternate in such a way that NREM dominates early in the night, while, as morning approaches, this ratio changes in favor of REM sleep. NREM sleep consists of stage N1 (very shallow sleep), stage N2 and finally stage N3 (deep sleep), also referred to as slow-wave sleep, because of the specific appearance of the slow delta waves brain activity of superficial cerebral cortex neurons, which can be visualized in the specialized sleep laboratories by the neural electrical activity recording technique, known as electroencephalography (EEG) (4). The goal of NREM sleep, according to recent research, is believed to be to participate in solidifying new knowledge and experiences, gained during wakefulness, into permanent memory records, known as the long-term memory.

REM sleep is also known as paradoxical sleep because the electrical activity of the brain is very similar to the wake state, even if, during this stage, we sleep and often dream, while the body abruptly loses muscle tone, a state known as REM atonia (3).

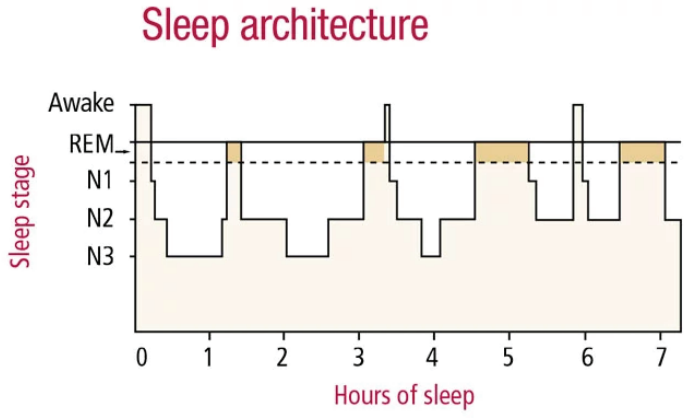

Figure 7.1. Sleep architecture. *Available from: https://www.helpguide.org/harvard/biology-of-sleep-circadian-rhythms-sleep-stages.htm*

7.3. Sleep quantity and quality

Modern lifestyles in the world's more developed countries have led to the spontaneous acceptance of the trend of single-phase sleep, or in the single sleep episode during the 24-hour day, which is generally considered as "normal". Unfortunately, this is quite mismatched with human nature. Modern lifestyle has caused sleep to become a luxury of the privileged individuals who, even in such a single-phase model, barely manage to afford to sleep for an average of five to six hours a night during a 24-hour period. There are still isolated tribes in the world that live without electricity and artificial lighting and sleep for more than seven hours during the night, but also have the privilege of napping for half an hour to an hour during the day. Such sleep model has been described in the literature as a two-phase model, judging by anthropological,

biological and genetic markers (3). Specifically, certain cultures, such as the Mediterranean ones (i.e., Spain, Italy, Greece), including Croatia, practice some kind of a transitional form that is not a pure form of single-phase or two-phase sleep (6), given that, mainly for social reasons, people rarely sleep longer than six hours during the night (3). The rapid development of the society and the technology advancement leave a mark on everyone, children and adults alike. In children, the rhythm of wakefulness and sleep is different from the one in adults and elderly. The need for sleep in children is stronger, but bedtime is frequently delayed, while the desire to sleep longer in the morning is increased. In addition, staying up all night to party on the weekends or days off is quite common, especially in high school kids. There are more and more electronic devices and young people are constantly using them, even late in the evening. The electronic devices emit the so-called blue light, which has been proven to have a negative effect on sleep. All this poses a serious risk of poor sleep quality in children and young people and has a negative impact on their health, creating favorable conditions for the development of some chronic diseases in adulthood. Although the exact causal link is still unknown and more research is needed, research has shown that children who on average get a grade C (or 3, according to the Croatian grading system), have poorer quality of sleep, sleep shorter, have an irregular rhythm of wakefulness and sleep on weekdays and weekends, compared to children who get better grades (9, 10). Anger, sadness, and fear are common words children in puberty use when describing their daily mood. They also have difficulty controlling emotions and coping with problems, both at school and in family and personal relationships (11, 12). A study by Carskadon and colleagues showed that high school students who go to sleep two hours later on weekends compared to weekdays are more prone to depressive disorders than students who tend to avoid such a significant difference in weekday and weekend sleep (13). In his study, Dahl has shown that drowsiness leads to difficulty in maintaining attention, impulsiveness, disables "sitting still" in school, impairs the ability to complete tasks and generally generates an image very similar to that associated with the Attention Deficit Hyperactivity Disorder (ADHD) (14). More recent studies have shown that the transition from elementary to high school often results in aggressive behavior, which is associated with shorter sleep and later bedtime (15). The fact that children with a poor quality of sleep are more likely to experiment with drugs, alcohol, smoking, etc., is particularly alarming (16).

It is especially important to understand the consequences of poor sleep among children in puberty and adolescence, as they appear to be closely linked to the key elements of the human development. Fostering healthy sleep habits in young people is essential for lifelong success and for, what the psychologists

call, social competence. Additionally, the transition from childhood to adulthood is a critical time for creating values and habits that will shape their lives. Thus, the intervention to improve sleep in puberty and adolescence is imperative to good health in adulthood. Therefore, all of us should at least start to publicly voice what healthy sleep looks like, how it affects academic success, health and disease prevention. Research has shown that basic sleep needs remain the same throughout life. In addition, insufficient sleep accumulates into a state of sleep debt or chronic sleep deprivation (Figure 7.2), resulting in lower school performance and chronic fatigue (3). The school system can contribute to some changes in order to help schools set the so-called "sleep-friendly" start times, which is promoted in different countries around the world (16-20). There are still many challenges ahead, the goal is clear, but it will take time to achieve the concrete results (21), given that we lack epidemiological data on children's sleep habits across Croatia.

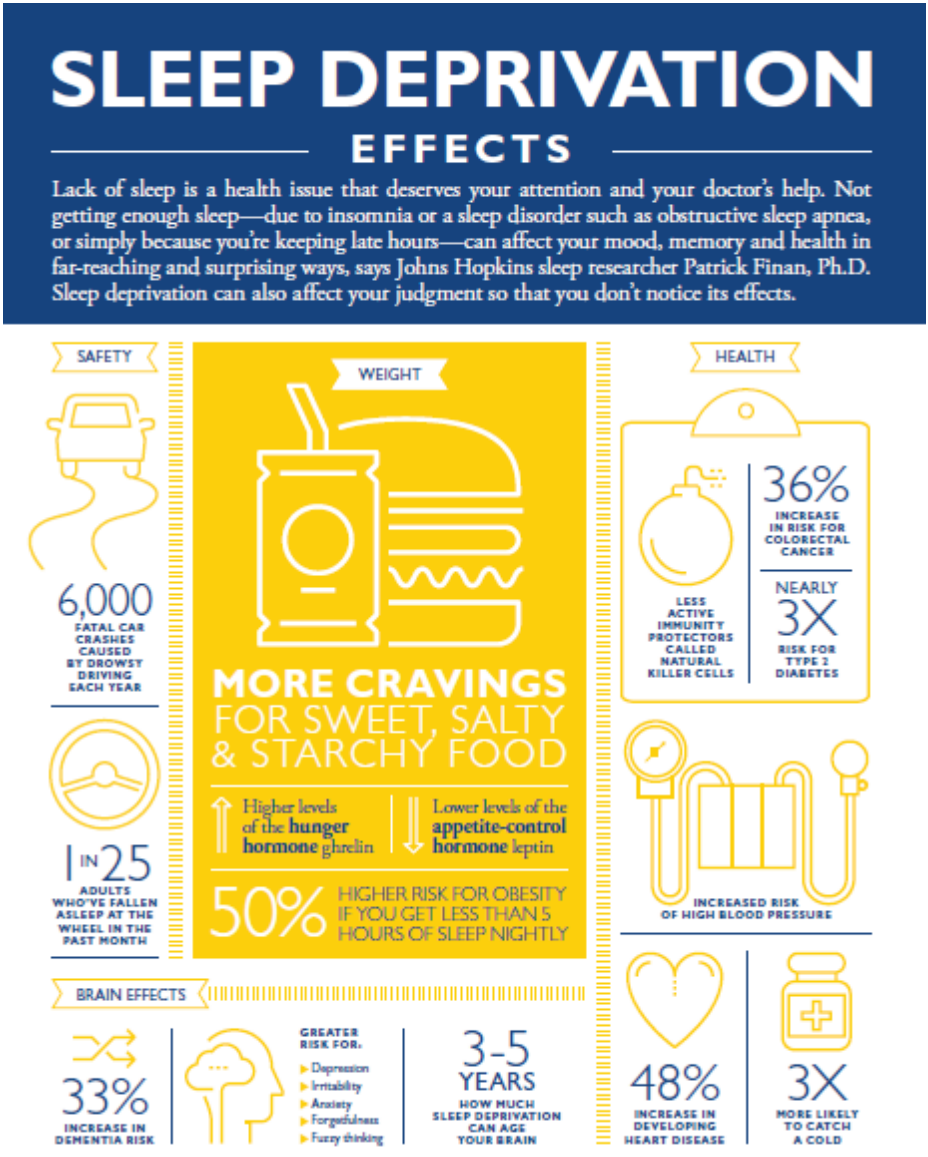

Figure 7.2. Effects of sleep deprivation; Available from*: https://www.hopkinsmedicine.org/health/wellness-and-prevention/the-effects-of-sleep-deprivation*

Education of teachers, pediatricians and all school staff on children's need for sleep during puberty and adolescence is required. In addition, those involved in education should be aware of the early signs of sleep disorders,

especially drowsiness and difficulty in maintaining alertness and attention in school children, thereby allowing them to react urgently to tackle a potential problem that a child may be experiencing, especially in case of poor academic performance, getting poor grades and behavioral disorders.

The knowledge of sleep physiology and healthy sleep habits need to be integrated into school curricula. The primary goal should be to demonstrate the importance of healthy sleep and the negative effects of poor sleep on health and disease development to children. Changing the school day schedule to the morning shift only should also be considered. However, this also entails adjusting a range of extracurricular activities such as sports, arts and other activities that children take part in after their regular schoolwork. The Croatian education system in primary and secondary schools is organized in a way that the morning and afternoon shifts in most schools alternate on a weekly basis, which, combined with many extracurricular activities, promotes an irregular wakefulness and sleep cycle that contributes to poor sleeping habits in children. However, Košćec and colleagues have shown that the afternoon shift in the Croatian education system somewhat compensates for the need for sleep (22).

The planned introduction of full-day teaching from 9 a.m. to 4 p.m. is scientifically based and a praiseworthy attempt in many countries around the world. Such changes have also been planned in the Republic of Croatia, which will require time and patience, but will also help improve the well-being of our children. This should be one of the imperatives in disease prevention and health care programs for children, which are the most vulnerable group in society.

7.4. Assessment of sleep disorders

It is important to emphasize that there are around 80 recognized sleep disorders according to the latest International Classification of Sleep Disorders (ICSD-3), which are divided into 7 sections:

- Insomnia
- Sleep-related breathing disorders
- Central disorders of hypersomnolence
- Circadian rhythm sleep-wake disorders
- Parasomnias
- Sleep-related movement disorders
- Other sleep disorders

This large variety of sleep disorders makes it difficult to make a proper diagnosis and treatment, and there is a growing need for extensively trained sleep medicine experts, somnologists. We also need sleep medicine centers or laboratories, equipped with special diagnostic equipment, and the standard operating procedures to be conducted under the supervision of trained personnel. All of the requirements listed above are the prerequisites to give an accurate diagnosis and provide adequate treatment, which often requires an interdisciplinary approach.

Raised public awareness about importance of sleep as a pillar of a healthy life, and improved medical education to prepare doctors to successfully tackle sleep disorders and their association with many prevalent diseases in modern societies, will make it possible for a family doctor and sleep medicine experts to help anyone who reports having sleeping difficulties. It needs to be emphasized that taking a sleep history should be a part of a standard medical school curriculum. Taking a sleep history involves structured sleep-related questions, such as description of the present sleep problems, usual bedtime and wake up times, evaluation of excessive daytime sleepiness, nighttime awakenings, troubles with falling asleep or getting up early in the morning, snoring, unusual behavior during the night, etc.

Most prevalent symptom is the excessive daytime sleepiness, which could be evaluated by the Epworth Sleepiness Scale (23) (See 7.7. Apendix), which has been validated in Croatian to test possible sleepiness in eight normal daily situations (24). This questionnaire can be used to screen the patients that might be exposed to occupational or road safety risks, especially in a population of professional drivers.

There are lot of other screening questionnaires that can be used in a daily clinical routine to screen patients who are at risk of having sleep disorders. Special attention should be paid to early signs of one of the most frequent sleep-related breathing disorder, obstructive sleep apnea (OSA). The STOP questionnaire can be used for this disorder, and it is composed of only 4 questions about Snoring, Tiredness, Observed breathing cessations during sleep and elevated blood Pressure. STOP and its extended version STOP-BANG (STOP + BMI, Age, Neck circumference and Gender) questionnaire have been evaluated in Croatian, as well as Epworth sleepiness scale, and can be used for screening patients who are at risk of having OSA (24). In addition, there are other questionnaires such as Pittsburgh Sleep Quality Index questionnaire (PSQI) (25) for evaluation of sleep quality, or BEARS questionnaire that helps clinicians evaluate potential sleep problems in children under 18 years of age (26). It is important to rule out other health or emotional conditions that

may be affecting or interfering with someone's sleep. Difficulties to fall or stay asleep and/or feeling tired or not well-rested during the day despite spending enough time in bed at night could point to the diagnosis of one of more than eighty sleep disorders (27).

7.5. How to sleep better?

For anyone who would like to change or improve their sleep habits, the National Institute of Health in the US has issued twelve recommendations for healthy sleep (28):

1. Stick to a sleep schedule. Go to bed and wake up at the same time each day. As creatures of habit, people have a hard time adjusting to changes in sleep patterns. Sleeping later on weekends won't fully make up for a lack of sleep during the week and will make it harder to wake up early on Monday morning.
2. Exercise is great, but not too late in the day. Try to exercise at least 30 minutes on most days but not later than 2-3 hours before your bedtime.
3. Avoid caffeine and nicotine. Coffee, colas, certain teas, and chocolate contain the stimulant caffeine, and its effects can take as long as 8 hours to wear off fully. Therefore, a cup of coffee in the late afternoon can make it hard for you to fall asleep at night. Nicotine is also a stimulant, often causing smokers to sleep only very lightly. In addition, smokers often wake up too early in the morning because of nicotine withdrawal.
4. Avoid alcoholic drinks before bed. Having a "nightcap" or alcoholic beverage before sleep may help you relax, but heavy use robs you of deep sleep and REM sleep, keeping you in the lighter stages of sleep. Heavy alcohol ingestion also may contribute to impairment in breathing at night. You also tend to wake up in the middle of the night when the effects of the alcohol have worn off.
5. Avoid large meals and beverages late at night. A light snack is okay, but a large meal can cause indigestion that interferes with sleep. Drinking too many fluids at night can cause frequent awakenings to urinate.
6. If possible, avoid medicines that delay or disrupt your sleep. Some commonly prescribed heart, blood pressure, or asthma medications, as well as some over-the-counter and herbal remedies for coughs,

colds, or allergies, can disrupt sleep patterns. If you have trouble sleeping, talk to your healthcare provider or pharmacist to see whether any drugs you're taking might be contributing to your insomnia and ask whether they can be taken at other times during the day or early in the evening.

7. Don't take naps after 3 p.m. Naps can help make up for lost sleep, but late afternoon naps can make it harder to fall asleep at night.
8. Relax before bed. Don't overschedule your day so that no time is left for unwinding. A relaxing activity, such as reading or listening to music, should be part of your bedtime ritual.
9. Take a hot bath before bed. The drop in body temperature after getting out of the bath may help you feel sleepy, and the bath can help you relax and slow down so you're more ready to sleep.
10. Have a good sleeping environment. Get rid of anything in your bedroom that might distract you from sleep, such as noises, bright lights, an uncomfortable bed, or warm temperatures. You sleep better if the temperature in the room is kept on the cool side. A TV, cell phone, or computer in the bedroom can be a distraction and deprive you of needed sleep. Having a comfortable mattress and pillow can help promote a good night's sleep. Individuals who have insomnia often watch the clock. Turn the clock's face out of view so you don't worry about the time while trying to fall asleep.
11. Have the right sunlight exposure. Daylight is key to regulating daily sleep patterns. Try to get outside in natural sunlight for at least 30 minutes each day. If possible, wake up with the sun or use very bright lights in the morning. Sleep experts recommend that, if you have problems falling asleep, you should get an hour of exposure to morning sunlight and turn down the lights before bedtime.
12. Don't lie in bed awake. If you find yourself still awake after staying in bed for more than 20 minutes or if you are starting to feel anxious or worried, get up and do some relaxing activity until you feel sleepy. The anxiety of not being able to sleep can make it harder to fall asleep.

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7.7. APPENDIX

EPWORTH SLEEPINESS SCALE

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation:

0 = no chance of dozing

1 = slight chance of dozing

2 = moderate chance of dozing

3 = high chance of dozing

Situation:	
Sitting and reading	0 1 2 3
Watching TV	0 1 2 3
Sitting inactive in a public place (e.g. a theater or a meeting)	0 1 2 3
As a passenger in a car for an hour without a break	0 1 2 3
Lying down to rest in the afternoon when circumstances permit	0 1 2 3
Sitting and talking to someone	0 1 2 3
Sitting quietly after a lunch without alcohol	0 1 2 3
In a car, while stopped for a few minutes in traffic	0 1 2 3

Sum _____

Interpretation of the score:

0-5	Lower Normal Daytime Sleepiness
6-10	Higher Normal Daytime Sleepiness
11-12	Mild Excessive Daytime Sleepiness
13-15	Moderate Excessive Daytime Sleepiness
16-24	Severe Excessive Daytime Sleepiness

CHAPTER 8: STRESS: CAUSES, CONSEQUENCES AND MANAGEMENT OF CHRONIC PSYCHOLOGICAL STRESS

Ivana Kolčić

"The time to relax is when you don't have time for it."
Sydney Harris

8.1. Introduction

We cannot live or survive without a functional physiological stress response. It was our great ally throughout a very long evolutionary process of becoming modern humans. The physiological response we call stress saved us from the wolves, storms, assaulters and all other factors posing a threat to our integrity. This is acute stress, which helps us engage in a fight or summons our energy and focus on running away from danger. It is regulated via the hypothalamic-pituitary-adrenal (HPA) axis with cortisol being the final hormone secreted from the adrenal glands, and via the sympathetic nervous system, with adrenaline as the final product. Both of these hormones elicit their effect via specific receptors that can be found all over the body's systems, which is why stress response involves such a profound reaction that affects the whole body.

It was Hans Selye who first used the term stress as a negative impact on homeostasis in his book published in 1956, along with the terms stressor and stress response (1). The stress in modern society is all-prevailing and it is associated with many daily situations we find ourselves in.

The word stress is oftentimes regarded just as a negative psychological experience, which happens as a reaction to certain inputs from the environment, or from within our body. There is also a positive type of stress, such as the feeling of excitement due to the welcoming a new baby in the family, graduation, embarking on a long-wanted travel adventure or winning the lottery. Additionally, what adds to the complexity of this phenomenon is that the same trigger can elicit both positive and negative stress reactions in different people. For example, going shopping can be very positive and exciting for some people, while others may associate shopping with a financial burden, crowded malls and an overall negative experience.

This chapter will deal with chronic and negative psychological stress. This is the kind of stress that results in negative health consequences, in both physical and mental health domains.

8.2. The prevalence and main causes of stress in daily life

The prevalence of stress in the general population is very high. For instance, it has been estimated that 60–80% of patients' visits in primary care in the USA may have a stress-related component (2). The Stress in America 2011 survey, conducted in the USA among 1,226 adults aged 18 and older, showed that as many as 22% of people experienced extreme stress (3). The main reasons identified in the survey as the most important sources of stress included money issues, work-related issues, economy, relationships, family responsibilities, health problems and job stability (3). If we divide those reasons into the group of stressors we can control and those that are beyond our control, we can see that not many of them are under our direct influence. For example, we cannot start printing our own money, most commonly we have a boss or two, certain co-workers we have to work with and deadlines we have to meet. There is also a government in place, politicians who make the laws, and there are big and rich companies as part of the market, which altogether determine the direction of the economy, ultimately influencing our job stability. Stressors over which we may have some control are our relationships and health (problems). However, it is down to our close relationships and our daily habits to serve either as the source of stress or as a powerful source of strength that we use to unwind and decrease its detrimental impact.

Whether a person perceives stimuli from the environment or from within as stressful or not is determined by many factors, including genetic factors, early experiences during infancy and childhood, personality, social circumstances and support, previous experiences and established coping patterns, education, nutrition, sleep, and so on. It is the way of reacting to different stressful situations and our coping mechanisms repertoire that make a difference in susceptibility to illness and our overall well-being (4).

Some periods in life are more vulnerable to the effect of stressors, such as the neonatal period, childhood and adolescence. The most widely studied stressors in children, with the most devastating long-term effects, include exposure to violence (sexual, physical, emotional, or neglect), war and terrorism, parental divorce/marital conflict, and exposure to nonresponsive caregivers (1). Such early experiences may result in a plethora of disorders later in life, such as affect dysregulation, provocative behaviors, avoidance of intimacy, disturbances in attachment, higher levels of both general distress and major psychological disturbances, including personality disorders, poor school

performance, antisocial behavior, anxiety, depression, family conflict, lack of support from friends, learned helplessness, post-traumatic stress disorder and symptoms of depression, when these children are compared to their peers who did not experience such profound adverse life events (1).

Certain personality traits as predictors of more intense stress perception were recognized a long time ago, such as type A behavior pattern, which was first associated with atherosclerosis and coronary heart disease (5). These findings were also confirmed by the Framingham study, which showed in 1980 that type A behavior and suppressed hostility (not showing or discussing anger) may be involved in the pathogenesis of coronary heart disease in both men and women (6). In short, people who are highly competitive and immersed in their work, very careful with their time management, impatient and devoted to multitasking are described as type A behavior pattern.

Another psychological trait associated with the heightened stress response is hostility, which can be described as a negative cynical attitude toward others, with a propensity for anger or aggression (7). A recent study in people with type 2 diabetes showed that more hostile individuals had a greater increase in plasma interleukin-6 concentration following the acute stress tasks, as well as decreased salivary cortisol output, pointing to the increased susceptibility to stress-induced increase in inflammation markers (7). On the other hand, it was found that positive affect, such as optimism, is associated with a lower risk of cardiovascular events and all-cause mortality (8).

Recent findings showed that even some genetic factors may play a part in stress response, such as certain single nucleotide polymorphisms in genes coding for various endocrine and immune molecules (9).

8.2.1. Work-related stress

Work-related stress is so prevalent that we take it for granted. According to the survey conducted in the European Union in 2005 (fourth European Survey of Working Conditions), stress was experienced by an average of 22% of working Europeans (10). Substantial differences were observed between countries, with the highest levels of stress reported in Greece (55%), followed by Slovenia (38%), Sweden (38%), and Latvia (37%), while the lowest prevalence was recorded in the Czech Republic (17%), Germany, Ireland, and the Netherlands (16% in all), and the United Kingdom (12%) (10).

In general, the modern work environment is very stressful, marked with constant deadlines, the fear/threat of being fired, unproductive office politics, long-hours and excessive amounts of time spent at work, which have all been positively correlated to perceived psychological stress (11). High workload, low control, low support, job insecurity, and low income can be added to the list as the main risk factors associated with work-related stress (10).

There are some sectors, which are particularly prone to higher stress levels. In the EU, it was shown that stress at work was especially and most commonly prevalent in people who work in the education and health sectors, followed by agriculture, hunting, forestry and fishing (10).

The health care system setting is practically a textbook example of a stressful environment. Physicians, nurses, and other medical staff are working in constantly changing and emotionally highly demanding setting, on top of which there is responsibility for other people's lives, long work hours and a physically demanding job, night shifts and on-calls, strict hierarchy, and let us not forget loads of administrative burden. Hence, it is no wonder that health professionals experience "mounting system pressures that contribute to occupational stress, including burnout, which has been defined as emotional exhaustion, depersonalization, and a low sense of personal accomplishment from work" (12).

In a sample of US physicians, as many as 54% of the physicians reported at least one symptom of burnout (measured using the Maslach Burnout Inventory in 2014), while the satisfaction with work-life balance declined from 49% to 41% between 2011 and 2014 (13). Compared to the general population, physicians had twice the risk for burnout and 32% reduced odds for satisfaction with work-life balance (13).

Physician burnout has been associated with many adverse effects, and these do not include only physician's health, but also the effects on patients, health care workforce and systems, as well as the associated costs, making it a public health crisis (14). In concrete terms, physician burnout is associated with an increased risk of making medical errors and consequent malpractice claims, impaired communication between physicians and patients, reduced patient satisfaction, increased absenteeism, presenteeism (employees come to work, but function at less than full capacity because of ill health), and workforce turnover with overall reduced productivity of the health care system (12).

8.3. Health consequences of chronic psychological stress

Making direct causal inferences between chronic exposure to psychosocial stressors and health consequences is challenging since the relationship between them is quite complex. It is affected by a multitude of parameters, such as the nature, number, and persistence of the stressors as well as by the individual's vulnerability (i.e., genetics, constitutional factors) and learned coping mechanisms (1). Another challenging fact affecting study results is that heightened stress is most commonly associated with other unhealthy habits, like smoking, excessive alcohol use and poor quality of sleep. Nevertheless, countless studies have demonstrated that chronic stress is associated with a plethora of negative health outcomes (Figure 8.1).

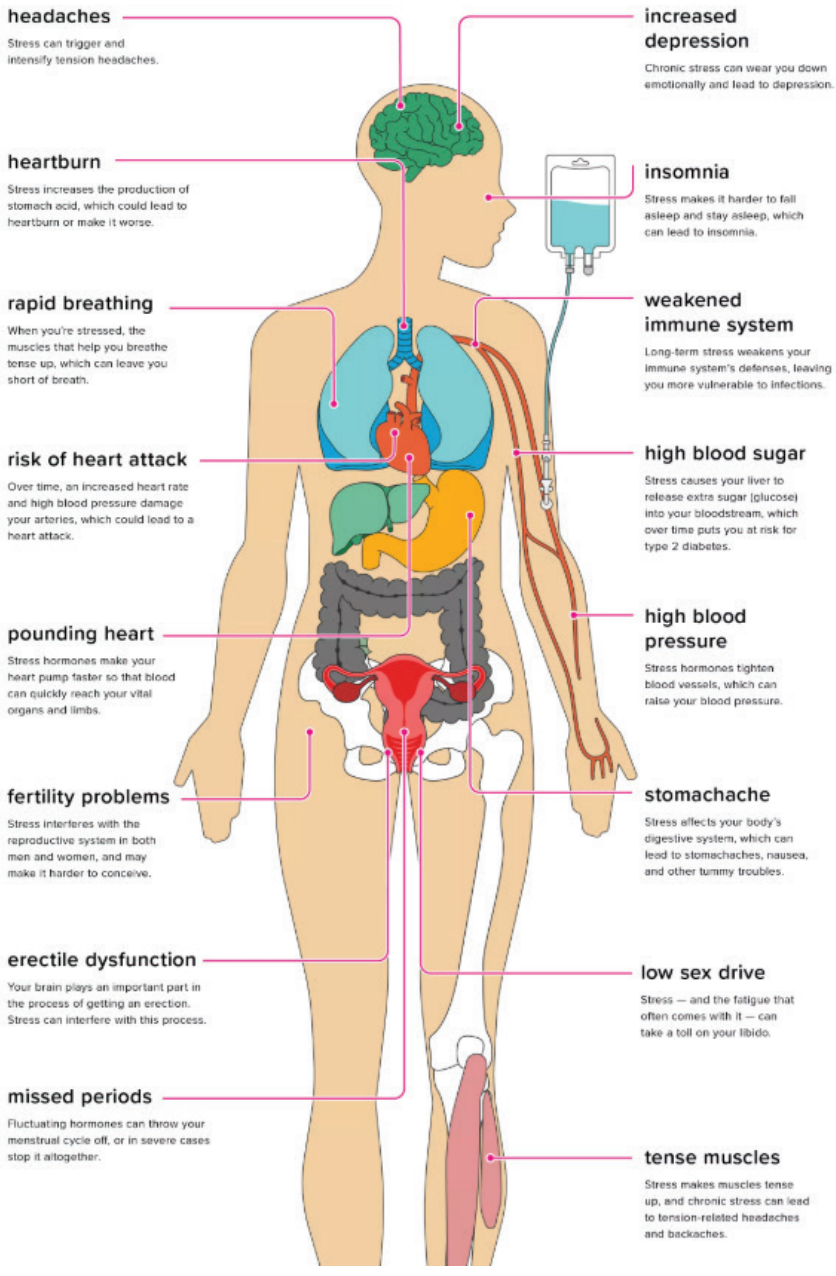

Figure 8.1. The effects of stress on the human body (15). *Available from: https://www.stress.org/stress-effects*

The most evident effect of increased stress level is an emotional strain. This strain can reveal itself in several forms, such as anxiety, excessive worry, guilt, nervousness, increased anger, frustration, hostility, frequent or wild mood swings and depression (15). These can then manifest themselves in other body clues like headaches, jaw clenching, teeth grinding, muscle tension and spasms, tremor, stammering, blushing and sweating, cold or sweaty hands and feet, dry mouth, chest pain, palpitations, tachycardia, and overall feeling of low energy and fatigue (15). Those are just some of the obvious symptoms, and they could be quite intense and overwhelming, all the way to the panic attack mimicking myocardial infarction.

In the general population of the USA, the most commonly reported symptoms of stress were irritability or anger, fatigue, lack of interest, motivation or energy, headache and upset stomach (3). People deal with these symptoms in several distinctive ways, some good for health and some not so good. For instance, the most common approaches were listening to music, exercising or walking, reading, spending time with friends or family and napping, but there were also some unhealthy consequences, such as skipping meals, overeating or eating unhealthy foods and difficulties with falling asleep (3).

There is hardly any bodily system that remains unaffected by chronic stress on a cellular level, however, describing all of them along with their pathophysiological mechanisms would be beyond the scope of this book.

So, we will keep our focus on the most impactful ones. One of those is within the domain of mental health, namely depression, impaired cognition, and dementia, as well as other neurodegenerative disorders. Studies have found that long-term exposure to high levels of cortisol can result in impaired cognitive performance, especially in spatial memory, pointing to the neurotoxic effect of cortisol on the hippocampus (a brain structure responsible for learning and memory), which has a high density of glucocorticoid receptors (16). In addition to the profound impact on the brain networks, chronic stress and elevated concentration of cortisol can exert reduced antioxidant enzyme capacity, oxidative injury and the subsequent state of neuroinflammation (11). Indeed, maladaptive effects of chronic stress, coupled with the poor diet and physical inactivity, may even converge to form a “perfect storm” behind the Alzheimer’s disease pathogenesis (11).

Another very important player in a dynamic matrix of tissues and organs is the microbiota (the entire set of microbes and their genes in the gut), possibly being the key regulator between chronic stress and neuroinflammation (17). In short, many preclinical studies conducted so far pointed toward the involvement of gut microbiota in the processes of modulation of brain development, function

and behavior via immune, endocrine and neural pathways of the brain-gut-microbiota axis (18). There are study results that indicate that stress can remodel microbiota composition, as well as increase intestinal permeability, while a dysfunctional intestinal barrier could permit a microbiota driven pro-inflammatory state affecting the brain (18). It has been shown that the gut microbiota is required for normal development of the HPA axis, with a certain critical period in early life, when microbiota colonization must occur to ensure normal development of this critical stress-signaling pathway (18). Hence, there is a certain loop in action, since stress response starting in the brain affects microbiota, while microbiota affects brain development and functioning. Is there something we can do about it? Well, luckily, it seems that the answer is "yes", and it involves our plates. Nourishing us is only one part of what food does for us, it also has to provide for our microbial commensal partners. The group of bacteria we call "good bacteria" need dietary fiber to produce short-chain fatty acids (SCFAs). The main SCFAs are butyrate, acetate, and propionate, produced in the human colon by some classes of bacteria (18). SCFAs can reduce the luminal pH and enhance the absorption of some nutrients, as well as directly impact gut microbiota composition via the toxic effects on some gut microbiota species and they can also strongly inhibit the growth of *Salmonella* (19). SCFAs are also very important neurohormonal signaling molecules (18). Butyrate is particularly important, with roles ranging from regulation of the immune system (anti-inflammatory effect), maintenance of the epithelial barrier and promotion of satiety after a meal and it was suggested to be protective against colorectal cancer, inflammatory bowel disease, graft-versus-host disease, diabetes and obesity (20). It is no wonder that studies almost consistently find that low-fiber diets, such as fast food and processed foods, have been associated with increased intestinal permeability and depressive symptoms, while diets rich in vegetables, fruit and fish were associated with a lower level of depressive symptoms (18).

The alterations in gut microbiota composition have so far been associated with neurodegenerative diseases, mood disturbance, depression, and anxiety while emerging evidence suggested that gut-brain axis dysfunction may also be involved in the etiology of schizophrenia, addiction, Parkinson's disease, autism spectrum disorder and attention-deficit hyperactivity disorder (21). After gaining such insights, this may normally be enough information to find the motivation for filling our plates with foods packed with fiber, such as whole grains, vegetables, fruits, legumes, nuts, and seeds, to increase the availability of the SCFAs. On top of that, fostering daily 'de-stressing' approaches would let us reap even more benefits for our mental and physical health.

Our immune system would also benefit from less chronic psychological stress. Many studies have demonstrated that chronic stressors are associated

with suppression of both cellular and humoral immunity, unlike acute stressors that last only for a few minutes, which were found to be associated with potentially adaptive upregulation of some parameters of natural immunity and downregulation of some functions of specific immunity (22). These interactions between the central nervous system and the immune system are possible via common signal mediators and receptors, and psychological stressors can disrupt these networks (23). This, in turn, may have very serious repercussions, such as the contribution to the initiation and progression of some types of cancer via impairment of the immune functions, mainly the function of natural killer cells and cytotoxic T-cells, which are responsible for detection and removal of tumor cells (23).

The association between chronic psychological stress and cardiovascular diseases (CVD) is also not a new topic discussed in biomedical literature. It is even incorporated into clinical guidelines for CVD prevention, such as in the 2016 European Guidelines on cardiovascular disease prevention in clinical practice (24). Both acute and chronic stress are regarded as a risk factor for coronary heart disease (CHD), acute stress being able to induce transient myocardial ischemia, triggering the cardiac events in people who already have advanced atherosclerosis, while chronic stress can increase the risk of recurrent CHD events and mortality (25). Mechanisms behind such associations include alterations in autonomic function, especially in the HPA axis, which is affecting hemostatic and inflammatory processes, endothelial function and myocardial perfusion, along with more commonly present unhealthy lifestyle in people suffering from chronic stress, low adherence to behavior change recommendations or medications (24). Increased cardiac electrical instability, myocardial ischemia, plaque disruption, and thrombus formation are the pathophysiological consequences of increased stress level, contributing to important clinical events such as arrhythmia, myocardial infarction, cardiomyopathy, and stroke, marking stress a very important target for prevention (26). Indeed, prevention is even more important in younger people. A large population-based cohort study found that stress-related disorders, such as post-traumatic stress disorder, acute stress reaction, adjustment disorder, and other stress reactions were more strongly associated with early onset of cardiovascular diseases, since the risk was 40% higher in people younger than 50 years, while the risk of CVD was 24% higher in people older than 50 years (27).

The importance of the association between psychological stress and cardiovascular health is portrayed in the expanding new field of cardiology. It is the behavioral cardiology. There are several key domains relevant to behavioral cardiology, and these include health-related behaviors, negative emotions, and mental mindsets, chronic stress and its management, social connectedness and a sense of purpose (28).

Alongside with already described consequences of chronic stress, there are many more described in biomedical literature. For example, stress is a risk factor for the development of type 2 diabetes mellitus, as well as a prognostic factor in people already diagnosed with diabetes (29). Psychological stress may impair wound healing after surgery (30), and it was associated with decreased peak antibody titers after influenza vaccination (31), decreased telomerase activity (32) and shorter telomere length (33), which indicates accelerated aging in people under chronic stress.

The consequences of work-related stress are daunting, for both workers and employers, and they permeate our society too. Many studies show work-related stress can cause cardiovascular diseases, such as hypertension, angina pectoris, coronary heart disease, stroke, as well as diabetes (10). Work-related factors that appear to be contributing most strongly to these outcomes include working very long hours (associated with diabetes, hypertension and cardiovascular diseases), shift and night work (the risk of cardiovascular diseases in people working rotating shifts and night shifts increases by at least 40% compared to day workers), high-demand job (high blood pressure and high cholesterol levels in men and hypertension in women), bullying or organizational downsizing (cardiovascular diseases risk) (10). The possible pathophysiological mechanisms along with maladaptive unhealthy behaviors underlying the association between work-related stress and coronary heart disease are shown in Figure 8. 2 (34).

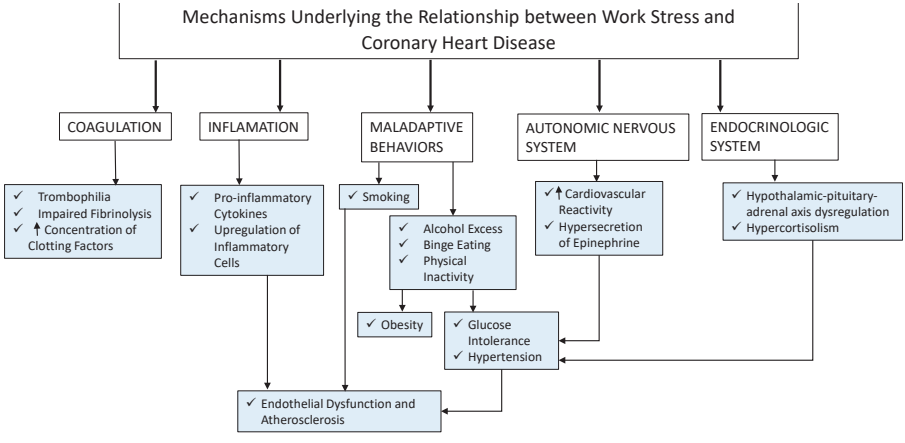

Figure 8.2. Potential behavioral and pathophysiological mechanisms behind the association between work-related stress and atherosclerosis and coronary heart disease (34). *Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6015274/*

8.4. How to measure stress level?

Quantitative measurement of subjective characteristics, such as pain and emotions, is always quite challenging. Measuring stress also falls into that category. There is a multitude of approaches, such as the use of the questionnaires, measuring cortisol concentrations or recording the heart rate variability (HRV), to name some of the most commonly used. Another important point is to distinguish between measuring the acute and chronic stress because chronic stress can exhaust the organism's response and result in a chronic state of dysregulation (35), which may also be important and needs to be identified in the clinical assessment.

The easiest and most commonly used approach in the assessment of stress is the application of self-reported questionnaires. There are many questionnaires in use. For details on the available instruments, please see the summary prepared by Hellhammer and colleagues (35). For the list of validated and reliable questionnaires used for the measurement of stress, burnout, and well-being, please see the Further reading section of this chapter. One of the most commonly used and validated questionnaires is the Perceived Stress Scale (PSS) (36). This scale of 10 questions (most commonly used version) is aimed at assessing an individual's overall experiences and perceptions of life pressures during the last month as unpredictable, uncontrollable and overloading. The PSS score, in which the higher score determines the higher level of perceived stress, was shown to be associated with many health outcomes, such as catching a cold, likelihood of being a smoker, having a lower level of physical activity, and impaired immune function (35). PSS questionnaire is free for use in the general population, and the questions with the scoring system are available in 8.9. Appendix 1.

Another and ideally complementary approach to using the questionnaire in assessing the stress level is the measurement of the 'final product' within the HPA axis – cortisol. Cortisol can be measured in blood, saliva or hair, with saliva being the most commonly used approach, representing well the blood concentration of cortisol. Cortisol concentration has a distinctive diurnal cycle, hence the timing of the cortisol test makes all the difference. The highest concentration is physiologically found within the first hour after waking up, and the concentration is the lowest in the evening. Along with individual saliva samples across the day or, ideally across several days, some approaches describe specific patterns of cortisol excretion. These are the calculation of derived variables, such as the cortisol awakening response (CAR), and area under the curve (AUC). Calculation of the CAR is one of the most important

approaches used to detect the increase in cortisol secretion during the first 30–45 minutes after waking up in the morning, and it has been extensively used in research and associated to a wide range of psychosocial, physical and mental health parameters, making it a key variable for psychoneuroendocrinological research (37). AUC is used to estimate the circadian fluctuation and changes of cortisol concentration, and to assess the overall secretion over a specific period (38). There are many challenges in applying these methods in general practice, as they require high compliance and cooperation of the respondents. For example, several saliva samples have to be taken according to a strict protocol at the exact time points during the day. Respondents have to restrain from the use of different substances and usual activities, such as coffee, smoking, chewing gum, brushing teeth, exercising, etc. Additionally, many other factors have to be taken into account, such as the season, the mode of waking up (i.e. alarm clock use), menstrual cycle phase, shift work, medication use, different health conditions and diseases, and so on, since all of these have a distinct effect to cortisol secretion and concentration (37). When we take all of this into account, besides the fact that some of the studies have found that questionnaire-based measures of perceived stress can be poorly associated with biological measures of stress (35), we can conclude that the clinical use of cortisol measurement as a marker of stress is a big challenge. For example, studies have reported conflicting results, such as that both elevated and dampened cortisol levels have been associated with depression, posttraumatic stress disorders, irritable bowel disease, burnout, chronic fatigue, fibromyalgia, etc. (35). A possible explanation is that the HPA axis adapts to chronic stress by first becoming up-regulated, while still being able to compensate, but later becomes down-regulated or exhausted (35). Anyway, one conclusion, which can be reached from all of these findings, is that we now know that we have a lot more to learn about stress and how to measure it to reach the clinical relevance and applicability.

Another physiological measurement that can be used for stress level assessment is the heart rate variability (HRV). The clinical relevance of HRV was first recognized in 1965, and it has been associated with myocardial infarction, diabetic neuropathy, left ventricular dysfunction and tetraplegia, to name some important health outcomes (39).

HRV is measuring the effect of the autonomic nervous system on the heart, namely the oscillation in the interval between consecutive heartbeats, which is affected by the balance between sympathetic and parasympathetic tone (40). Even though it sounds simple enough, it may be quite challenging to get a grasp around the terms and measures included in the HRV analysis.

For example, the major methods of HRV analysis are divided into the time-domain (subdivided into statistical and geometric approaches) and frequency-domain methods (40). The good news is that HRV measurement and analysis are becoming more user-friendly, and widely available via different devices, such as pulse oximeter, photoplethysmography, ECG devices, and even the wearables (watches and wrist or chest bands) (40). The literature suggests that elevated stress has a distinctive effect on the HRV (such as a decrease in the RR interval, increase in the low-frequency/high-frequency ratio), which justifies its use for the objective assessment of psychological health and stress (41). For more details on HRV, please see the meta-analysis and review of the literature on the association between HRV and stress prepared by Hye-Geum Kim and colleagues (41), as well as the Kubios HRV user's guide (listed at the end of this chapter under the Additional useful reading).

8.5. How to deal with excessive stress: self-management for stress reduction and coping approaches

The first step in getting better is realizing you have a problem in the first place. In the matters of chronic stress, sometimes it is hard to recognize its overall pressure until it has already grown out of proportions. That is why it is important to include consultation about stress in daily clinical practice, especially for primary level physicians. Unfortunately, this is not the case in reality. For example, the rates of stress management counseling by U.S. primary care physicians were extremely low (2). As few as 3.0% out of 33,045 office visits included stress management counseling during 2006–2009 study period, being the least common type of counseling, compared to counseling about nutrition (16.8%), physical activity (12.3%), weight reduction (6.3%), and tobacco cessation (3.7%) (2). There is, of course, much room for improvement. Indeed, the European guidelines on cardiovascular disease prevention in clinical practice emphasize the need for stress management (24). There are many approaches, which include getting help by specialized psychologists, such as individual or group counselling, stress management programs, such as cognitive-behavioral stress management, meditation, autogenic training, biofeedback, breathing, yoga and/or muscular relaxation (24), mindfulness interventions (42), promoting resilience (43), and possibly many more. Alongside these possibilities, a lot can be done with the self-management approach, which will be described in this section.

Our daily habits and ways of interacting with people and the environment can both be the source of stress or a powerful source of strength that we use to

unwind, and consequently either increase or decrease the detrimental impact stress has on both mental and physical health. Unfortunately many people fall into the trap of adopting unhealthy habits to fight the emotional toll of stress, such as smoking, alcohol use, coffee, and junk food intake. Actually, individuals who reported high levels of chronic stress had increased activity in brain regions involved in rewards and motivation when they observed images of palatable and high-calorie foods (11). Based on these findings, we can conclude that our modern, stress-filled lifestyle is closely related to the obesity epidemic, such that obesogenic feeding helps in disrupting physiological stress responses, while chronic stress promotes obesogenic feeding (11), closing the positive loop of unhealthy habits.

Unfortunately, it is not likely that we will be able to reduce the frequency and amount of daily stressors, given the nature of the most common stressors. Hence, the phrase often heard, even by the doctors: "You have to reduce your stress!" is hardly feasible in reality. What every person can do, and what is the only approach for cutting down the negative health consequences of chronic stress, is to modify the person's reaction to stressors and finding appropriate ways to unwind. This will prevent the build-up of adverse consequences. Effectiveness of specific approaches can be different from person to person, and it is important to talk to patients about what could work for them, given their schedules, attitudes, and aptitudes. There are many approaches for self-management and dealing with stress, and here we will list some of them, such as the three tips to manage stress by the American Heart Association (44) (Table 8.1), and different propositions by some of the world's most respectful institutions in both clinical and public health domain (Table 8.2).

Table 8.1. Techniques useful for downshifting and better coping with stress, proposed by the American Heart Association (44)*; Available from: https://www.heart.org/en/healthy-living/healthy-lifestyle/stress-management/3-tips-to-manage-stress#relaxation*

Approach	How to put it in practice?
Practice and apply **positive self-talk**: take control over your inner voice, it is very powerful and you can talk yourself into either coping with stressful situations or into falling apart in the face of adversity	Change negative and down-putting messages into positive and encouraging messages to yourself, such as: • Instead of *"This is too hard, I can't do this"* say to yourself "*I'll do the best I can, I've got this!"* • Instead of *"I'm going to fail, everything is going wrong"* say to yourself *"I can handle this if I take one step at a time, I've done it before!"*

Find your own emergency stress-stoppers	There are many ways to cut the thread of stress, find several approaches which work best: • Count to 10 before you speak or react • Take a few slow, deep breaths until you feel your body un-clench a bit • Go for a walk, even if it's just to the restroom and back. It can help break the tension and give you a chance to think things through • Try a quick meditation or prayer to get some perspective • If it's not urgent, sleep on it and respond tomorrow. This works especially well for stressful emails and social media trolls • Walk away from the situation for a while, and handle it later once things have calmed down • Break down big problems into smaller parts. Take one step at a time, instead of trying to tackle everything at once • Turn on some chill music or an inspirational podcast to help you deal with road rage • Take a break to pet the dog, hug a loved one or do something to help someone else • Work out or do something active. Exercise is a great antidote for stress!
Engage in stress-busting activities, even if it lasts for a little while at the time	The most important point is to actively discontinue rumination. In other words, be mindfully present in the activity and stop thinking about the bad things that happened or about what is left to do. Some examples of the activities are: • Make art; draw, color, paint, or play a musical instrument • Work on a scrapbook or photo album to focus on good memories • Read a book, short story or a magazine • Meet a friend for coffee or a meal • Play a favorite sport like golf, tennis, or basketball • Do a hobby like sewing, knitting, or making jewelry • Play with your kids or pets – outdoors if possible • Listen to music or watch an inspiring performance • Take a walk in nature • Take a relaxing bath and feel the stress wash away • Meditate or practice yoga • Work in the garden or do a home improvement project • Go for a run or bike ride to clear your head • Dance

Table 8.2. Additional important habits, coping approaches and useful mindsets to beat negative effects of chronic psychological stress

Ten stress busters proposed by the NHS (45)	**Healthy ways of coping with stress proposed by the CDC (46)**	**Stress management strategies proposed by the Mayo Clinic (47)**
Be physically active	Exercise on a regular basis	Get regular physical activity. Inactive ways to manage stress, such as watching TV, surfing the internet or playing video games, may seem relaxing, but they may increase your stress over the long term

	Get plenty of sleep	Be sure to get plenty of sleep
Avoid unhealthy habits, don't rely on alcohol, smoking and caffeine as your ways of coping, the most unhelpful thing you can do is to turn to something unhealthy to help you cope	Eat healthy, well-balanced meals Avoid drugs and alcohol because even though they might help in the short-term, they can create additional problems and increase the stress you are already feeling	Be sure to eat a healthy, balanced diet. Avoid tobacco use, excess caffeine and alcohol, and the use of illegal substances
Take control and manage your time better (the act of taking control is in itself empowering, and it's a crucial part of finding a solution that satisfies you and not someone else)		
Work smarter, not harder - prioritizing your work, concentrating on the tasks that'll make a real difference		
Challenge yourself, it helps build confidence		
Connect with people	Talk to others and share your feelings with people who are close to you	Spend time with family and friends
Help other people and get some perspective about your life		
		Practice relaxation techniques, such as deep breathing, meditation, yoga, tai chi or massage
Try to be positive		Keep a sense of humor
Have some 'me time'	Take care of yourself Give yourself a break if you feel stressed out, especially from things that make you feel stressed	Set aside time for hobbies, such as reading a book or listening to music
Accept the things you can't change		
	Recognize when you need more help, ask for professional help if you feel you cannot cope with the problems or if you are thinking about suicide; talk to a psychologist, social worker, or professional counselor	

Finally, a physician can effectively help the patient only if the physician is healthy and functional. The role of lifestyle medicine is to address the health of the health professionals too, not just the health of the patients. Given the high prevalence of stress and even burnout among physicians, it is important to deal with this appropriately, taking into account that this is a shared responsibility of both healthcare systems and individual physicians (14). All the stakeholders in health care must work together to develop and implement effective remedies for physician burnout, otherwise, medicine cannot fulfil its mission for patients, and neither for public health (14).

Some of the possibilities to tackle physician burnout have already been tested. For instance, in the randomized clinical trial including 88 physicians, individualized six coaching sessions facilitated by a professional coach were used to enhance the well-being and reduce distress in physicians (48). The results were quite promising, pointing to the beneficial effect of coaching, such as reducing emotional exhaustion and overall burnout, while improving the quality of life and resilience (48).

8.6. Conclusion

Modern Western medicine has progressed immensely in the last couple of decades, driven by technological advancements. We have achieved the longest life expectancy than ever before, and we have more diagnostic and therapeutic options to choose from than ever before. Yet, the burden of disease is still quite high, with so many people dying prematurely from preventable chronic diseases. We got very good at treating the disease, but we are less good at treating the patient, and not very good at treating the person (49). Stress and its health consequences can serve as a perfect illustration of this point.

In conclusion, we are aware of the leading health-related problems, fueled by our modern unbalanced lifestyle, and current imperfect situation within our destabilized healthcare systems. We have the means and the know-how to make a substantial positive impact on these ubiquitous challenges. We need to act now. Lifestyle medicine may easily be the healing approach to increase the well-being of individuals, populations, and the entire healthcare systems.

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8.9. Appendix 1.

Perceived Stress Scale questionnaire (36); Available from: https://www.mindgarden.com/documents/PerceivedStressScale.pdf

	The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.	Never	Almost never	Sometimes	Fairly Often	Very Often
1	In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2	In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3	In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
*4 (R)	In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
*5(R)	In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6	In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
*7 (R)	In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
*8 (R)	In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9	In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

*R means that scoring for those four questions is reverse: 0 becomes 4, 1 becomes 3, 3 becomes 1, 4 becomes 0

Scoring: after reversing 4 positively formed questions, sum up all the answers. The maximum score is 40 points, and the higher score denotes the higher level of chronic psychological stress perceived by the respondent

CHAPTER 9: SMOKING

Tanja Dragun

"Giving up smoking is the easiest thing in the world. I know because I've done it thousands of times."
Mark Twain

9.1. Introduction

Among all the preventable diseases and associated risk factors worldwide, smoking offers one of the greatest opportunities for prevention. Up to two thirds of smokers in Western countries are thinking about quitting in the next six months and nearly half have attempted to quit in the past year (1). There is a common misapprehension that people actually choose to smoke. Smokers did not choose to become lifelong smokers, they only chose to light the first few cigarettes. Most smokers never decided to get panic-stricken without cigarettes. Nobody needs a cigarette to enjoy meals or cope with stress before they become addicted to nicotine. It is hard to believe that any smoker parent in the world would like the thought of their children smoking, which shows that most smokers mostly regret taking up smoking.

9.2. Prevalence of smoking

Tobacco use remains a major public health concern. The worldwide distribution of smoking prevalence demonstrates two extreme clusters: South-East Asia and the Pacific islands and Europe – particularly the Balkan region. In three countries in Pacific Islands (Kiribati, Timor and Nauru) and two countries in the Balkans (Montenegro and Greece) more than 40% of the population smokes. Indonesia, Russia, Bosnia and Herzegovina, Serbia (39%), and Chile (38%) complete the top ten countries with the largest prevalence of smokers (2).

Tobacco use typically begins in childhood or adolescence, and 80% of smokers begin smoking by the age of 18 (3). Early smoking onset could directly increase the risk for later tobacco dependence. Studies of the developing brain in animals suggest that nicotine can induce permanent changes that lead to addiction, which may be applied to young developing human adolescent brains (3). Worldwide, about 30 million young adults begin smoking each year (about 50% of young men and about 10% of young women), and unfortunately current patterns of behavior suggest that most of them will not stop (4).

Smoking prevalence peaked around 1960 among men and about two decades later among women (5). Nowadays there are more former smokers than current smokers in most high-income countries. However, cessation remains uncommon in low and middle-income countries (4, 6).

In almost all countries, men smoke more frequently than women (35% of men and 6% of women in the world smoke) (7). However, women metabolize nicotine more quickly than men (8), which may contribute to their increased susceptibility to nicotine addiction and may help explain why it is more difficult for women to quit smoking (9). Interestingly, tobacco addiction is highly prevalent among persons with mental illness or substance-abuse disorders (10).

9.3. Harmful effects of smoking

The tobacco epidemic is one of the biggest public health threats the world has ever faced, killing more than 8 million people a year around the world, with more than 7 million being attributed to direct tobacco use (11). Cigarette smoking remains a major cause of preventable disease and premature death worldwide (6). Tobacco use is the leading cause of death from cancer, cardiovascular and pulmonary disease. It is also a major risk factor for respiratory tract and other infections, osteoporosis, reproductive disorders, adverse postoperative events, delayed wound healing, duodenal and gastric ulcers, and diabetes (12). The economic costs of tobacco use are substantial and include significant health care costs for treating the diseases caused by tobacco use, as well as the lost human capital that results from tobacco-attributable morbidity and mortality. This is largely due to the fact that tobacco smoke contains a deadly mix of more than 7,000 chemicals; hundreds of which are harmful, and about 70 that can cause cancer (12, 13). Furthermore, smoking causes an instant and long-term rise in blood pressure and heart rate, reduces blood flow to the heart and the brain, reduces the amount of oxygen reaching body tissues, increases the risk for blood clots and directly damages blood vessels

(14). The overall mortality among smokers is about three times higher than in similar persons who never smoked. Smokers on average lose at least a decade of their life (15). As death rates among those who never smoked have fallen, the absolute differences in survival between those who continue to smoke and those who have never smoked have widened and now exceed 30% for both sexes (15). Although nicotine plays a minor role, if any, in causing smoking-induced diseases, addiction to nicotine is the indirect fundamental cause of these diseases (16).

9.3.1. Nicotine addiction

As previously mentioned, although most of the toxicity of smoking is related to other components of cigarette smoke, the pharmacologic effects of nicotine primarily produce the addiction to tobacco (17). Research suggests that nicotine may be as addictive as heroin, cocaine or alcohol (13). Smoking is a highly efficient form of drug administration. Inhaled smoke particles carry the nicotine into the lungs, where it is rapidly absorbed into the pulmonary venous circulation. The nicotine then enters the arterial circulation and moves quickly from the lungs to the brain, where it binds to nicotinic cholinergic receptors (18). The entire process takes only a few seconds. Unlike cigarettes, nicotine medications marketed to promote smoking cessation deliver nicotine slowly (19). Besides delivering nicotine to the brain quickly, cigarettes have been designed with additives and engineering features to enhance its addictiveness (20). Once in the brain, nicotine stimulation of nicotinic cholinergic receptors releases a variety of neurotransmitters (18, 21). Release of dopamine, glutamate, and GABA is particularly important in the development of nicotine dependence. Dopamine is a neurotransmitter that signals a pleasurable experience and is critical for the reinforcing effects of nicotine and other substances. Dopamine has a compelling drive on eating as well (22).

The processes of neuroadaptation (increase in the number of binding sites on the nicotinic cholinergic receptors in the brain) and receptor desensitization (ligand-induced closure and unresponsiveness of the receptor) are believed to play a role in tolerance and dependence that develop with repeated exposure to nicotine (23, 24). Smokers use nicotine to induce pleasure, reduce stress and anxiety, in other words, to take control of their mood. The decrease in brain reward function, which is experienced during nicotine withdrawal is an essential component of nicotine addiction and a key barrier to abstinence (25). Although smoking is believed to improve concentration, reaction time, and performance of certain tasks, *relief from withdrawal symptoms* is probably the primary reason for smoking (26). Cessation of smoking causes the emergence of withdrawal symptoms: irritability, depressed mood, restlessness, and

anxiety (27), which makes a powerful incentive to relapse (28). Anhedonia, feeling that there is little pleasure in life and that activities that were once rewarding are no longer enjoyable, can also occur with withdrawal from nicotine, as from other drugs of abuse (29).

When a person addicted to nicotine stops smoking, the urge to resume persists even after withdrawal symptoms dissipate. In his daily life, the smoker comes to associate specific moods, situations, or environmental factors with the rewarding effects of nicotine, mainly with the relief from withdrawal symptoms. They usually light a cigarette after a meal, with a cup of coffee or an alcoholic drink, or with other friends who smoke. Oftentimes, these cigarette-related cues trigger relapse. The association between cues and the anticipated effects of nicotine constitute conditioning.

9.4. Benefits of smoking cessation

As the risk of continuing to smoke is tremendous, smoking cessation also provides extensive benefits. As mentioned, smoking is associated with a decade of lost life, and cessation reduces that loss by about 90% (15). Options to help increase cessation rates on a national level, and decrease smoking initiation rates worldwide include higher prices of cigarettes through an increased tax, restrictions on smoking in public places, bans on tobacco advertising and promotion and raising public awareness about the hazards of smoking and the benefits of cessation, as well as easy access to stop smoking services that help people quit (6, 30).

Seventy percent of smokers say they would like to quit, and every year, 40% do quit for at least 1 day (31). Unfortunately, 80% of those who attempt to quit on their own relapse within the first month. Six months later, only 3% of smokers remain abstinent (17). To sum up, the rate at which persons, mostly children and adolescents, become daily smokers nearly matches the quit rate, so the prevalence of cigarette smoking has entered a very slow decline in recent years (31). The health benefits of smoking cessation are, of course, greater for people who quit smoking at earlier age (12, 13). However, quitting smoking at any age leads to significant reductions in the risks associated with smoking (32). You are never too old to quit.

9.5. Why do people start and keep on smoking?

Regardless of all the grim facts that surround smoking, smoking is still quite prevalent. Most of the time, the only reason people start smoking is

because so many people are doing it already, and if they are children or adolescents, they believe that smoking makes them feel and look like an adult. The main reason people keep on smoking is to relieve withdrawal symptoms that absence of nicotine usually creates.

When talking to patients about quitting smoking, it is very important to address the issue of fear. All smokers have a deep fear that they will have to survive a long period of deprivation and unsatisfied craving in order to stop smoking. They also fear that a meal or social occasion will never be quite as enjoyable without a cigarette, or that they will never be able to concentrate, handle stress or be as confident without smoking. They may fear that they will have to spend the rest of their lives craving for the occasional cigarette.

It is important to explain to patients that these fears are not relieved by cigarettes but rather created by them, through nicotine dependence. The physician should help the patient consider the possibility that life without cigarettes is not only as enjoyable, but even more enjoyable in so many ways, and extra health, more energy and money saved are high on the list of advantages. Smokers usually have some illusions regarding smoking, all of which can interfere with the decision to quit smoking. Some of the most common illusions are:

"I enjoy smoking."
"Smoking relieves boredom and stress."
"Smoking relaxes me."
"Smoking helps me concentrate."
"I could never stop, I I don't have any willpower."

Unfortunately, sometimes all the credible reasons to stop smoking can actually make it harder to stop because they inadvertently create a sense of sacrifice, a feeling that by quitting smoking, people are *giving something up.* Generally speaking, smokers are convinced that smoking produces a feeling of pleasure or helps them fulfill their needs, and believe that quitting is a sacrifice. However, what smoker actually gets from smoking is *a relief of symptoms caused by nicotine addiction.*

Withdrawal symptoms from nicotine do not include physical pain. However, they do include an empty, restless feeling that something's missing in their life, and without nicotine, the smoker becomes nervous, insecure, agitated and irritable. Within seconds of lighting a cigarette, fresh nicotine is supplied and the craving ends, resulting in the feeling of relaxation and confidence that the cigarette gives to the smoker. This feeling of relaxation, confidence and focus is then attributed to the cigarette itself, rather than to the relief of withdrawal symptoms. Non-smokers do not suffer from the empty

feeling of needing a cigarette, therefore it must be the cigarette that causes this feeling. The enjoyment that the smoker gets from a cigarette is the pleasure of trying to get back to the state of peace, tranquility and confidence that the non-smoker enjoys all the time. A funny metaphor that could be attributed to smoking is that smoking is like wearing tight shoes just to feel the pleasure of taking them off. The good news to communicate to patients is that nicotine is a fast-acting drug and leaves the system in up to three weeks, after which the withdrawal symptoms subside.

Positive motivation is always a good idea. Therefore, it is vital for the patient to understand that it is not the non-smoker who is being deprived, but rather the smoker, because the smoker is sacrificing his or her health, energy, money, confidence and peace of mind.

9.6. How to help patients quit smoking

Smokers can and they really do quit smoking. In fact, today there are more former smokers than current smokers (12). However, success rates are still relatively low (17). The average smoker attempts to quit five times before they permanently succeed (33). Primary care physicians have many opportunities to counsel patients about smoking cessation (34). The **5 A's framework (ask, advise, assess, assist, arrange)** can help physicians to incorporate smoking cessation counseling into busy clinical practices (34).

Ask about tobacco use. All tobacco users should be identified and smoking status should be documented at every visit.

Advise the patient to quit. The physician should express unambiguous support for smoking cessation and gently emphasize the benefits of quitting.

Assess readiness to quit. Willingness to quit, readiness for change, all the pros and cons of changing should be assessed. Smoking history is also important, what happened on previous attempts to stop smoking, how did the patient feel, what led to the relapse, how they feel now, and so on.

Assist the patient in quitting. Help the patient make a plan to quit smoking. Dispel all the illusions that smokers have about smoking. Offer support and additional resources (pharmacotherapy if needed), help patients anticipate difficulties and encourage them to prepare their social support systems and their environment for the impending change. Address withdrawal symptoms and explain that they will peak within the first week of quitting, but will only last for two to four weeks. Address possible weight gain. Although most smokers gain fewer than 4.5 kg after quitting, weight gain can vary. Explain that food

is not a substitute for nicotine, that nobody needs nicotine to survive, and that withdrawal symptoms will soon pass.

Arrange a follow up. Follow-up plans should be set; for patients who have recently quit, it is important to elicit the benefits of quitting and ask them to anticipate and troubleshoot any situation that might lead to relapse.

The 5 R's (relevance, risks, rewards, roadblocks, and repetition) can be used to help those who are not yet ready to quit (35).

Relevance. Encourage the patient to indicate how quitting is personally relevant to him or her.

Risks. Encourage the patient to identify potential negative consequences of tobacco use that are relevant to him or her. These risks can be acute risks (shortness of breath, exacerbation of asthma, increased risk of respiratory infections, pregnancy complications, impotence and infertility), long-term risks (heart attack and stroke, lung and other cancers, long-term disability, and need for extended care), and environmental risks (increased risk of lung cancer and heart disease for the spouse, increased risk for low birth weight, respiratory infections in children of smokers).

Rewards. Ask the patient to identify potential relevant benefits of stopping tobacco use. Examples of benefits include improved health, better taste of food and sense of smell, saving money, feeling better about oneself, setting a good example for children and decreasing the likelihood that they will smoke, feeling better physically, performing better in activities, improved appearance, reduced wrinkling, and so on.

Roadblocks. Ask the patient to identify barriers or impediments to quitting and provide treatment (problem-solving counseling, medication) that could address barriers.

Repetition. Repeat assessment of readiness to quit. If patients still do not feel ready to quit, end the visit on a positive note with an invitation for them to come back if they change their minds.

9.6.1. Pharmacological therapy (34)

Currently, three classes of medications have been approved for smoking cessation: nicotine replacement products (patch, gum, spray, inhaler, and lozenge), bupropion, and most recently, varenicline (17). Absolute smoking cessation rates range from 5 to 35%, depending on the drug and the intensity of concomitant counseling.

Nicotine replacement products

The goal of nicotine replacement therapies is to mimic or replace the effects of nicotine from tobacco, relieve cravings for nicotine and reduce nicotine withdrawal symptoms (36). Replacement therapy is available as slow-release skin patches and in more rapidly acting forms (i.e., chewing gum, nasal spray, inhalers, and lozenges), which deliver nicotine to the brain faster than skin patches, but still more slowly than smoking cigarettes.

Bupropion

Bupropion was used as an antidepressant medication among veterans, when it was observed that the veterans spontaneously quit smoking. This serendipitous observation led to marketing bupropion for smoking cessation. It is believed that bupropion simulates the effects of nicotine by increasing dopamine and norepinephrine levels in the brain (37).

Varenicline

Varenicline was synthesized with the goal of developing a specific partial agonist for the alpha4-beta2 nicotinic receptor, in order to reduce cravings and withdrawal symptoms while blocking the binding of inhaled nicotine (38). Varenicline is an analog of cytisine, a plant alkaloid that has been reported to have some benefit in smoking cessation, but is thought to have generally poor oral bioavailability.

9.7. New tobacco products: new threats?

Heated tobacco products (HTP)

When the public concerns about the health risks of smoking were first voiced, the tobacco companies developed a new type of cigarettes promoted as "light" and "low-tar". Tobacco industry advertised this type of cigarettes as healthier and created the perception that "light" cigarettes were a safe alternative to smoking (39). Since then, studies have repeatedly shown that smokers of "light" and "low-tar" cigarettes are still exposed to a risk of serious health problems, which was sometimes even more serious compared to smokers of regular cigarettes (40, 41). Tobacco industry still faced with threats of global decline in tobacco consumption due to health reasons. Recently, they introduced and advertised "heated tobacco products", claiming again that they are significantly less harmful than traditional cigarettes.

HTPs are "tobacco products that produce aerosols containing nicotine and toxic chemicals that develop through heating of the tobacco, or by activation of a device containing tobacco" (11). They contain nicotine and other non-tobacco additives, as well as other chemicals that are not found in cigarette

smoke, which may have certain health effects (11). There is no evidence to prove that HTPs are less harmful than conventional tobacco products. Finally, HTPs have a negative impact on personal and public health (42-45), therefore the WHO expressed severe disapproval of all forms of tobacco, including HTPs.

Electronic Nicotine Delivery Systems (ENDS) are devices which heat a liquid solution (e-liquid) to create an aerosol, commonly called vapor, which is then inhaled by the user. The main constituents of the solution are propylene glycol, with or without glycerol, flavoring agents and nicotine (11).

The main risks of e-cigarettes are adverse health effects, and especially their potential to promote continued addictive nicotine use and recruit new smokers (46). Similar to HTPs, e-cigarettes undermine prevention and cessation of tobacco use. As they are widely available and advertised, they could become the main gateway to nicotine dependence (47). ENDS have been increasingly advertised, marketed and promoted since their introduction in 2012. This raises concerns about misleading health claims and claims on cessation efficacy, with accentuated targeting young people with flavored products.

E-cigarettes do not contain tobacco, only nicotine. However, the WHO still considers them a serious public health concern. Short-term health effects appear to be not as harmful as the risk that conventional tobacco poses (48, 49), but the long-term health effects are still unknown. Even though they are considered less harmful than conventional cigarettes, as the WHO postulates, there are several considerations to bear in mind (11):

- the use of such products containing nicotine is unsafe among youth and pregnant women;
- the aerosol from e-liquid contains certain toxic substances that may increase the risk of cancer, cardiovascular or pulmonary disease;
- non-smokers are exposed to nicotine and other toxicants by inhaling the aerosol exhaled by e-cigarette smokers;
- the question whether e-cigarettes are a useful cessation tool is quite a debatable

Finally, it is always wise to remember that the reason for introducing new tobacco products (HTPs and ENDS) in the first place was to prevent smokers from quitting and attract non-smokers. These products still remain addictive and carcinogenic to humans (43-45, 47).

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CHAPTER 10: MEDICATIONS AND LIFESTYLE MEDICINE: RATIONAL PHARMACOTHERAPY

Ivana Mudnić

"Medicines cure diseases, but only doctors can cure patients."
Carl Jung

10. 1. Introduction

Without a doubt, medication therapy is among the greatest achievements in modern medicine. Just think about the development of antibiotics or antituberculotics in the first half of the 20th century, as well as anti-HIV infection or anti-cancer drugs a little later in the same century. Additionally, rational application of medicines has significant beneficial effects on the immune system, which can reverse pathological processes and interact with pathophysiologic mechanisms of many complex diseases.

On the other hand, on several occasions, we have recently witnessed sensational media reports on the development of new, more efficient drugs for treatment of various diseases. However, many of those findings were followed by the adverse events or drug interactions reports and some of them were withdrawn from the market (1).

Finally, we need to be aware of the fact that pharmaceutical companies have some of the highest profit margins in the world; only banks have a profit margin comparable to pharmaceutical companies, which still enjoy higher profit margins than media, oil and gas companies and carmakers (2, 3). Expenditure on research and development for new drugs by the pharmaceutical industry has also increased, while only small number of those drugs (one tenth, approximately) enter the phase of research involving human participants, and most of those drugs show little or no improvement in comparison to existing therapy (4).

10.2. Adverse drug reactions

An adverse drug event (ADE) or adverse drug reaction (ADR) is a damaging or unintentional response. Adverse drug reactions are claimed to be the fourth leading cause of death, higher than accidents, AIDS and pulmonary disease. The FDA has further estimated that 300,000 preventable adverse effects occur in hospitals (5). According to other literature reports, ADRs are estimated to affect 19% of patients admitted to inpatient care, and one third of them were assessed as preventable. Even if most ADEs are moderate in severity, and cause no permanent harm to the patient, they prolong hospitalization duration and increase the costs (6). As for the elderly patients group, one in ten hospital admissions are due to ADRs (7). Expectedly, the elderly are the most prone to develop ADRs. On the other side, adverse reactions occurring only in certain vulnerable patients, regardless of their age, include intolerance, allergy, which is usually immune-mediated, and idiosyncrasy, which often has an underlying genetic etiology. Types of ADRs and some examples are presented in Table 10.1.

Table 10.1. Classification of adverse drug reactions

Type (explanation)	Effect (drugs)
A (**a**ugmented pharmacological effects)	Bradycardia (beta-blockers); hypoglycemia (insulin, oral antidiabetics)
B (**b**izarre/unpredictable effects)	Anaphylaxis, Stevens-Johnson syndrome/ toxic epidermal necrolysis (anti-seizures drugs, uricosurics)
C (**c**hronic effects)	Tardive dyskinesia (antipsychotics); analgesic nephropathy (nonsteroidal anti-inflammatory drug NSAIDs)
D (**d**elayed effects)	Teratogenic effects (thalidomide); carcinogenic effects (diethylstilbestrol)
E (**e**nd-off-treatment effects)	"Rebound" hypertension (after the sudden withdrawal of centrally - acting antihypertensive, e.g. clonidine)
F (therapeutic **f**ailure)	Lack of the effect (vaccines, oral contraceptives, antiviral drugs)

The dose dependency of all the types of ADRs is nowadays generally accepted, considering that those occur at doses which are usually used both in treatment and/or prevention of disease (8). However, many drugs that are currently available are prescribed as "one size fits all", but they do not work the same way for everyone. It can be difficult to predict who will benefit from a medication, who will not respond at all, and who will experience ADRs. Pharmacogenomics is the study of how genes affect a person's response to drugs. This relatively new field combines pharmacology and genomics to

develop effective, safe medications and doses that will be tailored to a person's genetic makeup (9).

While there is immense value in the use of appropriate medication, the benefits of each medication need to be critically evaluated and weighed against their potential harms. In some situations, very serious ADRs can be accepted since the medication may cure potentially lethal diseases. For example, for anticancer drugs, even life-threatening side effects may be acceptable if they increase the chances of survival. The more benign a condition is, the fewer the acceptable side effects.

10.3. Medications in lifestyle medicine

As mentioned earlier, lifestyle medicine denotes "the application of environmental, behavioral, medical and motivational principles to the management of lifestyle-related health problems in a clinical and/or public health setting" (10). It differs from purely behavioral approaches in several characteristics, while it differs from nonmedical clinical practice in that it may include medication, and even surgery where appropriate, e.g. for weight control. However, in lifestyle medicine medications are used more as an adjunct to a therapeutic lifestyle intervention, than as a primary treatment (11).

For several chronic diseases, it was shown that lifestyle changes, in combination with safe and proper use of medication, is the most promising approach in the treatment. For example, in diabetes, the meal plan, physical activity, and use of glucose-lowering medications are designed to work in concert with each other to have a synergistic effect on improving glycemic control and avoiding hypoglycemia (12). In the treatment of hyperlipidemia, lifestyle therapy is usually combined with cholesterol or triglyceride-lowering medications. In patients with very high or severe hypertriglyceridemia, it is imperative to keep triglyceride levels below 5.6 mmol/L to minimize the risk of pancreatitis. In this situation, lifestyle therapy will often need to be combined with triglyceride-lowering medications to achieve this biochemical target (13). Although interstitial lung diseases in smokers are usually treated with steroids, the mainstay of initial therapeutic approach is smoking cessation, whereas medications could again be helpful (14).

Because medication adherence is important for improving chronic disease outcomes, especially at the start of treatment, patients deserve collaborative discussions to learn more about their medications and to address barriers to taking their medications. This is more evident when the side effects

are outweighed by the benefits. It was shown that patients with consistent follow-up have better adherence to medications and lifestyle behaviors (15).

10.3.1. Medications with possible effects on lifestyle changes

Without elaborating on the wide range of medications available and their minor ADRs, it is worth pointing out some potential problems with interaction between lifestyle change and medications. One of most common lifestyle changes is weight loss. Since eating behavior is an expression of endocrine, neurophysiologic, and psychological processes, prevention and treatment of obesity are challenging. There is considerable scientific and financial interest in developing pharmacologic therapy for this condition. Many hormones and neuronal mechanisms regulate intake (appetite, satiety), processing (absorption, conversion to fat, glycogen, etc.), and output therapy, but despite extensive research, no available pharmacologic therapy has succeeded in maintaining a weight loss of over 10% for 1 year. In contrast, weight-reducing surgery readily achieves a sustained weight loss of 10–40% (16). Even a 5–10% weight loss can lower one's blood pressure and lead to improved glycemic control.

Gastrointestinal flora also influence metabolic efficiency, and study on mice suggests that altering the microbiome can lead to weight gain or loss (17). Altered intestinal microbiota composition has been noticed not only in obesity, but also in cardiovascular diseases, colon cancer, rheumatoid arthritis and diabetes. In general, the gut microbiota has been shown to influence host metabolism, food consumption, satiety, glucose homoeostasis, and weight gain. A recent study on antidiabetic drugs and their effects on gut microbiota it has found that the main effect is on the microbiome composition, basically increasing the short-chain fatty acids-producing bacteria, responsible for losing weight and suppressing inflammation (18).

Until approximately 15 years ago, the most popular and successful appetite suppressants were the nonselective 5-HT2 agonists **fenfluramine** and **dexfenfluramine.** Combined with **phentermine** as Fen-Phen and Dex-Phen, they were moderately effective. However, these 5-HT2 agonists were found to cause pulmonary hypertension and cardiac valve defects and were withdrawn from the market (19). Older drugs still available in the USA and some other countries include **phenylpropanolamine, benzphetamine, amphetamine, methamphetamine, phentermine, diethylpropion, mazindol, and phendimetrazine.** These drugs are all amphetamine mimics and, as central nervous system appetite suppressants, they are generally helpful only during the first

few weeks of therapy. Their toxicity is significant and includes hypertension and addiction liability (20).

Liraglutide, lorcaserin, orlistat, and phentermine are the only single-agent drugs currently approved in the USA and Europe for treatment of obesity (21).

Pharmaceutical industry has looked for other strategies to develop effective products. One such strategy has been to combine low doses of existing weight loss drugs, which were used for other indications and proved to be safe. Two such products are combination of **topiramate/phentermine** and **naltrexone/bupropion.** In spite of the low doses, their long-term safety has been questioned (22). **Mirabegron,** a β_3 adrenoceptor agonist approved for the treatment for overactive bladder may be interesting in the future because β_3 agonists activate brown fat to consume more energy (23). **Sibutramine** and **rimonabant** (cannabinoid receptor blocker that also causes depression) were marketed for several years but were later withdrawn because of increasing evidence of cardiovascular and other toxicities (24).

Because of the low efficacy and the toxicity of the available drugs, intensive research continues.

In contrast to the effect of those medications, weight gain is a common side effect of many different medications (25).

Prescription medications causing most weight gain are **antipsychotics,** some **antidiabetics,** oral **corticosteroids** and some **antidepressants.** Lesser effects come from the **anxiolytics,** some **antihypertensives** and some **anticonvulsants.** The clinician and the patient should anticipate the possibility of weight gain with these medications. Methods to avoid weight gain must be preplanned and implemented to minimize any detrimental effect of additional body weight at the time of prescribing the drug (12).

Another important lifestyle strategy is the increase in physical activity and exercise. Physical activity is a lifestyle recommendation for different indications, including diabetes or hypercholesterolemia. In the treatment of both diseases, drugs can be and usually are used. The discovery of **statins** has been equated in importance with the development of antibiotics at the beginning of the 20th century. Several studies have shown their value in reducing mortality and morbidity from heart disease and stroke (26). One significant side effect of the statins is myalgia or muscle related pain or soreness, including cramping and increased muscle tears. At the extremes this may manifest as rhabdomyolysis (5). The higher rate of myalgia and myositis in exercising individuals, such as athletes, is of particular concern (27). In this scenario, medical

professional should be careful in prescribing drugs and/or suggesting physical exercise. One alternative for such a patient is taking another cholesterol-lowering medication such as **nicotinic acid.**

Exercise is a non-drug alternative, which has proven benefits also in the treatment of depression. However, these patients are usually treated with pharmacotherapeutics. While the new generation of selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) appear to be effective with the milder side effect profile than previous medications of this type (tricyclics, MAO-inhibitors), they can still have side effects that can be counterproductive in lifestyle changes (28). Reduced libido and erectile dysfunction in men may add to depression, and weight gain is also common with some of these drugs. Alternatives include choosing specific agents that do not cause weight gain, physiological approaches or alternative, evidence-based over-the-counter medication, such as Saint John's wort (29).

Some studies have shown an increase in erectile dysfunction, hypertension and well-known stomach and gut problems as a result of **nonsteroidal anti-inflammatory drugs** (NSAID) (30). The COX-2 inhibitors were presented as good alternative, but some of them were withdrawn because of the increased risk of heart attack and stroke. Paracetamol will suffice as an analgesic without the side effects.

Glucocorticoids can increase the risk of osteoporosis and bone fractures caused by physical activity if used for long-term treatment and should be used cautiously (31).

Regarding antihypertensive medications, the risk of fatigue and muscle pain, which would limit physical activity, and the risk of diabetes still might be potential problems with some **beta-blockers** and **diuretics,** respectively (32).

10.3.2. Food-drug interactions

A drug interaction is defined as any alteration, pharmacokinetics and/or pharmacodynamics, produced by different substances, other drug treatments, dietary factors and habits such as drinking and smoking (33). An interaction of drug with food, herbs, and dietary supplements is usually the consequence of a physical, chemical or physiologic relationship between a drug and a product consumed as food, nutritional supplement or over-the-counter medicinal plant.

Food-medication interactions can be clinically relevant, especially when they must be avoided to prevent undesirable effects or exploited to optimize medication therapy (34). Medications with narrow therapeutic index or

potential life-threatening toxicity, e.g., oral anticoagulants, anticancer drugs and immunosuppressants, some NSAIDs, opioid analgesics, and cardiovascular medications, may be at risk of significant food-drug interactions to occur. Practical advice for those taking specific medications on foods to avoid is provided below.

Since some diuretics are known to cause potassium, calcium and magnesium wasting, supplementation of these minerals may be necessary. Triamterene is known as a "potassium sparing" diuretic. When taking triamterene, eating large amounts of potassium-rich foods such as bananas, oranges and green leafy vegetables or salt substitutes should be avoided, as well as licorice (35).

When patients are using tetracycline, they should avoid dairy products, antacids, and vitamin supplements containing iron because they can interfere with the effectiveness of medication.

Rapid, potentially fatal increase in blood pressure can occur if foods or alcoholic beverages containing tyramine are consumed while taking MAO inhibitors. These include aged cheese, aged meats, soy sauce, tofu, miso, fava beans, snow peas, sauerkraut, avocado, bananas, yeast extracts, raisins, ginseng, licorice, chocolate, and caffeine (35).

Cigarette smoking can affect the metabolism of different psychotropic drugs (e.g., clozapine, fluvoxamine, olanzapine, haloperidol), usually by increasing clearance of these drugs from the body via the induction of hepatic cytochrome P450 enzymes (primarily CYP1A2) (36).

On the other hand, grapefruit juice with its furanocoumarins is an inhibitor of CYP3A4 and can be contraindicated with certain drugs, such as simvastatin, as this may result in significant increase of the plasma concentrations of the drug, increasing the risk of ADRs (37).

10.4. Conclusion

As important part of lifestyle medicine, medications should never be used as substitute for lifestyle change. Pharmacotherapy should be rational, used in proper dose in combination with adequate diet and physical activity, and the adverse drugs reactions should not outweigh their benefits.

10.5. Literature

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CHAPTER 11: THE ROLE OF FAMILY MEDICINE PHYSICIANS AND GENERAL PRACTITIONERS IN PROMOTING HEALTHY LIFESTYLES

Marion Tomičić

"The good physician treats the disease. The great physician treats the patient who has the disease".

Sir William Osler

11.1. Introduction

In 1978, the World Health Organization (WHO) presented its Health for All program in Alma Ata, which gave a new dimension to primary health care, based on the overlap of reciprocity, social justice and equality, and the individual and community placed at the center of care (1).

One of the most frequently quoted definitions of primary care and general practice is the Leeuwenhorst definition from 1974: "The general practitioner is a licensed medical graduate who gives personal, primary and continuing care to individuals, families and a practice population irrespective of age, sex and illness. It is the synthesis of these functions which is unique" (2). Focus was put on the patient as an individual in a family and cultural context, continuity of care, and the sustained relationship with patients. This definition describes the particulars of the general practitioner (GP) in terms of working methods such as continuity, comprehensiveness, community-based work (or even in patients' homes), a family approach, and good communication (6). Early definitions and descriptions of general practice gave prominence to systems, settings, and methods, creating opportunities for good general practice.

New insights and advances in medicine have led to the further development of family medicine. The European definition has been applied in Europe since 2002. It emphasizes that family medicine is "an academic and scientific discipline with its own educational content and research, based on scientific facts, clinical activity, and clinical specialty orientated to primary care" (3). This document, published by the European organization of family physicians,

not only defines the profession, but also the fundamental characteristics and core competencies of family physicians (Figure 11.1).

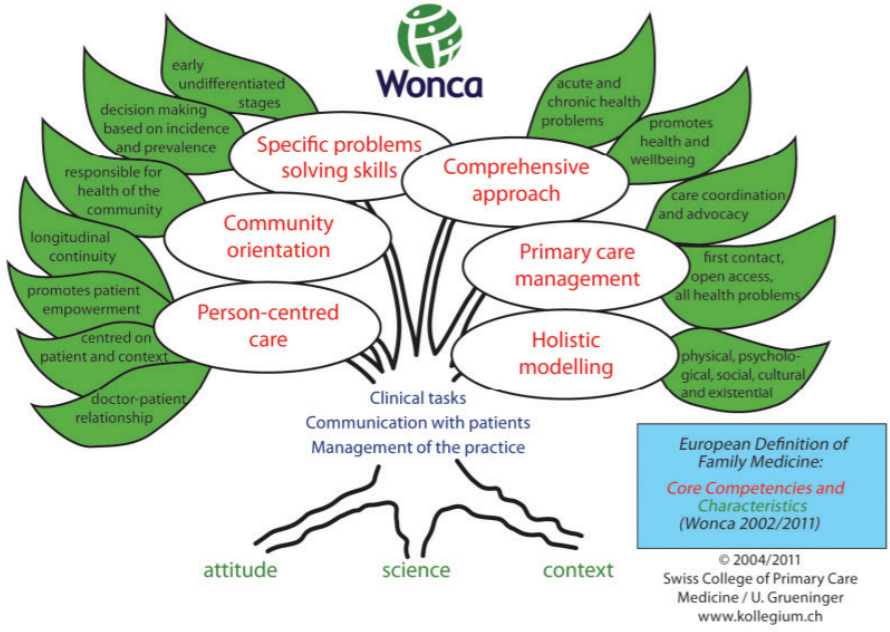

Figure 11.1. WONCA tree: Core competencies and characteristics of general/family medicine, as produced by the Swiss College of Primary Care (revised 2011) (3)**.** *Available from: https://www.woncaeurope.org/sites/default/files/documents/Definition%203rd%20ed%202011%20with%20revised%20wonca%20tree.pdf*

GP is the first contact physician who continuously cares for individuals and families, regardless of gender, age or illness. By providing patient-centered care, a person (not a disease) is placed at the center, with all his or her problems (biological, sociological and psychological) in the everyday environment (home, workplace and wider environment). An important concept of the approach is to look at each health problem from the position of the patient, in accordance with his or her psychological, social, cultural and value systems (what does this really mean for the patient?). In this way, GP provides preventative (encouraging healthy lifestyles) and curative health care to individuals and the community based on a holistic, comprehensive, continuous and integrated approach to the patient (3, 4).

11.2. Chronic non-communicable diseases and preventive activities in family medicine

The demographic trend of an aging population and the modern way of life characterized by life-threatening lifestyles have contributed to the development of the pandemic of chronic non-communicable diseases, which are today the most significant public health problem in developed society (5-8).

With a high proportion of the population over the age of 65, Croatia is one of the countries with so-called "old population". The burden of disease now indicates that we live in a world in which chronic non-communicable diseases have taken over the primacy. According to data from the Croatian Institute of Public Health, cardiovascular diseases, of which about 24,000 people die each year, are the leading cause of mortality and morbidity with the largest contribution to the burden of the disease. The indicators point to the poor status of "demographic health", which poses a significant challenge to achieving the sustainable development of society as a whole and responding appropriately to the health needs of an increasing number of older people (9).

In response to these challenges, the improvement and promotion of health, followed by preventive activities and the promotion of healthy lifestyles, come to the fore. We are aware that most of the modern day diseases would disappear or occur at an older age if people made healthier food choices, if they engaged in physical activity appropriate for their age, if they avoided smoking and excessive alcohol consumption. The role of the GP and their team is critical to conducting preventative activities in primary health care. To do so, the GP should, in collaboration with the nurse, collect for each person in care anamnestic information about risk factors, perform anthropometric measurements, measure arterial blood pressure, etc. (10-12).

Depending on the stage of the disease in which we have intervened, prevention can be divided into primary, secondary and tertiary. Using screening measures, we identify people with an increased risk of developing a particular disease. The purpose of screening is to identify risk factors or diseases promptly and to carry out treatment or intervention, which will cure, stop or slow down a disease that can lead to death, disability, damage and reduced quality of life. Primary prevention aims to healthy people and involves eliminating the risk of the disease and improving general health to prevent the onset of the disease. Secondary prevention refers to the identification of persons with increased risk and/ or patients with the early symptom-free disease to prevent the development of symptomatic disease on time, thus stopping its progression and preserving life expectancy and quality of life. Tertiary prevention is

the recognition and management of those conditions that cannot be treated or conditions that have consequences despite treatment. It aims to preserve the patient's quality of life when treatment cannot prevent the disease (5, 6, 9, 11-14).

However, the classical approach of primary, secondary and tertiary prevention has not been shown to achieve the desired goals at a population level.

The question we need to ask and be relentlessly focused on finding an answer is what we are doing wrong and how to improve preventative activities to achieve the desired goals?

Do we make mistakes in the ways we approach and communicate with the patient?

Do patients possibly have a low perception of delayed risk?

What is our personal view on healthy lifestyles and do we apply them?

Is there a way, method, or measure by which we can successfully prevent the development of non-communicable chronic diseases?

Do we feel that we have sufficient health counseling skills and knowledge?

Do we have enough time for counseling?

To what extent do the patient's attitudes and request for pharmacological therapy influence our decision on which method of intervention to choose?

Consequently, all the information and questions available resulted in the idea of health promotion aimed at improving population health, not just preventing disease.

11.3. GPs and health promotion

Improving/promoting health or primordial prevention is a set of general measures that increase the body's ability and resilience by eating properly, maintaining healthy body weight, exercising, controlling stress and avoiding other harmful habits (smoking, excessive alcohol consumption), targeting the entire population and its environment, rather than just specific population groups.

A series of studies show that lifestyle changes have a significant effect on delaying the onset of chronic non-communicable diseases, or achieving treatment goals by eliminating individual risk factors. Nevertheless, it is currently common practice to treat more and invest less in the prevention and

promotion of healthy living (10-15). The patient makes an appointment, we examine him or her and run the necessary diagnostic tests, make a diagnosis and then prescribe the medicine. If we look into the financial side of it, we will see that curative medicine is usually much better paid than health promotion.

11.4. What can we do as GPs to work more effectively on the promotion of healthy lifestyles?

First of all, we need to start from ourselves, become aware of how important health is to us, and realistically look at our lifestyle. Physicians who have adopted healthy lifestyles or are considering to make such a change are more likely to ask patients about their diet, physical activity, smoking, and are more likely to advise patients to try to change. Available research indicates that a doctor's sense of personal health and illness has an impact on their daily work. When feeling unwell, a physician may provide suboptimal medical care, he or she will be less empathetic and concerned about the patient, which leads to decreased patient satisfaction (16-18).

The key to achieving a lifestyle change is to establish an empathetic relationship with the patient, using appropriate communication. This only confirms Balint's claim that the most commonly used medicine in family medicine is the doctor himself (20). In the opinion of the patient, a good doctor is empathetic, reliable, non-judgmental and supportive, while respecting the patient's needs, values, beliefs, goals, personality traits and fears. The quality of communication between the doctor and the patient directly affects the outcomes of the treatment, that is, the health of the individual. As the primary goal of lifestyle counseling is to change behaviors outside the clinic, time spent with the patient should be structured and effective (20, 21).

How to conduct effective counseling? During the first encounter with the patient, it is extremely important to use active listening skills in communication. By carefully listening to the patient, we will notice all the non-verbal and verbal messages to learn more about the patient's personal goals and expectations. By understanding and accepting the specifics of each, we send the message that we are interested, concerned and empathetic, thus encouraging open and honest communication. If necessary, we can help them by asking simple, open-ended questions (How are you? How can I help you?). The patient should be allowed and encouraged to be an active participant, allowing him/her to choose a topic and then, through active listening, to identify the problem that really bothers him/her (22-24).

Going through this first step, the GP should be aware of the fact that patients are most often coming to the clinic with an already developed idea of how to solve an existing problem. However, most patients report that they have often been interrupted in presenting their ideas and that doctors are quick to switch to clinical reasoning and offer solutions accordingly. We must not forget that for the patient in family medicine, the best practice is to provide patient-centered care, whereby we place the focus of attention on the person with all the difficulties in the everyday environment. Observing a health problem from a patient's perspective, by his/her psychological, social, cultural and value systems, and finding out what it means to the patient is a crucial moment in the process of choosing how to solve the problem (20-24).

11.5. Shared decision-making – patients as partners

The doctor's role has changed, from one who knows best (the paternalistic model) to one who considers and respects the patient's decision. Collaborative partnership, or joint decision-making, is an approach in which an informed and interested patient, in collaboration with a physician, assumes greater responsibility for his health, without shifting responsibilities solely to the physician. With this approach, we empower the patient and encourage him or her to take greater responsibility for their health (25-27).

Nevertheless, in our daily work, we often encounter patients who are aware of their unhealthy lifestyles and their effects on their health, without being prepared or trying to change anything about it.

The question is how to engage the patient's motivation for change? When asked if they are motivated/willing to change, e.g. if they want to quit smoking, we often get very short answers such as yes, no and maybe, which are very difficult to interpret.

With additional questions, the GP should develop the patient's intrinsic motivation to act, and more importantly, to make the necessary changes. Motivational interviewing can help us with that. Motivational interviewing is a direct and patient-centered method of stimulating intrinsic motivation for change that we achieve through research and resolution of ambivalences. According to this method, the motivation for change is something that we can help awaken in the patient, not something that must be innate to him. Attention is given to the patient's wishes, opinions and feelings. On one side of the seesaw is the motivation or desire to change, on the other side is the

patient's resistance to change. Although most patients are well aware of both disadvantages and benefits of certain behaviors, only a few will ever successfully implement the changes. The intrinsic model defines the ambivalence that occurs when deciding to change, which may be conditioned by fear of change, the complexity of implementation or discomfort, or stepping out of one's comfort zone.

That is why the attempt to change is unsuccessful and results in disappointment and giving up on further attempts with unmotivated patients. When interviewing, it is important to assess the patient's real desire for change (I want to lose weight because I will be healthier) and how much of it is "imposed" by external circumstances or the environment (e.g. spouse has some health concerns and insists on change).

The goal is to improve patients' self-confidence and to believe that they can successfully implement this change. It is expected that there will be resistance and reluctance in the course of trying to change lifestyles. The role of the physician is to assess when the patient's resistance is so high that further insistence may result in a compromise of the therapeutic relationship. It is then crucial to be patient, to allow the patient to express their fears and resentments by patting their backs (26-30).

If the GP knows how to assess the strengths and weaknesses of the patient, making it possible to find the intrinsic/extrinsic focus of motivation they can work on, then the GP has a better chance of really helping the patient.

There are many methods and approaches to stimulate patient motivation. Most require additional GP education and collaboration with a smaller and bigger team in a network of health and non-health professionals.

11.6. How to incorporate lifestyle medicine into a GP's daily work?

Most GPs are overloaded with a large number of consultations per day, but also with additional administrative work. The average length of consultation or time available to the doctor is really short, between 7 and 10 minutes. This time is not enough to take anamnestic data on risk factors, anthropometry and blood pressure measurements, let alone conduct a motivational interview, and point and guide patients through lifestyle changes.

We often devote just a fraction of that short time to our patients who would really benefit from that, sending them "meaningless" messages they already know. Messages like "you have to lose weight, you need to stop smoking, try to engage in healthy living habits" rarely or never help achieve the desired effect.

On the contrary, sometimes they may have the opposite of the desired effect. By sending such a message, we clearly show the patient that we do not have time for him.

We cannot conduct a motivational interview in a standard, short and limited consultation. Longitudinal, ongoing care for the patient through multiple encounters during shorter or longer consultations, not necessarily related to a lifestyle change, would serve as the basis of the relationship needed to gain further insight into the patient's personality and his or her motivational locus. The consultation needs to be planned, with enough time for good communication, which means having enough time to really hear what the patient has to say (and share his or her hopes, fears, and potential solutions). After the consultation, depending on the medical evaluation, the GP should plan the next appointment.

The nurse is an important part of the GP team and can take over part of the care. Before the motivational interview, the nurse should collect information on diet, physical activity, smoking, etc. by using structured questionnaires and anthropometric measurements. Furthermore, specially trained nurses may, on the recommendation of a physician, provide individual or group counseling (for example, on proper nutrition). The community nurse represents an additional resource for promoting a healthy lifestyle, with a unique perspective of a healthcare professional entering the patient's home. The information that nurses gather are an important part of getting a realistic picture of a patient's personality and their families, and his/her motivation to change.

All this, apart from the individual approach, provides the opportunity to work with small groups. In this way, it would be easier to get things organized, with good logistical support from Community Health Center.

11.7. Literature

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INDEX

CIP - Katalogizacija u publikaciji
S V E U Č I L I Š N A K N J I Ž N I C A
U S P L I T U

UDK 616-084(082)
615.83(082)
613(082)

LIFESTYLE medicine : the roadmap to our best possible health / Ivana Kolčić & Tanja Dragun. - Split : School of Medicine of the University, 2021.

Bbibliografija uz svako poglavlje. - Kazalo.

ISBN 978-953-7524-30-2

1. Kolčić, Ivana 2. Dragun, Tanja
I. Preventivna medicina -- Zbornik II. Zdravlje -- Prevencija -- Zbornik
181224041

Lifestyle medicine is a new paradigm in medicine. Our usual, conventional approach in western medicine most commonly focuses simply on treating the symptoms of chronic diseases with medications or surgery for the rest of the patients' lives. Unlike this approach, lifestyle medicine is addressing all of the true and underlying causes of the leading health problems in our modern societies. These root causes of non-communicable diseases are our daily habits, which comprise our lifestyle, and are embedded in our environments and social circumstances.

This book brings an overview of the field of lifestyle medicine and its importance to patients' health. It is intended for physicians and other health-care professionals who would like to adopt a positive attitude toward lifestyle change interventions and to start the application of this field, on a personal level and in daily medical practice.

The book includes main pillars of lifestyle medicine practice; nutrition, physical activity, sleep habits, stress management, and smoking. Additionally, we tackle the central issue of motivating patients for real and sustainable change, embedded in the principles of health behavior change and motivational interviewing.

9 789537 524302
ISBN 978-953-7524-30-2