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Nutrition and Technology in the Management of Diet-Related Chronic Diseases: Providing Evidence-Based Nutrition Recommendations in the Collaborative Development of a Nutrition Optimization Tool for Physicians at Grady Health Systems

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Introduction

Computer science students at Georgia Institute of Technology (GT) created a web-based nutrition optimization application to assist physicians and dietitians at Grady Health System (GHS) in providing evidence-based nutrition recommendations for those with type 2 diabetes, chronic kidney disease (CKD), cardiovascular disease (CVD), and hypertension (HTN). The app will generate a meal plan, recipe list, and grocery list based on the patient's condition and monthly food budget. The purpose of this capstone project is to assist GT students by providing dietary recommendations based on current guidelines and accepted dietetic practices. This literature review explores the prevalence of the above diet-related chronic diseases within the community served by Grady Health Systems (GHS), current dietary guidelines for such diseases, current barriers, and existing technology in nutrition-related healthcare.

Diet Related-Chronic Diseases

GHS Community Health

The relationship between diet and health is well established. The US Burden of Disease Collaborators identified poor diet quality as the leading cause of premature death and disability, accounting for over half a million deaths in 2016, 83.9% of which were attributed to cardiovascular disease.[1,2] According to the Centers for Disease Control (CDC), heart disease, diabetes, and kidney disease were among the ten leading causes of death in Georgia in 2017.[3] Unsurprisingly, a 2019 Community Health Needs Assessment (CHNA) completed by GHS also identified these conditions in the top ten leading causes of death in the GHS service area (Fulton and Dekalb counties in the Atlanta, Georgia metro area), with diseases of the cardiovascular system making up the top three places.[4]

The CHNA also identified several social determinants of community health that disproportionately affect those in the community served by GHS, including economic security, housing, food access, educational attainment, limited English speaking, and transportation.[4] As a consequence, persistent health disparities contribute to increased disease burdens and death rates among Latino and African American residents, single-parent households, those without legal immigration status, and several zip codes in the southern half of GHS's service area.[4] Although the GHS's service area as a whole consists of residents who earn a higher income, have a higher level of education attainment, and have higher rates of housing security and health insurance when compared with the state, for residents in these specific zip codes in the southern half of GHS's the opposite is true.[4]

Comorbidity Relationships

The relationship between diabetes, CVD, HTN, CKD is complex; when two of these diseases exist together care can become complicated. HTN and diabetes are the two leading causes of CKD, a progressive disease with five stages.[5] The goal of care for CKD is to slow progression as much as possible.[6] In the earlier stages of CKD, the management of comorbidities, such as HTN and diabetes, is recommended.[6] Both CKD and HTN are often referred to as silent diseases, as the early stages often have no signs or symptoms.[6] In fact, only 10% of those with CKD stages 1-3 are aware of their condition.[7] Those with CKD are also at a higher risk for CVD, which can complicate the management of the disease.[7] The National Institute of Diabetes and Digestive and Kidney Disease reports that there is an increase in hospitalizations among those with CKD who have comorbidities such as CVD and diabetes, and more than 50% of people with CKD stage 5 are caused by CVD.[7]

Additionally, CVD is the leading cause of death in those with diabetes, and glucose intolerance, HTN, and dyslipidemia are all risk factors for CVD. [7,8] Although this relationship exists, the 2016 National Diabetes Survey from the National Diabetes Education Program reports that only 75% of those with diabetes or at risk for diabetes are aware of the link between the two diseases.[7]

As a risk factor, obesity can contribute to the development of these diet-related chronic diseases. Low socioeconomic status (SES), food access, and education attainment have been linked to higher rates of obesity.[8] These social determinants of health can contribute to an obesogenic environment where weight gain is promoted and weight loss is challenging.[8] For example, low SES neighborhoods have few grocery stores and an abundance of fast-food restaurants, and are associated with higher body weight, waist circumference, and elevated nutrition-related biomarkers.[8] A recent study from Ward et al. published in the New England Journal of Medicine predicts that by the year 2030, more than half of adults in Georgia will be obese. Furthermore, severe obesity, classified by a body mass index (BMI) of 35 kg/m2 or greater, will become the most common BMI category among low-income adults, women, and non-Hispanic Black residents.[9] It is, of course, too early to say whether these estimates will come to fruition, however, the implications for the GHS community are alarming and highlight the need for interventions.

Guidelines for Diet-Modifications

Though the pathophysiology of chronic diseases is complex, modifiable risk factors such as poor diet quality, obesity, physical inactivity, and excessive alcohol intake can contribute to

the development of HTN, CVD, type 2 diabetes, and CKD.[8,10] As such, lifestyle factors are often viewed as a primary intervention to prevent and manage diet-related chronic diseases.

Dietary Approaches to Stop Hypertension (DASH) is a cardioprotective eating pattern recommended for both HTN and CVD. It is high in fruits and vegetables, nuts, and low-fat dairy, but low in saturated fat, total fat, and sodium.[11] The DASH diet emphasizes calcium, fiber, magnesium, and potassium to aid in lowering blood pressure.[11] The guidelines for HTN from the Academy of Nutrition and Dietetics (AND) recommend meeting the Dietary Reference Intakes (DRIs) for these nutrients through diet to aid in blood pressure control.[11] Those that are unable to meet the DRIs through their diet, may benefit from supplementation if recommended and monitored by their registered dietitian (RD).[11]

Two approaches that have been proven to lower blood pressure are reducing sodium intake and following the DASH diet.[11,12] When these approaches are combined, they create a synergistic effect.[11,12] Generally, evidence-based recommendations from AND, the American College of Cardiology/American Heart Association (ACC/AHA), and the 2015-2020 Dietary Guidelines for Americans (DGA) agree that an ideal reduction of sodium to 1500 mg daily in those with HTN produces positive clinical effects on blood pressure.[11–13] The AND guidelines and the 2015 DGA suggest a limit of 2300 mg among all adult populations, while the ACC/AHA guidelines are slightly more generous with a recommendation of 2400 mg daily.[11–13] The ACC/AHA also suggests reducing one's normal intake by at least 1000 mg if the ideal 1500 mg is not achievable.[12]

A cardioprotective diet is also recommended for those with diabetes, HTN and CVD.[11,12,14] According to AND, a cardioprotective diet is tailored to the individual limits saturated fat, trans-fat and cholesterol while providing adequate macronutrients and fiber.[14]

However, there are several differences in the recommendations for total, saturated, and trans fats as part of a cardioprotective diet. For example, AND recommends limiting total fat to 25-35% of total calorie intake, and saturated fat and trans-fat to below 7% of total calories.[14] However, the AHA/ACC guidelines recommend no more than 5-6% of total calories from saturated fat and to reduce trans-fats for a cardioprotective diet.[12] The 2015 DGA recommends that less than 10% of total calories are consumed as saturated fat, and trans-fat consumption should be as low as possible.[13]

According to the American Diabetes Association (ADA), there is a lack of evidence that a specific diet is beneficial for all those with diabetes, and a variety of healthy eating patterns, including Mediterranean, vegetarian, low-fat vegan, low fat, low carbohydrate, and the DASH diet are all examples of appropriate patterns.[15] As such, an individualized approach to diet is recommended for macronutrient distribution, with consideration to personal preferences, such as traditions, culture, religion, health beliefs and goals, and economics.[15] Protein needs are increased for those with diabetes, and the ADA recommends 1-1.5 grams per kilogram of body weight daily.[15] Emphasis should be placed on non-starchy vegetables, minimizing added sugars and refined grains, and choosing whole foods over highly processed foods whenever possible.[15] For those with overweight or obesity, a reduced energy, healthful eating plan, with a goal of weight loss, weight maintenance, and weight gain prevention is recommended.[15]

Dietary guidelines for CKD differ depending on the stage.[16] As previously mentioned, in the first two stages of CKD, the goal of care is to prevent disease progression by controlling comorbidities such as diabetes and HTN.[16] As CKD progresses to stage 3, dietary modifications beyond those required for controlling comorbidities are recommended.[16] In stages three through five, before dialysis, daily protein needs are lowered to 0.6-0.8 grams per kilogram of body

weight, with at least 50% from high biological value sources to prevent additional damage to the kidneys while providing sufficient essential amino acids.[16] While protein is restricted, the recommended range for caloric intake increases from the 25-30 calories per kilogram of body weight, a commonly used as a simplistic weight-based equation, to 25-35 calories per kilogram of body weight.[16,17] It is important to emphasize healthy sources of fat and limit saturated fat to less than 7% of total fat due to the increased risk in CVD among those with CKD.[16] At these stages, potassium and phosphorus are not typically restricted, but if they may be on an individual basis depending on the patient's blood chemistry.[16]

As CKD progresses to stage 5 and dialysis is required, the diet requires further adjustment. To prevent protein-energy wasting in dialysis, protein is increased to 1.1-1.5 grams per kilogram of body weight daily, with at least 50% from high biological value sources.[16] Similarly, sodium intake is slightly more liberalized at this stage to 2-3 grams daily. Hyperkalemia, hypercalcemia, and hyperphosphatemia are common in stage 5 of CKD on dialysis due to metabolic changes or medications.[16] It is recommended that potassium is limited to 2-4 grams per day or 40 mg per kilogram of body weight daily, calcium is restricted to 2 grams per day, and phosphorus is limited to 800-1000 mg per day while a patient is undergoing hemodialysis.[16] Fluid intake is also generally restricted to 1 liter per day in addition to the amount of urine a patient generates.[16] Management of CKD at all stages presents many challenges and should be individualized and closely monitored by both a physician an RD.[16]

In the absence of guidelines for specific disease states, specific nutrient intake should default to that recommended for the general population, which is given by age and gender by the DRIs.[18] For macronutrient distribution, the Acceptable Macronutrient Distribution Range (AMDR) is used.[18] Other recommended lifestyle modifications for the diet-related chronic

diseases discussed in this review include moderating or abstaining from alcohol consumption, and 40 minutes moderate to intense exercise 3 to 4 times per week.[11–13]

Nutrition Counseling and Education

Given the complex dietary modifications required to control these diseases, it is no surprise that evidence suggests that the management of diet-related chronic diseases should include medical nutrition therapy (MNT), as well as nutrition counseling and nutrition education.[11,12,14–16,19] MNT refers to "nutritional diagnostic, therapy, and counseling services for the purpose of disease management which are furnished by a registered dietitian or nutrition professional."[19] A recent systematic literature review concluded that MNT delivered by an RD as part of a multidisciplinary healthcare team is effective in improving weight, BMI, waist circumference, hip circumference, fasting blood glucose, Hemoglobin A1c (HBA1c), fasting insulin, insulin resistance, LDL-cholesterol and HDL-cholesterol in a variety of health conditions including diabetes, CVD, and CKD.[20] Additionally, RD delivered MNT to patients with diabetes, CKD stages 3- 4, or a kidney transplant is covered by the Center for Medicare Services (CMS).[16]

Diabetes Self-Management Education and Support (DSMES) addresses clinical, educational, psychosocial, and behavioral aspects required for daily self-management of diabetes.[21] DSMES has also resulted in reduced HbA1c levels, improved quality of life, reduction in diabetes-related complications, and is also considered reimbursable under CMS when the service is accredited by the Association of Diabetes Care and Specialists or the ADA.[21] However, DSMES is distinct from MNT as it often occurs in a group setting and covers general education while MNT can occur one-on-one or in a group and is individualized, and referral to a registered dietitian for MNT along with DSMES should be incorporated in diabetes care.[21] It is

recommended that those with diabetes receive DSMES at four critical times: at diagnosis, annually, when not meeting treatment targets, as complicating factors emerge, and when transitions in life and care occur.[21] Though MNT for several conditions and DSMES are reimbursable under CMS, a referral is required from the primary healthcare provider.[21]

Barriers to Diet-Related Chronic Disease Management

Patient Barriers

Though lifestyle interventions are appropriate interventions for diet-related chronic disease, various studies have identified barriers to managing these chronic diseases. Commonly cited challenges for patients include food access and cost, a lack of practical information, cultural food preferences and practices, and the time required for grocery shopping, planning and preparing meals.[22–27] Many of these barriers are associated with the social determinants of health identified by GHS' CHNA, suggesting that these challenges may be relevant to the GHS community.[4]

Several studies exploring the relationship between income, food access, and chronic disease, have observed that low socioeconomic status (SES) and low access to food create significant barriers to accessing healthcare and managing chronic disease.[23,26,27] Suarez et al. (2015) described lower levels of serum carotenoids and higher blood pressure in those living in food deserts and in those with low income suggesting lower fruit and vegetable intake in those with low food access.[27] Similarly, a qualitative study by Orzech et al. (2013) found that many with diabetes and HTN are aware of the dietary guidelines for managing their diseases, but a lack of economic security contributed to little control over food choices.[23] Lack of control over food choices is often a barrier for those with low SES and people experiencing homelessness.[23,25,26]

These populations may be forced to rely more heavily on food pantries where there are limited fresh foods and an abundance of processed and canned foods due to low food access and the need for shelf-stable foods.[23,25,26] Processed and canned foods often have higher levels of sodium, sugar, and fat, which are recommended to limit in diet-related chronic diseases.[28] However, there are canned and frozen foods available with low or no added sodium, sugar, and fat that are low cost, nutrient-dense options, with long shelf lives.[28] Bertoni et al. (2011) found that many with a low SES attempting the DASH diet were concerned with the spoilage of fresh foods, and were unsure if fresh or frozen foods could be substituted, indicating that education regarding healthy fresh and canned options is warranted.[23]

Research has also identified that gaps in knowledge and education needs affect patients' ability to manage these diseases. Bertoni et al. (2011) found that among African Americans with HTN and a low SES, the literature on the DASH diet was not practical.[23] Study participants suggest that the literature could be improved with the addition of ingredient substitutions, keeping to a 7th-grade reading level, and providing a guide for better understanding food labels, the difference between types of fat, alternatives for when fresh produce is not affordable, and more information about how to reach food goals.[23-] These findings are consistent with Lopez-Vargas et al.'s 2014 study of Australian patients with CKD stages 1-4, which identified through focus groups that patients sought more practical advice regarding meal preparation and which foods to choose or avoid.[24] The study also reported that patients referenced a lack of information and awareness regarding CKD among the general population, younger generations, and general practitioners.[24] Patients reported the desire for better communication with their physician, and more information about how to slow the progression of CKD.[24] Those with CKD face specific challenges in managing potassium, calcium, and phosphorus restrictions because they are often

not listed on nutrition labels, cannot be sensed through taste, and are widely used in food additives and preservatives.[6]

If not considered in a patient's care, their cultural background may also serve as a barrier to adherence to dietary modifications. Across several studies, a lack of familiarity with recommended foods and the availability and cost of recommended foods was a source of frustration.[22,23,26]Aroian et al. (2012) conducted a qualitative study of attitudes and beliefs in a Hispanic population found that cultural expectations may make it difficult to turn down unhealthy foods that are associated with tradition as they are viewed as markers of ethnicity, hospitality, and affection.[22] This is similar to Bertoni et al.'s findings that African American patients with HTN felt that because the DASH diet doesn't include familiar foods or cooking techniques, temptation at community gatherings was a significant barrier.[23] Focus group members from this study also stated that foods included in the DASH diet brochures were unfamiliar, unavailable, or expensive to prepare.[23] Orzech (2013) described patients' feelings that the recommendations for dietary changes conflicted with diets traditionally enjoyed by Latino and African American communities, forcing them to give up preferred foods.[26] According to focus groups within the study, Latino women were most affected by this as they often reported making traditional foods for loved ones that they were unable to eat themselves.[26] This is consistent with recommendations highlighting the need to individualize nutrition interventions with consideration to the patient's culture.[12,15,16,19]

Healthcare System Barriers

Although evidence shows MNT provided by an RD is economically and clinically effective in managing diet-related chronic diseases, studies indicate that it is an underutilized approach.[16,19,29] In the United States, it is estimated that less than half of those with diabetes

receive diabetes education, and even fewer have seen an RD.[19] A 2020 report states that only 5% of Medicare and participants receive DSMES in their first year of diagnosis.[21] Similarly, a retrospective study of CKD patients in the United States who began hemodialysis between 2005 and 2007 found that 88% of patients received no pre-dialysis MNT.[16]

Physicians are recognized as having a significant influence on patients and serve as facilitators of diet-related behavior change for the prevention and management of chronic diseases.[29] Although the guidelines for the management of diet-related chronic diseases place importance on lifestyle approaches, research suggests that physicians are not implementing these forms of interventions.[1,30] Devries et al. (2017) found that although 95% of surveyed cardiologists believe that personally providing patients with at least basic nutrition information is part of their role, 59% report spent three or fewer minutes discussing nutrition at each patient visit.[1] Given that poor diet is the leading cause of death, largely facilitated through diet-related chronic diseases, failure to provide nutrition education to at-risk patients can contribute to late diagnosis, comorbid conditions increased healthcare costs, and poor health outcomes.[1,5,10]

Implicit or unconscious bias among physicians pertaining to weight, gender, ethnicity, and race may also serve as a barrier to patient care and perpetuate health care disparities.[21] Referrals to RDs and other healthcare professionals may be limited by implicit bias if a physician or provider incorrectly assumes that a patient has a low willingness or ability to participate.[21] Dash et al. (2020) conducted a recent survey of Canadian physicians about their knowledge, attitudes, and behaviors related to delivering dietary advice for patients with HTN, finding that perceived patient barriers may play a role in the physicians' choice to discuss dietary approaches to reducing blood pressure.[30] Specifically, when physicians were asked to identify various factors that played a role in discussing diet with patients with HTN, the belief that patients are dishonest

about their diet was acknowledged by 76% of respondents, and the belief that patients would not follow their advice was indicated by 57.5%.[30]

Physicians have cited multiple barriers to delivering diet-related care, including time and nutrition knowledge deficits.[1,30] For example, it is well established from a variety of studies that physicians lack the formal education and training in nutrition required to provide patients with effective nutrition education and counseling.[29–34] Several articles have been published to educate physicians on the importance of nutrition education and counseling for patients with chronic diseases and how to incorporate these techniques into their practice.[29,35,36] However, these articles appear to be primarily concerned with the potential for physicians to receive reimbursement for providing nutrition counseling rather than offering a referral to an RD.[29,35,36] Furthermore, these articles make no attempt to differentiate between the quality of nutrition counseling and education provided to patients by physicians and that given by an RD.[29,35,36] In contrast to the limited nutrition education received by physicians, nutrition is the primary focus of an RD's education. The role of an RD is essential for the management of diabetes and CKD.[15,16,37,38] The ACC/AHA guidelines for cardiovascular disease prevention recommend counseling for lifestyle changes, including nutrition as a primary intervention, however, they only acknowledge the role of an RD in managing diabetes.[12] The guidelines fail to acknowledge the positive clinical outcomes associated with MNT provided by an RD in the care of those with HTN and CVD.[12,20]

It has been suggested that in addition to educating physicians about nutrition, a multidisciplinary approach incorporating nurses, dietitians, and others in nutrition education and counseling should be adopted.[39] However, low referral rates from physicians and other providers may contribute to low utilization rates of MNT and DSMES.[21] Dash et al. (2020) found that although only 38.8% of physicians engaged in diet-related discussions with their patients, half

reported that they never or rarely referred patients to an RD.[30] McClinchy et al. (2015) identified a need for more referral opportunities to an RD, and evidence-based nutrition education materials for non-RD healthcare workers to use when working with patients with diet-related chronic diseases.[40]

Nutrition Technology in Meal Planning for Diet-Related Chronic Diseases

Nutrition informatics applications have been developed for a variety of uses in the clinical setting. Skouroliakou et al. conducted a study on an application tool developed to aid in the meal planning and menu assessment responsibilities of the RD in an inpatient setting.[41,42] Their research suggests that using nutrition informatics systems in a clinical setting can reduce errors in the calculation of patient needs, can reduce time spent by the RD on these tasks, and may allow for more time dedicated to nutrition counseling and education.[41,42]

Computerized meal planning has been an area of interest for optimization of nutrition, cost, and satisfaction for nearly 80 years.[43] Several models have been designed to mimic the thought process of an RD in assessing a patient's nutrient needs and designing meal plans.[43,44] A Malaysian, web-based menu-generating and management system called DietPal is able to automatically calculate nutrient and calorie intake according to a dietary recall, and automates the process of calculating the client's nutrient and energy needs based on anthropometrics.[44] DietPal also generates a meal plan based on these needs and stores it for future recall to use in patients with similar energy and nutrient needs.[44] Interestingly, this 2004 article stated that the future aims were to generate meal plans for diabetes, hyperlipidemia, obesity, and HTN, but no updates on DietPal were found during the course of this literature review.[44]

DIETOS is an Italian dietary recommender system for managing and monitoring chronic diseases.[45] This system differs from DietPal in a number of ways, most notably that it does not provide a meal plan, but instead lists recommended foods, quantity of foods, and functional properties of recommended foods.[45] DIETOS is designed for use by the patient rather than the RD.[45] Due to the previously discussed relationships between chronic diseases, DIETOS was designed to act a screening tool for monitoring the development of comorbidities.[45] DIETOS prompts users to answer questions about their health including what kinds of medications they take and various laboratory values.[45] The series of questions follows a flow chart, and each new question is determined by the patient's response to the previous question.[45] DIETOS then creates a user profile for the patient and provides both a diagnosis and a recommended diet to follow (i.e., low protein, salt, calories, etc.).[45] In a clinical experiment designed to assess the ability of DIETOS to correctly diagnose a patient with CKD (including staging), diabetes, and hypertension, DIETOS had a 100% specificity and a 91% sensitivity when compared with a nephrologist's diagnosis of 40 patients.[45] DIETOS indicates that future aims are to incorporate recipes and diets compatible with the patient's health status, but no updates were available at the time of this review.[45]

Evidence suggests that healthcare professionals are supportive of the use of technology in the management of diet-related chronic diseases.[30,44,46] Dash et al. (2020) found that 80% of surveyed physicians viewed nutrition-focused apps and Electronic Medical Record (EMR) tools as facilitators for providing nutrition education and counseling with patients with HTN.[30] In another study done by Karduck et al. (2018) of more than 700 clinicians, indicates that 53% are recommending smartphone applications to patients with diabetes and obesity, and many believe app usage may result in improved health outcomes and adherence to dietary recommendations.[46]

Project Description

The chronic diseases chosen for this project were based on their relevance to the community and the GT team. As previously discussed, the current MNT recommendations for these disease states include many dietary restrictions, which can be challenging for patient adherence. Additionally, many of the dietary restrictions or modifications for these disease states can be expressed numerically, allowing for computation by the software. For example, limits to saturated fat are expressed as a percentage of one's total daily caloric intake which is calculated using either predictive equations such as Mifflin St. Jeor or by simplistic weight-based equations expressed as calories per kilogram of body weight.[17] For simplicity within the app, this project utilized the simplistic weight-based equations.

The web-based application sources recipes using an Application Programming Interface (API) from a company called Spoonacular. This API pulls recipes from websites and blogs, then provides recipes, recipe photos and data on nutrition content, ingredients, and estimated cost for each recipe. The application then uses linear optimization to find the best possible meal plan for patients based on nutrition parameters which are calculated using patient information input by the physician (i.e. disease state, weight, sex, age, height, and food budget) and the macronutrient and micronutrient ranges for each disease state provided as part of this capstone project. Finally, the application provides a 7-day meal plan, recipe list, grocery list, and nutrition education materials for the patient.

A flowchart meant to mimic the thought process an RD would use to determine and classify a patient's BMI, and subsequently which weight to use for simplistic weight-based estimations of energy needs was developed and provided to the GT team (see appendix I). Additionally, an excel file with minimum and maximum values for relevant micronutrients and

macronutrients was developed using the evidence-based guidelines previously discussed. This excel file was provided to the GT team to incorporate into the software for computation of nutrition parameters required for linear optimization (see appendices II-VI). Finally, evidence-based patient nutrition education materials were developed for each disease state (see appendices VII-XI).

Project Limitations

This project had several limitations. The accuracy of the nutrition information in Spoonacular was not verifiable as it was pulled from many websites. Dietary restrictions for the project were limited by the nutrients, units of measure, and ingredients in Spoonacular's API (i.e., unable to account for the biological value of protein for CKD). Although BMI is a useful tool, there is no substitution for an RD's clinical judgment in assessing a patient. After consideration, adjustments were made to the project to include only patients below 65 years of age, as those over 65 would likely require a more detailed assessment. Guidelines consistently indicate the need to individualize MNT for patients, which was not possible through this particular project. To account for this limitation, a referral to an RD was recommended, and nutrition education materials were developed with a disclaimer that the application, meal plan, and literature are not a substitute for MNT. Another limitation of the project was that the meal plans could not be individualized based on the patient's culture due to the limited data available from Spoonacular. The literature review was also limited in the ability to explore current nutrition technology, as the language used in computer science is often technical and challenging for other disciplines to navigate. It is also possible that new technology developed for the market is not available in the literature due to concerns over technology theft from competitors.

Future Considerations

Future applications should explore further ways to alleviate identified barriers to managing diet-related chronic diseases. For example, future designs should explore the potential for the application to facilitate a multidisciplinary approach to care by allowing RDs and physicians to collaborate within the application, as well as integration with electronic health record software for automated referrals to an RD. Additionally, there is a potential for RDs to create their own API consisting of reliable, budget-friendly recipes while incorporating seasonality, ingredients covered by food stamps, and cultural preferences. Furthermore, the possibility of linking the application to a grocery delivery service (i.e., Amazon Fresh, Instacart) to alleviate the barriers of a lack of transportation and food deserts should be explored.

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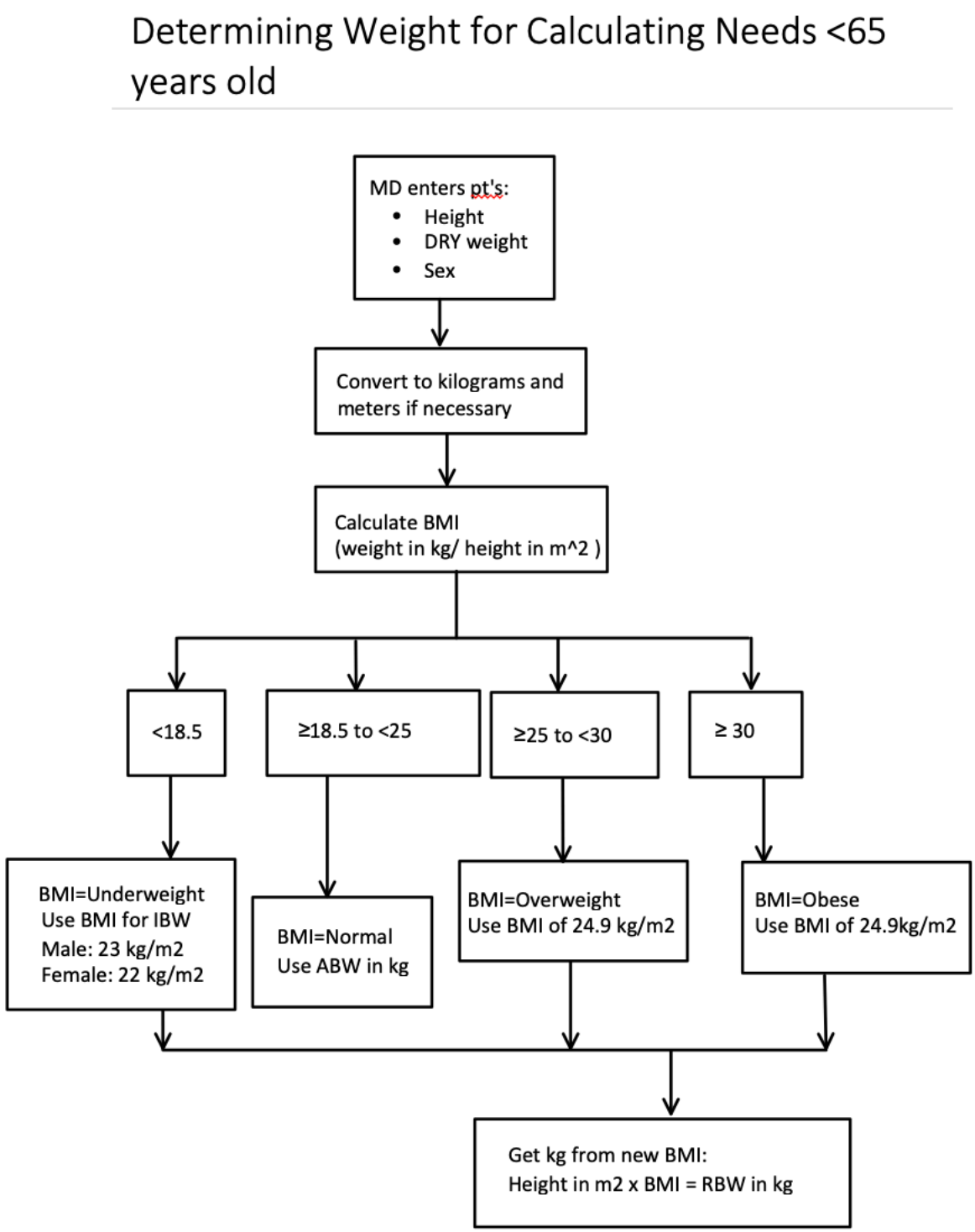
Appendix I: Flowchart for Determining Weight



IBW: Ideal Body Weight; ABW: Actual Body Weight; RBW: Recommended Body Weight

Appendix II: Nutrition Parameters

Disease, Sex, Age	Min Calories (kcal/kg BW/day)	Max Calories (kcal/kg BW/day)	Min Protein (g/kg BW/day)	Max Protein (g/kg BW/day)	Min Carbs (% of total daily kcal)	Max Carbs (% of total daily kcal)	Min Fat (% of total daily kcal)	Max Fat (% of total daily kcal)	Max Alcohol (g)	Min Copper (mg)	Min Calcium (g)	Max Calcium (g)	Min Chloride (mg)	Max Cholesterol (mg)	Max Saturated Fat (% of total daily kcal)	Min Vitamin C (mg)	Min Vitamin D (µg)	Min Vitamin E (mg)	Min Vitamin K (µg)	Min Vitamin B1 (mg)	Min Vitamin B2 (mg)	Min Vitamin B5 (mg)	Min Vitamin B3 (mg)	Min Vitamin B6 (mg)	Min Vitamin B12 (µg)	Min Fiber (g)	Min Folate (g)	Min Iodine (g)	Min Iron (mg)	Min Magnesium (mg)	Min Manganese (mg)	Min Phosphorus (mg)	Max Phosphorus (mg)	Min Potassium (mg)	Max Potassium (mg)	Min Selenium (g)	Min Sodium (mg)	Max Sodium (mg)	Min Zinc (mg)
HTN																																							
Male, 19-30	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	9.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	400	2.3	700		4700		0.000055	1500	2300	11
Male, 31-50	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	9.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	420	2.3	700		4700		0.000055	1500	2300	11
Male, 51-64	25	30	0.8	1	45	65	20	35	0	0.9	1		2000	199	9.99	90	15	15	120	1.2	1.3	5	16	1.7	2.4	30	0.0004	0.00015	8	420	2.3	700		4700		0.000055	1300	2300	11
Female, 19-30	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	9.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	310	1.8	700		4700		0.000055	1500	2300	8
Female, 31-50	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	9.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	320	1.8	700		4700		0.000055	1500	2300	8
Female, 51-64	25	30	0.8	1	45	65	20	35	0	0.9	1.2		2000	199	9.99	75	15	15	90	1.1	1.1	5	14	1.5	2.4	21	0.0004	0.00015	8	320	1.8	700		4700		0.000055	1300	2300	8
CVD																																							
Male, 19-30	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	400	2.3	700		4700		0.000055	1500	2300	11
Male, 31-50	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	420	2.3	700		4700		0.000055	1500	2300	11
Male, 51-64	25	30	0.8	1	45	65	20	35	0	0.9	1		2000	199	6.99	90	15	15	120	1.2	1.3	5	16	1.7	2.4	30	0.0004	0.00015	8	420	2.3	700		4700		0.000055	1300	2300	11
Female, 19-30	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	310	1.8	700		4700		0.000055	1500	2300	8
Female, 31-50	25	30	0.8	1	45	65	20	35	0	0.9	1		2300	199	6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	320	1.8	700		4700		0.000055	1500	2300	8
Female, 51-64	25	30	0.8	1	45	65	20	35	0	0.9	1.2		2000	199	6.99	75	15	15	90	1.1	1.1	5	14	1.5	2.4	21	0.0004	0.00015	8	320	1.8	700		4700		0.000055	1300	2300	8
Diabetes																																							
Male, 19-30	25	30	1	1.5	45	65	20	35	0	0.9	1		2300	199	6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	400	2.3	700		4700		0.000055	1500	2300	11
Male, 31-50	25	30	1	1.5	45	65	20	35	0	0.9	1		2300	199	6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	420	2.3	700		4700		0.000055	1500	2300	11
Male, 51-64	25	30	1	1.5	45	65	20	35	0	0.9	1		2000	199	6.99	90	15	15	120	1.2	1.3	5	16	1.7	2.4	30	0.0004	0.00015	8	420	2.3	700		4700		0.000055	1300	2300	11
Female, 19-30	25	30	1	1.5	45	65	20	35	0	0.9	1		2300	199	6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	310	1.8	700		4700		0.000055	1500	2300	8
Female, 31-50	25	30	1	1.5	45	65	20	35	0	0.9	1		2300	199	6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	320	1.8	700		4700		0.000055	1500	2300	8
Female, 51-64	25	30	1	1.5	45	65	20	35	0	0.9	1.2		2000	199	6.99	75	15	15	90	1.1	1.1	5	14	1.5	2.4	21	0.0004	0.00015	8	320	1.8	700		4700		0.000055	1300	2300	8
CKD stages 3-4																																							
Male, 19-30	25	35	0.6	0.8	45	65	20	29.99	0	0.9	1		2300		6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	400	2.3	700	individualized	4700	individualized	0.000055	1500	2300	11
Male, 31-50	25	35	0.6	0.8	45	65	20	29.99	0	0.9	1		2300		6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	420	2.3	700	individualized	4700	individualized	0.000055	1500	2300	11
Male, 51-64	25	35	0.6	0.8	45	65	20	29.99	0	0.9	1		2000		6.99	90	15	15	120	1.2	1.3	5	16	1.7	2.4	30	0.0004	0.00015	8	420	2.3	700	individualized	4700	individualized	0.000055	1300	2300	11
Female, 19-30	25	35	0.6	0.8	45	65	20	29.99	0	0.9	1		2300		6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	310	1.8	700	individualized	4700	individualized	0.000055	1500	2300	8
Female, 31-50	25	35	0.6	0.8	45	65	20	29.99	0	0.9	1		2300		6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	320	1.8	700	individualized	4700	individualized	0.000055	1500	2300	8
Female, 51-64	25	35	0.6	0.8	45	65	20	29.99	0	0.9	1.2		2000		6.99	75	15	15	90	1.1	1.1	5	14	1.5	2.4	21	0.0004	0.00015	8	320	1.8	700	individualized	4700	individualized	0.000055	1300	2300	8
CKD stage 5 with HD																																							
Male, 19-30	25	35	1.1	1.5	45	65	20	29.99	0	0.9	1	2	2300		6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	400	2.3	2000	4000	800	1000	0.000055	2000	3000	11
Male, 31-50	25	35	1.1	1.5	45	65	20	29.99	0	0.9	1	2	2300		6.99	90	15	15	120	1.2	1.3	5	16	1.3	2.4	38	0.0004	0.00015	8	420	2.3	2000	4000	800	1000	0.000055	2000	3000	11
Male, 51-64	25	35	1.1	1.5	45	65	20	29.99	0	0.9	1	2	2000		6.99	90	15	15	120	1.2	1.3	5	16	1.7	2.4	30	0.0004	0.00015	8	420	2.3	2000	4000	800	1000	0.000055	2000	3000	11
Female, 19-30	25	35	1.1	1.5	45	65	20	29.99	0	0.9	1	2	2300		6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	310	1.8	2000	4000	800	1000	0.000055	2000	3000	8
Female, 31-50	25	35	1.1	1.5	45	65	20	29.99	0	0.9	1	2	2300		6.99	75	15	15	90	1.1	1.1	5	14	1.3	2.4	25	0.0004	0.00015	18	320	1.8	2000	4000	800	1000	0.000055	2000	3000	8
Female, 51-64	25	35	1.1	1.5	45	65	20	29.99	0	0.9	1.2	2	2000		6.99	75	15	15	90	1.1	1.1	5	14	1.5	2.4	21	0.0004	0.00015	8	320	1.8	2000	4000	800	1000	0.000055	2000	3000	8

Appendix III: HTN Nutrition Education Handout

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

Hypertension

Blood pressure that is too high (hypertension) can lead to a heart attack or stroke. This handout includes small changes in your food choices and activity levels can help to manage your blood pressure and reduce your risk.

Registered Dietitian Nutritionists (RDNs) are food and nutrition experts trained in Medical Nutrition Therapy. An RDN will work with you one-on-one assess your individual nutrition needs and come up with a plan to meet those needs. Receiving nutrition therapy, education, and counseling from an RDN has proven to be effective in helping to manage this condition. Ask your doctor for a referral and call (404) 616-1000 to make an appointment with a Registered Dietitian at Grady.

KEY POINTS

LIMIT SODIUM

Most of the sodium we get comes from salt in our food and drinks.

- Limit sodium to no more than **2300 milligrams (mg)** each day**.**
- Limiting sodium to **1500 mg** each day can lower your blood pressure even more.

LIMIT UNHEALTHY FATS

Unhealthy fats can raise your risk for heart disease and stroke.

- **Limit saturated fats** found in animal products.
- **Avoid Trans fats** found in fried foods and packaged baked goods.

Saturated fats are usually solid at room temperature.

CHOOSE HEALTHY FATS

Eat these heart-healthy fats more often.

- **Choose unsaturated fats**
- **Choose omega-3 fatty acids** found in some fish and nuts.

Healthy fats are usually liquid at room temperature.

RECOMMENDED LIFESTYLE CHANGES

ADD PHYSICAL ACTIVITY

Increasing physical activity can help you to lower your blood pressure.

Aim to exercise for about 30 minutes most days of the week.

KEEP A HEALTHY WEIGHT

If you're overweight, talk to your doctor or registered dietitian about setting a goal for a healthy weight.

If you're at a healthy weight, try to maintain your weight.

MODERATE ALCOHOL

If you drink alcohol, make sure it's in moderation.

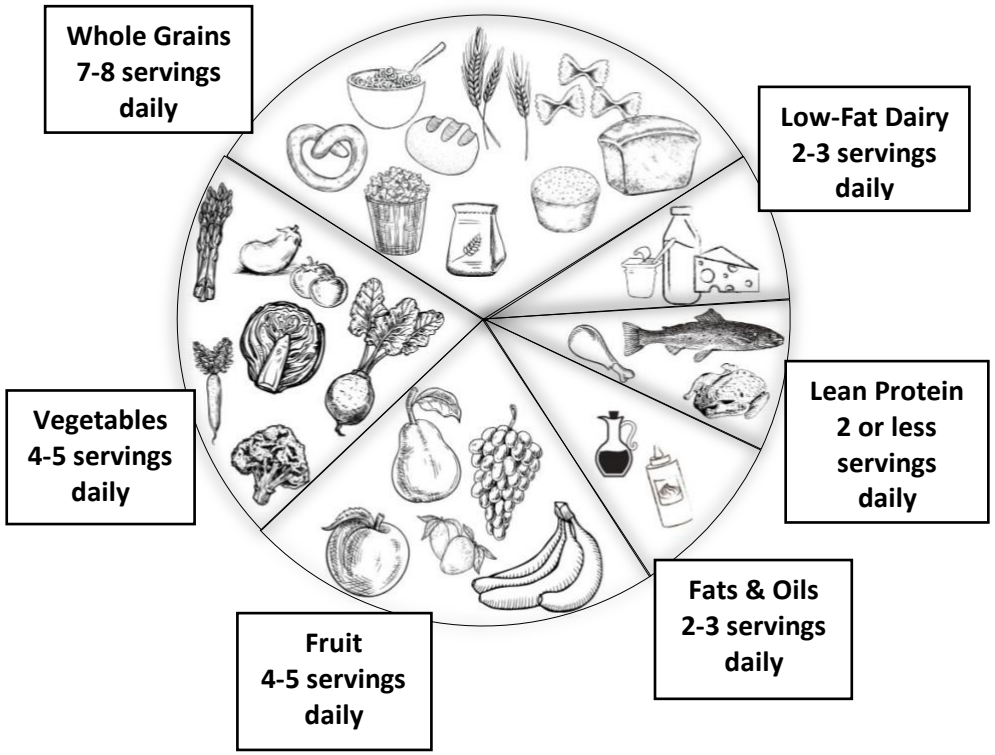
Women: 1 drink per day
Men: 2 drinks per day

If you don't drink, don't start.

BUILD A BALANCED PLATE TO LOWER YOUR BLOOD PRESSURE

Dietary Approaches to Stop Hypertension (DASH) is a healthy eating pattern that can help you to lower your blood pressure. This diet is rich in fruits, vegetables, and low-fat dairy and low in saturated fat, total fat, and sodium.

DAILY SERVINGS



WEEKLY SERVINGS

NUTS, SEEDS, & LEGUMES
Weekly Servings: 4 - 5

SWEETS
Weekly Servings: 5 or fewer

FOOD GROUP	GREAT CHOICES
GRAINS: for energy and fiber	Whole wheat bread, whole wheat pasta, English muffin, pita bread, cereals, grits, oatmeal, brown rice, unsalted pretzels and popcorn
VEGETABLES: for potassium, magnesium, and fiber	Broccoli, kale, carrots, collards, green beans, green peas, lima beans, potatoes, spinach, squash, sweet potatoes, tomatoes
FRUIT: for potassium, magnesium, and fiber	Apples, dates, apricots, bananas, grapes, oranges, tangerines, mangoes, melons, peaches, pineapples, raisins, strawberries
LOW-FAT DAIRY: for calcium and protein	Fat-free (skim) or low-fat (1%) milk Fat-free, low-fat, or reduced-fat cheese Fat-free, low-sodium cottage cheese Fat- free or low-fat regular or frozen yogurt
LEAN PROTEIN: for protein and magnesium	Select only lean meats Trim away visible fat Broil, roast, or poach Remove skin from poultry
FATS & OILS: choose heart healthy fats	Soft margarine, vegetable oil (such as canola, corn, olive, or safflower), low-fat mayonnaise, light salad dressing
NUTS, SEEDS, & LEGUMES: for energy magnesium, protein, and fiber	Almonds, hazelnuts, mixed nuts, peanuts, walnuts, sunflower seeds, peanut butter, kidney beans, lentils, split peas
SWEETS: choose sweets that are low in fat	Fruit-flavored gelatin, fruit punch, hard candy, jelly, maple syrup, sorbet and ices, sugar

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

SODIUM LOWERING TIPS

COOK AT HOME

- Cooking at home allows you to have more control over the salt in your meals.
- Focus on meals with foods in their original form (like those in your "Build a Healthy Plate for Lower Blood Pressure" handout). These foods are naturally lower in sodium when compared to pre-packaged foods, which should be eaten less often.

READ LABELS

- When grocery shopping, look for foods labeled "low sodium," "reduced sodium," or "no salt added." Look to the "Reading Labels" section of this handout for more information on food labels.

BOOST FLAVOR

- Try flavoring foods with herbs, spices, garlic, vinegars, pepper and citrus juices.
- Learn to add flavor with different cooking methods.
  - Boost the flavors of meat, poultry, and fish with high heat cooking methods such as pan searing, grilling, or broiling, which can help to brown meat and add flavor. Be careful not to overcook, burn, or char meat because it can be harmful to your body.
  - Grill or roast veggies using a very hot oven (450 degrees F) for a sweet, smoky flavor. Before cooking, brush or spray lightly with a heart healthy oil and sprinkle with herbs or seasonings.

HEALTHY FATS GUIDE

CHOOSE THESE

UNSATURATED FATS:

- Nuts, avocados, peanut butter
- Olive oil, canola,soy bean oil, corn oil, sunflower oil
- Liquid or tub margarines

OMEGA-3 FATTY ACIDS:

- Fatty fish like salmon, tuna, mackerel, and sardines
- Walnuts, flaxseed, chia seeds, hemp seeds, eggs

LIMIT SATURATED FATS:

- Foods from animal fat
- Fatty beef, lamb, pork, poultry with skin, beef fat
- Lard and cream, butter, cheese, whole fat dairy
- Coconut oil, palm oil

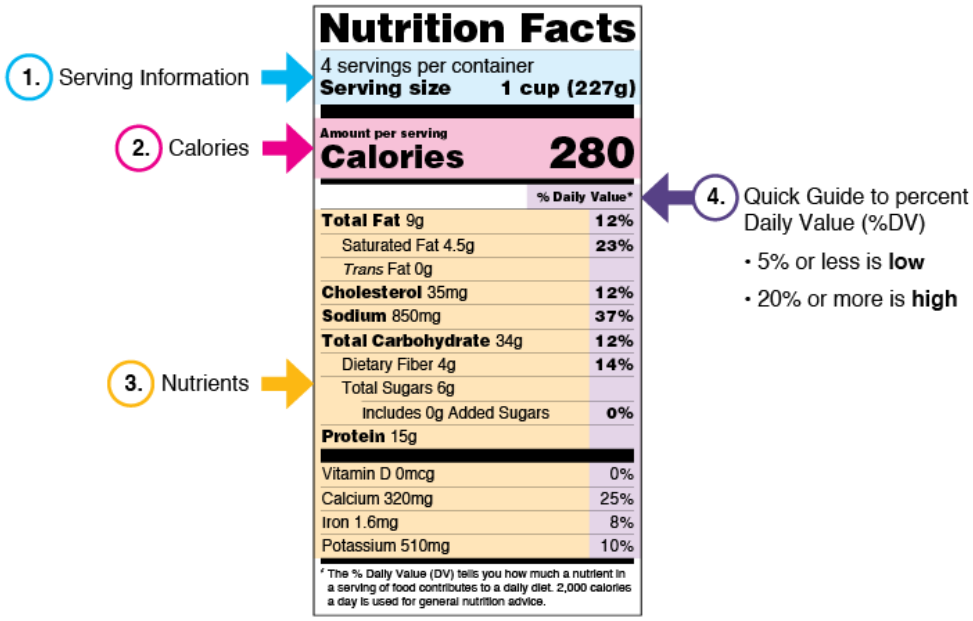
***AVOID* TRANS FATS:**

- Foods with hydrogenated oil
- Fried foods such as french fries, doughnuts, fried chicken
- Baked goods like cake, pies, biscuits, frozen pizza
- Stick margarine and other spreads

LIMIT or AVOID THESE

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

READING LABELS



Source: FDA.gov, How to Understand and Use the Nutrition Facts Labe, 2020

1. **Serving Information:** Check the serving size. Many pre-packaged foods have multiple servings in one container. All of the calculations listed on the Nutrition Facts label are for ***one serving only*.** If you regularly eat more than the serving size, you might be getting more than you intend to.

2. **Calories:** Calories are listed on the Nutrition Facts label by serving size. The number of calories we need each day depends on many different factors, and our needs can change with time. Check with a Registered Dietitian Nutritionist to find out how many calories you need each day.

3. **Nutrients:** Look for foods that are low in sodium (remember that 1500 mg -2300 mg each day can help to lower your blood pressure), fat (especially saturated and trans fats), and added sugars (sugars that are added as a part of processing instead of being naturally found in a food). The DASH diet outlined on the "Build a Balanced Plate to Lower Blood Pressure" portion of this handout is low in these nutrients, but rich in good nutrients like potassium, magnesium, calcium, and fiber.

4. **Quick Guide to Percent Daily Value (%DV):** This number is based on a 2000 calorie diet. The %DV number is the percentage of ***one serving*** of a food item out of 2000 calories. It is important to remember that %DV is for the entire day, not just one serving or meal. Aim for low in total fat, saturated fat, trans fat, cholesterol, and sodium. Aim high for vitamins, minerals and dietary fiber.

REMEMBER:

Make to ask your doctor about a referral to a Registered Dietitian and make an appointment with for individualized Medical Nutrition Therapy.

Appendix IV: CVD Nutrition Education Handout

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

Cardiovascular Disease

Blood pressure that is too high (hypertension) and unhealthy blood cholesterol levels, can lead to a heart attack or stroke. This handout includes small changes in your food choices and activity levels can help to manage these conditions and reduce your risk.

Registered Dietitian Nutritionists (RDNs) are food and nutrition experts trained in Medical Nutrition Therapy. An RDN will work with you one-on-one assess your individual nutrition needs and come up with a plan to meet those needs. Receiving nutrition therapy, education, and counseling from an RDN has proven to be effective in helping to manage this condition. Ask your doctor for a referral and call (404) 616-1000 to make an appointment with a Registered Dietitian at Grady.

KEY POINTS

LIMIT SODIUM

Most of the sodium we get comes from salt in our food and drinks.

- Limit sodium to no more than **2300 milligrams (mg)** each day**.**
- Limiting sodium to **1500 mg** each day can lower your blood pressure even more.

EAT FOR HEART HEALTH

Follow a heart-healthy eating pattern like the DASH diet which focuses on these nutrients.

- Whole grains
- Fruits
- Vegetables
- Lean proteins
- Low-fat dairy
- Nuts, seeds, & legumes
- Heart-healthy fats

CHOOSE HEALTHY FATS

Unhealthy fats can raise the levels of LDL cholesterol in your blood. Limiting these can lower your LDL cholesterol and risk for stroke and heart attack.

- **Choose** unsaturated fats and omega-3 fatty acids.
- **Limit** saturated fats and avoid trans fats. Saturated fat should be less than 7% of your total calories each day.

RECOMMENDED LIFESTYLE CHANGES

ADD PHYSICAL ACTIVITY

Increasing physical activity can help you to lower your blood pressure.

Aim to exercise for about 30 minutes most days of the week.

KEEP A HEALTHY WEIGHT

If you're overweight, talk to your doctor or registered dietitian about setting a goal for a healthy weight.

If you're at a healthy weight, try to maintain your weight.

MODERATE ALCOHOL

If you drink alcohol, do it in moderation.

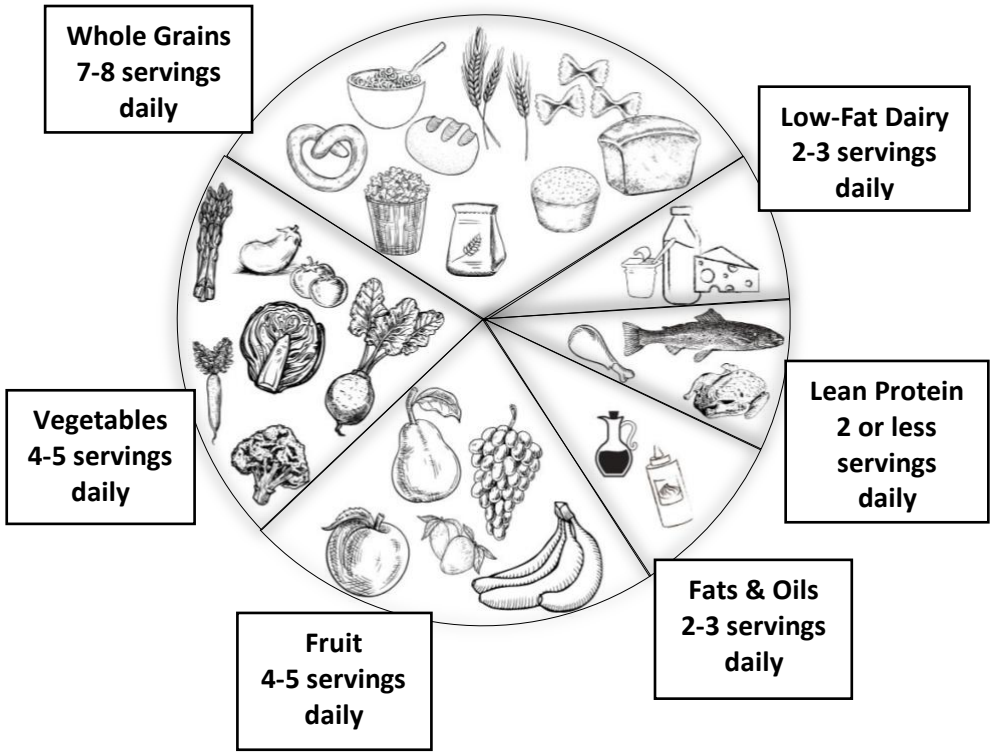
Women: 1 drink per day
Men: 2 drinks per day

One drink: 12 ounces of beer, 5 ounces of wine, or 1.5 ounces distilled spirits

BUILD A BALANCED PLATE FOR A HEALTHY HEART

Dietary Approaches to Stop Hypertension (DASH) is a healthy eating pattern that can help you to reduce unhealthy blood cholesterol levels, lower blood pressure, and lower your risk for heart disease. This diet is rich in fruits, vegetables, and low-fat dairy and low in saturated fat, total fat and sodium.

DAILY SERVINGS



WEEKLY SERVINGS

NUTS, SEEDS, & LEGUMES
Weekly Servings: 4 - 5

SWEETS
Weekly Servings: 5 or fewer

FOOD GROUP	GREAT CHOICES
GRAINS: for energy and fiber	Whole wheat bread, whole wheat pasta, English muffin, pita bread, cereals, grits, oatmeal, brown rice, unsalted pretzels and popcorn
VEGETABLES: for potassium, magnesium, and fiber	Broccoli, kale, carrots, collards, green beans, green peas, lima beans, potatoes, spinach, squash, sweet potatoes, tomatoes
FRUIT: for potassium, magnesium, and fiber	Apples, dates, apricots, bananas, grapes, oranges, tangerines, mangoes, melons, peaches, pineapples, raisins, strawberries
LOW-FAT DAIRY: for calcium and protein	Fat-free (skim) or low-fat (1%) milk Fat-free, low-fat, or reduced-fat cheese Fat-free, low-sodium cottage cheese Fat- free or low-fat regular or frozen yogurt
LEAN PROTEIN: for protein and magnesium	Select only lean meats Trim away visible fat Broil, roast, or poach Remove skin from poultry
FATS & OILS: choose heart healthy fats	Soft margarine, vegetable oil (such as canola, corn, olive, or safflower), low-fat mayonnaise, light salad dressing
NUTS, SEEDS, & LEGUMES: for energy magnesium, protein, and fiber	Almonds, hazelnuts, mixed nuts, peanuts, walnuts, sunflower seeds, peanut butter, kidney beans, lentils, split peas
SWEETS: choose sweets that are low in fat	Fruit-flavored gelatin, fruit punch, hard candy, jelly, maple syrup, sorbet and ices, sugar

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SODIUM LOWERING TIPS

COOK AT HOME

- Cooking at home allows you to have more control over the salt in your meals.
- Focus on meals with foods in their original form (like those on your "Build a Balanced Plate for a Healthy Heart" page). These foods are naturally lower in sodium when compared to pre-packaged foods, which should be eaten less often.

READ LABELS

- When grocery shopping, look for foods labeled "low sodium," "reduced sodium," or "no salt added." Look to the "Reading Labels" section of this handout for more information on food labels.

BOOST FLAVOR

- Try flavoring foods with herbs, spices, garlic, vinegars, pepper and citrus juices.
- Learn to add flavor with different cooking methods.
  - Boost the flavors of meat, poultry, and fish with high heat cooking methods such as pan searing, grilling, or broiling, which can help to brown meat and add flavor. Be careful not to overcook, burn, or char meat because it can be harmful to your body.
  - Grill or roast veggies using a very hot oven (450 degrees F) for a sweet, smoky flavor. Before cooking, brush or spray lightly with a heart healthy oil and sprinkle with herbs or seasonings.

HEALTHY FATS GUIDE

CHOOSE THESE

UNSATURATED FATS:

- Nuts, avocados, peanut butter
- Olive oil, canola,soy bean oil, corn oil, sunflower oil
- Liquid or tub margarines

OMEGA-3 FATTY ACIDS:

- Fatty fish like salmon, tuna, mackerel, and sardines
- Walnuts, flaxseed, chia seeds, hemp seeds, eggs

LIMIT SATURATED FATS:

- Foods from animal fat
- Fatty beef, lamb, pork, poultry with skin, beef fat
- Lard and cream, butter, cheese, whole fat dairy
- Coconut oil, palm oil

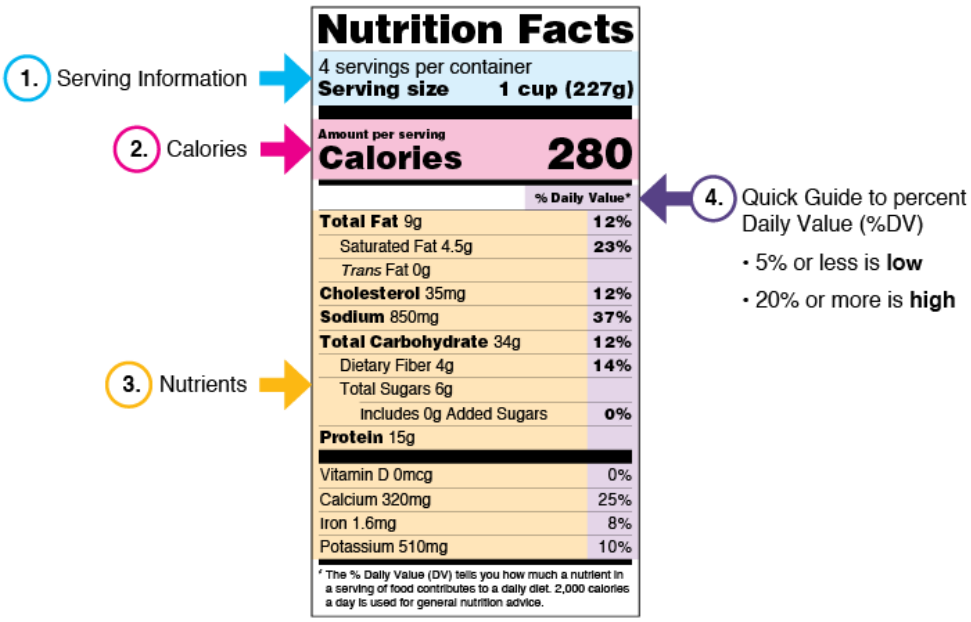
***AVOID* TRANS FATS:**

- Foods with hydrogenated oil
- Fried foods such as french fries, doughnuts, fried chicken
- Baked goods like cake, pies, biscuits, frozen pizza
- Stick margarine and other spreads

LIMIT or AVOID THESE

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

READING LABELS



Source: FDA.gov, How to Understand and Use the Nutrition Facts Labe, 2020

1. **Serving Information:** Check the serving size. Many pre-packaged foods have multiple servings in one container. All of the calculations listed on the Nutrition Facts label are for ***one serving only*.** If you regularly eat more than the serving size, you might be getting more than you intend to.

2. **Calories:** Calories are listed on the Nutrition Facts label by serving size. The number of calories we need each day depends on many different factors, and our needs can change with time. Check with a Registered Dietitian Nutritionist to find out how many calories you need each day.

3. **Nutrients:** Look for foods that are low in sodium (remember that 1500 mg -2300 mg each day can help to protect your heart), fat (especially saturated and trans fats), and added sugars (sugars that are added as a part of processing instead of occurring naturally in a food). The DASH diet, outlined on the "Build a Balanced Plate for a Healthy Heart" portion of this handout, is low in these nutrients and high in good nutrients like potassium, magnesium, calcium, and fiber.

4. **Quick Guide to Percent Daily Value (%DV):** This number is based on a 2000 calorie diet. The %DV number is the percentage of ***one serving*** of a food item out of 2000 calories. It is important to remember that %DV is for the entire day, not just one serving or meal. Aim for low in total fat, saturated fat, trans fat, cholesterol, and sodium. Aim high for vitamins, minerals and dietary fiber.

REMINDER:

Make sure to ask your doctor about a referral to a Registered Dietitian and make an appointment with for individualized Medical Nutrition Therapy.

Appendix V: Diabetes Nutrition Education Handout

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

DIABETES

Blood sugar levels that are too high (hyperglycemia) . This handout includes small changes in your food choices and activity levels can help to manage these conditions and reduce your risk.

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KEY POINTS

LIMIT SODIUM

Most of the sodium we get comes from salt in our food and drinks.

- Limit sodium to no more than **2300 milligrams (mg)** each day**.**
- Limiting sodium to **1500 mg** each day can lower your blood pressure even more.

CHOOSE HEALTHY CARBS

Choose carbohydrate sources that are nutrient-dense:

- High in fiber, vitamins and minerals
- Low in added sugar, sodium, and unhealthy

CHOOSE HEALTHY FATS

Unhealthy fats can raise the levels of LDL cholesterol in your blood. Limiting these can lower your LDL cholesterol and risk for stroke and heart attack.

- **Choose** unsaturated fats and omega-3 fatty acids.
- **Limit** saturated fats and **avoid** trans fats. Saturated fat should be less than 7% of your total calories each day.

RECOMMENDED LIFESTYLE CHANGES

ADD PHYSICAL ACTIVITY

Increasing physical activity can help you to lower your blood pressure.

Aim to exercise for about 30 minutes most days of the week.

KEEP A HEALTHY WEIGHT

If you're overweight, talk to your doctor or registered dietitian about setting a goal for a healthy weight.

If you're at a healthy weight, try to maintain your weight.

MODERATE ALCOHOL

If you drink alcohol, do it in moderation.

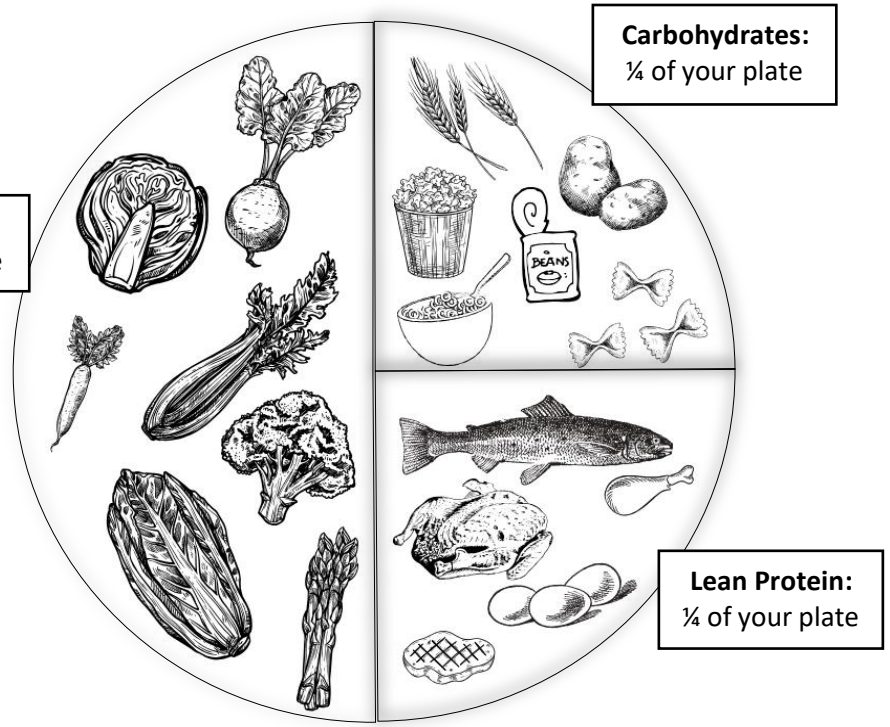
Women: 1 drink per day
Men: 2 drinks per day

One drink: 12 ounces of beer, 5 ounces of wine, or 1.5 ounces distilled spirits

BUILD A BALANCED PLATE WITH DIABETES

The Plate Method is a healthy eating pattern that can help you to manage your blood sugar levels.

The Plate Method



CATEGORY	FOODS
CARBOHYDRATES: ¼ of your plate	Rice, breads, pastas and starchy vegetables like corn, beans, peas, and potatoes
NON-STARCHY VEGETABLES: ½ of your plate	Carrots, okra, peppers, cabbage, celery, and green beans, broccoli, cauliflower, kale, and lettuce
LEAN PROTEIN: ¼ of your plate	Lean meats, fish, and poultry, tofu, and eggs

TIPS

- Eat 3 meals every day with 1-2 snacks in between meals.
- Avoid skipping meals because it can cause your blood sugar to go too high or too low.
- Aim to eat the same amount of carbohydrates at the same time each day.
- Use smaller plates about 9 inches across to keep portions the right size.
- Regularly check your blood sugar and take scheduled medicines.
- Notice foods that cause your blood sugar rise.
- Use heart-healthy cooking techniques like baking, broiling, grilling instead of frying foods.

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CARBOHYDRATE GUIDE

Our bodies use carbohydrates as a source of energy or fuel for our daily activities and body functions by converting carbohydrate containing foods that we eat to simple sugars. With diabetes, the body isn't able to transfer sugar from the blood to the cells as well as it normally can which can lead to high blood sugar. Making changes to your diet can help you to manage your blood sugar.

Choose:	Limit:	Avoid
○ Eat more often: non-starchy vegetables like broccoli, carrots, greens, peppers, and tomatoes ○ Eat less often: starchy vegetables like potatoes, corn, and peas.	○ Processed meats ○ Desserts ○ Chips ○ Bakery pastries and muffins	○ Sugar-sweetened coffee, soda, and juice

SODIUM LOWERING TIP

COOK AT HOME

- ○Cooking at home allows you to have more control over the salt in your meals.
- ○Focus on meals with foods in their original form (like those on your "Build a Balanced Plate with Diabetes" page). These foods are naturally lower in sodium when compared to pre-packaged foods, which should be eaten less often.

READ LABELS

- ○When grocery shopping, look for foods labeled "low sodium," "reduced sodium," or "no salt added." Look to the "Reading Labels" section of this handout for more information on food labels.

BOOST FLAVOR

- ○Try flavoring foods with herbs, spices, garlic, vinegars, pepper and citrus juices.
- ○Learn to add flavor with different cooking methods.
  - ▪Boost the flavors of meat, poultry, and fish with high heat cooking methods such as pan searing, grilling, or broiling, which can help to brown meat and add flavor. Be careful not to overcook, burn, or char meat because it can be harmful to your body.
  - ▪Grill or roast veggies using a very hot oven (450 degrees F) for a sweet, smoky flavor. Before cooking, brush or spray lightly with a heart healthy oil and sprinkle with herbs or seasonings.

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HEALTHY FATS GUIDE

CHOOSE THESE

UNSATURATED FATS:

- Nuts, avocados, peanut butter
- Olive oil, canola,soy bean oil, corn oil, sunflower oil
- Liquid or tub margarines

OMEGA-3 FATTY ACIDS:

- Fatty fish like salmon, tuna, mackerel, and sardines
- Walnuts, flaxseed, chia seeds, hemp seeds, eggs

LIMIT SATURATED FATS:

- Foods from animal fat
- Fatty beef, lamb, pork, poultry with skin, beef fat
- Lard and cream, butter, cheese, whole fat dairy
- Coconut oil, palm oil

***AVOID* TRANS FATS:**

- Foods with hydrogenated oil
- Fried foods such as french fries, doughnuts, fried chicken
- Baked goods like cake, pies, biscuits, frozen pizza
- Stick margarine and other spreads

LIMIT or AVOID THESE

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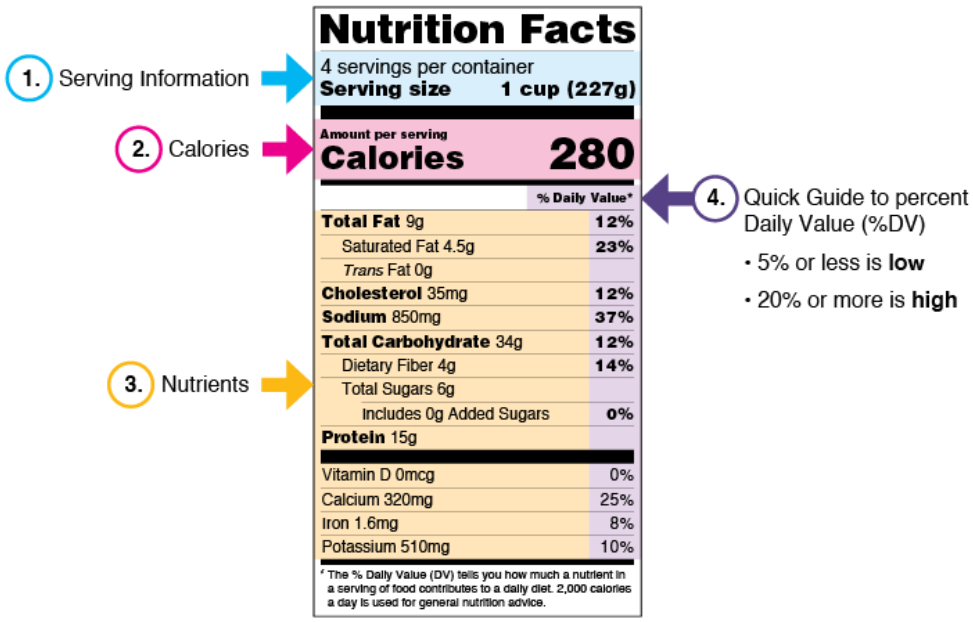
READING LABELS



Source: FDA.gov, How to Understand and Use the Nutrition Facts Labe, 2020

1. **Serving Information:** Check the serving size. Many pre-packaged foods have multiple servings in one container. All of the calculations listed on the Nutrition Facts label are for ***one serving only*.** If you regularly eat more than the serving size, you might be getting more than you intend to.

2. **Calories:** Calories are listed on the Nutrition Facts label by serving size. The number of calories we need each day depends on many different factors, and our needs can change with time. Check with a Registered Dietitian Nutritionist to find out how many calories you need each day.

3. **Nutrients:** Look for foods that are low in sodium (remember that 1500 mg -2300 mg each day can help to protect your heart), fat (especially saturated and trans fats), and added sugars (sugars that are added as a part of processing instead of occurring naturally in a food). The Plate Method, outlined on the "Build a Balanced Plate with Diabetes" portion of this handout, is low in these nutrients and high in good nutrients like fiber, protein, vitamins, and minerals.

4. **Quick Guide to Percent Daily Value (%DV):** This number is based on a 2000 calorie diet. The %DV number is the percentage of ***one serving*** of a food item out of 2000 calories. It is important to remember that %DV is for the entire day, not just one serving or meal. Aim for low in total fat, saturated fat, trans fat, cholesterol, and sodium. Aim high for vitamins, minerals and dietary fiber.

REMINDER:

Make sure to ask your doctor about a referral to a Registered Dietitian and make an appointment with for individualized Medical Nutrition Therapy.

Appendix VI: CKD, stages 3 & 4 Nutrition Education Handout

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

Chronic Kidney Disease, stages 3-4

With Chronic Kidney Disease (CKD), your kidneys are not able to filter waste from foods and drinks as well as when the kidneys are healthy. Making changes to your diet can help you to feel better and can help to slow down the rate of damage to the kidneys. With CKD, your needs may change over time as your kidney disease progresses. Other factors like diabetes and high blood pressure can affect your nutrition needs with CKD. It is ***important*** *to work with your doctor and Registered Dietitian Nutritionist (RDN) to manage your health and slow down kidney damage from CKD. This handout gives a brief overview of some changes that your doctor and RDN may recommend and tips for making diet changes, but it is* ***not a substitute for Medical Nutrition Therapy from an expert****.*

Registered Dietitian Nutritionists are food and nutrition experts trained in Medical Nutrition Therapy. An RDN will work with you one-on-one assess your individual nutrition needs and come up with a plan to meet those needs. Receiving nutrition therapy, education, and counseling from an RDN has proven to be effective in helping to manage this condition. Ask your doctor for a referral and call (404) 616-1000 to make an appointment with a Registered Dietitian at Grady.

KEY POINTS

Limit Sodium
- No more than 2300 milligrams per day

Limit Protein
- The amount you need will be specific to your needs

Protein Source is Important
- Choose from animal and plant proteins

Make Heart-Healthy Food Choices
- Limit saturated fats to less than 7% and avoid trans fats

Limit Phosphorus if Needed
- If the levels in your body are too high, your care team may recommend a limit

Limit Potassium if Needed
- If the levels in your body are too high, your care team may recommend a limit

RECOMMENDED LIFESTYLE CHANGES

ADD PHYSICAL ACTIVITY	KEEP A HEALTHY WEIGHT	MODERATE ALCOHOL
Increasing physical activity can help you to lower your blood pressure. Aim to exercise for about 30 minutes most days of the week.	If you're overweight, talk to your doctor or registered dietitian about setting a goal for a healthy weight. If you're at a healthy weight, try to maintain your weight.	If you drink alcohol, make sure it's in moderation. -Women: 1 drink per day -Men: 2 drinks per day One drink: 12 oz of beer, 5 oz of wine, or 1.5 oz spirits

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

SODIUM

When you have CKD, it is important to manage your blood pressure and limit how much sodium or salt you get through food and beverages. Too much sodium in CKD can cause your body to retain water. The tips below can help you to lower your sodium intake.

COOK AT HOME

- Cooking at home allows you to have more control over the salt in your meals.
- Focus on meals with foods in their original form. These foods are naturally lower in sodium when compared to pre-packaged foods, which should be eaten less often.

READ LABELS

- When grocery shopping, look for foods labeled "low sodium," "reduced sodium," or "no salt added." Look to the "Reading Labels" section of this handout for more information on food labels.

BOOST FLAVOR

- Try flavoring foods with herbs, spices, garlic, vinegars, pepper and citrus juices.
- Learn to add flavor with different cooking methods.
  - Boost the flavors of meat, poultry, and fish with high heat cooking methods such as pan searing, grilling, or broiling, which can help to brown meat and add flavor. Be careful not to overcook, burn, or char meat because it can be harmful to your body.
  - Grill or roast veggies using a very hot oven (450 degrees F) for a sweet, smoky flavor. Before cooking, brush or spray lightly with a heart healthy oil and sprinkle with herbs or seasonings.

PHOSPHORUS AND POTASSIUM

These nutrients may be cut back depending on your individual needs. Your doctor and RDN can help you to decide if these nutrients will need to be limited.

Higher Phosphorus Foods

- Meat, poultry, fish
- Bran cereals and oatmeal
- Dairy foods
- Beans, lentils, nuts
- Dark-colored sodas/pop like coke, fruit punch, and some bottled iced teas

Higher Potassium Foods

- Oranges, bananas, and orange juice
- Potatoes, tomatoes
- Brown and wild rice
- Bran cereals
- Dairy foods
- Whole-wheat bread and pasta
- Beans and nuts

Lower Phosphorus Foods

- Fresh fruits and vegetables
- Breads, pasta, rice
- Rice milk
- Corn and rice cereals
- Light-colored sodas/pop like sprite, or iced tea

Lower Potassium Foods

- Apples, peaches
- Carrots, green beans
- White bread and pasta
- White rice
- Rice milk (not enriched)
- Cooked rice and wheat cereals, grits
- Apple, grape, or cranberry juice

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HEALTHY FATS GUIDE

Choosing heart-healthy fats can help to keep both your heart and your kidneys healthy. Aim to limit your saturated fat to less than 7% of your total daily calories and avoid trans fats.

CHOOSE THESE

UNSATURATED FATS:

- Nuts, avocados, peanut butter
- Olive oil, canola,soy bean oil, corn oil, sunflower oil
- Liquid or tub margarines

OMEGA-3 FATTY ACIDS:

- Fatty fish like salmon, tuna, mackerel, and sardines
- Walnuts, flaxseed, chia seeds, hemp seeds, eggs

LIMIT SATURATED FATS:

- Foods from animal fat
- Fatty beef, lamb, pork, poultry with skin, beef fat
- Lard and cream, butter, cheese, whole fat dairy
- Coconut oil, palm oil

***AVOID* TRANS FATS:**

- Foods with hydrogenated oil
- Fried foods such as french fries, doughnuts, fried chicken
- Baked goods like cake, pies, biscuits, frozen pizza
- Stick margarine and other spreads

LIMIT or AVOID THESE

PROTEIN GUIDE

Choosing the right type and amount of protein can help to protect your kidneys from further damage. Protein is necessary for your body to function, but what we don't use gets processed through your kidneys as waste. Eating more protein than you need can make your kidneys work harder than they need to.

- Eat protein in small portions.
- Replacing some animal proteins with plant proteins can reduce how hard your kidneys have to work, and help to control blood sugar and blood pressure.
- Plant proteins may have more potassium and phosphorus. These nutrients may be limited in stages 3 and 4. Your doctor and registered dietitian can tell you if you need to limit these nutrients.

Animal-protein foods	Plant-protein foods
○Chicken	○Beans
○Fish	○Nuts
○Meat	○Nut butters
○Eggs	○Soy products
○Dairy	○Grains

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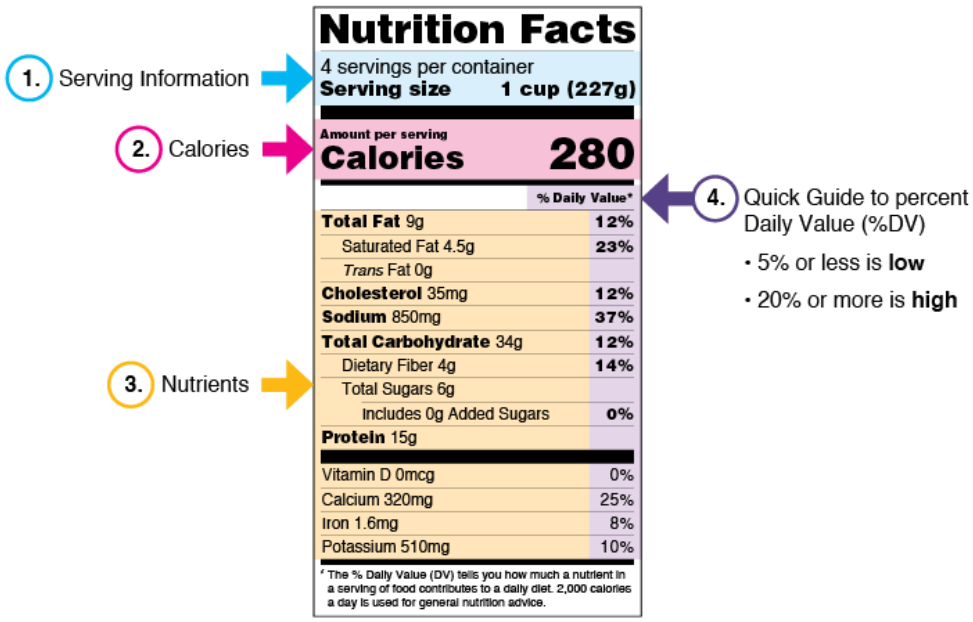
READING LABELS



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2. **Calories:** Calories are listed on the Nutrition Facts label by serving size. The number of calories we need each day depends on many different factors, and our needs can change with time. Check with a Registered Dietitian Nutritionist to find out how many calories you need each day.

3. **Nutrients:** Look for foods that are low in sodium (remember that 1500 mg -2300 mg each day can help to lower your blood pressure), fat (especially saturated and trans fats), and added sugars (sugars that are added as a part of processing instead of being naturally found in a food). If you need to limit potassium and phosphorus, check for these values as well.

4. **Quick Guide to Percent Daily Value (%DV):** This number is based on a 2000 calorie diet. The %DV number is the percentage of ***one serving*** of a food item out of 2000 calories. It is important to remember that %DV is for the entire day, not just one serving or meal. Aim for low in saturated fat, trans fat, cholesterol, and sodium. Aim high for vitamins and dietary fiber.

REMEMBER:

Make to ask your doctor about a referral to a Registered Dietitian and make an appointment with for individualized Medical Nutrition Therapy.

Appendix VII: CKD, stage 5 with Hemodialysis Nutrition Education Handout

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

Chronic Kidney Disease, stage 5

Hemodialysis

With Chronic Kidney Disease (CKD), your kidneys are not able to filter waste from foods and drinks as well as when the kidneys are healthy. As CKD progresses, the kidneys slowly lose their ability to filter waste which can result in the need for dialysis. Making changes to your diet can help you to manage your CKD, prevent complications, and make you feel better. It is ***important*** *to work with your doctor and Registered Dietitian Nutritionist (RDN) to manage your health while receiving hemodialysis. This handout gives a brief overview of some changes that your doctor and RDN may recommend and tips for making diet changes, but it is* ***not a substitute for Medical Nutrition Therapy from an expert****.*

Registered Dietitian Nutritionists are food and nutrition experts trained in Medical Nutrition Therapy. An RDN will work with you one-on-one assess your individual nutrition needs and come up with a plan to meet those needs. Receiving nutrition therapy, education, and counseling from an RDN has proven to be effective in helping to manage this condition. Ask your doctor for a referral and call (404) 616-1000 to make an appointment with a Registered Dietitian at Grady.

KEY POINTS

Limit Sodium
- No more than 3000 mg per day
- Your RDN can give you a specific range

Protein
- The amount you need will be specific to your needs

Fluid May be Limited
- Your RDN and doctor can tell you if you'll need to limit how much fluid you get from food and drinks

Make Heart-Healthy Food Choices
- Limit saturated fats to less than 7% and avoid trans fats

Limit High Phosphorus Foods
- To help keep bones healthy
- Found in many whole wheat products

Limit High Potassium Foods
- To protect your heart
- Found in many fruits and vegetables

RECOMMENDED LIFESTYLE CHANGES

ADD PHYSICAL ACTIVITY	KEEP A HEALTHY WEIGHT	MODERATE ALCOHOL
Increasing physical activity can help you to lower your blood pressure. Aim to exercise for about 30 minutes most days of the week.	If you're overweight, talk to your doctor or registered dietitian about setting a goal for a healthy weight. If you're at a healthy weight, try to maintain your weight.	If you drink alcohol, make sure it's in moderation. -Women: 1 drink per day -Men: 2 drinks per day One drink: 12 oz of beer, 5 oz of wine, or 1.5 oz spirits

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

SODIUM SWAPS

When you have CKD, it is important to manage your blood pressure and limit how much sodium or salt you get through food and beverages. Too much sodium in CKD can cause your body to retain water. The tips below can help you to lower your sodium intake. Look at the tips below for reducing sodium.

High-Sodium Foods

- Salt
- Regular canned vegetables
- Hot dogs and canned meat
- Packaged rice with sauce
- Packaged noodles with sauce
- Frozen vegetables with sauce
- Frozen prepared meals
- Canned soup
- Regular tomato sauce
- Snack foods

Low-Sodium Alternatives

- Salt-free herb seasonings
- Low-sodium canned foods
- Fresh, cooked meat
- Plain rice without sauce
- Plain noodles without sauce
- Fresh or frozen vegetables without sauce
- Homemade soup with fresh ingredients
- Reduced-sodium tomato sauce
- Unsalted pretzels
- Unsalted popcorn

SODIUM-LOWERING TIPS

COOK AT HOME

- Cooking at home allows you to have more control over the salt in your meals.
- Focus on meals with foods in their original form. These foods are naturally lower in sodium when compared to pre-packaged foods, which should be eaten less often.

READ LABELS

- When grocery shopping, look for foods labeled “low sodium,” “reduced sodium,” or “no salt added.” Look to the “Reading Labels” section of this handout for more information on food labels.

BOOST FLAVOR

- Try flavoring foods with herbs, spices, garlic, vinegars, pepper and citrus juices.
- Learn to add flavor with different cooking methods.
  - Boost the flavors of meat, poultry, and fish with high heat cooking methods such as pan searing, grilling, or broiling, which can help to brown meat and add flavor. Be careful not to overcook, burn, or char meat because it can be harmful to your body.
  - Grill or roast veggies using a very hot oven (450 degrees F) for a sweet, smoky flavor. Before cooking, brush or spray lightly with a heart healthy oil and sprinkle with herbs or seasonings.

Disclaimer: This handout is not intended to be a substitute for Medical Nutrition Therapy, professional medical advice, diagnosis, or treatment. Ask your doctor for a referral to a Registered Dietitian for individualized nutrition recommendations.

PHOSPHORUS AND POTASSIUM

Generally, for those on hemodialysis, 800-1000 mg each day of phosphorus, and 2000-3000 of potassium each day is recommended. Limiting how much potassium and phosphorus you get can be challenging. Your doctor and RDN can help you to decide how much of each nutrient you need and may prescribe you medication to help control these levels.

Higher Phosphorus Foods

- Meat, poultry, fish
- Bran cereals and oatmeal
- Dairy foods
- Beans, lentils, nuts
- Dark-colored sodas/pop like coke, fruit punch, and some bottled iced teas

Higher Potassium Foods

- Oranges, bananas, and orange juice
- Potatoes, tomatoes
- Brown and wild rice
- Bran cereals
- Dairy foods
- Whole-wheat bread and pasta
- Beans and nuts

Lower Phosphorus Foods

- Fresh fruits and vegetables
- Breads, pasta, rice
- Rice milk
- Corn and rice cereals
- Light-colored sodas/pop like sprite, or iced tea

Lower Potassium Foods

- Apples, peaches
- Carrots, green beans
- White bread and pasta
- White rice
- Rice milk (not enriched)
- Cooked rice and wheat cereals, grits
- Apple, grape, or cranberry juice

HEALTHY FATS GUIDE

Choosing heart-healthy fats can help to keep both your heart and your kidneys healthy. Aim to limit your saturated fat to less than 7% of your total daily calories and avoid trans fats.

CHOOSE THESE

UNSATURATED FATS:

- Nuts, avocados, peanut butter
- Olive oil, canola,soy bean oil, corn oil, sunflower oil
- Liquid or tub margarines

OMEGA-3 FATTY ACIDS:

- Fatty fish like salmon, tuna, mackerel, and sardines
- Walnuts, flaxseed, chia seeds, hemp seeds, eggs

LIMIT SATURATED FATS:

- Foods from animal fat
- Fatty beef, lamb, pork, poultry with skin, beef fat
- Lard and cream, butter, cheese, whole fat dairy
- Coconut oil, palm oil

***AVOID* TRANS FATS:**

- Foods with hydrogenated oil
- Fried foods such as french fries, doughnuts, fried chicken
- Baked goods like cake, pies, biscuits, frozen pizza
- Stick margarine and other spreads

LIMIT or AVOID THESE

PROTEIN GUIDE

Hemodialysis removes protein a large amount of protein from your blood each time. For this reason, the you will need to get more protein in your diet than you're probably used to. Choosing the right type and amount of protein can help to make sure that your body is getting what it needs from your diet.

Animal Protein Foods	Plant Protein Foods
○ Chicken ○ Fish ○ Meat ○ Eggs ○ Dairy	○ Beans ○ Nuts ○ Nut butters ○ Soy products ○ Grains

- Replacing some animal proteins with plant proteins can reduce how hard your kidneys have to work and help to control blood sugar and blood pressure.
- Plant proteins may have more potassium and phosphorus.
- Eat protein in small portions

Protein Serving Sizes	Meat, poultry, and fish	2-3 ounces cooked
	Dairy	½ cup of milk or yogurt or one slice of cheese
	Cooked Beans	½ cup
	Nuts	¼ cup
	Bread	1 slice
	Cooked rice or noodles	½ cup

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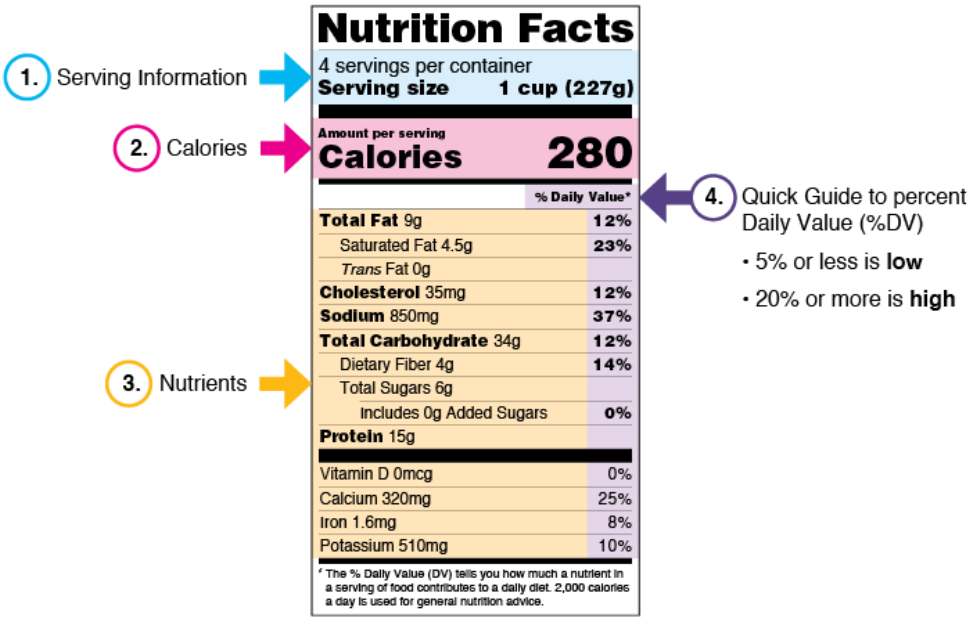
READING LABELS



Source: FDA.gov, How to Understand and Use the Nutrition Facts Labe, 2020

1. **Serving Information:** Check the serving size. Many pre-packaged foods have multiple servings in one container. All of the calculations listed on the Nutrition Facts label are for ***one serving only*.** If you regularly eat more than the serving size, you might be getting more than you intend to.

2. **Calories:** Calories are listed on the Nutrition Facts label by serving size. The number of calories we need each day depends on many different factors, and our needs can change with time. Check with a Registered Dietitian Nutritionist to find out how many calories you need each day.

3. **Nutrients:** Look for foods that are low in sodium (remember that 1500 mg -2300 mg each day can help to lower your blood pressure), fat (especially saturated and trans fats), and added sugars (sugars that are added as a part of processing instead of being naturally found in a food). Check both the nutrients and the ingredients for phosphorus and potassium.

4. **Quick Guide to Percent Daily Value (%DV):** This number is based on a 2000 calorie diet. The %DV number is the percentage of ***one serving*** of a food item out of 2000 calories. It is important to remember that %DV is for the entire day, not just one serving or meal. Aim for low in total fat, saturated fat, trans fat, cholesterol, and sodium. Aim high for vitamins, minerals and dietary fiber.

REMEMBER:

Make to ask your doctor about a referral to a Registered Dietitian and make an appointment with for individualized Medical Nutrition Therapy.