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Abstract

Medical Nutrition Therapy (MNT) is used by RDNs for clients with diet-related chronic diseases or conditions, often with the goals of behavior change and improved nutritional health outcomes through nutritional care plans, goal setting, and follow-ups. There exists a wealth of research that indicates its effectiveness in both the short and long term in producing positive health outcomes related, but not limited to, diseases such as type 1 and type 2 diabetes, cardiovascular diseases (CVD), chronic kidney disease (CKD) and certain types of cancer. While MNT is a cost-effective strategy in managing chronic disease, its success is contingent upon addressing barriers to compliance such as food insecurity, lack of access to follow-up care, and securing cooperation with health insurers. Based on this analysis, and the YMCA's capacity to address food insecurity, it is recommended that the YMCA establish clinical partnerships to facilitate the provision of MNT.

Defining MNT

MNT is an evidence-based medical approach that provides dietetic education and management to diagnose and treat chronic conditions through personal, goal-oriented nutrition plans. Some of these chronic conditions include diabetes, CKD, and gastrointestinal (GI) disorders among others. MNT can also reduce the complications of these and other diet-related diseases ("Medical Nutrition Therapy," 2018).

These nutrition care plans are administered by registered dietitian nutritionists (RDNs) ("Medical Nutrition Therapy," 2018). According to the Academy of Nutrition and Dietetics (AND), RDNs oversee assessment, diagnosis, intervention, and monitoring and evaluation of clients. A collaborative approach between RDNs and clients while creating a dietary plan can increase self-efficacy. MNT can also keep clients healthy as well as stave off and manage chronic, diet-related diseases and conditions.

Implementation of MNT

Overview

MNT is an effective dietary management tool utilized by a wide variety of medical professionals for diet-related chronic diseases and conditions. MNT can be deployed in numerous ways: a dietitian can provide MNT through in-person meetings in a care facility or through video conferencing in an individualized or group format (Zizzi et al., 2015; “Utah Diabetes Self-Management...,” n.d.).

The individualized plan created between the RDN and the client requires the institution of goals, a care plan, and specific interventions (“Medical Nutrition Therapy,” 2018). RDNs provide nutrition services that are comprehensive and tailored to the needs of the client. RDNs review the client’s eating habits and lifestyle choices and conduct an assessment of the client’s nutritional status. Based on this assessment, a personalized treatment plan is developed for each client by setting realistic health management and nutrition goals (Ellis, 2018; “Medical Nutrition Therapy for Weight Loss,” n.d.). The American Diabetes Association states that a collaborative effort in the development of an individualized dietary plan is vital (Franz et al., 2017). Each member of the care team must have a strong foundational knowledge of MNT principles. For this to occur, a dietitian must provide each member of the care team with evidence and research regarding MNT practices that can be used in the implementation of a care plan (Franz et al., 2017). Additionally, one of the most integral components of MNT is the use of guided follow-up to ensure the improvement and solidification of behavior change (“Medical Nutrition Therapy,” 2018).

MNT is not a therapy intended to serve as a weight management program but rather nutrition counseling to encourage and support the adoption of a healthy diet (Aboueid, 2018).

That being said, a client is more likely to be referred to MNT by a primary care provider (PCP) based on the presence of modifiable risk factors such as obesity, high cholesterol, and hypertension, that puts clients at higher risk for developing chronic disease (Aboueid, 2018). MNT has also benefited clients who are living with cancer, osteoporosis and heart disease. However, MNT is not as commonly recognized as a treatment provided for these conditions due to the fact that there is less guarantee that health insurance companies will provide coverage for MNT services for these specific conditions (“Medical Nutrition Therapy,” n.d.)

MNT: Diabetes

The majority of MNT programs are tailored to prevent and mitigate the health outcomes associated with diabetes. MNT is an important part of diabetes management because it creates a strong foundation for long-term care plans (Franz et al., 2017). Within the context of diabetes, the primary aims of MNT are to help the client to achieve and maintain stable blood glucose levels, lipid and lipoprotein profile, and blood pressure levels; prevent or slow the development of chronic comorbidities; address individual nutrition needs; and maintain proper dietary practices (“Nutrition Recommendations and Interventions for Diabetes,” 2008). It has also been proven effective in helping to lower A1C levels in individuals with both type 1 and type 2 diabetes by improving an individual's diet and promoting the intake of unprocessed, unrefined whole foods such as whole grains, fruits, and vegetables (“Medical Nutrition Therapy,” 2018).

MNT: Other Medical Conditions

MNT is also commonly used to prevent and manage other diet-related chronic diseases and conditions such as CVD, cancer, and GI disorders. Pertaining to CVD, dietary recommendations are targeted at reducing low-density lipoprotein (LDL) cholesterol and maintaining a healthy body mass index (BMI) and weight. Individualized treatment plans

targeted at preventing and/or managing CVD include increasing intake of plant protein, omega-3 fatty acids, dietary fiber, and whole grains; change in oils used in food preparation (i.e. to flax-seed oil, olive oil); decreasing intake of saturated fats, trans-fatty acids, and alcohol intake; and engaging in regular exercise (Olendzki et al., 2006, p.259). Within the context of cancer, MNT is primarily used to help patients maintain healthy body weight, strength, and lean body tissue as well as decrease side effects related to cancer (i.e. nausea, pain, hair loss) both during and after treatment (“Nutrition in Cancer Care,” 2018). GI disorders include gastroesophageal reflux disease, irritable bowel syndrome (IBS), celiac disease and pancreatitis among others. GI MNT is targeted at supporting the body’s energy levels and immune system and developing individualized dietary plans that are tolerated with a given medical condition. GI MNT sessions include comprehensive health assessment and review of GI diagnosis and, based on this assessment, development of specified goals and dietary practices to help manage symptoms (“GI Nutrition Therapy,” n.d.).

MNT is also effective for individuals living with advanced CKD. In CKD, the kidneys continue to work—albeit not as well as they should. Therefore wastes can build up, incrementally causing the body to normalize the presence of waste in the blood (NIH, 2014). A dietitian can help a person with this disease avoid foods high in sodium and potassium and to consume foods high in protein which can help filter out the waste. MNT may improve an individual's mental and physical health and help to delay the progression of disease. MNT can prevent or treat complications, including malnutrition, metabolic acidosis, hyperkalemia, mineral imbalance/bone disorders, anemia, and CVD (Narva, 2014).

Settings

MNT: Community Setting

Existing information on community-based MNT programming indicates that it is most commonly tailored to specific populations such as older adults, medically at-risk children and individuals with developmental disabilities. An example of one of these programs is KIDS FIRST, a nutritional program for medically at-risk children in Arkansas that provided screening, assessment, development of treatment plans, and monitoring of clients' progress (Baker & Vance, 1998). A program in Southwestern Pennsylvania for individuals with developmental disabilities followed a similar operational system and relied heavily upon hands-on demonstration and service provision in home environments, allowing for the development of feasible treatment plans to achieve specified health outcomes (Burke, 1997).

Some examples of how MNT programs are designed and implemented for a broader population include the Utah Department of Health's (DOH) MNT program and Dietitians at Home in Chicago, Illinois. The Utah DOH's program includes three initial hours of therapy over the first 12 months of services and two hours of follow-up provided each year ("Utah Diabetes Self-Management...", n.d.). A physician or dietitian can determine if more sessions are needed based on the medical needs of the client. Every meeting occurs in either individual or group settings and is 15 minutes or longer ("Utah Diabetes Self-Management...", n.d.). Dietitians At Home combines treatment with an educational component. These components include a comprehensive kitchen inspection, evaluation of the client's physical state and health, and an assessment of nutritional needs is conducted by a dietitian in addition to the identification and development of "patient-centered" goals and a nutritional plan ("What is Medical...", n.d.).

MNT: Clinical Setting

MNT is provided in various practice settings, including hospitals, physician offices, and private practice. MNT provided in the clinical setting is often tailored to a variety of health

conditions. University Hospitals, a healthcare system based in Cleveland, Ohio, for example, provides MNT through their Clinical Nutrition Department and supports patients with GI disorders, CVD, neurological disorders, endocrine disorders, cancer, diabetes, eating disorders, food allergies, heart failure, HIV/AIDS, hypertension, overweight/obesity, pulmonary disease, and renal disease (“Clinical Nutrition Services,” n.d.). At St. Jude’s in Tennessee, MNT is tailored to all conditions addressed by University Hospitals in addition to general disease prevention and wellness, pediatrics, and pregnant women (“Medical Nutrition Therapy,” n.d.). Sibley Memorial Hospital in Washington D.C. outlines the components of their outpatient MNT services: appointments include a review of medical and nutrition history, evaluation of dietary practices and consumption patterns, analysis of nutritional needs, creation of an individualized plan, provision of guiding resources and information, follow-up assistance, and a report to PCPs to ensure continuity of care (“Outpatient Nutrition Services,” n.d.).

MNT Stakeholders

Clients

To be eligible for MNT, an individual must be living with a chronic disease or condition or be at risk for developing a chronic disease. Due to this extensive inclusionary criteria, MNT serves a broad range of ages (“5 Benefits of MNT,” 2018). MNT focuses on nutrition counseling to improve dietary intake and is tailored to each client's nutritional needs (“Medical Nutrition Therapy,” 2018). Through the modification of one's dietary intake, clients benefit from a slowed progression and a potential reversal of chronic disease (Evert, 2019). For those who are at risk of developing chronic illness, MNT aids in prevention efforts through alterations in dietary intake (“5 Benefits of MNT,” 2018). The most common chronic diseases for which a client may receive MNT include, but are not limited to, type 1 and type 2 diabetes, gestational diabetes, and CKD

("Medical Nutrition Therapy," n.d.). For type 1 and type 2 diabetes, MNT has been proven to reduce hemoglobin A1C (Evert, 2019). For women who are pregnant, evidence suggests that MNT has helped to prevent weight gain during pregnancy in order to reduce the risk of developing gestational diabetes (Pari-Keener, 2020). MNT helps to slow clients' progression of CKD as well as prevent and reduce nutritional deficiencies, contributing to the prevention of comorbidities ("Chronic Kidney Disease," 2010).

Registered Dietitian Nutritionists (RDNs)

RDNs are the designated providers of MNT. In order to receive certification, RDNs must acquire specified educational and certificatory documentation:

- At minimum, a bachelor's degree from an accredited institution.
- Completion of a 6-12 month supervised practice program at a healthcare facility, community agency, and a food service corporation that has been accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND).
- Received a passing score on the Commission on Dietetic Registration national examination

("What is a Registered Dietitian Nutritionist," n.d.).

Initial consultations with RDNs are typically one hour long and follow-up sessions are scheduled at the RDN's discretion or depending on the client's insurance coverage.

Appointments following initial consultation are used to check the client's progress and determine if any changes needed to be made to the nutrition goals and treatment plan (Ellis, 2018).

Research shows that PCPs view dietitians as the most qualified providers of MNT for clients with obesity and patients living with diet-related chronic diseases ("MNT Effectiveness..." 2013). They are primarily responsible for screening and referral of clients,

determination of provision and frequency of MNT, nutrition intervention, care coordination, and monitoring and evaluation of nutritional intake and dietary practices (Briggs et al, 2018).

Primary Care Providers (PCPs)

The role of PCPs is to serve as the gatekeeper between a client who is living with or is at risk of chronic illness and a RDN who offers MNT services. Prior to referral, a PCP will generally use secondary care prevention methods such as annual physicals and basic screenings to determine whether a client could benefit from MNT (Aboueid, 2018). The screenings conducted by the PCP often include basic anthropometric measures to determine the BMI of a client as well as information the client provides regarding their dietary habits (Aboueid, 2018). Once an understanding of the client's dietary habits is obtained, this information is then shared with the RDN coinciding with the referral to determine an individualized treatment plan (Morris, 2010).

Specialized Physicians

Gastroenterologist

MNT is an effective service for a variety of GI issues including IBS, celiac disease, and Crohn's disease ("MNT: Gastrointestinal Disorders," 2015). A common dietary plan suggested by gastroenterologists for individuals with IBS is the low FODMAP diet, which is an evidence-based strategy that involves the removal of foods likely to contribute to and increase IBS symptoms (Collins, 2020; Gunnars, 2018). However, this dietary strategy is often administered to IBS clients for them to follow on their own accord (Collins, 2020). Hence, a relationship between gastroenterologists and RDNs is critical because rather than allowing individuals with IBS to handle dietary management independently, they can be referred to RDNs

who can help individuals develop a dietary plan to improve and maintain their digestive health (Collins, 2020).

Cardiologist

The provision of nutrition services such as diet modification are essential for those who have or are at risk of developing CVD (Racine, 2011). A dietary strategy recommended by cardiologists to reduce risk factors and improve CVD among their clients is the Dietary Approaches to Stop Hypertension (DASH) (Racine, 2011). The relationship between a cardiologist and a RDN is beneficial to the client as MNT services provided by a RDN helps assist clients in establishing and adhering to a dietary health plan like DASH to help minimize risk factors leading to CVD as well as sustain health for those who have CVD.

Neurologist

Neurological diseases often have a negative impact on the nutritional health of the person with a diagnosis as they suffer from deficiencies in micronutrients, leading to dehydration and malnutrition (Burgos, 2017). Dietary interventions however, are known to delay the progression of neurological diseases and reduce neurodegeneration associated with aging adults (Arthofer, 2017). Diets differ depending on the type of neurological disease which is why diets suggested by a neurologist must be specific to the individual. This is where the role of a RDN is necessary as part of the purpose of MNT is to provide specificity through the development of a diet plan (Burgos, 2017). Some of the neurological diseases that MNT works to improve include epilepsy, multiple sclerosis, amyotrophic lateral sclerosis (ALS), Parkinson's disease, and stroke (Burgos, 2017).

Endocrinologist

Part of the role of an endocrinologist is to help determine whether there is a hormonal imbalance within the body (“What is Endocrinology?,” n.d.). The endocrine system ensures that organs have the nutrients and stability they need to function properly (“Endocrine Nutrition,” n.d.). Improper nutrition disrupts the endocrine system, causing the body’s organs and glands to function incorrectly (“Endocrine Nutrition,” n.d.). Therefore maintaining nutritional health is crucial in sustaining organ and gland functioning, which can be done through the use of MNT provided by a RDN. The relationship between endocrinologists and RDNs is becoming more widely known as evidence emerges about the relationship between diet and the endocrine system (“Can a Dietitian...,” 2015). The acknowledgement of the relationship between nutrition and the function of the endocrine system reinforces the usefulness of MNT in facilitating proper function of organs and glands as well as developing a plan to achieve hormone stability (“Individualization May Aid Endocrinologists...,” 2011).

Oncologist

As an oncologist, one of the most challenging aspects of working with cancer patients is preventing malnutrition (Muscaritoli, 2019). Malnutrition resulting from a severe loss of nutrients and proteins is common among cancer patients due to forms of cancer treatments such as chemotherapy and radiation (Sauer, 2013). Despite limited existing randomized control trials, studies have indicated that MNT has been effectively used to improve the nutritional status of cancer patients (Muscaritoli, 2019). For this reason, it is critical to develop a solid network between oncologists and RDNs so as to incorporate nutrition management as a part of the typical treatment for a cancer patient in order to sustain their nutritional health.

Health Insurance Agencies

Within the context of MNT, healthcare insurers are responsible for determining coverage of care as well as reimbursement, cost-sharing, and other financial requirements to be paid, if any, by patients receiving MNT. Presently, for those eligible for Medicare and Medicaid, coverage of MNT varies. Medicaid programs vary state-by-state, making it difficult to determine a baseline for MNT coverage. Nutritional coverage details are not explicitly included as a mandatory or optional benefit, but could fall under “other diagnostic, screening, preventive, and rehabilitative services” (“Medicaid Medical Nutrition Therapy,” n.d.). Medicare Part B, on the other hand, covers MNT for enrollees with diabetes and/or renal disease with a referral from a PCP. Coverage includes an initial consultation, individual and/or group sessions, lifestyle management, and follow-up visits up to a certain amount which is determined by the health care provider. (“Nutrition therapy services,” n.d.). In a similar vein, Marketplace health insurance plans do not include MNT as a mandatory or optional benefit, leaving determination of coverage to the discretion of individual health insurance agencies (“What Marketplace health insurance plans cover,” n.d.).

MNT Patient Outcomes

There are two types of indicators, quantitative and qualitative, when discussing patient outcomes of MNT. Quantitative outcomes include regimented and individualized dietary plans that produce tangible health outcomes such as hypertension and hemoglobin A1C. Qualitative outcomes include quality of life and self-efficacy as well as general positive behavior change.

Tracking Quantitative Indicators

Recent studies have shown that MNT is an effective strategy in promoting dietary lifestyle changes that lead to positive health outcomes. MNT promotes an ongoing lifestyle that includes long-term changes in daily eating and exercise habits. It is also a way of controlling and preventing adverse health outcomes. When looking at MNT’s effectiveness in promoting

favorable health outcomes, some of the possible questions that could be asked are: “How effective is MNT provided by a RDN in addressing or preventing CVD, how effective is MNT provided by a RDN on weight management...?” (Franz et al., 2017).

A well-balanced diet can also reduce symptoms and risks that result from CVD, obesity, and type 2 diabetes making MNT an effective method for promoting health and wellness. Adhering to the DASH diet can assist this goal by reducing blood pressure, which can lower the risk of heart attack or stroke, slow symptoms of chronic disease, increase energy levels, and facilitate weight loss. Eating a diet that is rich in whole grains, fruits, vegetables and low-fat dairy products and limits consumption of saturated fat and high-cholesterol foods can lower blood pressure by up to 11 mm Hg (MayoClinic, 2019).

A common challenge in proving the effectiveness of MNT has been a lack of clinical studies as well as a lack of proper patient recordings of their diet. However, multiple individual face-to-face MNT sessions by a RDN over three to 21 months led to significant physiological improvements and a reduction in the development diet-related diseases (Sikand, 2018). The average weight loss achieved is one to two pounds per week and reflects similar benefits as produced by the DASH diet (Clinical Nutrition Programs, n.d.). Despite the lack of an array of evidence-based studies on the health implications of MNT on chronic diet-related diseases, existing data suggests that MNT is an effective disease management technique.

Tracking Qualitative Indicators

MNT is a service that is based on lifestyle and behavioral changes as well as psychosocial practices (Cefalu, 2017). This means that quality of life, self-efficacy, and related measures of well-being are essential to patient success. The AND uses the question, “What influence does MNT provided by a RDN have on quality of life?” to determine the effectiveness of MNT for those with diabetes (Franz et al., 2017). Surveys and focus groups can be used to

measure how social or interpersonal relationships have evolved within the context of MNT (Barr & Schumacher, 2003). Additionally, another goal of MNT is to improve a client's relationship with food. While the dietitian should counsel the client on eating more nutritious food, they should also ensure that the client's relationship with food remains positive or has become more positive than when they began the service (Cefalu, 2017). As discussed previously, MNT can involve assessing nutritional needs and creating individualized goals relating to those needs ("What is Medical...", n.d.). Addressing a client's needs and tracking goals are important aspects in the progression of behavior change. Another aspect of MNT that must be considered is the effectiveness of group sessions versus individual sessions (Agee et al., 2018). It is important to consider how the setting of MNT will affect specific populations in different ways.

While there are not ample amounts of information on the qualitative effectiveness of MNT itself, Diabetes Self-Management Education and Support (DSMES) has been shown to improve self-efficacy in patients with diabetes and often leads to clients increasing their use of medical services, both preventive and primary care ("How People with...", 2018). MNT is used as a component of DSMES, meaning similar results could be seen in MNT individually ("Medical Nutrition Therapy," 2018). Overall, research shows that numerous dietary interventions (caloric restriction, low-fat, low-carbohydrate) all lead to increases in quality of life to some degree of significance (Carson et al., 2014).

Effectiveness of MNT

The outcomes of the identified indicators can be organized into two groups, short-term and long-term.

Short-Term Outcomes

While short term outcomes may vary depending on the chronic illness under consideration, one of the indicators of the short-term effectiveness of MNT is that it helps to

improve behaviors at an individual level relating to shifts in attitudes, knowledge and beliefs regarding nutrition and dietary habits of the clients it serves (Racine, 2011). Individual behavior changes such as improving knowledge are critical in strengthening the nutritional health of clients and influencing their decision-making to improve eating habits (Racine, 2011). Another indicator of the short-term effectiveness of MNT is that a client's improved knowledge about nutrition can also positively impact their physiological health, particularly when it comes to external and internal stressors on the body that withhold the body's ability to function homeostatically. The inflammatory response is a major factor of physiological health and is significantly impacted by diet, as studies have shown an association between obesity and chronic inflammation (Swift, 2017; Lutz, 2020; Koca, 2017). While the inflammatory response is essential to the body's repair, chronic inflammation is unhealthy for the body as it can lead to chronic illnesses such as diabetes and CVD (Lutz, 2020; Ellulu, 2017). The short-term effects of MNT are portrayed through alterations made to improve dietary habits, which therefore reduce the risk of diet-related diseases such as diabetes and CVD among clients to maintain their physiological health (Hamulka, 2018).

Long-Term Outcomes

The long-term effects of MNT generally include the slowing, reversal, and prevention of chronic disease; reducing cholesterol levels; and facilitating weight loss and reduction in BMI ("5 Benefits of Medical Nutrition Therapy," 2019; Møller, Andersen, & Snorgaard, 2017).

One indicator of the effectiveness of MNT stems from its use of dietary recommendations as a tool for chronic disease management. MNT is known to improve health outcomes in overweight and obese adults as well as improve outcomes associated with lipid metabolism disorders (i.e. Tay-Sachs disease). Benefits include a reduction in total cholesterol and LDL cholesterol, triglycerides, BMI, and medication use as well as an increase in high-density

lipoprotein (HDL) cholesterol and quality adjusted life years (“Medical Nutrition Therapy Effectiveness (MNT) Systematic Review (2013-2015),” 2015). However, more data is needed to allow for a detailed examination of the long-term health effects of MNT in this regard.

A second indicator of MNT’s effectiveness is its ability to improve metabolic outcomes (i.e. blood glucose and hemoglobin A1C) in individuals living with diabetes (Pastors et al., 2003). According to a study conducted by the American Diabetes Association (ADA), patients who received an intervention incorporating the nutrition practice guidelines achieved a greater reduction in hemoglobin A1C (1.0 vs. 0.33%) than those patients who received standard nutrition intervention (Pastors, 2002). MNT has also been identified as an effective treatment for type 1 and type 2 diabetes as well as managing chronic disease, which is most effective when implemented closer to the time of diagnosis. A large contributor to the success of MNT is the educational and therapeutic component, which facilitates weight loss, metabolic management, and the adoption of healthy dietary practices. Early enrollment in MNT has also been shown to be an effective preventive measure against type 2 diabetes (Morris & Wylie-Rosett, 2010). Additionally, MNT has been seen to effectively achieve a six percent decrease in total and LDL cholesterol levels at three and six months in comparison to a one percent increase and a two percent decrease in both values at three and six months with general care provided by PCPs (Delahanty et al., 2001).

Research has also shown that MNT improves quality of life in low-income and/or uninsured individuals. MNT programs that are specifically designed for low-income communities recognize the barriers to health they face (i.e. income, access to health care, food insecurity) and determine strategies to navigate and in some cases overcome said barriers, ultimately contributing to improved health outcomes (Agee et al., 2018).

Discussion

Advantages

MNT has advantages for clients, RDNs, PCPs, and health insurance companies. One benefit of MNT for clients is improved health conditions and prevention of complications through dietary modifications, according to the ADA. A client may benefit from MNT as a strict and regimented diet can help cancer patients to maintain a healthy body weight, improve their strength, keep body tissue healthy and can reduce the side effects caused by cancer treatments. MNT is most effective with clients who are overweight or have certain diseases, including cancer, CVD, GI disorders, HIV/AIDS, kidney disease, or type 1 or type 2 diabetes (Stein, 2019). According to the AND, four studies regarding MNT (with or without oral nutritional supplementation) reported improved health outcomes related to energy intake, symptoms and cardiovascular risk incidences in patients with HIV/AIDS (Stein, 2019).

A second advantage for clients is that it can be cost effective, as some public and private insurance plans, such as Medicare, cover nutritional therapy (Stein, 2019). A third benefit of MNT is that unlike treatments that require regular attendance at a clinic, one can adhere to the prescribed diet at home. A personalized, disease-specific dietary plan helps in both reduction of and recovery from a chronic disease. For example, a patient with heart disease or diabetes can benefit from a MNT-prescribed diet high in healthy monounsaturated fats (Gray, 2019).

PCPs benefit from MNT as they are often the first point of contact between clients and RDNs. In turn, leading to an increase in service utilization by patients (“How People with...,” 2018). Nutrition plays an important role in prevention and management of many leading causes of morbidity and mortality seen in primary care, such as CVD, diabetes, and obesity. Due to the fact that physicians do not receive substantive training in nutrition education, it is important that

PCPs are aware of, and utilize, RDNs' services that not only benefit the client but also ensure continuity of care. RDNs benefit by augmenting and complementing the activities that physicians often use to prevent, assess, and treat nutrition related problems. Patients had better access to dietary services provided in familiar settings and family doctors learned about dietary counseling through direct feedback from RDNs (Crustolo, 2005).

Disadvantages

Overall, there are few risks related to MNT. A possible physical side effect is that a client could lose weight too rapidly, but this is easily avoided with strong guidance from a RDN (Johns Hopkins Medicine, n.d.). Additionally, it is important to note that comprehensive research on the effects of MNT for conditions other than diabetes is somewhat lacking. The lack of research means that PCPs and other health professionals could have difficulties justifying referring clients to a RDN. As mentioned previously, MNT services are not considered a mandatory benefit, and Medicare Part B only covers MNT services for those with diabetes or renal disease ("Nutritional therapy services," n.d.; "What Marketplace health...", n.d.). The potential cost barrier could be a disadvantage for many low- and middle-class individuals, excluding them from participating in MNT.

Another disadvantage of MNT for clients is barriers to compliance, including food insecurity and lack of access to follow-up care. The research on MNT does not fully acknowledge food insecurity's effect on compliance with MNT services. One in ten DC area residents are food insecure ("Hunger in Our Region," n.d.). If those seeking out MNT services cannot readily access resources to make changes in their diet, the effectiveness could be limited.

Group sessions are shown to be more effective than individual sessions for high-income individuals, while low-income individuals preferred individual sessions (Agee et al., 2018). Also,

considering that follow-up is a vital component of MNT, it is important to note that there could be issues with compliance. Patients, especially those who are low-income, could have low adherence rates because of barriers such as cost, transportation, patient-provider relationship, or the inability to take time off of work or away from family responsibilities (Abraham, 2019). However, creating a strong core knowledge of the treatment and providing continuous support and guidance can help prevent nonadherence (Fernandez-Lazaro et al., 2019). Additionally, telehealth has been shown to be just as effective at delivering MNT as traditional in-person sessions (Kelly et al., 2020). Telehealth sessions allow for clients to receive quality service while their environmental and economic circumstances are accounted for.

Cost and Cost Savings

Several research studies have concluded that MNT is a cost effective method of treatment in comparison to the costs of other therapies, treatments, and management tools for chronic health conditions. One study found that the average annual cost savings of individuals with type 2 diabetes utilizing MNT was \$4,145 and for type 1, \$9,990 (Heaps, 1997). Patients with type 2 diabetes incurred a \$275 bill per person for one year of MNT and consequently reduced medication costs by \$316 (Delahanty et al., 2020, p.2640). Studies have also found that MNT's cost effectiveness extends to other medical conditions beyond diabetes. The projected cost savings per person for patients with renal insufficiency was \$60,958 (Heaps, 1997). A study conducted by the Massachusetts Dietetic Association examined the benefits of MNT for patients with hypercholesterolemia (high cholesterol), finding that the mean cost of MNT was \$163 per patient versus treatment of hypercholesterolemia using drug therapy, which is \$1,450 (McGehee et al., 1995). Data published by the American Dietetic Association purported that MNT is a cost-effective treatment method for CVD as well (Toyer et al., 2010, p.1847).

In 2009, a randomized controlled trial of 147 health plan members reported that education and MNT reduced the risk of lost work days by 64.3% and the risk of disability days by 87.2%), supporting not only the health benefits produced by MNT but also its economic benefits (Wolf et al., 2009). In the same vein, in patients with dyslipidemia – abnormal amount of lipids in the blood – MNT contributed to an increase in quality-adjusted life years and reduced cost of medications from \$1,456 per year to \$638 (Sikand et al., 2018). If MNT promotes positive and sustainable behavior change, then cost savings could increase exponentially with the management and reduction of chronic diseases.

Within the Medicare population, MNT resulted in a reduction of hospital service utilization by 9.5% among patients with diabetes and 8.6% for those with CVD. Physician service utilization declined by 23.5% in diabetes patients and 16.9% in CVD patients. Reductions in hospital and physician visits by patients with chronic conditions save both individuals and medical facilities considerable amounts of money. At the time this study was conducted (1999), the estimated cost of covering MNT under Medicare was \$369.7 million between 1998 and 2004 and the cost benefits for covering MNT within the same period was estimated to be \$2.7 billion (Sheils & Stapleton, 1999).

The cost of MNT pales in comparison to the cost of treating chronic health conditions such as heart disease and stroke, cancer, diabetes, and obesity, which cost \$214 billion, \$174 billion, \$327 billion, and \$147 billion respectively. Treatment for those with chronic and mental health conditions constitute 90% of the U.S.' \$3.5 trillion annual health expenditure, which could be drastically reduced by the implementation and coverage of MNT for chronic and diet-related diseases (“Health and Economic Costs of Chronic Diseases,” 2020).

Value of MNT

As mentioned prior, MNT is valued as a service that improves the overall health of clients receiving the service through the modification of one's dietary intake in order to delay or reverse chronic disease progression or diagnosis (Evert, 2019; Racine, 2011). One of the most valuable aspects of MNT is that it is a client-centered service (Vettel, 2018). In this case, the client is responsible for taking control of their nutritional health with the guidance of an RDN who provides the service. An increase in self-efficacy among clients can be attributed to this sense of responsibility that MNT provides through the client-centered approach (Vettel, 2018). More specifically, self-efficacy can be seen as a result of MNT through the way that it empowers clients in their ability to achieve desired health outcomes independently (“Can MNT Change your life?,” 2017).

Furthermore the individualized approach of the MNT service provides clients with specific plans that help them to improve their nutritional health (CDC, 2018). This aspect of the MNT service is what distinguishes it from other options such as generalized nutrition education that is focused more on reinforcing knowledge surrounding nutrition and less focused on establishing individualized plans and strengthening client empowerment (“MNT versus Nutrition...,” 2006). This aspect of individuality strengthens the effectiveness of MNT through further improving the client's dietary habits.

Additionally, the financial savings for both the clients and health insurers as a result of MNT make it a valuable service for individuals with chronic and diet-related diseases. MNT is cost-effective because it improves health outcomes through altering a client's dietary habits, preventing said clients from having to buy expensive medications such as insulin, and or revert to costly therapies or surgeries as a result of their conditions (“MNT: Cost Effectiveness,” 2009; Heaps, 1997). On a similar note, MNT is valued in its contribution toward improving the

nutritional health of those who are food insecure (Vettel, 2018). This is due to the fact that it provides techniques on how to make cost-effective food purchases that not only help the client in food budgeting but also sustain a diet that is geared to their individual nutritional health needs (Vettel, 2018).

Conclusion

Recommendations

Based on existing evidence-based research and an analysis of MNT, it is recommended that the YMCA of Metropolitan Washington offer MNT through clinical partnerships. As discussed prior, research has indicated that the individualized dietary plans prescribed through MNT lead to improved health outcomes related to chronic, diet-related diseases, prevents the onset of said illnesses, and enhances overall mental and physical well-being of the clients it serves. MNT is also a cost-effective strategy for both individuals and the larger health system. Studies have indicated that investment in early intervention programs can prevent and reduce the burden of chronic diseases, which are much more expensive to treat after the onset of disease.

The YMCA currently provides a breadth of services that align with the goals of MNT: promoting the health and well-being of community members. Existing programs include nutrition counseling, a self blood-pressure monitoring system, cooking classes partly sponsored by the American Heart Association, a diabetes prevention program, and a family obesity intervention. Like the rest of the YMCA's programs, these programs have a wide reach that cover the many needs of community members. Therefore, MNT could be easily integrated into existing programs offered by the YMCA that target prevention and management of chronic diseases. Fifty-five percent of adults in Washington, DC are overweight and 354,000 residents have at least one chronic disease and 119,000 have two or more chronic diseases (DC DOH, 2019;

Partnership to Fight Chronic Disease, n.d.). Treating these conditions would cost approximately \$3.8 billion (Partnership to Fight Chronic Disease, n.d.). Implementation of MNT provides significant cost savings at the individual and systems levels. Not only would MNT reduce healthcare costs by reducing investment in treatment-based care, but it has been proven an effective intervention provided by other organizations, of which include other YMCA locations.

MNT would likely be well received by the community given its community-based orientation and accessibility. Integration into the existing YMCA structure would build upon and strengthen pre-existing relationships. MNT would also be highly beneficial to the DC community given the high prevalence of chronic diseases in the region. However, provision of MNT would come with certain challenges, one of them being the fact that not all health insurers cover MNT. Requiring them to do so would be a vital first step as health coverage ensures accessibility of care. Once coverage is procured, the next stage is the formation and reliance upon pre-existing clinical relationships. Secure partnerships are pivotal to client success because they ensure continuous, quality care. Coordinating MNT between the YMCA and outside clinical providers relies upon a strong, communicative relationship. Based on this investigation and consequent reflection, the provision of MNT by the YMCA of Metropolitan Washington would largely benefit the communities served.

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