12 Healthy Lifestyle Behaviors: The Optimal Nutrition to Combat Burnout

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Introduction to Nutrition

The previous chapter discussed how physical activity directly impacts resident wellness and resilience. This section will begin by reviewing some basics of nutrition such as energy requirements and the major components of food (i.e., macronutrients and micronutrients). The authors will then provide an overview of American and Canadian dietary guidelines. Lastly, the chapter will touch upon what is known regarding the dietary habits of residents, medical students, and physicians, along with suggestions to help optimize nutrition.

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The Basics of Nutrition

The topic of nutrition can feel overwhelming, due to the breadth of information available in both scientific and mainstream literature, as well as confusing, given evolving and sometimes conflicting recommendations. Given this, it is helpful to understand the scientific evidence of nutrition basics. For more detailed information, the reader is directed to section "Additional Resources" regarding additional resources at the end of this chapter.

When considering the potential health benefits and risks of food consumed, important factors to understand include caloric intake, food composition, (i.e., proteins, fats, or carbohydrates), as well as supply of vitamins and minerals. Various countries have published guidelines with recommendations for healthy eating, such as the US Dietary Guidelines for Americans (https://health.gov/dietaryguidelines/2015/guidelines/) and Canada's Dietary Guidelines (https://food-guide.canada.ca/en/guidelines/). Although the authors will discuss these recommendations later in greater detail, the general consensus is that a healthy diet involves regularly eating appropriately sized portions of nutrient dense food; both the quality (i.e., composition of food) as well as the quantity (i.e., caloric intake) matter.

Quantity

In considering the quantity of food that one should eat, it is not usually helpful to quantify amounts by weight or volume. This is due to the fact that 100 g of celery is quite different than 100 g of chocolate in its nutritional content. Rather, the caloric value of food consumed is a more informative measure. A calorie represents a unit of energy and is equivalent to the energy required to raise 1 kg of water from 15 to 16 °C [1]. From a more practical viewpoint, calories represent the energy which our body extracts from food to power our various functions. Calories are derived from carbohydrates, fats, and proteins within our food and drink. Micronutrients, which consist of vitamins and minerals, do not provide calories [2].

As with automobiles, the amount of fuel needed to run a human body varies significantly from one individual to the next. Each individual has an Estimated Energy Requirement (EER) which is defined as the dietary energy intake required to maintain an energy balance [3]. If a person consumes more energy (i.e., more calories) than required, they will have a net positive energy balance with the excess contributing to weight gain. A person's EER depends on their age, sex, weight, height, genetic composition, and activity levels [2, 3]. For example, a triathlete has a larger EER as compared to a sedentary adult. Furthermore, as people age, their basal metabolic rate decreases as does their EER [3]. Various equations and tables exist to help individuals determine their estimated EER. Please see the "Additional Resources" section for more information on this topic and to calculate your own EER.

Did You Know?

One pound of body fat is equivalent to 3500 calories. In other words, if you have an energy surplus of 500 calories per day, you will have gained 1 pound of fat after only 1 week [2].

Quality and Guidelines

Caloric intake is only one of the important metrics to consider, as the nutritional composition and overall quality of the food eaten also has a direct impact on health. The nutritional composition of food can be further broken down into macronutrients (i.e., carbohydrates, proteins, fats) and micronutrients (i.e., vitamins, minerals). Having a basic understanding of macro and micronutrients is important as these are the building blocks of the food that we consume and can affect our health in various ways [4]. Tables 12.1 and 12.2 provide a succinct overview of common and important nutrients, their sources, and their importance [2].

Many factors need to be considered regarding the composition of one's diet to promote optimal nutrition. Nutritional science, as a relatively new field of study, is rapidly changing such that there

Table 12.1 Macronutrients [2]

		Sources
Carbohydrates	*Simple carbohydrates* – quickly broken down and a quick source of energy	Fruit, honey, maple syrup
	Complex carbohydrates – larger molecules that are broken down to simple carbohydrates, provide energy more slowly, less likely to be converted to fat	Starch (in pasta, bread), root vegetables (potatoes, sweet potatoes)
Fats	*Monosaturated* – plant derived fat	Peanut butter, olives, avocadoes
	Polysaturated – plant derived fat	Canola oil, sunflower oil
	Saturated – animal derived fat	Beef, full fat milk, butter, cheese
	Trans fats – human-made fat in commercially prepared food	Commercially baked cookies, donuts

Table 12.2 Micronutrients [2]

		Sources
Vitamins	*Vitamin A* – important for vision, immune function and skin health	Beef, dairy products, leafy greens
	Vitamin B9 (folate) – important for cell division	Legumes, eggs, asparagus
	Vitamin B12 – important for red blood cell formation and proper nervous system function	Fish, meat, clams, dairy products
	Vitamin C – important for creation of neurotransmitters and collagen	Citrus fruit, tomatoes
	Vitamin D – important for bone health, calcium absorption and immune function	Fortified milk, fish, egg yolks
	Vitamin E – important antioxidant	Vegetable oils, nuts, whole grains
	Vitamin K – important for synthesis of blood clotting proteins	Leafy green vegetables

Table 12.2 (continued)

		Sources
Electrolytes and minerals	*Calcium* – important for bone and teeth formation, muscle contraction and relaxation	Dairy, fortified cereal, leafy greens
	Magnesium – important to maintain healthy bones	Whole wheat, nuts, seeds
	Zinc – important to promote immunity	Oysters, Turkey dark meat
	Iron – important for motor and cognitive development	Lean meat, seafood, nuts, fortified grain products
	Sodium – important for fluid and electrolyte balance, nerve impulse transmission	Canned foods, fast food
	Potassium – important for fluid and electrolyte balance, muscle activity	Potatoes, various fruits and vegetables

are still many ongoing discoveries and unknowns. Several countries have developed easy to access guidelines which provide simple, reasonable, and evidence-based suggestions. Canada's Food Guide, developed by Health Canada, recommends that vegetables, fruit, whole grains, and protein-rich foods (ideally plant-based proteins) be consumed [5]. The guidelines report that following such a diet has been associated with reduced risk of cardiovascular disease and associated risk factors such as hypertension and dyslipidemia. Health Canada also recommends unsaturated fats as preferred to saturated fats, as evidence suggests that preferential consumption of the former is associated with lower low-density lipoprotein (LDL), a form of cholesterol, and a reduced risk of cardiovascular disease. In addition, these guidelines recommend water as a regular beverage as opposed to other options such as juice or soft drinks. These recommendations are echoed by the US Department of Agriculture's Dietary Guidelines for Americans which propose similar dietary choices [4]. One easy to adopt strategy which is supported by both guidelines is the "plate method" (See Fig. 12.1). The "plate method" can be employed for any meal and recommends that:

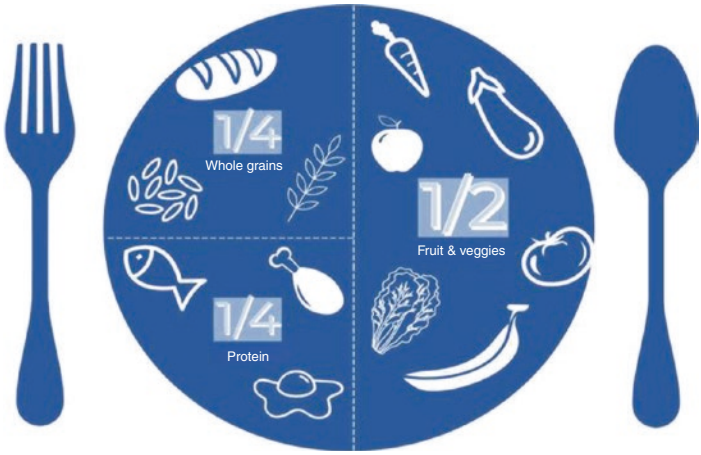

Fig. 12.1 The plate method [2]

- ½ the plate consists of fruits and vegetables,
- ¼ of the plate consists of whole grains, and
- ¼ of the plate consists of protein [2].

Please see the additional resources (see section "Additional Resources") for more information and links to guidelines.

What to Avoid?

Optimizing one's diet is as much about what is put in as it is about what is left out. There are many types of food which the guidelines suggest to avoid or minimize due to known problematic health effects.

Guidelines suggest that individuals limit the intake of processed foods, otherwise known as ultra-processed or highly processed products [5]. This group of "highly processed products" includes items such as sugary drinks, sugary breakfast cereals, and microwaveable meals. Canada's Food Guide notes that increased consumption of foods from this group has been associated with increased rates of obesity [5]. These products are associ-

ated with an increase in the amount of sodium, sugar, and saturated fats which can in turn lead to additional concerns such as an increased risk of hypertension and type 2 diabetes mellitus [6, 7]. Within this group of processed products are "processed meats" which include items such as hot dogs and beef jerky. Consumption of these food products has been associated with various forms of cancer and guidelines suggest that their intake be limited [8].

While many do not consider alcohol as a component of their diet, alcohol is a significant source of calories and has no nutritional value from a micro or macronutrient standpoint. In addition, alcohol is frequently co-ingested with sugary drinks as "mixers" which, as per Canada's Food Guide, contributes to its high caloric value. Lastly, alcohol use has been associated with a number of negative health outcomes such as injuries, liver disease, cardiovascular disease, cancer, and mental illness such as depression [9]. As such, alcohol intake is not considered part of a healthy diet and limited consumption is recommended. Guidelines regarding moderate and low risk drinking can be found on the websites of the Centers for Disease Control and Prevention (CDC) as well as the Canadian Centre on Substance Use and Addiction [10, 11]. Table 12.3 illustrates what constitutes low risk alcohol use for adults aged 65 and younger [10].

In addition to the effect of certain foods on one's health, the environment and where one eats can also have an impact. For example, communities with lack of access to supermarkets and fresh fruits and vegetables are associated with members having a higher BMI. Further, individuals who frequently eat out were found to have a significantly higher BMI as compared to individuals who cooked and ate at home [12]. In addition, Health Canada recommends home cooked meals and eating with other individuals [5]. Overall, the research suggests that avoiding restaurants and eating home cooked meals can be an important contributor to a healthy diet.

Table 12.3 Low and moderate risk alcohol use for adults [10]

Sex	Drinks per day	Drinks per week
Men	≤3 drinks per day	≤15 drinks per week
Women	≤2 drinks per day	≤10 drinks per week

Key Points

- Each individual's daily energy requirement is different and can be easily calculated using various formulas provided in the "Additional Resources" section of this chapter [4, 5].
- Guidelines recommend a varied diet consisting of vegetables, fruits, whole grains, and proteins which are preferably plant-based and portioned according to the plate method [4, 5].
- Processed foods, sugary drinks, excess sodium, and alcohol are not considered part of a healthy diet [4, 5].

Poor Nutrition and Medicine

In the previous section we discussed the components of an optimal diet in an ideal environment. Unfortunately, as residents enter training, a number of external and internal factors can impinge on the quality of their nutritional intake. These factors include increased stress, scarcity of time, extended periods of time at the workplace, and challenges with work-life integration. In this section we will examine what the literature tells us about the diets of those training to be doctors. As research specifically about resident diets is limited, data from medical students and staff physicians will be used to extrapolate information when appropriate.

In one study, an online survey was conducted to evaluate wellness behaviors of first year family medicine residents. The results revealed that only 25.2% of respondents consumed at least five servings of fruits and vegetables at least 5 days per week, well below dietary recommendations [13]. In a separate survey looking at the dietary habits of medical students, researchers identified that only 15.3% of learners followed dietary guidelines [14]. The quality of medical students' diets has also been shown to worsen over time, with decreased consumption of fruits and vegetables

and increased consumption of fast food as medical school progressed [15]. Examining the diets of staff physicians, a survey from California identified that 27% of respondents reported only occasionally eating breakfast or missing it all together [16]. From this same study, almost 40% of physicians reported eating red meat without restriction, which predicts a higher amount of saturated fat intake with its associated risks [16]. Resident diets are further worsened by the quantity and quality of free food (i.e., pizza lunches) often available during their training [17]. When comparing junior to senior physicians, one study identified the former as eating more fast food, less vegetables and fruits, and reduced frequency of breakfast [18]. Further, research has investigated the potentially negative effects of on-call shifts with regard to nutrition. In one study, 11 critical-care fellows were followed over the course of 35 on-call shifts. During these shifts, urinalyses were performed to assess hydration status. Approximately 21% of these measurements contained ketones and a specific gravity measurement suggestive of dehydration [19]. Lastly, while the important topic of substance misuse is beyond the scope of this chapter, several studies have examined rates of alcohol use within the resident population. In one study, resident physicians were more likely to have consumed alcohol within the past month as compared to high school graduates (87.6% vs 79.0%) [20]. In this same study 5% of residents were found to consume alcohol on a daily basis [20].

Physicians (and patients) do not usually simply choose to have a poor diet. Rather, there are numerous external factors that influence dietary choices. In one cross-sectional survey from the United Kingdom, physicians identified several barriers which interfered with healthy eating [21]. These barriers included a lack of breaks, heavy workload, inconvenient cafeteria operating hours, and lack of healthy options at the cafeteria. Regarding cafeteria operating hours, the study identified that hospitals often failed to provide access to meals for staff working overnight and on weekends. From this study, fewer than half of the physicians surveyed reported having regular meal breaks and only 12% felt supported by the National Health Service to engage in healthy eating behaviors [21]. In a Canadian study, residents were

surveyed regarding their dietary patterns while on call [22]. Barriers to healthy eating identified by residents included lack of time, poor access to food, and poor food quality. Overall, 81% of residents felt that their nutritional needs were not adequately met [22]. These results were also supported by an analysis of the quality of food offered at children's hospitals in California, which identified a large offering of high calorie impulse items (i.e., cookies) [23]. Lastly, physicians also identified the culture of medicine and the need to maintain professionalism standards as barriers to healthy eating. Specifically, physicians identified that they avoided taking breaks to avoid taking time away from treating ill patients [21].

Finally, research has also examined the link between a physician's diet and nutritional counseling provided to patients. Specifically, physicians and medical students who engage in healthy dietary practices are more likely to provide education and counseling to patients on this topic [24, 25]. Additionally, patients are more likely to be motivated to makes healthy changes if they receive counseling from a physician who engages in healthy lifestyle behaviors themself [26].

This chapter has provided a snapshot of the nutritional practices of resident physicians, medical students, and staff physicians. Despite the limitations of current evidence, this data does identify concerns and challenges regarding the diets of medical professionals. As nutrition is an essential component of wellness, more research is needed to better understand strategies to successfully promote and sustain optimal nutrition for healthcare providers themselves.

Key Points

- Research has identified numerous concerns regarding the diets of medical students, resident physicians, and staff physicians, such as poor adherence to dietary guidelines, skipping breakfast, and dehydration [14, 18, 19]

- External barriers such as lack of breaks, heavy workload, inconvenient cafeteria operating hours, and lack of healthy options influence dietary choices of physicians [21, 22].
- Patients are more likely to receive and be receptive to dietary counseling when provided by a physician who engages in healthy practices themself [26].

The Impact of Suboptimal Nutrition

In the previous section, the chapter's authors discussed some general concepts of nutrition, components of a healthy diet, and reviewed the available research looking at resident diets. In this section, they discuss the outcomes, both physical and mental, of a suboptimal diet.

Nutrition and Physical Health

The effects of poor nutrition on physical health are well studied and extensive. As per the World Health Organization, poor dietary habits have been associated with obesity and a number of nutrition-related chronic diseases. These diseases include type 2 diabetes mellitus, cardiovascular disease, cancer, osteoporosis, and dental disease [27]. The converse of these negative associations is also true. That is, healthy eating patterns are associated with reduced risk of cardiovascular disease, type 2 diabetes mellitus, certain types of cancers such as colorectal and postmenopausal breast cancers, and obesity. See the skill-building exercise below to learn more about the association between diet and chronic disease. Table 12.4 illustrates the main dietary components and their association with chronic disease.

In addition to the composition of one's diet, the timing of meals has also been shown to affect physical health. For example, eating meals at night has been associated with metabolic changes

Table 12.4 Dietary components and chronic disease

Dietary component	Association with chronic disease
Red meat and processed meat	Associated with increased risk of type 2 diabetes mellitus, stroke, and cardiovascular disease [28]. Lack of red meat can be associated with low iron and vitamin B12.
Nitrites and nitrosamine (e.g., from processed meats)	Evidence suggests an association with esophageal and gastric cancer [8]
Sugar	Associated with metabolic syndrome, type 2 diabetes mellitus, and cardiovascular disease [29]
Alcohol	Associated with injuries, liver disease, cardiovascular disease, cancer, and mental illness such as depression [9]

leading to weight gain and disorders such as type 2 diabetes mellitus [30]. Sleep patterns may also be affected by dietary composition, as fat and sugar intake have been associated with a disrupted circadian rhythm [30, 31]. This interplay between sleep and diet is important to note given the regular shift and overnight work with which resident physicians are faced. Circadian rhythm and sleep will be discussed further in Chap. 13.

There are limited studies examining the physical effects of poor dietary intake specifically on physicians. In a cohort study of 85,078 male physicians, 44% were overweight or obese [32]. In a cohort study at American teaching hospitals, almost 50% of third-year medical and surgical residents were found to be overweight. Additionally, the proportion of overweight residents was shown to increase as residency progressed [33]. Similarly, resident physicians in the US military have been shown to gain 4 pounds on average over the course of a three-year training program [34]. While limited, this research does suggest that resident physicians may be at risk of preventable weight gain secondary to dietary habits.

Nutrition and Cognition

Diet impacts cognitive functioning. For example, the Westernized diet which has a high proportion of saturated fats and refined sugars has been associated with impaired cognition. Cognitive

domains which appear to be particularly affected include memory, attention, executive function, and processing speed [35]. Another diet which has received considerable attention is the Mediterranean diet, especially, as it relates to the potential to decrease age-related cognitive decline and dementia. The diet itself consists primarily of vegetables, fruits, legumes, whole grains, nuts, fish, and olive oil [36]. A recent systematic review of observational studies identified that adherence to the Mediterranean diet was associated with improved cognitive functioning and reduced rates of cognitive decline [36]. Similar improvements in cognition have also been noted in randomized trials where the Mediterranean diet has been the intervention [37]. It is important to note that the quality of individual studies is heterogeneous given variability in samples sizes, use of standardized measurements, and study design. A number of studies have also examined the effects of breakfast on cognitive function. These studies identified that in malnourished children, skipping breakfast was associated with worsened cognitive performance [38]. While interesting, results from this pediatric study may not be representative of effects in the resident population. Research has examined whether or not the specific composition of breakfast had differential effects on cognition. Broadly, studies identified that breakfasts with a low glycemic load were associated with better cognition when looking at metrics such as memory and sustained attention [39]. Studies have also identified that eating a large lunch can be associated with worsened cognitive performance in the afternoon [40]. Overall, the composition and timing of our meals appear to have a significant effect on our cognition.

Hydration has been identified as another important factor when considering cognition. For example, a recent review identified that mild to moderate dehydration was associated with impairments in attention, immediate memory skills, and psychomotor function [41]. Dehydration has also been associated with subjective impairments on self-reported fatigue, diminished alertness and impaired concentration [42]. In addition, acute water consumption has been associated with improvements in visual sustained attention, short-term memory, reaction time, and mood [42].

New and emerging information continues to build our understanding of the relationship between oral intake and cognition in medical student and physician populations. In one study, the

cognitive effects of suboptimal nutrition were examined in a cross-sectional survey of 127 Japanese medical students. In this study, dietary behaviors such as skipping breakfast and irregular meals were associated with mental fatigue [43]. In another survey of 20 UK physicians, respondents reported having frequent difficulties accessing adequate nutrition and that this barrier was associated with tiredness, impaired concentration, and poor decision making [44]. However, it is important to note that this study was relatively small and limited to qualitative comments with an absence of objective measures.

Going beyond examination of the effects of poor nutrition on cognition in the physician population, several studies have looked at whether nutritional interventions could improve performance. In one study, a group of 20 physicians was observed during a normal working day as compared to a day where they received scheduled nutrition breaks. During the baseline and intervention periods, cognitive function was measured with a focus on reaction time, memory, attention, and visual information processing. The study identified that scheduled nutrition breaks with access to healthy options was associated with greater cognitive performance as compared to baseline [45]. The authors also identified that physicians' nutritional status, as measured through fluid intake and nutrient consumption, also improved in the intervention group [45]. While interesting, the quality of this study was limited by its small sample size and lack of randomization and other methodological factors. Overall, the association between diet and cognition is extremely relevant for physician trainees, especially given the need for high cognitive performance required by their work. Current evidence is limited, however, and more work is needed including larger and randomized trials.

Nutrition and Mental Health

In addition to effects on cognition, research has also begun to identify that diet has an important effect on our mental health. Studies from the general population have identified an association between various diets and mental health outcomes [46].

Results from several adult studies are described in a recent meta-analysis which identified diets consisting of fruit, vegetables, fish, and whole grains as being associated with a reduced risk of depression [46]. In a second meta-analysis, moderate to high adherence to the Mediterranean diet (i.e., vegetables, fruits, legumes, whole grains, fish, and olive oil) was shown to be protective against depression [47]. When looking at the individual components of the Mediterranean diet, fatty acids such as those found in olive oil have also been shown to possibly reduce the risk of depression [48, 49]. As described in the next section, consumption of omega-3 fatty acids, which are commonly found in fish, has also been shown to reduce the likelihood of developing depression.

Research has also examined the effects of the Westernized diet. In one study, researchers identified higher rates of anxiety and depression in women who consumed this diet, even after controlling for multiple variables including education, age and socioeconomic status [50]. Similarly, a population-based study from Spain identified that increased fast food consumption was also independently associated with an increased risk of depression [51].

Unfortunately, there are limited studies which have specifically examined the impact of diet on physician mental health. In a survey of UK physicians, respondents reported emotional symptoms of irritability, frustration, and a sense of being emotionally drained when faced with poor access to nutrition [44]. Similar results were found in a survey of Canadian residents, with poor nutrition being associated with lower well-being scores and increased risk of burnout [22]. Further, in a survey of family medicine residents, higher rates of alcohol use were correlated with symptoms of burnout such as stress, emotional exhaustion, depersonalization, and depression [13]. Conversely, higher quality nutrition was associated with less depersonalization and greater life satisfaction in one study examining the lifestyle behaviors of pediatric residents [52]. Despite the limited research, appropriate nutrition is clearly recognized as an important factor for physician wellness. Physicians would benefit from systems-based approaches to support them in optimizing their nutrition. For example, in Canada, the Alberta Medical Association

Physician and Family Support Program has developed resources which help to promote and provide psychoeducation on wellness, including workplace nutrition [53].

Did You Know?

Research has identified troubling effects of burnout and poor mental health in the physician population. In one cross-sectional survey of 7905 American surgeons, poor mental health, symptoms of burnout, and depression were all positively associated with medical errors [54]. While not directly examining the effects of poor diet on medical errors, results such as these may point to a possible link between dietary habits, mental health, and medical errors. Diet and safety will be discussed further in the next section.

Nutrition and Safety

The association between poor nutrition and safety is not as well defined as the link between sleep deprivation and motor vehicle accidents, as will be discussed in the next chapter (See Chap. 13). However, limited research suggests that mild hypoglycemia in patients with type 1 diabetes mellitus (<3.6 mmol/L [<65 mg/dL]) is associated with impaired driving due to a depressed central nervous system [55]. Further, a study of healthy volunteers identified that mild hypoglycemia was associated with impairments in fine motor skills, memory, and information processing [56]. The association between nutrition and safety has also been examined in the aerospace industry. In one study, pilots suffering from mild-moderate dehydration showed poorer flight performance and spatial cognition as compared to their hydrated counterparts [57]. Lastly, one study examined the effects of hypohydration (i.e., <25% of recommended fluid intake) on driving performance in healthy volunteers. The results were quite striking as hypohydration resulted in an increase in driving errors, similar to what would be observed in patient's suffering

from sleep deprivation or individuals with a blood alcohol content of 0.08% [58].

The evidence to support a correlation between poor nutrition and safety risk remains limited. Additionally, no research has been done to examine this question specifically in the resident physician population.

Key Points

- Dietary habits are associated with physical illness, cognitive performance, and mental health [27, 35, 50, 51].
- Dietary habits may also have implications regarding safety but further research is needed [55–58]
- Evidence suggests that resident physicians are at risk of negative health outcomes secondary to their dietary habits [32, 33, 44].

Adopting Healthy Nutrition and Dietary Habits

In this chapter so far, the authors have established that resident physicians are at risk of poor dietary habits. In addition, poor diet has been associated with a number of adverse effects such as poor physical and mental health. In light of this, nutritional intake is an area requiring attention to promote physician and resident wellness. The following section will discuss strategies aimed at promoting healthy eating.

General Strategies

Resident physicians are encouraged to follow the nutritional guidelines of their respective countries, such as Canada's Food Guide and the US Dietary Guidelines for Americans (See section "Additional Resources"). These guidelines are easy to read and

provide useful strategies which are evidenced informed. As discussed above, both guidelines recommend diets which consist predominantly of vegetables, fruits, whole grains, low fat dairy, and a variety of protein-rich foods (e.g., seafood, lean meat, legumes, soy). Both guidelines also recommend fresh and home cooked meals rather than eating out and processed/prepared foods. This is relevant to resident physicians given the limited healthy options offered at hospital cafeterias and vending machines. Residents are encouraged to take regular nutrition breaks throughout the day. As discussed above, having regular meals has been associated with improved cognitive performance [45]. While residents may be hesitant to take time away from patient care, they should be educated about the potential effects of poor nutritional intake on cognitive performance.

Dehydration, as discussed previously, can have significant impacts on cognitive performance. It is important for residents maintain hydration, even during the busiest of shifts, to avoid any deleterious effects. Recommended fluid intake varies between guidelines and depends on climate and activity levels. In the USA, the National Academies of Sciences and Engineering suggests that an adequate daily fluid intake for men is 3.7 L and for women is 2.7 L (Fig. 12.2) [59]. These values represent fluid intake from all sources, including both food and beverages. Residents can take note of their hydration status by monitoring for symptoms of dehydration as detailed in Table 12.5 [40].

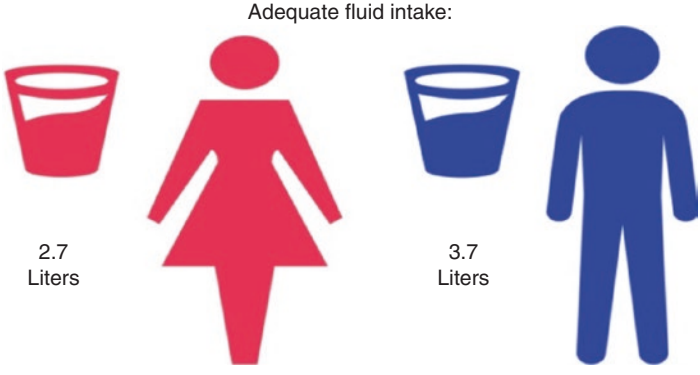

Fig. 12.2 Recommended fluid intake [59]

Table 12.5 Common signs of dehydration [40]

Dark colored urine
Decreased urine output
Dry mouth
Fatigue
Constipation
Light headedness
Headache

Moreover, the authors of this chapter suggest some simple and practical tips that might help, including:

- Carrying a snack in your pocket

- Spending time in meal prep at home once per week or month and then freezing/storing it in portions
- Buying pre-cut/pre-washed veggies, fruits, or salads
- Using grocery delivery services, meal delivery, and meal preparation services
- Using fountains and water bottle filling stations in hospitals, universities, and clinics.

The previous section discussed how the composition and timing of meals can adversely affect circadian rhythm as well as increase the risk for certain metabolic disorders (See section "Nutrition and Physical Health"). As a result, previous studies have recommended that shift workers avoid eating large meals between midnight and 6:00 AM [30]. This suggestion could be applied to overnight call shifts where residents should avoid overindulging while awake overnight.

Key Points

- Home cooked meals are preferable to "convenience foods" which are often available in hospital cafeterias and vending machines [4, 5].

- Resident physicians should take regular nutrition breaks throughout the day [45].
- Resident physicians should monitor their hydration status and ensure regular fluid intake to prevent dehydration and its negative effects on performance [40, 58].

Supplementation

In addition to healthy meals and snacks, there is a lot of hype about dietary supplementation and whether or not this is an evidence-based practice to optimize nutrition. Supplements may be consumed in the form of tablets, capsules, or liquids and are intended to supplement diets with one or more of the following ingredients: vitamins, minerals, fatty acids, fiber, plant matter, and bacteria (in the form of probiotics). Dietary supplements are a multibillion-dollar industry with thousands of products available to consumers. However, the benefits of many available supplements remain uncertain at best. The authors emphasize the importance of getting input from a family physician prior to supplementation. It is preferable to obtain these vitamins and minerals from dietary sources, when at all possible. The authors also refer the reader to Tables 12.1 and 12.2 for a list of good food sources for minerals and vitamins.

Did You Know?

While certain dietary supplements may be beneficial, there are potential associated adverse effects. In the USA, one study estimated that on a yearly basis, 23,000 ED visits are secondary to the adverse effects of numerous dietary supplements [60]. As such, resident physicians should always speak with their family physician before starting supplements.

Is there an App for Optimal Nutrition?

As smartphone usage has expanded, so have the number of applications which focus on health, nutrition, and physical activity. Apps which are tailored towards nutrition generally focus on weight loss through calorie counting [61]. Calories can either be manually entered by the user or the phone's camera can scan a barcode to automatically enter the appropriate nutritional values. Apps can also provide the user with a daily calorie target which incorporates their weight, age, height, physical activity, and overall goal (weight gain vs. weight loss). In addition to calorie counting, these apps can also help users plan nutritious meals and view nutritional information [62]. Other features which are often present include reminders, social network integration, calendars, and journaling. Regarding the effectiveness of these apps, a recent meta-analysis looked at 12 studies which compared the efficacy of apps versus other weight loss options. The analysis identified that apps led to a significant reduction in weight and BMI as compared to other approaches such as counselling and provision of psychoeducational resources [63, 64]. Despite the evidence suggesting that apps may help with weight loss, there is a lack of research into whether or not these apps promote longstanding behavioral change and if they improve the overall quality of diets rather than simply reduce calories.

While there is still much to learn about the potential of nutrition-related apps, they may provide an easy to access resource for resident physicians wishing to optimize their diets, especially when it comes to weight loss or maintenance. Choosing an app can be difficult, given the fact that there were over 97,000 health-related apps in 2015 [64]. Current evidence is scarce for recommending one app over another. However, a number of systematic reviews have assessed the quality of multiple apps. Interested residents are encouraged to review this chapter's references and try an app to see if it helps them optimize their overall nutrition and health [61, 65].

Changes at a Systems Level

While resident physicians may want to optimize their diets and follow suggestions that have been made in this chapter, they are still affected by multiple systemic and external barriers. As with other aspects of resident wellness, meaningful dietary change will only occur when there is a commitment from both individual residents and the system as a whole.

As discussed earlier in this chapter, a major barrier for resident physicians is the lack of healthy food options offered in hospitals as well as inconvenient cafeteria hours. Improvements could include the following [17, 21, 23]:

- Displaying nutritional information
- Reducing availability of high calorie items
- Limiting sugary beverages
- Improving cafeteria hours
- Installing vending machines offering healthy meal options

Further, increasing the accessibility of healthy options would also benefit allied healthcare workers, patients, and their families [17].

Professional organizations and medical schools have a vested interest in supporting the dietary habits of resident physicians. For example, the American Board of Pediatrics has amended their core competencies to include a focus on resident nutrition [66]. Similarly, an Emergency Medicine Resident Wellness Consensus Summit was held in 2017 leading to the development of a longitudinal curriculum for resident wellness. A major focus of this curriculum was self-care, which included a module on nutrition [67]. While these changes are a start, further efforts at a systems level are needed to assist residents when it comes to improving dietary habits.

Check your Learning

Case Study

Greg is a third-year surgical resident. He is currently on his sixth week of an acute care surgery rotation. This rotation is often considered one of the most difficult surgery rotations and Greg has

had trouble adapting to multiple stresses including long hours and having to manage critically unwell patients. Greg is starting to feel exhausted. He and his team typically start rounding on patients at 6:00 AM, which means that Greg has to be up, ready, and out of the house by 5:30 AM. To maximize his sleep, Greg usually skips a full breakfast and simply has a granola bar and a large coffee on the way to work. After rounds, Greg is off to the operating room where he is the first assist on any number of cases, which can last several hours at a time. During the surgeries, Greg often feels quite thirsty and hungry, with subsequent feelings of poor concentration. Even between cases, Greg has limited access to food and drink as he is tasked with completing necessary paperwork and managing post-operative care. If the opportunity arises, Greg will occasionally grab a chocolate bar and another coffee in between cases. Once the day's operations are over, Greg will finally attend to his hunger by heading to the cafeteria. In general, he is too tired when at home the night before to prepare a lunch to bring for himself. Greg often feels frustrated by the lack of choices available at the hospital's cafeteria and will usually settle for a burger, pizza, or fish and chips. After grabbing something to eat, Greg will head back to the ward to address any outstanding patient concerns, see new consults, and supervise medical students. Greg finds this portion of the day especially difficult as he is quite tired. Recently, Greg has noticed that he is deriving less satisfaction from his work and is having trouble empathizing with patients. Furthermore, he often feels irritated with questions from medical students and can be short in his answers. Arriving home, often after 19:00, Greg is frequently too tired to prepare a full meal. He often settles on ordering pizza or heating up a frozen dinner, though sometimes he will just snack before bed. He is often disappointed in himself for not cooking dinner, feeling that he should do better. In addition to feeling disappointed, Greg has felt slightly depressed over the last several months, with an overall lack of motivation to do anything pleasurable.

Question 1. **As time on his rotation progresses, Greg starts to worry about the negative effects of a poor diet and how this could be affecting his health. Poor dietary habits have been associated with which of the following?**

A. **Impairments in cognition**
B. **Risk of physical illness**
C. **Depression and symptoms of burnout**
D. **All of the above**

Answer: D ✓
Numerous studies have documented a positive association between poor dietary habits and all of the above outcomes. (Please see sections "Nutrition and Physical Health", "Nutrition and Cognition", and "Nutrition and Mental Health" for a full discussion of these impacts*). If we look at Greg's diet specifically, we can identify several components which may be affecting his health in a negative manner. Firstly, Greg notes that he often skips breakfast in the morning, a habit which has been shown to be associated with worsened cognitive performance [38]. Further, Greg's fluid intake is low through the day and he is at risk of mild dehydration. As we discussed earlier, dehydration can be associated with impairments in attention, immediate memory skills, and psychomotor function [41]. Lastly, Greg appears to frequently consume frozen and fast food, components of the Westernized diet, which itself has been associated with impaired cognition, anxiety, and depression [35, 50]. It is also important to note that Greg's poor dietary habits have arisen in the context of multiple external barriers. In his case, these barriers include: long working hours, lack of breaks, lack of healthy options at the cafeteria, and professional responsibilities* (i.e., *patient care).*

Question 2. **As the rotation continues, Greg's mental health worsens to the point of him missing work and isolating himself from friends and family. It is during this time that he fully recognizes and accepts that his diet and other lifestyle factors may be impacting his well-being. Greg is committed to change, though he is unsure about the best approach. What best describes the diet recommended for Greg based on Canadian and US guidelines?**

A. **Regular consumption of vegetables, fruit, whole grains, and proteins**
B. **Preferential consumption of refined grains and red meat**
C. **Regular consumption of fruits, vegetable, and saturated fats**
D. **A diet with a focus on dairy, fruits, and fish**

Answer: A ✓
Both guidelines recommend regular consumption of vegetables, fruit, whole grains, and proteins. Unsaturated fats are preferable to saturated fats given the purported benefits on cholesterol [4, 5].

Question 3. **In addition to the acute effects of his diet, Greg is also concerned about how his dietary practices may affect his future health. Given his highly skilled work, Greg wants to adopt a diet which will preserve his cognition for as long as possible. Which diet could potentially protect Greg against future cognitive decline?**

A. **Atkins diet**
B. **Ketogenic diet**
C. **Mediterranean diet**
D. **Westernized diet**

Answer: C ✓
A recent systematic review of observational studies identified that adherence to the Mediterranean diet was associated with improved cognitive functioning and reduced rates of cognitive decline [36]. The Westernized diet has been associated with negative physical, cognitive, and mental health outcomes. In addition to the effects on cognition, research has identified that high adherence to the Mediterranean diet was shown to be protective against depression [47]. As noted previously, the Mediterranean diet consists primarily of vegetables, fruits, legumes, whole grains, fish, and olive oil.

Key Takeaways

- Individual energy requirements differ greatly for individuals and can be calculated using the EER equation (see "Additional Resources" below) [2].
- Guidelines recommend regular consumption of vegetables, fruits, whole grains, and proteins [4, 5].
- Limited evidence suggests that resident physicians may suffer from poor dietary habits [13, 17, 19].
- Dietary habits are associated with physical illness, cognitive performance, and mental health [27, 35, 50, 51].
- Residents should take regular nutrition breaks at work while also maintaining an adequate level of hydration [45, 58].
- Dietary supplementation may be appropriate for certain individuals in certain circumstances, though guidance from a healthcare professional is recommended before starting a supplement.
- Smartphone apps may provide useful tools for weight management [61–65].
- Systemic changes are needed to address barriers which negatively impact the nutritional health of resident and practicing physicians [17, 21, 23].

Additional Resources

Table 12.6 enlisted selected dietary resources.

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Table 12.6 Selected dietary resources

Selected dietary resources	Brief description
Canada's food guide https://food-guide.canada.ca/en/	Provides access to resources for both consumers and clinicians. Lists the evidence used in the development of the guidelines
2015–2020 Dietary guidelines for Americans https://health.gov/dietaryguidelines/2015/	Provides access to the USDA's dietary guidelines
Choose my plate https://www.choosemyplate.gov/eathealthy/WhatIsMyPlate	Easy to digest description of healthy eating basics. In addition, a number of infographics are available to aid with patient teaching
Dudek SG. Nutrition essentials for nursing practice. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010.	An easy to digest textbook on the basics of nutrition
Gerrior S, Juan W, Basiotis P. An easy approach to calculating estimated energy requirements. Prev Chronic Dis. 2006;3(4):A129.	A useful resource that describes how to calculate your EER
Unlock food https://www.unlockfood.ca/en/AboutUnlockFood.aspx	A website that is written and reviewed by Canadian dieticians (and thus evidence-based) and has info on nutrition throughout the lifespan as well as recipes, media, and interactive tools

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