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Evaluation of Nutrition Education Materials in the Cardiac Short Stay Units in Vancouver, BC

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Evaluation of Nutrition Education Materials in the Cardiac Short Stay Units in Vancouver, BC

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SUMMARY

Introduction: Coronary Artery Disease (CAD) is a condition that reduces quality of life, life expectancy and productivity. Changes in lifestyle habits (such as dietary) are necessary to manage CAD. Health professionals rely on printed educational materials to reach as many patients as possible, and those materials need to be tailored to the audience and comply to recent evidence to be effective in reducing risk of secondary events in CAD. **Objective:** To evaluate the nutrition education materials available to patients in CAD diagnose and management units in British Columbia (BC), Canada. **Methods:** Four guidelines for secondary prevention of CAD were summarized into 25 topics. 3 Hospitals in BC provided all their printed materials used for nutrition education following CAD diagnose. Materials were scored according to the presence of guideline topics and to a Plain Language checklist validated by the Centers for Disease Control and Prevention. Percentage scores were calculated and compared to develop suggestions to improve patient care in CAD units. **Results:** Guidelines were complete, in agreement with each other and with current evidence. None of the materials achieved satisfactory grades, with compliancy to dietary guidelines of 32%, 48% and 48%, and checklist scores of 58%, 58% and 41%. The materials were not considered suited for patients regarding language or actionability. **Conclusion:** The educational materials did not reach acceptable levels of compliance to the guidelines. It is recommended that they are redeveloped by dietitians, using the most recent evidence on this field and the a language level adequate to their audience.

INDEX

LIST OF FIGURES

1 INTRODUCTION

According to the World Health Organization (WHO), Cardiovascular Diseases (CVD) is the leading cause of death worldwide. These diseases affect the circulatory system through blockages, lesions and weakening of the blood vessels, congenital defects, heart failure and several other presentations. The conditions with the higher levels of mortality are Ischemic heart diseases, a group of disorders that affect blood irrigation to the heart and can lead to death of the myocardium, impairing blood flow throughout the body (WHO, 2011b).

Coronary Artery Disease (CAD) is a progressive and incurable type of ischemic heart disease caused by build up of fatty or calcified plaques in the vessels that carry oxygenated blood to the heart muscle. According to the WHO, there are many factors associated to CAD, including advanced age, diabetes, obesity, high blood pressure and some genetic conditions that lead to accelerated weakening of the arteries. The disease's progression can be slow, leading to the development of symptoms such as chest tightness, angina, shortness of breath and chest pain during physical activity. Even though the causes of the disease are still under investigation, the "*Global Atlas on cardiovascular disease prevention and control*" lists 4 preventable risk factors for CAD: Tobacco use, physical inactivity, harmful use of alcohol and unhealthy diet, as being responsible for a great percentage of CAD cases (WHO, 2011a, 2011b).

Programs that promote lifestyle changes such as cardiac rehabilitation (CR) are centered on dietary and exercise coaching. They have been proven to reduce the complications caused by CVD and lower the rates of secondary CAD events (new blockages, heart attacks) after percutaneous coronary intervention (PCI) and coronary artery bypass graft surgery (CABG). Although these two procedures are the only ones able to provide instant revascularization of the affected area, CR provides recovery from treatment and management of risk factors that reduce the chances of recurring CVD events. These programs are also supported by the majority of physicians that deal with diagnosis and management of CAD (Leon, A. et al, 2003). Unfortunately, attendance to these programs is low, and the success of the treatment depends on the patients' motivation to change. Dieticians are not able to provide individual counselling in all settings, and medical doctors are not trained to attend to these issues during their daily interactions with patients (Mampuya, 2012).

For that reason, the development of Educational Materials can be useful in clinical settings to promote the increase of awareness and knowledge of information that can lead to improved dietary habits. It is established that tailored printed and electronic communication can reach patients and guide changes in habits, especially if a structure is available for the patient to further develop their knowledge and be coached through changes that are more difficult (Gans et al., 2009). Another factor that increases the importance of educational materials is that they reduce the need for in person meetings with patients. This can be beneficial in cases where the care centers are distant from individual's residences, or going to the center on itself is a factor that reduces attendance to the programs. The improvement granted by these developments has been evidenced in more recently developed programs that are home based, Being developed to be used by patients with minimal supervision from health professionals (Jolly et al., 2008; Taylor et al., 2015). In British Columbia, that is the case for many islands and the interior/northern region of the province, as they are spread far from specialized care that is able to provide them with the coaching they need to improve their habits towards food.

However, presenting patients with the evidence is not enough. The presentation of the material should be considered not only for a matter of aesthetics, but also for what helps patients to understand the information. Tailoring materials accordingly can adapt them for age and literacy, for the best mean through which the information will reach the targets and for a design that will capture their attention and assure that the information was *trans*mitted. That is extremely necessary as patients have different levels of education and an educational material should reach as many people as possible to save resources and provide optimal care without discrimination of people. One of the key principles of *trans*mitting health-related information is using plain language, witch involves knowing what patients are capable of understanding and "*trans*lating" the evidence into a simple version that will not require extensive medical training or research to understand (Noar, Benac, & Harris, 2007).

As more knowledge is acquired relating CAD and nutrition, there is the need for health organizations to update, tailor and improve their educational materials to provide a better care to patients that will not be reached by complex programs such as Cardiac Rehabilitation. The opportunity to reach patients in their own residences to contribute with their recovery and treatment demands the monitoring of current research and the

development of accurate and understandable materials to pass the information along, and that is the subject of this study.

1.1 Main Objective

To evaluate the printed nutrition education materials (PNEM) provided to patients diagnosed with CAD in 3 cardiac centers in British Columbia.

1.2 Specific Objectives

- To collect all PNEMs available to patients in Cardiac Short Stay Units (CSSU);
- To compare the available information to the most recent CR guidelines;
- To revise any conflicting information according to the most recent guidelines and evidence on treatment and prevention of CAD;
- To suggest updates to the materials when not according to evidence;
- To evaluate the quality of the materials regarding readability and action ability.

2 LITERATURE REVIEW

2.1 Coronary Artery Disease

Coronary Artery Disease is characterized by an inflammatory process following repeated lesions in the inner endothelium of the coronary arteries (Herrmann & Lerman, 2012). The inflammation leads to a build up of a compound of cells, cholesterol and clotted blood, reducing the blood flow needed to bring nutrients to the myocardium and through that triggering the symptoms that are characteristic of the disease, with the

possibility of progressing a complete obstruction happens. This final stage of the disease causes the infarction of the muscle, commonly called heart attack, and it happens when a small blood clot gets caught in the decreased vessel lumen.

The symptoms of the disease vary among groups. Women, for example, tend to have less specific symptoms and have more misdiagnosed episodes than men (Quader & Wilansky, 2015). The typical symptoms of the initial onset are shortness of breath, shortness of breath on exertion, chest pain or angina, dizziness and palpitations. Patients that present any of these may be subject to imaging exams such as angiography or echocardiograms, at which point the doctor can give a certain diagnosis and estimate how big the occlusion is (Wilson, 2015).

Currently there are three established treatments for this disease: two that involve revascularization of the heart muscle, and another that slows or reverses the growth of plaques. Coronary Artery Bypass Graft, usually called CABG, is an open-heart surgery that uses a healthy vessel from somewhere in the body to bypass the occlusion. Percutaneous Coronary Intervention (PCI) is a less invasive procedure done in an angiography clinic, in which a balloon catheter is guided from a larger artery into the coronaries to expand the affected artery and restore blood flow. Medical management is done with medications that reduce symptoms, blood pressure and cholesterol, and can dilate the arteries to increase the blood flow to the myocardium. These should be associated with lifestyle changes, so that the risk factors can be managed in a long-lasting way (Lavi, Kandzari, & Barsness, 2012).

When effective, those treatments just alleviate symptoms. Patients treated with PCI usually present with new blockages, even though some studies show reduced rates of death and Myocardial Infarction. When the underlining causes of plaque formation are not managed, patients are subject to developing blockages in other arteries, or the further narrowing of old ones, followed by the reappearance of symptoms (Lavi, Kandzari, & Barsness, 2012). Management of this condition is better attained through Cardiac Rehabilitation programs, that will be discussed further in this paper.

2.2 Manageable Risk Factors

Many risk factors have been identified for the formation of blockages in the coronaries. Since the disease is multifactorial, there is no way to narrow the single defining factor that leads to the onset, but some have been observed more often in patients and therefore are treated as more significant than others. In this review, only four of the known manageable factors will be described as they are the most associated with diet.

2.2.1 Obesity

In 2008, 35% of adults above the age of 20 were obese. This number increases as a *trans*ition from infectious to chronic diseases happen, and overweight is well correlated to the development of other diseases. The Global status Report on non communicable diseases has estimated that 35.8 million of Disability Adjusted Life-Year are lost due to overweight, meaning that it causes not only premature death, but also loss of quality of life and productivity among adults (WHO, 2011b).

Obese people are more likely to develop diabetes, heart diseases, dyslipidemias, some types of cancer and other diseases. This happens both because of the underlying mechanisms of inflammation and hormonal dysbalanced (independent effects of obesity) and the factors that led to obesity in the first place (Lichtenstein et al., 2006). The main causes of obesity are lifestyle (diet, physical activity), hereditary and metabolic disorders. From these, the effect of unhealthy eating habits and sedentarism (high energy intake *versus* low energy expenditure) are the most important factors, and are also related to many other chronic conditions. This means that strategies that reduce obesity levels could potentially reduce the rates of other chronic conditions as well (Public Health Agency of Canada, 2011).

For this reason, many strategies and plans have been developed to reduce the ratios of overweight and obesity throughout the world. Governments have been increasingly aware of this fact as the cost of healthcare and pensions due to weight-related morbidity increases (Withrow & Alter, 2011). The burden put in the health services due to these conditions is not only noticeable, but also reducible. Many strategies have

been proved successful and are supported by governments such as Australia, Brazil and France. Examples of these are the treaties with the food industry, increasing taxes on sugary beverages, prohibition of children-targeted food commercials and campaigns to increase the consumption of fruits and vegetables (Branca, Nikogosian, & Lobstein, 2007).

These kinds of campaigns can be developed through many strategies, and one of them is nutrition education. The usage of this method involves stablishing what are the healthy habits (evidence) and coaching people on how to appropriate those into their lives. It is important to remember that individualized strategies work best, especially when the treatment is goal-oriented by a certified health professional such as a Registered dietitian. Most strategies will use a combined effort to improve eating habits while encouraging the increase in physical exercise suggesting, therefore, the need of a multidisciplinary team (Smith et al., 2011).

2.2.2 Diabetes

Diabetes is characterized as the presence of abnormally high levels of blood sugar. There are many known types of diabetes, but the most common are types I and II, where type II is mostly associated with increased body weight and insulin resistance, and type I mostly related to autoimmune damage of the pancreas. Since type I has different effects on the metabolism and it is not highly correlated with CAD, only type II will be considered in this review.

This disease has a significant impact in an individual's metabolism. The increase in blood sugar affects the flexibility of blood vessels and creates an environment that promotes inflammation and damage of the vessels' endothelium. As fat cells have a constant supply of sugar, there is an increase of fat synthesis, leading to weight gain and worsening the overweight that is already so common in patients with this condition. The insulin shots that reduce blood sugar may also promote weight gain, and associated comorbidities reduce the patient's disposition to exercise (foot wounds, amputations, hypoglycemia, etc.) (Herrmann & Lerman, 2012).

According to Farkouh et al (2012), diabetes is present in 25% of CAD cases that undergo revascularization in multiple vessels. This has led to special protocols for

these kinds of patients, since the progression is much faster and the severity (number of vessels affected, proportion of the occlusion) of the disease is greater. There is already a recommendation that patients that present with both diagnosis should be forwarded to a heart surgeon to consider Coronary Artery Bypass Graft for treatment, as Percutaneous Coronary Intervention would lead to suboptimal management of symptoms and it would not reduce the risk for heart attacks or cardiac death. This was attested in the clinical trial developed in 2012 where patients were randomly assigned to either CABG and PCI, and CABG patients responded better in all outcomes except in the prevalence of stroke (1% higher in the CABG group) (Farkouh et al., 2012).

2.2.3 Dyslipidemia

Blood lipids are essential factors in the formation of the atherosclerotic plaque. Oxidation of fat-carrying lipoproteins is an important factor for the build-up of a blockage, but that is not the only mechanism responsible for the formation of the plaque. Atherosclerosis commonly starts when repetitive injury happens in the *intima* layer of the vessel. Depending on the healing process of the organism, the vessel can go back to its healthy state or progress into more dangerous formations. If the inflammation progresses, the cell recruitment promotes a favorable environment for the formation of a differentiated immune cell, called the foam cell. This cell derives from a macrophage that accumulated intracellular fat, and that is where blood lipids can accelerate the process. The cell is unable to metabolize these substances, especially when they are oxidized and in high concentrations (Anderson et al., 2016; Herrmann & Lerman, 2012).

For these molecules to be oxidized, they need to be circulating in a favorable environment, which happens more commonly when there is excess LDL (low density lipoprotein), VLDL (very low density lipoprotein), ILD (intermediate density protein), chylomicron remnants and Lipoprotein A in the bloodstream. These fat-carriers are containers of higher proportions of Apolipoprotein B, making them atherogenic and potentially damaging to the blood vessels when in high concentrations as they have more cholesterol available for oxidation. There is one other factor that relates to the potential damage of these fats, the molecule called HDL (high density lipoprotein), which has the

function of carrying cholesterol back into the liver for redistribution or excretion. HDL, therefore, reduces the amount of oxidized cholesterol available for plaque formation and adequate levels of HDL reduce the risk for cardiovascular disease (Anderson et al., 2016).

The blood lipids are well correlated to cardiovascular disease, and for that reason many strategies to reduce the risk of that condition relies on managing LDL, triglycerides and HDL levels. Medical interventions are based on certain drugs that act on absorption and synthesis of fats, but also based in lifestyle changes that include mainly diet and exercise coaching. HDL levels, for example, are not easily changed, but respond well to exercise and reasonably well to certain kinds of unsaturated fats. LDL responds well to the reduction of saturated fat (when not replaced by carbohydrates), and extremely well to the elimination of *trans*-fatty acids (TFA) (FAO, 2010; Hall & Lorenc, 2010). Since the greater part of TFA intake comes from processed foods, many governments have been convinced to regulate the upper levels of that substance in food products, banishing the use of hydrogenated oils and mandating the replacement of these ingredients with aims to improve the population's health. Governmental actions like this are important to reduce the exposure of people to such harmful ingredients, especially when executed side-by-side with educational programs that empower the population to avoid the less healthy options (Colón-Ramos, Monge-Rojas, & Campos, 2014; Todfield, 2015).

2.2.4 High Blood Pressure

High blood pressure (HBP) is one of the main causes for the damage in the vessels' inner lining. There is a direct and progressive correlation between the increase in blood pressure and the risk of cardiovascular disease, and because of that, it is hard to determine a safe threshold above the normal levels (<120 mm Hg systolic and <80 mm Hg diastolic) in which there is no damage that leads to the development of atherosclerosis (Lichtenstein et al., 2006).

The challenge is of concern of most health organizations. Since HBP is multifactorial, managing environments and campaigns requires a thorough understanding of the

most influential factors in the condition. As many studies have been developed in the field, most discoveries point to a harmful lifestyle rather than one cause. The rise of processed foods coupled with a drastic reduction in the consumption of fruits and vegetables, low levels of physical activity, epidemic of overweight and alcohol abuse are just examples of what healthcare has been forced to tackle to reduce the effects of a rising blood pressure. It's been of greater concern the trend observed in many epidemiological studies that show an increase in children's and teenagers' blood pressure and diagnose of blood pressure abnormalities (Kit et al., 2015; Lurbe et al., 2016; Rosner et al., 2013).

The balance between sodium and potassium intake has been of greater concern for most guidelines, as there is convincing evidence correlating this ratio with misbalances in blood pressure. This concern is well established since the displacement of fresh fruits and vegetables by industrialized products (containing additives such as monosodium glutamate (MSG) and sodium saccharin, plus excessive amounts of sodium chloride) have shifted the balance towards an increase in blood pressure. Many organizations have been calling for a government intervention in reducing the addition of these substances to reduce the intake of hidden sodium, not only because of concerns with blood pressure but also because of chronic kidney disease patients. As making agreements with the food industry is a long and exhaustive process, the quickest pathway to improving the Na/K ratio is through encouraging people to switch back to eating unprocessed vegetables, fruits and legumes (Gutiérrez, 2013; Lurbe et al., 2016).

2.3 Cardiac Rehabilitation

After being diagnosed with heart disease, patients often lose part of their quality of life, having restrictions added to their daily tasks. Shortness of breath, weakness, and reduced muscle strength are just reduced in many cases, and the patient needs time and guidance to restore their health. Even after the clinical/surgical treatment is administered, the association of the disease with lifestyle habits leads to the establishment of a rehabilitation process that helps the patient to manage these associated factors. This kind of program is called Cardiac Rehabilitation (CR), and it is considered to be such an important part of the treatment that health professionals are instructed

to always discuss the benefits with patients prior to discharge from hospital (Piepoli et al., 2010).

The core components of CR are established by approved guidelines and have been defined as necessary to provide complete assessment and treatment. They have been summarized as: Baseline Assessment, Nutritional Counselling, Lipid Management, Blood Pressure Management, Tobacco Cessation, Weight Management, Diabetes Management Psychosocial Management, Physical Activity Counselling and Exercise Training. Even though many of these overlap, some reports from programs in Ohio, USA, have shown that there is a critical gap in the nutritional evaluation, diabetes care and weight management aspects, likely caused by the low rate of referrals to Registered Dietitians. Since nutritional recommendations followed pre-established general guidelines, the centers were relying on pre-prepared, standard materials and orientations that other health professionals could manage (Zullo et al., 2012).

Patients that go through CR delay secondary cardiac events, have reduced cardiovascular disease risk and improved overall quality of life. This is mainly because of the management of risk factors and follow-up after the treatment of initial symptoms, essential components of an effective management of any chronic condition. Unfortunately, the percentage of patients that effectively join programs like that is low (34% in 2014) and attendance is affected by the kind of primary event, kind of treatment, gender, ethnicity and proximity to a CR center/hospital (Grace et al., 2014).

Programs have adapted to try to improve attendance by offering alternative times, teaching about home activities, and even creating outpatient online rehabilitation, which does not require going to a center and can be adapted to the patient's routine (Taylor et al., 2015). It is important to highlight that women are especially prone to not joining cardiac rehabilitation. Although reasons for that are still unknown, many groups have been directing their efforts into developing new ways to provide education to female cardiac patients, including printed manuals and more spaced meetings to reduce the time commitment the patient has to make. Since women experience cardiovascular disease differently than man, gender-adapted treatments are of great interest of health authorities and should be treated as an important development to improve healthcare (Grace et al., 2014).

2.4 Effects of Nutrition Education in Prevention of Secondary Events

Dietary habits are key in most chronic diseases since they also affect other risk factors. Standard guidelines and recommendations stablish that eating habits need to be evaluated and improved for most chronic conditions. In the case of CAD, the management of risk factors is related to slowing down the progression of the disease and involves much research to determine which diet factors have a substantial impact in the reduction of secondary events and symptoms (Rees et al., 2013). Programs that ought to increase fruit and vegetable intakes have observed significant reduction in blood pressure and microvascular function, and even though data from clinical trials are scarce, the biological pathways and physiological explanations are enough to encourage fruit and vegetable consumption, even to reduce LDL and total cholesterol (Dragsted et al., 2006; Woodside, Young, & McKinley, 2013). Many ongoing trials are assessing the premise that strategies to introduce whole dietary plans with changes to all food groups intakes are more effective to reduce risk factors and all-cause mortality (Delgado-Lista et al., 2016; Weber et al., 2016). These studies are motivated by promising results, especially related to the Mediterranean diet and reduced blood pressure, mean plasma glucose level and cholesterol ratios (Ramon Estruch et al., 2006). Trials with the Mediterranean diet have even observed a higher adherence in the modified diet groups than the groups that received education towards a “prudent” diet, suggesting that the nutrition education provided to patients along with the differences in the diet was contributing to their better outcomes (Ramón Estruch et al., 2013).

Although there is evidence to encourage all patients with cardiovascular disease to seek modification in their lifestyle, strategies to motivate behavioral changes vary widely. It is well established that any health-related intervention should be oriented by a certified health professional, and that dietitians should be the leads in nutrition-related activities. Other health professionals often misinterpret or miscommunicate evidence that is not from their fields, making it even more difficult for patients to understand the directives they should follow to improve their health (Ma et al., 2010). In fact, some guidelines are so complicated that a study has shown no statistical difference between a simple orientation for fiber intake increase and complete AHA-based recommendations (Ma et al., 2015).

However complicated to apply, dietary changes are still at the cornerstone of CAD treatment and in Cardiac Rehabilitation, they are incentivized in group and individual sessions and facilitated by dietitians (in preference). Nutrition Education may be developed in-person and via printed/electronical materials, with some evidence even pointing towards some superiority of printed educational materials to increase fruit and vegetable intake (Wright et al., 2011). One aspect that is relevant to the effectiveness is that the program is tailored to the patient in question and progressively presented instead of given as a single package. A study that compared different approaches to a nutrition education program concluded that tailored, multiple packets of materials were more effective at increasing fruit and vegetable intake and improving optimal fat intake than non-tailored or tailored materials delivered in one single package (Gans et al., 2009).

2.5 Knowledge *Trans*lation in Health Services

Evidence is not tailored towards the standard patient or their families. Sometimes, even health professionals have issues in understanding and applying evidence to their practices, especially when the evidence comes from another specialty. Given the abundant amount of evidence being generated every year, it is not an easy task to be up to date in all evidence regarding dietary guidelines. Dietitians are outnumbered and sometimes not accessible because of location and financial reasons, and patients would remain in need for dietary counselling if other professionals did not step to support secondary prevention related to eating habits. For that reason, some organizations have tried to organize and disseminate the best evidence for use in general practice, encountering many challenges in the way (Truswell, Hiddink, & Blom, 2003).

On the American Heart Association website alone, searching for the words “dietary guidelines” returns over 1000 results. These results would be mostly related to official guidelines, dietary guideline-related news, and government official statements, which are not inviting for professionals or patients. Only 30% of the family doctors in British Columbia have reported using some kind of nutrition related resource for patient counselling, and the cause may be the absence of official resources that can be replicated and disseminated. As a result, this requires of the professional to prepare their own

materials or rely in outdated/inadequate information from unofficial sources (Wynn et al., 2010).

Reliable information in this field will, most often, be prepared by dietitians and adapted into the language that is suitable for most people. Dietitians translate the information into a language and format that is common to the public, making it easier for patients and health professionals to understand it. Use of appropriate dissemination strategy is also key to allowing the patients to access the information, whether it is websites, games, printed materials or in-person counselling. There is not agreement regarding the most effective means of providing education, since studies have shown the variability in different groups' preference of vehicle. The professionals would preferably assess the target audience on literacy, computer literacy, interest and time availability before developing the material, so that the information is accessible and understood. One of the keys aspects of the process is the evaluation of the language level comprehended by the target audience. Materials are often tailored to a lower level of literacy-audience so that the reach can be increased, but most evidence in the area indicates that patients prefer to be presented a material that fits their literacy, nothing overly complicated, neither too shallow (Boyde & Peters, 2014). Optimally, the materials would be evaluated by members of the target audience so that there is validation of the materials and evaluation of behavior change and risk modification. That would establish the optimal language to the specific audience (Williams et al., 2016).

Plain language principles are a crucial factor and many organizations try to develop guides to improve patient-health professional communication. Checklists such as the Centers for Disease Control *Clear Communication Index Score Sheet* were developed in accordance to laws passed in the United States that guarantee the right of the population to have access to understandable information. Principles that guide the adaptation of language to fit most levels of literacy are also described in the Federal Plain Language Guidelines as being essential aspects of communication. The most important topics to improve the text are choosing simple words and verbs, using the active voice (ex.: *you should do* instead of *this should be done*), being concise, writing in the way you speak and avoiding jargons (CDC, 2013; Vincent, 2011). An important aspect of plain language writing is consulting with the target audience using focus groups or interviews to assess the comprehensiveness of the information, a step that is often deemed unviable and skipped by the organizations that are developing the educational material (Wizowski, Harper, & Hutchings, 2014). The *Score sheet* used in

the analysis of the materials in this study is available in the attachments (Attachment 1).

With regards to information resources for people with CAD, a recurring type of material is a sort of manual that provides orientation about many aspects of secondary prevention strategies, including lifestyle (diet, exercise and smoking), medication, routine follow-up, symptom recognition and management. An example is the *Heart Manual*, a resource that has become key in the development of home-based rehabilitation programs. Three randomized control trials have been developed to validate the tool and the results of the most recent study have shown that there were no differences in risk reduction or habit modification between the patients who received the Manual (home-based care) and those who received the traditional rehabilitation program (hospital based (Dalal et al., 2007; Jolly et al., 2008; Lewin et al., 1992). This serves as an encouragement to professionals to develop new tools to increase patient engagement and adherence to treatment. The Manual is an example of knowledge translation done with excellence. The evidence since the first issue has evolved and changed and the information is easily understood with minimal contact between health professionals and patients regarding instructions for secondary prevention. Knowledge translation refers to the process of transforming raw evidence (studies, articles) into understandable information. This is also developed to disseminate new guidelines and recommendations to health professionals, as a way to keep their practice in accordance with the most recent evidence Developments in knowledge translation allow health care professionals to increase their reach and impact in patients that cannot or will not participate in hospital-based programs (Boyde & Peters, 2014).

3 METHODS

3.1 Study Type

This is a Quality Improvement project, divided in steps of theoretical research, collecting and evaluation of materials, and synthesis of recommendations based on the results of the analysis.

3.2 Selection of the hospitals

The choice of the hospitals was based in the characteristics of the province of BC and availability of staff to provide the information. Three hospitals from three different health authorities were included in the analysis, one being from the interior or rural area, one from a large urban centre and another from a suburb. These hospitals receive patients with various levels of literacy, access to information and lifestyle, being optimal choices for a representative sample of British Columbia's Health care standards.

3.3 Selection of materials

The study group requested, via email, if the hospital staff could send all the material that was available to patients at Catheterization Laboratories and everything that was provided by dieticians and nurses to support healthier dietary choices. In one of the hospitals, it was possible to talk to the dietician responsible for the patients admitted for Angiography, and in another, it was possible to visit the lab and assess the availability of the Educational Materials. The three hospitals agreed with disclosing the information for the purposes of this study. The head nurses and dieticians selected the materials that served the purpose of educating patients that had a positive diagnosis of CAD.

3.4 Reference search

Literature search was done in online libraries such as Google Scholar, The Library of the University of British Columbia and Web of Science. Using the keywords as "coronary heart disease", "cardiac rehabilitation", "diet", "dietary habits", "secondary prevention", "diet and cholesterol", "diet and heart disease risk", "printed educational materials", "nutrition education materials, in different combinations. All peer-reviewed

studies from 2006 onwards were considered. Studies in English and Portuguese were considered.

3.5 Recommendation synthesis

Due to great variability in the information about dietary factors and CAD, the synthesis of recommendations was done by following the 2011 updates from the American Heart Association (AHA)/American College of Cardiology Foundation (ACCF), the 2009 position paper from the European Association of Cardiovascular Prevention and Rehabilitation (EACPR) and the Canadian Cardiology Society (CCS) Guidelines from 2016. A summary of core recommendations regarding dietary management of 5 key factors was developed based on these papers (Cholesterol, Blood Pressure, Blood Glucose, Overweight and Supplementation). If any inconsistencies were found, further research was done on the specific topic (Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2011).

For analysis of plain language principles, the Centers for Disease Control and Prevention (CDC) plain language principles and checklist were used. This checklist has four sections, divided according to important aspects of educational materials (Core components, Behavioral Recommendations, Number usage and Risk explanation). The checklist recommends that materials below 90% of compliance should be improved by following the descriptions contained in a separate document, the user guide (CDC, 2013).

3.6 Comparison of materials and recommendations

From the selection of the most important recommendations, tables were developed so that the information in the materials could be easily compared to the most up to date guidelines. Recommendations were grouped per risk factor they referenced to, and the results of the comparison lead to two “grades”: adequately mentioned in the material or inadequately mentioned (absent or inaccurate). Overall compliancy was given in percentages.

For analysis of plain language principles, the same readability formulas, plain language checklists and actionability scoring tools were used for all the materials to achieve a balanced evaluation. Validated tools were used to guarantee a relevant analysis according to prestigious organizations such as the CDC (CDC, 2013).

4 RESULTS AND DISCUSSION

4.1 Recommendations for secondary prevention of CAD

4.1.1 Lipid Management

The four evaluated guidelines agreed with most of the recommendations towards lipid management. The guideline that elaborated the most in this aspect was the 2006 AHA Diet and Lifestyle Recommendations, which listed not only the diet factors, but also hints and strategies to reach the goals. This guideline was also the only one to encourage the consumption of vegetable oils other than olive oil, and to state that specific kinds of fiber are an important part of this management.

All guidelines agreed in regards to trans-fat, cholesterol and saturated fat intake reduction. This is not, however, the case for the whole scientific community. Although most have evidenced a proportional increase of CVD risk as saturated fat intake increases, the restriction of cholesterol intake has been debatable. A character that has been present in these discussions is the egg, or more specifically egg yolk, which is a food rich in cholesterol, but also in many vitamins and fatty acids that are important in a healthy diet. The question of whether daily consumption of eggs poses a threat to cardiovascular health can be evidenced in studies back from 1982, when epidemiological studies already suggested that other aspects of diet could have a bigger impact in diet than cholesterol from the yolk (Dawber et al., 1982).

A trial that compared diets rich in carbohydrate, vegetable protein or unsaturated fat, for example, concluded that when other dietary components replace carbohydrates there is a significant reduction of Blood pressure, LDL cholesterol and CVD risk (Appel

et al., 2005). The AHA has already stated that carbohydrates should not replace fats to improve the lipid profile in patients, but a recent meta-analysis still confirms that LDL levels rise when there is a greater consumption of saturated fat (Schwingshackl & Hoffmann, 2013). The chart below shows the dietary recommendations extracted from the guidelines.

Figure 1: Summary of dietary recommendations for Lipid Management.

AHA/ACCF (2011)	ESC (2010)	AHA/ACC (2006)	AHA Nutrition (2006)
• 200mg/day cholesterol • <7% of calories as saturated fat; • Avoid trans-fatty acids (<1% of daily energy); • w-3 fatty acids from fish;	• <200mg/day cholesterol • <7% of calories as saturated fat; • Increase mono/poly unsaturated fats; • Increase w-3 from fish; • Mediterranean diet; • Alcohol moderation.	• Limit trans-fatty acids • <200mg/day cholesterol • <7% of calories as saturated fat.	• Avoid trans-fatty acids; • Reduce saturated fat; • Avoid very low-fat diets (<15%); • Reduce cholesterol consumption; • Increase fiber intake (insoluble, β-glucan and pectin); • Consume 2 servings of fish/week; • 25-35% energy as fat; • Replace hydrogenated fat with liquid vegetable oils.

(Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2006, 2011)

4.1.2 Blood Pressure

Improvement of BP through diet is mostly related to the sodium/potassium balance. This was a recurrent topic in the guidelines as their recommendations highlighted sodium restriction and increased intake of potassium-rich foods such as fruits, vegetables and dairy products. There were no disagreements among the guidelines. Two of them clearly recommended the adherence to the DASH (Dietary Approaches to Stop Hypertension) diet while the others didn't. This is not a significant issue since they still recommended eating habits very similar to the diet, even if they did not call it by the same name. Another subject of great importance is alcohol consumption, which was referred to in all guidelines. However, because of the evidence related to the protective effects of moderate alcohol and wine consumption, this will be discussed further ahead.

An interesting point brought by the 2006 AHA Diet and Lifestyle Recommendations is about the intake of vegetable protein as a strategy to reduce BP. There is now a reliable amount of evidence that indicates that the increase in consumption of vegetable protein (with special highlights to soybean) promote the reduction of systolic blood

pressure even further, making it an important and safe recommendation to people with high BP. The results of trials show a greater effect when vegetable protein displaces carbohydrates from the diet, indicating that a higher protein intake might be effective for hypertensive patients (Altorf - van der Kuil et al., 2012; Appel et al., 2005; Rebholz et al., 2013; Wang et al., 2008). Figure 2 shows the topics that were summarized from the recommendations.

Figure 2: Summary of dietary recommendations for Blood Pressure Management.

AHA/ACCF (2011)	ESC (2010)	AHA/ACC (2006)	AHA Nutrition (2006)
• Alcohol moderation; • Sodium restriction; • Increase fresh fruits and vegetables; • Increase low-fat dairy products.	• Sodium restriction; • Moderation in alcohol intake (30g/day/men, 15g/day/women); • DASH diet; • W-3 fatty acids; • High fresh fruits and vegetables; • High low-fat dairy products.	• Alcohol moderation; • Sodium restriction; • Increase fresh fruits and vegetables; • Increase low-fat dairy products.	• Sodium restriction (2.3g/day); • Moderated alcohol (1-2 drinks/day); • Increased potassium, • DASH diet; • Replace some carbohydrates with plant-sourced protein; • Replace some carbohydrates with monounsaturated fat; • Increase fruits and vegetables.

(Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2006, 2011)

4.1.3 Diabetes

Despite being such a recurring risk factor for CAD, diabetes is often managed separately, so the guidelines for risk management are not rich enough to describe all the recommendations regarding dietary management of diabetes. The most detailed guideline is from the European Society of Cardiology. Among its topics, it recommends a slightly higher proportion of fat than the Acceptable Macronutrient Distribution Range of 20-35% of calories as fat. That is mainly to facilitate a reduction in carbohydrate consumption, but it is not in agreement with evidence as there is no optimal macronutrient distribution specific for the management of diabetes (Wheeler et al., 2012). Dietary counselling should be individualized, as it is recommended for all patients, so that the effectiveness of the treatment can be maximized (Franz, 2016; Wheeler et al., 2012).

All guidelines recommend that patients be followed up by a multidisciplinary group and reduce the consumption of added sugars to proper treat the condition and prevent

further damage to the cardiovascular system. This is in accordance with the evidence that shows that excessive consumption of simple sugars is prejudicial for individuals whether diabetes is involved or not, and in agreement with the 2009 AHA Guidelines on Dietary Sugars Intake and Cardiovascular Health (Johnson et al., 2009). The latter is consistent with the most comprehensive treatment plans for Diabetes. Patients that need to be in this kind of care will require more specialized diet, nutrition education and follow up, since the treatment of diabetes on itself is considered diet-centered (Franz, 2016). But since the association of diabetes and CVD risk factors (dyslipidemia, overweight and high BP) is strong independently of CVD being established or not, two of the guidelines suggest that the same lifestyle modifications mentioned for those factors should be followed by diabetic patients. The recommendations are listed in Figure 3.

Figure 3: Summary of dietary recommendations for Diabetes Management.

AHA/ACCF (2011)	**ESC (2010)**	**AHA/ACC (2006)**	**AHA Nutrition (2006)**
• Apply all recommendations from B. pressure, Lipid Management and Overweight.	• 30-35% of daily calories as fat; • 10% of daily calories as monounsaturated fat; • Avoid *trans-fatty acids*; • 30g/day fibre; • 5 servings of fruit/vegetables/day; • Avoid food with added sugars.	• Lifestyle modification.	• Calorie restriction; • Avoid food with added sugars; • Increase fiber intake.

(Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2006, 2011)

4.1.4 Overweight

Managing body weight is a broad aspect of nutrition and there is much debate on the better strategy to use in each case. For improvement of CAD factors, all guidelines but one recommend a weight loss up to 10% as effective and with quick response. The one that didn't suggest that preventing weight gain should be the focus as that is more easily obtainable than a significant weight loss. All guidelines stated that calorie restriction should be the focus of interventions, but that it should be incentivized through behavioral programs that changed eating habits.

Calorie restriction is currently being contested as the main source of weight loss. Some studies report a greater weight loss in patients following a high-fat diet than a hypocaloric diet (Schwingshackl & Hoffmann, 2013). Other studies with metabolic syndrome patients have reported a substantial weight loss (similar to what was observed in the AHA healthy diet group) when the focus of the orientation was the increase in fiber, not calorie restriction (Ma et al., 2015). Most meta-analysis conducted in the field of weight loss have reached the conclusion that it is possible to reach significant weight loss with either low carbohydrate or low fat diets, but the results always favor low carbohydrate diets as the ones that incur in greater weight gain. This suggests that the optimal diet will be related more so to the acceptance of the patient than the diet itself. Because of the evidenced benefits of a 5-10% weight loss in CAD patients, some attention has been given to the substantially increased weight loss in Diabetes type 2 patients and very low energy diets, but there is not enough information about adherence in a real-world setting or the risks on the long term (Rehackova et al., 2016).

The conflicts between the current evidence allows space for the maintenance of strategies that focus on eating habits more widely since those will have a wider effect in the patient's health, and concurrently, their weight. The 2006 AHA Diet and Lifestyle Recommendations also suggested that home-cooking can be an important tool for weight loss in any case in which the patient relies in foods from restaurants for the majority of their calorie intake. Preparing food at home has been observed in national studies in the USA as a predictor of a healthier diet, but there is still the need for large trials that focus on weight loss to strengthen and replicate these recommendations more widely (Wolfson & Bleich, 2014). The topics from the guidelines that refer to weight loss were summarized in Figure 4.

Figure 4: Summary of dietary recommendations for Overweight Management.

AHA/ACCF (2011)	ESC (2010)	AHA/ACC (2006)	AHA Nutrition (2006)
• Loss of 5-10% body weight from baseline; • Balance between caloric intake and expenditure; • Participation on behavioral programs.	• Nutritional individualized counselling; • Goal-determining; • Follow-up monitoring; • Loss of 5-10% body weight from baseline; • Balance between caloric intake and expenditure.	• Balance between caloric intake and expenditure • Participation on behavioral programs; • Loss of 10% body weight from baseline.	• Prevent weight gain is more effective than attempts to lose weight; • Calorie restriction; • Increase fruits and reduce juices; • Prefer home-cooked meals.

(Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2006, 2011)

4.1.5 Supplementation

All four guidelines suggest the use of w-3 fatty acids supplements as part of the treatment for CAD. The recommended amount of 1g/day is in agreement with current evidence on the impact in CVD risk reduction. Other supplements mentioned include viscous fibre, sterols/stanols and one of the materials alluded the absence of evidence towards other supplements such as antioxidants and vitamins.

The evidence in large meta-analysis shows the triglyceride lowering effects of fish oil supplementation. There is mechanistic explanation about the effects of EPA and DHA fatty acids and CVD risk prevention. Large reviews support the hypothesis that fish and fish oil improve the lipid profile, especially in dyslipidemia, by reducing triglyceride and increasing HDL – cholesterol concentrations, and also that the combination of EPA and DHA reduce inflammatory markers that are elevated in cardiovascular diseases (Allaire et al., 2016; Mozaffarian & Wu, 2012). However, some studies have pointed that there is an increase in LDL – cholesterol associated with this supplementation, which leads to the conclusion that the decision to supplement these nutrients should be made individually by the doctor and dietitian (Oelrich, Dewell, & Gardner, 2013). Some recent reviews have concluded there is not enough evidence to support the guidelines, and that there was no reduction of CVD risk in observational studies (Chowdhury et al., 2014). This, however, is under investigation and most organizations still support the usage of polyunsaturated fat as part of the treatment for CAD.

There is a correlation between vitamin supplementation above the Recommended Dietary Allowance and increased mortality, and evidence points that there are no benefits associated with the excessive intake of ‘antioxidant’ nutrients such as Vitamin E, A and Carotenoids (Bjelakovic, Nikolova, & Gluud, 2013). Stanols and sterols, however, have been supplemented and used in fortified foods with great success. There is substantial evidence that they reduce cholesterol levels and assist with treatment of dyslipidemia by reducing cholesterol absorption and regulating its synthesis, making this, therefore, a reliable supplement for the management of CAD (Gylling et al., 2014). Supplementation recommendations from each of the guidelines are described in the figure below.

Figure 5: Summary of dietary recommendations for Supplementation.

AHA/ACCF (2011)	ESC (2010)	AHA/ACC (2006)	AHA Nutrition (2006)
• 1g/day fish oil capsules;	• 1g/day w-3 fatty acid capsules; • 2g/day sterols/stanols; • 10g/day soluble fibre.	• 2g/day sterols/stanols; • 10g/day viscous fibre; • 1g/day fish oil capsules.	• 1g/day Fish oil (EPA+DHA); • 2g/day sterols/stanols • Possible harmful effects for vitamin supplements; • No evidence for antioxidant supplements.

(Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2006, 2011)

4.2 Summary of recommendations

Table 1 shows the compilation of recommendations from the 4 guidelines. This set up allowed the extraction of the most recurrent or novel strategies to manage risk factors, from which Table 2 was organized to summarize the main topics from all the guidelines.

The selection of these recommendations was essential to compare the materials and reach a valid score basis to evaluate them. For each of the risk factors 5 topics were extracted, to a total of 25. All the guidelines provided important insight to point to the topics that needed confirmation from the most recent evidence and were equally important in the construction of the summary. It was already expected that the 2006 AHA Diet and Lifestyle Recommendations would be more detailed in regards to diet since the other ones tackled many issues not address in the latter. However, these specific recommendations did not have greater significance than the ones mentioned in the majority of the guidelines, and were only part of the final summary in a few topics that have good evidential support.

Table 1. Dietary recommendations for secondary prevention of CAD.

Guideline	Lipid Management	Blood pressure	Diabetes	Overweight	Supplementation
AHA/ACCF (2011)	• 200mg/day cholesterol • <7% of calories as saturated fat; • Avoid *trans*-fatty acids (<1% of daily energy); • w-3 fatty acids from fish;	• Alcohol moderation; • Sodium restriction; • Increase fresh fruits and vegetables; • Increase low-fat dairy products.	• Apply all recommendations from B. pressure, Lipid Management and Overweight.	• Loss of 5-10% body weight from baseline; • Balance between caloric intake and expenditure; • Participation on behavioral programs.	• 1g/day fish oil capsules;
ESC (2010)	• <200mg/day cholesterol • <7% of calories as saturated fat; • Increase mono/poly unsaturated fats; • Increase w-3 from fish; • Mediterranean diet; • Alcohol moderation.	• Sodium restriction; • Moderation in alcohol intake (30g/day/men, 15g/day/women); • DASH diet; • W-3 fatty acids; • High fresh fruits and vegetables; • High low-fat dairy products.	• 30-35% of daily calories as fat; • 10% of daily calories as monounsaturated fat; • Avoid *trans-fatty acids*; • 30g/day fibre; • 5 servings of fruit/vegetables/day; • Avoid food with added sugars.	• Nutritional individualized counselling; • Goal-determining; • Follow-up monitoring; • Loss of 5-10% body weight from baseline; • Balance between caloric intake and expenditure.	• 1g/day w-3 fatty acid capsules; • 2g/day sterols/stanols; • 10g/day viscous fibre.
AHA/ACC (2006)	• Limit *trans*-fatty acids • <200mg/day cholesterol • <7% of calories as saturated fat.	• Alcohol moderation; • Sodium restriction; • Increase fresh fruits and vegetables; • Increase low-fat dairy products.	• Lifestyle modification.	• Balance between caloric intake and expenditure • Participation on behavioral programs; • Loss of 10% body weight from baseline.	• 2g/day sterols/stanols; • 10g/day viscous fibre; • 1g/day fish oil capsules.
AHA Nutrition (2006)	• Avoid *trans-fatty acids*; • Reduce saturated fat; • Avoid very low-fat diets (<15%); • Reduce cholesterol consumption; • Increase fiber intake (insoluble, β-glucan and pectin); • Consume 2 servings of fish/week; • 25-35% energy as fat; • Replace hydrogenated fat with liquid vegetable oils.	• Sodium restriction (2.3g/day); • Moderated alcohol (1-2 drinks/day); • Increased potassium, • DASH diet; • Replace some carbohydrates with plant-sourced protein; • Replace some carbohydrates with monounsaturated fat; • Increase fruits and vegetables.	• Calorie restriction; • Avoid food with added sugars; • Increase fiber intake.	• Prevent weight gain is more effective than attempts to lose weight; • Calorie restriction; • Increase fruits and reduce juices; • Prefer home-cooked meals.	• 1g/day Fish oil (EPA+DHA); • 2g/day sterols/stanols • Possible harmful effects for vitamin supplements; • No evidence for antioxidant supplements.

(Anderson et al., 2016; Piepoli et al., 2010; Smith et al., 2006, 2011)

Table 2. Summary of combined dietary recommendations for secondary prevention of CAD

Lipid Management	**200mg/day cholesterol**	**<7% of calories as saturated fat**	**Avoidance of trans-fatty acids**	**Mediterranean Diet**	**Increase Cold Waters Fish Intake**
Blood Pressure	**Sodium moderation**	**Fresh fruits and vegetables and Low-fat dairy products**	**Replace carbohydrates with monounsaturated fat and vegetable protein**	**DASH Diet**	**Alcohol Moderation**
Diabetes	**30-35% of daily calories as fat**	**10% of daily calories as monounsaturated fat**	**Avoid food with added sugars**	**Fruits and vegetables**	**Lifestyle modification according to diabetes management**
Overweight	**Loss of 5-10% body weight from baseline**	**Balance between caloric intake and expenditure**	**Participation on behavioral programs**	**Prevent weight gain**	**Prefer home cooked meals**
Supplementation	**2g/day sterols/stanols**	**10g/day soluble fibre**	**1g/day fish oil capsules**	**No evidence for antioxidant supplements**	**No evidence for vitamin supplements and possible harmful effects**

4.3 Compliancy of Evaluated Materials

4.3.1 Compliancy to Dietary Recommendations

Table 3 shows the evaluation and scores of each of the materials in percentage. The material belonging to Health Authority (HA) 1 had the worst results, with only 32% of the recommendations being present. The other materials presented the same compliancy %, differing in the Lipid Management and Supplementation topics.

Table 3. Compliancy of Evaluated materials to the recommendations

	Health Authority 1		*Health Authority 2*		*Health Authority 3*	
	Adeq	Inadeq	Adeq	Inadeq	Adeq	Inadeq
Lipid Manag.	2	3	4	1	3	2
Blood Pressure	2	3	4	1	4	1
Diabetes	3	2	3	2	3	2
Overweight	1	4	1	4	1	4
Supplementation	0	5	0	5	1	4
Overall (%)	**32%**	**68%**	**48%**	**52%**	**48%**	**52%**

The strongest recommendations were related to blood pressure control, and the only topic that was not mentioned was the recommendation of the DASH diet. None of the materials recommended the Mediterranean diet for Lipid Management, either. The evidence towards the benefits of both diets are well established and they are recommended even as standard healthy eating habits, being composed mainly of unprocessed foods, whole grains and unsaturated fat, while being well balanced regarding its macronutrient distribution. DASH-style diets are well researched and have been confirmed to reduce blood pressure (systolic BP by 6.74 mmHg, diastolic BP by 3.54 mmHg), weight in overweight individuals (1.42 kg higher weight loss when compared with healthy/prudent diets in 8–24 weeks), CVD risk (20%), CAD (21%), stroke (19%), and heart failure (29%) (Salehi-Abargouei et al., 2013; Saneei et al., 2014; Soltani et al., 2016). The absence of this recommendation may be suggestive of a concern regarding patients following diets without supervision from dietitians, but the guidelines still support and incentive that the DASH diet be mentioned, discussed and adapted

towards the patient's lifestyle, as one of the greatest concerns about lifestyle interventions is related to the adherence in the long term. Some studies have shown that adherence to the diet in a long term is more important in weight loss than the macronutrient composition of the diet (Pagoto et al., 2013).

Still about Blood Pressure, there is an important characteristic of the recommendation for dairy intake, which was present in two of the materials. Although both advise patients to consume low fat dairy products, the tone of the recommendation is not of an incentive, but of caution. There is substantial evidence regarding the consumption of milk products (great sources of potassium) and reduced BP/improved vascular function, with results that point to an 8-16% lower risk (depending on the fat content), even though the effect is only significant for fluid products and not for cheese, butter, etc. (Heraclides et al., 2012; Maki et al., 2013; Ralston et al., 2012). Such a high relationship would be expected to produce frequent recommendations on the materials, and the brief statements about dairy intake were not consistent with current evidence. One reason for this could be that, in Canada, dairy consumption is high among the population, with rates that reach 598g/day (in 2011), and milk is largely recommended in the national Food Guide as one of the 4 food groups (FAO, 2016; Government of Canada, Health Canada, 2011). It is hard to determine if the absence of this incentive is harmful for the population, but there is certainly more space for this recommendation in materials that focus on BP control.

The Mediterranean diet (MD) was not mentioned in any of the materials. As it is with the DASH diet, the MD is well established in the literature as effective in leading to weight loss, improvement in lipid profile and overall CVD risk reduction (Ramón Estruch et al., 2013). Many programs already use the diet as the main course of treatment, and the guidelines are incisive about it. The ESC advises that the MD be implemented for all patients with Stable Coronary Disease, being incisive that this is a reliable strategy for secondary prevention (Piepoli et al., 2010). However, this does not mean that the diet will be acceptable or viable in all settings. For many populations, this diet will be too expensive or too different from their culture, and therefore, may be rejected. Adaptations to this diet can be built in any culture, as the basis for it relies in whole grains, fish, vegetables, extra-virgin olive oil and red wine. An ongoing trial from Brazil has developed a strategy to adapt the principles of the MD (in association with the DASH diet) to the country's food culture and economic boundaries. The study indicates that one of the main offsets of the traditional MD is cost, and that using its

principles in a different setting might open up the way to innovative dietary treatments to CVD (Weber et al., 2016). This shows that there is no reason for the exclusion of the recommendation from the materials, as patients with access to those types of foods could benefit from the diet on itself, and further adaptations could be suggested in the strategies proposed by them.

Supplementation recommendations were the scarcest among all the HAs, with only one of them addressing the subject at all, with the mentioning of w-3s and fish oils. Although the controversy related to these nutrients was mentioned above, it is still of concern that the materials would not address this, at least opening the possibility for the patient to discuss the subject with its health care provider. Supplementation is simpler for patients to comply with and the faster effects can be a great incentive for them to remain in treatment, being, therefore, a good topic to highlight in educational materials. Some ongoing studies are also measuring the effects of olive oil supplementation in a Mediterranean diet, opening a new opportunity for recommendations that can be accessory to more complex lifestyle changes (Delgado-Lista et al., 2016). Supplementation of Sterols and Stanols, however, is safe and can induce a further reduction in LDL-cholesterol. The association of medical management of blood lipids and stanol/sterol supplementation is also safe and the effects are cumulative, suggesting that patients in need to manage dyslipidemias would benefit from consumption of supplements or foods fortified with these plant components (Sorrentino, 2012). Most evidence suggest that these be recommended to patients with chronically cholesterol not responsive to statin medication, hereditary elevated cholesterol or unable to take statins, since there is still the need for randomized trials to strengthen the recommendation (Gylling et al., 2014).

The recommendations towards alcohol consumption can sometimes be vague as there is not a clear distinction between the beneficial effects of a moderate consumption and of total abstinence. The materials did not recommend the consumption, as it is usual in most cases. The evidence about alcohol intake and CVD risk reduction are mostly related to wine and its high polyphenol concentration, though some studies have reported similar benefits for spirit and beer consumption. The association between CVD risk and alcohol was sustained even with hypertensive patients (Costanzo et al., 2011; Huang et al., 2014). Wine is an important component of the Mediterranean diet, and studies have shown that it confers protective effects to cardiovascular health even in healthy individuals (Chiva-Blanch et al., 2013). The Canadian Evidence and

Guidelines for Low-Risk Drinking state that there are protective effects at a very low consumption, with all-cause mortality risk reduction being present only at half to one drink per day, while emphasizing that these benefits are only observed in middle age onwards and not out scaling the risks brought by its consumption (Butt et al., 2011). This shows that even the most cautious recommendations suggest the protective effects of alcoholic drinks, making it safe to recommend to individuals that are confident that that moderate consumption will not lead to dependency or abuse.

The presence of recommendations to increase the consumption of monounsaturated fats (MUFA) and vegetable protein might not be effective in some of the materials, since the evidence only supports the benefits for this when these nutrients replace carbohydrates. Even though this is reported as a topic for the management of diabetes, it also applies for metabolic syndrome prevention and BP reduction, being one of the components of the DASH diet (Siervo et al., 2015). The presence of these in trials regarding weight loss also show the potential that the carbohydrate replacement has. It is important to notice that most reviews that showed a significant effect have reported that it is not significant when the nutrients displaced are other types of fat or protein. Some studies even suggest that the reduced carbohydrate intake might be more relevant than the increase in those other nutrients, but low carbohydrate intake has been associated with low vegetable intake in observational studies (Appel et al., 2005; Schwingshackl et al., 2014). More recent studies point that although replacing carbohydrates with MUFA (especially Olive Oil) result in improved insulin secretion, sensitivity and fasting glucose, polyunsaturated fatty acids could yield a greater effect when present in the same parameters (Imamura et al., 2016). Replacement of carbohydrate with protein improves endothelial function and other CVD biochemical markers, such as Leptin and inflammation activators. This has been proven stronger for soy protein, but the results for other vegetable proteins are also indicative of a protective effect (Rebholz et al., 2013; Schwingshackl et al., 2014). There is substantial evidence pointing to benefits to the inclusion of vegetable protein and partial substitution of carbohydrates for MUFA and protein. This is a topic that could be emphasized in the materials.

A final topic to be discussed is not necessarily an issue, it is the usage of qualitative recommendations rather than quantitative. This reaches into the subject of literacy and numeracy skills, as some studies report that patients have more difficulty understanding numbers than text (Carbone & Zoellner, 2012). This is mostly related to risk indicators, but it is possible that it expands into macronutrient range, servings and serving

size, and some biochemical indicators. Guidelines often give goals as numbers, but since they are meant for a population with higher literacy skills such as health professionals, that is not necessarily a problem. However, when it is the professional's intention to pass along the knowledge, it is uncertain of whether the use of numbers would benefit patients, as having to do mathematical calculation significantly hinders the understandability of educational materials (Vincent, 2011). There is the need for more research in the specifics of health literacy and nutrition education materials to determine the best way to talk about goals with patients (Carbone & Zoellner, 2012).

4.3.2 Compliancy to Plain Language Principles

The application of the CDC Clear Communication Index Score Sheet yielded concerning results, especially in regards to Risk explanation. Table 4 shows the final score of the materials in each section of the evaluation sheet and the adequacy percentage.

Although attempts were made to maintain an objective analysis, the evaluation of these materials was made by individuals with much higher health literacy skills than the average target audience and it is subject to overestimation of the scores. Therefore, the interpretation of these results should be made with caution.

Table 4. Score of the materials according to the CDC Clear Communication Index Score Sheet (CDC, 2013).

		Max. Points	Health Authority 1	Health Authority 2	Health Authority 3
Core (A)	**Call to Action**	3	1	1	1
	Language	3	2	2	1
Behavioral Recommend. (B)		2	2	2	2
Numbers (C)		2	2	1	1
Risk (D)		3	0	1	0
N/A (session)		5	1 (D)	1 (D)	1 (D)
Score		-	58%	58%	41%

Although all the materials were scored as unsatisfactory, there were some differences among them that influenced the analysis. The materials from the HA 1, for example, were divided in 4 separate issues according to risk factors (**Diabetes** and Heart Disease, How to Control Your **Blood Cholesterol** and Reduce Your Risk of Heart Disease, How to Control Your **Blood Pressure** and Reduce Your Risk of Heart Disease and How to Control Your **Weight** and Reduce Your Risk of Heart Disease) which complicated the understanding and reading of the material and the establishment of a central message. The material dove into the subject of risk from the start, but did not explain the nature of risk or its levels for all the factors. That was detrimental for the material as the patient would not be able to understand how the message relates to with risk reduction or how much the risk can be reduced by following the recommendations. The other materials also mentioned risk, but their focus on an overall healthy diet made it less important for the patient specifically to understand risk.

Messages about risk can be confusing for most audiences. Choosing to display numerical information, explaining the mechanisms through which risk increases and mentioning how behaviors affect risk is challenging. The principles that guide these might not be the same that guide other aspects of the material. Rakow and authors (2015) have defined three main areas that challenge risk communication: The nature of the risk or the mechanism(s) by which they arise; how best to present quantitative risk information about risk probabilities; and the role played by people's emotional reactions to the risks that they face (Rakow, Heard, & Newell, 2015). As guidelines only sometime display numerical effects of each behavior in risk reduction, professionals should use other sources such as Meta-analysis and Systematic Reviews to improve the quality of the information displayed to the patients (Fagerlin, Zikmund-Fisher, & Ubel, 2011).

A recurring problem in two of the materials was the display of recommended number of servings and serving size. Although not easily bypassed, this issue is one of the reasons of why the Food Pyramid was contested and replaced by more comprehensive materials. When patients have to do any kind of calculation, as simple as a Body Mass Index, their understanding and interest are greatly reduced (Vincent, 2011). Health professionals should avoid displaying numerical information through quantitative recommendations as much as possible, especially when the patients are going to interpret and use the information by themselves.

4.3.3 Actionability of the Materials

All materials had low scores in actionability, that is, how they clearly instruct and motivate their target audience to change a behavior. The absence of a main message was one of the most crucial problems, as fragmented and wide information does not facilitate the identification of “the most important things” to take away from the materials. This point has been shown to be essential in all health based information, and more thought should be put into the use of a title or summary section that motivates and catches the attention of the audience (CDC et al., 2009).

The display of strategies was not a question in the Score sheet. However, it is an important aspect to highlight since dietary recommendations are made stronger when the patient is given “hints” to assist in transforming the information into action. Materials from HA 1 and 2 presented many strategies for fat and sodium reduction and had several associated resources to support adherence and motivate patients. This is a characteristic that made the text more actionable and easy to read. In contrast, in HA 1 the text flowed more like a scientific statement and not like a material that aimed to change behavior. It brought information about factors that affected their risk but did not mention strategies to support the practice of those factors. Dietitians are professionals that work closely with patients to determine strategies tailored to the individual, using their extensive knowledge to suggest practices that can improve their patient’s adherence to treatment. It is expected that materials developed by these health professionals would include practical guidance that is evidence based and patient centered, so that their recommendations are more easily implemented by the patient in their everyday lives.

5 CONCLUSION

Current evidence shows many dietary aspects that are relevant to clinical practice and easy to explain, with great potential to improve the outcomes of the diverse courses of treatment for CAD. Dietitians have access to this information and can use it to develop their practices and guide their recommendations. Since professionals in

this field need to be informed of evidence that is constantly being updated, having summaries and reviews of most evidence can help them to be in accordance with guidelines and provide more practice-based evidence to improve guidelines themselves.

The results of this study show that the evaluated materials were lacking in compliance with current evidence for diet and for Plain Language Principles. Improvements could be made regarding compliancy to current guidelines, usage of other sources of information and organization of recommendations to better encourage adherence to a CAD-adequate diet. These improvements may come from many sources, but there are already pre-established materials that can be used to guide the development of evidence-based, practical, orientation in a large scale. As health information is developed, health professionals can be the main source of knowledge to patients and establish the first contact through well produced educational materials that can reach beyond their scope of in-person interaction and aid in the early establishment of Rehabilitation principles soon after CAD diagnose.

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8 ATTACHMENTS

8.1 Attachment 1: The CDC Clear Communication Index Score Sheet

CDC Clear Communication Index Score Sheet

Name of material _____

Name of person scoring _____

Date __ __ / __ __ / __ __ __ __

Before you begin, identify your primary audience, their health literacy skills, your primary communication objective, and main message. You must know these 4 pieces of information to score the material accurately. If you don't have this information, wait until you do to score the material.

Note about translated materials: If the audiences for the English and non-English versions are different, you should create and score the materials separately to account for audience differences.

1. Who is your primary audience? _____

Note: See Appendix B of the User Guide for a list of common public health audiences.

2. What do you know about the health literacy skills of your audience?

List as many relevant characteristics about your audience as you can. Try and include evidence about their literacy and numeracy skills; words, numbers, and health concepts they find familiar; their prior experience with the topic; and their ability to comprehend different information formats, such as graphs. If you don't have any information at all, assume average to low health literacy skills.

_____

3. What is your primary communication objective?

A communication objective is what you want your audience to think, feel, or do after they receive the message or material. Example 1: Increase the proportion of women between 18-25 years who intend to increase consumption of folic acid. Example 2: Increase the proportion of sexually active adults with favorable attitudes about taking an HIV test.

_____

4. What is the main message statement in the material?

The main message statement is the one thing the audience must remember. The statement may be 1-3 short sentences.

_____

If you are reviewing an existing material with multiple messages, list all possible messages.

_____

CDC Clear Communication Index Score Sheet

Using the Score Sheet

The Index has a total of 20 items in 4 parts. These 20 items are presented as questions.

- Questions 1-11 in Part A **apply to all materials**.
- Questions 12-20 in Parts B, C, and D may not apply to all materials.
- Choose one answer for each item you score.
- Only score a point when all instances of an item in the material meet the criteria.

More detailed descriptions and examples of each item can be found in the User Guide.

Part A: Core
The items in this section (1-11) apply to all materials.

Questions	Score *(Check one per question)*
Main Message and Call to Action	
1. Does the material contain one main message statement? *A main message is the one thing you want to communicate to a person or group that they must remember. A topic, such as heart disease or seasonal flu, isn't a main message statement. If the material contains several messages and no main message, answer no. (User Guide page 5)* **NOTE:** If you answered **No** to Question 1, **score 0 for Questions 2-4** and **continue** to Question 5.	Yes = 1 No = 0
2. Is the main message at the top, beginning, or front of the material? *The main message must be in the first paragraph or section. A section is a block of text between headings. For a Web material, the first section must be fully visible without scrolling. (User Guide page 6)*	Yes = 1 No = 0
3. Is the main message emphasized with visual cues? *If the main message is emphasized with font, color, shapes, lines, arrows or headings, such as "What you need to know," answer yes. (User Guide page 7)*	Yes = 1 No = 0
4. Does the material contain at least one visual that conveys or supports the main message? *For example, count photographs, line drawings, graphs and infographics as visuals. If the visual doesn't have a caption or labels, answer no. If the visual has human figures who aren't performing the recommended behaviors, answer no. (User Guide page 8)*	Yes = 1 No = 0
5. Does the material include one or more calls to action for the primary audience? *If the material includes a specific behavioral recommendation, a prompt to get more information, a request to share information with someone else, or a broad call for program or policy change, answer yes. If the call to action is for someone other than the primary audience, answer no. (User Guide page 10)*	Yes = 1 No = 0

CDC Clear Communication Index Score Sheet

Language	
6. Do both the main message and the call to action use the active voice? *If only the main message or only the call to action uses the active voice, answer no. If you answered no to #1 or #5, answer no. (User Guide page 11)*	Yes = 1 No = 0
7. Does the material always use words the primary audience uses? *If all specialized or unfamiliar terms are explained or described (not just defined) the first time they are used, answer yes. Acronyms and abbreviations must be spelled out and explained if unfamiliar to the audience. (User Guide page 12)*	Yes = 1 No = 0
Information Design	
8. Does the material use bulleted or numbered lists? *If the material contains a list with more than 7 items, and the list is not broken up into sub-lists, answer no. If the list is for additional information or references only or at the end of the material, answer no. (User Guide page 14)*	Yes = 1 No = 0
9. Is the material organized in chunks with headings? *This item applies to prose text and lists. If the chunks contain more than one idea each, answer no. If the headings don't match the information chunks, answer no. (User Guide page 15)*	Yes = 1 No = 0
10. Is the most important information the primary audience needs summarized in the first paragraph or section? *The most important information must include the main message. A section is a block of text between headings. For a Web material, the first section must be fully visible without scrolling. (User Guide page 17)*	Yes = 1 No = 0
State of the Science	
11. Does the material explain what authoritative sources, such as subject matter experts and agency spokespersons, know and don't know about the topic? *If the material addresses both, answer yes. If the material addresses only one (what is known or not known), answer no. (User Guide page 18)*	Yes = 1 No = 0
Part A score	**Total _____ / 11**

Comments

CDC Clear Communication Index Score Sheet

Part B: Behavioral Recommendations

Answer this question to determine if items 12-14 apply to the material.

Does the material include one or more behavioral recommendations for the primary audience?

- If **yes** – score items 12-14.
- If **no** – skip to Part C.

Questions	Score *(Check one per question)*
12. Does the material include one or more behavioral recommendations for the primary audience? *If no, STOP here and don't score Part B. (User Guide page 19)*	Yes = 1 No = 0
13. Does the material explain why the behavioral recommendation(s) is important to the primary audience? *If you offer only numbers to explain the importance of the behavioral recommendation with no other relevant information for the audience, answer no. (User Guide page 20)*	Yes = 1 No = 0
14. Does the behavioral recommendation(s) include specific directions about how to perform the behavior? *This may include step-by-step directions or a simple description (for example: Look for cereal with 100% daily value of folic acid). If the material includes information about when and how to contact a medical provider or health official, answer yes. If the material mentions when and how often to perform a behavior, answer yes. (User Guide page 21)*	Yes = 1 No = 0
Part B score	**Total _____ / 3**

Comments

Part C: Numbers

Answer this question to determine if items 15-17 apply to the material.

Does the material include one or more numbers related to the topic?

- If **yes** – score items 15-17.
- If **no** – skip to Part D.

Questions	Score *(Check one per question)*
15. Does the material <u>always</u> present numbers the primary audience uses? *Many audiences find numbers distracting or confusing. Make sure the numbers in the material are both familiar and necessary to support or explain the main message statement. If not, delete them. Whole numbers are used by most audiences. The types of numbers used will vary for each audience. (User Guide page 22)*	Yes = 1 No = 0
16. Does the material <u>always</u> explain what the numbers mean? *For example, "The amount of meat recommended as part of a healthy meal is 3 to 4 ounces – it will look about the same size as a deck of cards." (User Guide page 23)*	Yes = 1 No = 0
17. Does the audience have to conduct mathematical calculations? *Adding, subtracting, multiplying, and dividing involve calculations. Calculating a common denominator for the purposes of comparison is a mathematical calculation. Use the same denominator, even for absolute risk (example: 1 out of 3), throughout the material so that audiences don't have to calculate. (User Guide page 24).* **NOTE: for this item, Yes is scored 0 and No is scored 1.**	Yes = 0 No = 1
Part C score	**Total _____ / 3**

Comments

CDC Clear Communication Index Score Sheet

Part D: Risk

Answer this question to determine if items 18-20 apply to the material.

Does the material present information, including numbers, about risk?

- If **yes** – score items 18-20.
- Items 19 and 20 have a "not applicable" (NA) option.
- If **no** – skip to Calculate the Score.

Questions	Score *(Check One per Question)*
18. Does the material explain the nature of the risk? *If the material states the threat or harm and how and why people may be affected, answer yes. If the material has only the threat or harm but no explanation, answer no. For example, if the material states there are 1,000 new cases of a contagious disease in Springfield, does it also state that people in Springfield may be more likely to get the disease, why they may be more likely, and how serious the threat of the disease is? (User Guide page 26)*	Yes = 1 No = 0
19. Does the material address both the risks and benefits of the recommended behaviors? *This includes actual risks and benefits and those perceived by your audience. If the material addresses only risks or only benefits, answer no. If no behavioral recommendation is presented, answer not applicable (NA). (User Guide page 27)*	Yes = 1 No = 0 NA
20. If the material uses numeric probability to describe risk, is the probability also explained with words or a visual? *Examples of probability information in a risk message are numbers (such as 1 in 5 or 20%). If the material presents numeric risk and also uses text to explain the probability, answer yes. If the material presents numeric risk and also uses a visual to explain the probability, answer yes. If the material only presents numeric risk, answer no. If the material does not include this type of probability information, answer not applicable (NA). (User Guide page 28)*	Yes = 1 No = 0 NA

Part D score

Total _____ / 3

OR _____ / 2
(if you answered NA for only **1** item)

OR _____ / 1
(if you answered NA for **2** items)

Comments

CDC Clear Communication Index Score Sheet

Calculate the Score for the Material

- **Step 1:** The total points that the material earned (this is the numerator).
  - » A: _____ B: _____ C: _____ D: _____ = _____
- **Step 2:** The total possible points that the material could have earned (this is the denominator).
  - » A: __11__ B: _____ C: _____ D: _____ = _____
- **Step 3:** The numerator divided by the denominator multiplied by 100 to get the total score.

_____ / _____ x 100 = _____

How to Interpret the Score

The purpose of the Index is to improve the clarity of communication products.

If the total score is 90 or above:

Excellent! You have addressed most items that make materials easier to understand and use.

If the total score is 89 or below:

Note which items scored 0 points. Use the descriptions and examples in the User Guide to revise and improve the material. Then apply the Index again to check your work. You can use the Index as many times as you need to revise the material to get a score of 90 or above.

Additional Comments