Exploring Dietary Assessment Practices and Use of Electronic Dietary Assessment Tools in Team-Based Primary Care: A Mixed Methods Study

by

I. Carolina Bonilla

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ABSTRACT

EXPLORING DIETARY ASSESSMENT PRACTICES AND USE OF ELECTRONIC DIETARY ASSESSMENT TOOLS IN TEAM-BASED PRIMARY CARE:
A MIXED METHODS STUDY

I. Carolina Bonilla
University of Guelph, 2013

Advisors:
Drs. P. Brauer, A. DiCenso, R. Hanning, & H. Keller.

In primary care (PC) health providers are delivering nutrition advice and counselling to patients. Yet, a number of challenges have been identified in conducting dietary assessment (DA). Electronic DA (e-DA) tools within mobile apps or websites can potentially facilitate DA in team-based PC. The objective of the study was to explore current DA practices and use of e-DA tools by various disciplines of health providers in Family Health Teams (FHTs) using a mixed-methods sequential design. Data collection included interdisciplinary focus groups (FGs) and a web-based survey. Fifty health providers from various disciplines participated in 11 FGs. Identified themes included: 1) Assessment of diet in an interdisciplinary fashion; 2) Improvement of patients’ eating habits with use of e-DA tools; 3) Support of health providers with use of e-DA tools; and, 4) Integration of e-DA tools into FHTs. One hundred and ninety-one health providers from 89 FHTs were included in the web-based survey. The two studies found that most providers offer a DA very frequently with diverse DA methods. The use of e-DA tools by health providers and patients is still low, although registered dietitians significantly use more e-DA tools than other health providers. There was high interest among all disciplines in the use of e-DA tools for the management of obesity, diabetes and heart disease, especially for patient self-monitoring. Several recommendations were suggested to facilitate uptake of e-DA tools into practice.
AKNOWLEDGEMENTS

This acknowledgements section provides me with an opportunity to thank the numerous people who made this project possible. I would like to express my sincere thanks to my advisor Dr. Paula Brauer for her continued guidance, encouragement, and patience over the years during my graduate program. Thank you to my other advisory committee members, Dr. Alba DiCenso, Dr. Rhona Hanning and Dr. Heather Keller for your insights and constructive feedback. Thank you to Dr. Debbie MacLellan for agreeing to act as external examiner and providing me with constructive comments which brought additional clarity to my work. Many thanks to Mrs. Dawna Royall for helping me with the qualitative analysis.

I would like to also extend my thanks and acknowledgements to the health providers of Family Health Teams for taking the time to participate in this study.

I am also very grateful to my husband, daughter and family for their constant support, love, care and cheering me on throughout this journey.

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<tr>
<td>AFHTO</td>
<td>Association of Family Health Teams of Ontario</td>
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<tr>
<td>AME</td>
<td>Assessment of barriers and support, Monitoring and Evaluation of outcomes</td>
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<td>ASA24</td>
<td>Automated Self-Administered 24-hour Recall</td>
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<td>BMI</td>
<td>Body Mass Index</td>
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<td>CASM</td>
<td>Cognitive Aspects of Survey Methodology</td>
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<td>CCM</td>
<td>Chronic Care Model</td>
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<td>CD(s)</td>
<td>Chronic Disease(s)</td>
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<td>CIHR</td>
<td>Canadian Institutes of Health Research</td>
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<tr>
<td>CNF</td>
<td>Canadian Nutrient File</td>
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<tr>
<td>CRI</td>
<td>Cardiovascular Research Institute</td>
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<tr>
<td>CVD(s)</td>
<td>Cardiovascular Disease(s)</td>
</tr>
<tr>
<td>DA</td>
<td>Dietary Assessment</td>
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<tr>
<td>DINE</td>
<td>Dietary Instrument for Nutritional Education</td>
</tr>
<tr>
<td>DRI</td>
<td>Dietary Reference Intakes</td>
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<tr>
<td>e-DA</td>
<td>Electronic-Based Dietary Assessment</td>
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<td>EDs</td>
<td>Executive Directors</td>
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<td>EMRs</td>
<td>Electronic Medical Records</td>
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<tr>
<td>ESHA</td>
<td>Elizabeth Stewart Hands and Associates</td>
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<td>FHTs</td>
<td>Family Health Teams</td>
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<td>FP</td>
<td>Family Physicians</td>
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<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
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<td>FGs</td>
<td>Focus Groups</td>
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<td>GTA</td>
<td>Greater Toronto Area</td>
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<td>HEA</td>
<td>Health Education Authority</td>
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<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>KT</td>
<td>Knowledge Translation</td>
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<td>LR</td>
<td>Literature Review</td>
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<td>MOHLTC</td>
<td>Ministry of Health and Long-Term Care</td>
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<td>MPM</td>
<td>Multiple-Pass Method</td>
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<td>Abbreviation</td>
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<tr>
<td>NCI</td>
<td>National Cancer Institute</td>
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<td>NHANES</td>
<td>National Health and Nutrition Examination Survey</td>
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<td>NP</td>
<td>Nurse Practitioner</td>
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<td>NPS</td>
<td>National Physician Survey</td>
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<tr>
<td>NS</td>
<td>Not Statistically Significant</td>
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<td>OMRU</td>
<td>Ottawa Model of Research Use</td>
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<td>PC</td>
<td>Primary Care</td>
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<td>PDA</td>
<td>Personal Digital Assistant</td>
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<td>PHAC</td>
<td>Public Health Agency of Canada</td>
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<td>Phar</td>
<td>Pharmacist</td>
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<td>PR</td>
<td>Paper Record</td>
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<td>QIIP</td>
<td>Quality Improvement and Innovation Partnership</td>
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<tr>
<td>RCT</td>
<td>Randomized Controlled Trial</td>
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<td>REAP</td>
<td>Rapid Eating Assessment for Patients</td>
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<td>REB</td>
<td>Research Ethics Board</td>
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<td>SNAP</td>
<td>Smoking Nutrition Alcohol and Physical Activity</td>
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<td>SW</td>
<td>Social Worker</td>
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<tr>
<td>USDA</td>
<td>U.S. Department of Agriculture</td>
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<td>WAVE</td>
<td>Weight Activity Variety and Excess</td>
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Chapter 1: Introduction

It is well established that diet plays an important role in the development of the most prevalent diseases in our society (Health Council of Canada, 2007; The Conference Board of Canada, 2012; Public Health Agency of Canada, 2012). An unhealthy diet is considered one of the four common, modifiable, behavioural risk factors that contribute to the development of major chronic diseases (CDs); the other risk factors are smoking, alcohol consumption, and physical inactivity. A diet rich in fruits, vegetables, and whole grains decreases the risk of nutrition-related CDs such as cardiovascular disease (CVD) and its risk factors, diabetes, and some cancers (Public Health Agency of Canada, 2012).

The majority of nutrition-related chronic conditions in Canada are managed in Primary Care (PC) settings (National Physician Survey, 2010). PC refers to the first-contact of care that deals with the majority of health problems in the population and is the foundation of any health care system (Starfield, Shi & Macinko, 2005). In comparison to other models of care, PC teams are emerging as a preferred care model, because recent studies have demonstrated that this model increases access to care including preventive care, improves patients’ overall health, and enhances patient satisfaction, especially in patients with chronic conditions (Barrett, Curran, Glynn, & Godwin, 2007; Dahrouge et al., 2011). In Ontario, Family Health Teams (FHTs) are one example of an interdisciplinary team-based model that has become increasingly interested in the use of electronic tools to support preventive care and patients’ self-management activities, as described in Wagner’s well-known Chronic Care Model (CCM). This model emphasizes the importance of a provider-patient partnership by increasing communication and improving self-management of patient’s health condition(s) through knowledge, skills, and confidence to address lifestyle changes (Bodenheimer, Wagner & Grumbach, 2002; Bodenheimer, 2003; E-health Ontario, 2010; Siminerio, 2010).

In dietetics, interest has focused mainly on new electronic dietary assessment (e-DA) tools designed to assist and facilitate the evaluation of diet. These new tools are either Web-based or applications (apps) for mobile devices that can be used on Smartphones or Tablets. Some potential advantages of e-DA tools in PC include providing immediate results; increased likelihood of more accurate reporting of food by using photographs and portion sizes; direct data entry that reduces data errors and interviewer bias; and, facilitating self-monitoring of diet over
time. Patients with nutrition-related conditions in PC can use e-DA tools, provide more detailed information about diet and potentially improve nutrition counselling effectiveness. That said, there are some limitations of e-DA tools, namely the need for computer access and knowledge by patients and care providers; knowledge of the official language; and extra time required to discuss results with patients in an already time-restricted environment (Burke et al., 2011; Calfas et al., 2002; Ngo et al., 2009; Probst, Faraji, Batterham, Steel, & Tapsell, 2008; Thompson, Subar, Loria, Reedy, & Baranowski, 2010).

Besides RDs or nutritionists, the medical literature identifies physicians, nurses, and pharmacists as health providers actively involved in the delivery of dietary advice to patients (Brauer et al., 2006; Brotons et al., 2003; Walters et al., 2009). However, there is very little information on how health providers in team-based PC, other than RDs, obtain dietary information from their patients, current dietary assessment (DA) methods, common constraints to obtaining accurate DA, as well as the potential benefits, barriers, and limitations of the new e-DA tools.

The Ottawa Model for Research Use (OMRU) is a knowledge translation (KT) model that provides direction on the most important elements to consider when evaluating an innovation for implementation in health care organizations (Logan, Harrison, Graham, Dunn, & Bissonnette, 1999; Graham & Logan, 2004). The section on assessment of barriers and supports of potential adopters of the OMRU framework guided the overall research questions of the study.

The main objective of the study was to explore current DA practices and use of new e-DA tools, including the benefits, barriers and recommendations in the context of FHTs by conducting an exploratory sequential mixed methods study based on focus group interviews followed by a short web-based self-reported survey.
Chapter 2: Literature Review

This chapter begins with an overview of the prevalence of nutrition-related chronic diseases (CDs) in Canada as context for the need to assess diet in primary care (PC) settings. Since most dietary assessment (DA) for common conditions is occurring in PC, the study focuses on exploration of DA in an inter-disciplinary PC context, where resources for lifestyle change are expected to be greater than in single practitioner family medicine practices. Among PC team-based models, Family Health teams (FHTs) are explicitly interdisciplinary in practice and it was the model chosen to investigate the topics of the present study; a brief description of FHTs is provided. General aspects of DA practices are reviewed with a main focus on PC settings, followed by a description of the state of knowledge of current DA practices and common challenges for different disciplines of health providers: family physicians (FPs), nurse practitioners (NPs), registered nurses (RNs), pharmacists and registered dietitians (RDs). Thereafter, the classification of new e-DA tools and examples of published studies are discussed.

The OMRU framework, a knowledge translation (KT) model informed the development of some questions used in the focus groups and survey. A brief review of this model is provided. The chapter concludes with the rationale for using the sequential mixed-methods design to achieve the study objectives.

2.1. Prevalence of Nutrition-related Chronic Diseases (CDs) in Canada

The Public Health Agency of Canada (PHAC) monitors six of the most common and costly CDs: cardiovascular diseases (CVDs), chronic respiratory diseases, diabetes, muscular-skeletal diseases, mental illnesses, and cancers (PHAC, 2012). Among these diseases, nutrition-related diseases such as CVD, diabetes, and some cancers are identified as the main causes of death in the country. For example, in 2009, for both males and females the major causes deaths were cancer of all forms (30%), followed second by CVD (21%), third by cerebrovascular diseases (6%), and sixth by diabetes mellitus (3%) (Statistics Canada, 2012). In 2008, approximately 27% of the population was reportedly diagnosed with at least one CD, the most prevalent being heart disease, diabetes, cancer, and joint problems. Together, these conditions cost an estimated $80 billion annually for hospital stays, physician visits, and drugs (Health Council of Canada, 2007; Statistics Canada, 2010).
The causes of these CDs are complex, and involve both non-modifiable and modifiable factors (The Conference Board of Canada, 2012). Examples of non-modifiable factors include age, gender and genetic predisposition, while the most accepted and common modifiable or behavioural factors are tobacco use, alcohol consumption, being overweight, physical inactivity, and unhealthy diets (PHAC, 2012). The main risk factors associated with CDs are classified into three main categories:

1) background risk factors: age, gender, and genetic predisposition
2) behavioural risk factors: smoking, alcohol consumption, unhealthy diet, and physical inactivity
3) intermediate risk factors: high serum cholesterol, hypertension, and obesity or overweight.

Risk factors, however, do not occur in isolation; social and economic conditions, such as culture, education, socio-economic status, urbanization, and availability of health services, can, in one way or another, be inter-related and can influence the onset and prognosis of disease (PHAC, 2012).

Over the past few decades, Canadians have reduced some behavioural risk factors, particularly smoking (8% reduction from 1999 to 2011) (Health Canada, 2011) and physical inactivity (approximately 10% reduction from 2001 to 2010) (Statistics Canada, 2012). At the same time, some factors such as high blood pressure, and obesity continue to rise. The prevalence of obesity in adults (Body Mass Index ≥30), for example, has doubled in men from 11.5 to 24.3 % ($p<.05$) and by 1.5 times in women from 15.9 to 23.9 % ($p<.05$) between 1978–1979 and 2007–2009 according to recent analysis of the Canadian Health Measures Survey using previous and more current data (Shields, Carroll & Ogden; 2011; Tjepkema, 2006).

The aging population, rise of CDs and their risk factors, has put pressure on PC and prompted efforts to reform services across the country. To this end, the creation of interdisciplinary PC delivery models such as FHTs is one example of a provincial effort to reform the PC system. Among other goals, a reformed PC system was to have greater focus on prevention such as greater promotion and adoption of healthy lifestyle behaviours (Health Council of Canada, 2007).
2.2. Family Health Teams (FHTs)

FHTs are one of the 11 service models that currently exist in the province of Ontario (Health Force Ontario, 2007). The use of interdisciplinary teams in PC has led to improvements in clinical outcomes in comparison to non team-based care, primarily in patients with depression, diabetes, hypertension and congestive heart failure (Barrett et al., 2007; Jacobson 2012). In addition, studies in this area report that individuals who access a PC team benefit from shorter waiting times and are more likely to receive health promotion and disease prevention interventions than those who are seen by non-team-based health providers (Aggarwal & Hutchison, 2012; Family Health Teams, 2009).

Approximately 200 FHTs operated in the province of Ontario in 2013 (Ministry of Health and Long-Term Care (MOHLTC), 2013). In FHTs, a wide range of health disciplines such as FPs, NPs, RNs, clinical pharmacists, RDs and social workers (SWs), work individually and as a group to provide better care to their patients. The number and type of health providers in specific FHTs have been largely influenced by the business plans put forward by FHTs themselves, subject to provincial oversight, and in turn have been influenced by the specific size and needs of the practice population and the availability of required resources (Family Health Teams, 2009). Therefore, the size and specific provider mix varies substantially. In the present context of nutrition counselling, it was estimated from a survey that about 80% of FHTs employed at least one RD, but current information is not publicly available (Walters et al., 2009).

FHTs offer a wide range of programs to promote healthy living in general and help patients to manage common conditions such as diabetes, hypertension, and CVD (Guelph Family Health Team 2013; Hamilton Family Health Team, 2013). FHTs have made progress in applying information technology (IT) to support both patients and health providers in their practices, and this is a key feature of the model. This is especially the case for Electronic Medical Records (EMRs), which assist in the delivery of care. According to the Association of Family Health Teams Ontario (AFHTO) 79% of FHTs are using EMRs at their clinics (AFHTO, personal communication, June 14, 2013). FHTs continue to develop use of IT for their personnel and their patients; for instance, some FHTs have web-portals connected to patients’ EMRs enabling patients to add self-monitored health-related information such as blood pressure, glucose levels, and body weight to their profiles in addition to requesting medication refills (Family Health
Teams, 2009; Walters et al., 2009; West Carleton Family Health Team, 2009). Thus, with regard to the use of IT for health purposes in Ontario, FHT personnel are likely to be early adopters of new electronic tools in PC.

2.3. Dietary Assessment (DA) in Primary Care (PC)

2.3.1. Dietary assessment: general concepts.

Dietary intake assessment (DA) is basic to an overall nutrition assessment; the other parts of a nutritional assessment are anthropometry, medical examination and blood work. DA tools and nutrition screening tools are used by health professionals, these instruments differ by the type of information collected and purpose of this information. In DA the purpose is to identify the nutrition status and general dietary patterns and in nutrition screening tools is risk of malnutrition of an individual (Jones, 2006). Comprehensive DA can involve calculation of all forty-two common nutrients and comparison with Dietary Reference Intakes (DRI) values, analysis of non-nutrient substances in the diet, and evaluation of meal and eating patterns (Subar, 2004; Wilson & Temple, 2001). More typically, however, DA involves an assessment of a subset of nutrients and an evaluation of food choices and eating patterns. DA can be completed by the patient through self-monitoring, or by a third party, for example a trained interviewer or observer (Gibson, 2005). Diet self-monitoring means that the individual documents their dietary intake; and this activity is recognized as one of the main strategies used to increase behaviour awareness and produce dietary change (Wadden, Butryn, & Byrne, 2004; Wadden, Crerand & Brock, 2005).

Common DA methods include twenty-four-hour dietary recalls done once or more often, Food Frequency Questionnaires (FFQs), and food journals or food records (Coulston, Rock & Monsen, 2001). Food journals or records are usually completed by patients and are a record of their food, beverage, and supplement intake over a specified period of time. Occasionally, supplementary information, such as the time of day or night food was eaten, location, hunger status, and emotional state is also recorded (Calfas et al, 2002). It is essential that the food record be representative of the patient’s typical food intake on both weekdays and weekends, hence the duration of the record is determined by the consistency of the diet from day to day. As a general rule, in order to accurately assess the intake of most nutrients within 10% of diet day to day variability, a minimum of four days of dietary intake record is required (Gibson, 2005;
Livingstone & Black, 2003). Common issues in dietary self-reporting include: difficulty estimating usual portion sizes; errors in description of ingredients in mixed dishes, for example stews or quiches; omission of dietary supplements; interviewer biases; and the under- or over-reporting by women, obese individuals or those with low levels of education (Coulston et al, 2001; Gibson, 2005).

2.3.2. Dietary assessment in primary care settings.

In an effort to guide health providers to effectively counsel patients on lifestyle issues in PC offices, the U.S. Preventive Service Task Force in the years 2003 and 2012 have recommended the five A's construct as a clinical counselling strategy (U.S. Preventive Service Task Force 2003 & 2012). This framework is utilized for counselling patients on diet, physical activity, smoking cessation, and alcohol consumption (Glasgow, Bull, Piette, & Steine, 2004; Zwar et al., 2005).

Of importance, the five-A’s approach recommends to first conduct an assessment of the behaviour to identify risk factors. The other steps are to provide advice for dietary change, agree on goals for dietary change, assist patients to change dietary practices by addressing barriers, and arrange regular follow-up and support meetings. The style of delivering behavioural counselling is medium to high intensity, through one-on-one interviews or group sessions. This intervention is recommended for health professionals such as a RD, a trained physician, a RN or NP. Although, it remains unknown to what extent the five-A’s approach has been adopted by health providers in PC settings, it is consistent with other care process models used by various professions, and it clearly supports DA as the first step in the process of providing dietary advice and counselling.

Comprehensive DA is especially recommended for certain patients suffering from prevalent conditions such as dyslipidemia, diabetes, hypertension, and obesity, but the use of such typical dietary assessment methods (e.g., series of various 24 hour recalls) requires a high level of knowledge, skills and time to complete the nutrition analysis (Little et al., 1999; US Preventive Task Force, 2003 & 2012). Consequently, to increase effectiveness of DA in typical physician-based PC, several brief DA instruments have been proposed for use to obtain estimates of key aspects of the typical dietary intake of patients, address the need for dietary counselling, suggest dietary interventions, and monitor modifications in dietary patterns. Two examples of these instruments recommended for use by the patient either at home or in the office waiting room
prior to visiting their primary health provider are Weight, Activity, Variety, and Eating (WAVE) tool that evaluates weight and health behaviours and the Rapid Eating Assessment for Patients (REAP) tool (Gans et al., 2003 & 2006). REAP includes 27 questions to assess intake of whole grains, calcium-rich foods, fruits and vegetables, saturated fat and cholesterol, sugary beverages and foods, sodium, alcoholic beverages, and physical activity; it is estimated to take 10 minutes to complete. REAP has undergone test-retest reliability in comparison with the Healthy Eating Index (HEI) score and correlations run from $r=0.55 (p<.001)$ for total fat to $r=0.25$ (NS) for both grains and dairy foods. Although these tools (REAP and WAVE) have been developed for PC use, one limitation is that their use in PC as “general DA tools” is limited.

The SNAP (Smoking Nutrition Alcohol and Physical Activity) Lifescrpt questionnaire is another example of a tool specifically for PC use. SNAP was created to support PC practitioners such as physicians and nurses in Australia and utilizes the five A’s approach to identify risk factors in the general population (Harris et al., 2005). In the area of nutrition, SNAP evaluates the number of servings of fruits, vegetables, grains, dairy and meat and alternatives. Feasibility studies have been conducted with PC providers (Amoroso, Hobbs & Harris, 2005; Harris, 2005) and these studies have found that the nutrition assessment section takes about 10 minutes to complete, and is useful; however some health providers felt that it is complicated to follow in comparison to smoking and alcohol assessments (Amoroso et al., 2005). No validation of the SNAP tool has been conducted.

2.3.3. Difficulties in offering dietary assessment in primary care (PC).

It has been well recognized that there is a lack of nutrition-related interventions, including DA, by health providers working in typical PC offices. This phenomenon can be attributed to several challenges that can be summarized as follows:

a) health provider level: limited time, nutrition knowledge and skills of physicians and nurses in conducting DA and offering nutrition counselling; lack of nutrition-related support tools and little health professional interest in health promotion and nutrition is often perceived as “difficult to conduct” and “time consuming” (Calfas et al, 2002; Wynn, Trudeau, Taunton, Gowans, & Scott, 2010).

b) health system level: time constraints in PC offices are common, there is limited time to offer DA, advice and counselling to patients, particularly for patients suffering from nutrition-
related chronic conditions who often present with multiple diseases. The shortage of RDs within PC settings is currently an issue, including in team-based care (Forman-Hoffman, Little, & Wahls, 2006; Goldstein, Whitlock, DePue, & Planning Committee of the Addressing Multiple Behavioral Risk Factors in Primary Care Project, 2004). Cost-related issues, such as cost-recovery for health providers offering dietary counselling, including DA, and extra costs for patients to receive nutrition-related services contribute to health system challenges in many Canadian PC practices (Rosser, 2003; Royal & Brauer, 2009).

c) patient level: the lack of motivation or interest for dietary change, poor nutrition-related knowledge, lack of time to complete DA questionnaire(s), over-reporting or under-reporting dietary data, and poor relationships with health providers have been previously described as barriers to DA and dietary counselling in PC (Brotons et al., 2003; Calfas et al, 2002; Ciliska et al., 2006; Forman-Hoffman et al., 2006; Goldstein, Probst & Tapsell, 2005; Hiddink et al., 1995; NPS, 2007; Rosser, 2003; Ruelaz et al., 2007; Truswell, Hiddink, & Blom, 2003; van Weel, 1997; Weaver, 2008; Whitlock, Orleans, Pender, & Allan, 2002).

The following paragraphs will briefly describe knowledge of current DA practices in PC, particularly by professions involved in providing dietary advice: FPs, NPs, RNs, pharmacists, and RDs.

2.3.4. Dietary assessment by health provider.

2.3.4.1. Family physicians.

Canadian FPs recognize the importance of their role in offering dietary advice and nutrition counselling to their patients as seen in two recent studies that investigated the nutrition practices offered by FPs in PC (Sinclair, Lawson & Burge, 2008; Wynn et al., 2010). While the main focus of these studies was not on DA, they provide some insight into the importance that FPs give to providing dietary advice and counselling. The first study was a survey that included 451 FPs working in PC in the province of British Columbia (Wynn et al., 2010). Seventy percent of FPs expressed that “nutrition is a significant component in the progression and prevention of many CDs”, while 80% expressed that “nutrition counselling is one of my professional roles”. The study reported that physicians felt more confident in providing general nutrition information than specific information on special topics. Interestingly, the physicians who felt more
comfortable providing nutrition counselling also felt that their patients benefited from such counselling and were more likely to spend more time in providing nutrition advice.

The second study was a survey in the province of Nova Scotia. In this study, a total of 1,562 participants aged eighteen years and older were asked how frequently they received dietary advice from their FPs (Sinclair et al., 2008). It was found that participants reported more dietary advice from family physician(s) when they were at risk of or with a diagnosed CD, and reported more number of visits than apparently healthy individuals. In addition, 38% of participants were receiving dietary advice at the time of the study in PC offices. Thus, FPs recognize their role in providing dietary advice, especially in patients at risk of or already diagnosed with a CD. However, the details in relation to how DA is conducted, the types of patients receiving DA as well as the supporting tools physicians are using, if any, remain unknown.

The overall findings of the Sinclair et al. (2008) and Wynn et al. (2010) studies are supported by studies conducted outside of Canada. These studies highlight that physicians are providing dietary advice to patients (Befort et al, 2006; Ruelaz, 2007; Truswell et al, 2003; van Weel, 1997; Wadden et al., 2004; Warsi et al., 2004). This is particularly true for patients who are overweight, obese, or diabetic, or those who have some CVD risk factors, such as dyslipidemia or hypertension.

In healthy individuals, Brunner, Rees, Ward, Burke, & Thorogood (2007) published a literature review of 38 RCTs to assess the effects of providing dietary advice to achieve dietary changes or improved cardiovascular risk profile among healthy adults. General practitioners, FPs and nurses in the study provided dietary advice. In general, participants in the dietary advice arm reduced the total serum cholesterol by 0.16 mmol/L (95% CI 0.06 to 0.25) and LDL cholesterol by 0.18 mmol/L (95% CI 0.1 to 0.27), reduction of systolic blood pressure 2.07 mmHg (95% CI 0.95 to 3.19), 1.15 mmHg diastolic (95% CI 0.48 to 1.85), and 24-hour urinary sodium excretion 44.2 mmol (95% CI 33.6 to 54.7) in a period of 3-24 months. The majority of trials evaluated dietary intake with FFQs, and reported that those participants receiving advice had in average an increase of fruit and vegetables intake by 1.25 servings a day (95% CI 0.7 to 1.81). Increase of dietary fiber intake by 5.99 g/day (95% CI 1.12 to 10.86), reduction of total dietary fat by 4.49 % (95% CI 2.31 to 6.66) and saturated fat intake by 2.36 % (95% CI 1.32 to 3.39). Health providers
involved in the studies received training from 40 minutes to 40 hours by a RD or clinical nutritionist.

Befort et al. (2006) found that individuals attending PC offices are interested in receiving dietary counselling from their health providers, in particular from physicians and nurses. However, the desire to receive dietary counselling is often not met because of health providers’ perceptions of time constraints during clinical visits or the perceived lack of motivation for dietary change among patients, or a combination of both.

Although the importance of providing dietary advice has been previously recognized (Brunner et al., 2007), and a number of studies have been conducted to test the effectiveness of nutrition counselling for healthy and sick patients in PC offices, there does not appear to be a comprehensive document that explains what DA instruments and/or dietary-related questions Canadian FPs are using to assess the patients’ diets, particularly in team-based settings. This information would be important to understand current practice, identify challenges, and provide context for the role of e-DA tools in FPs’ practices.

2.3.4.2. Registered nurses (RNs) and nurse practitioners (NPs).

In Canadian PC settings, RNs and NPs are particularly involved in preventive care and disease management activities. In team-based care, RNs and NPs often coordinate patient care, and work collaboratively with physicians, RDs, pharmacists, and other health providers to identify nutrition problems as well as reinforce the importance of dietary modifications, especially in patients with CD (Barrett et al., 2007). NPs, unlike RNs, receive additional training and licensing that allows them to autonomously diagnose, order, and interpret certain diagnostic tests, prescribe pharmaceuticals, and perform specific procedures within a legislated scope of practice (e.g., manage high blood pressure, diabetes, and other nutrition-related illnesses). In relation to diet, NPs can order therapeutic diets and offer nutrition counselling, either independently or in collaboration with physicians or RDs (Canadian Nurses Association, 2010).

Brief paper-based DA instruments have been developed exclusively for nurses working in PC. For example, the Dietary Instrument for Nutritional Education (DINE) is a FFQ designed for practice nurses. Overall, DINE provides a fat and fiber score that can be used for further dietary advice (Roe et al., 1994). Another example is Oxford’s Health Education Authority (HEA) instrument. This is a patient- or nurse-administered tool that assesses portion sizes of foods
divided into five food groups eaten in a “normal day” (Little et al., 1999 & 2000). It has been recommended, particularly in the UK, that PC nurses should use these instruments for DA (Little et al., 2000). However, the extent of use of these tools in routine nursing practice is limited.

The roles and responsibilities of nurses working in Ontario Family Health Networks (FHNs), a team-based model, were discussed in a Delphi process study to define inter-professional nutrition services (Brauer et al., 2006). The study found strong support for nurses to provide basic nutrition advice to patients during individual appointments; screen for nutrition-related problems and make referrals to an RD for in-depth counselling; as well as reinforce messages resulting from nutrition counselling made by RDs or other health providers.

In PC, several researchers have studied the outcomes of RN and/or NP based on dietary advise and counselling interventions for healthy individuals and patients at risk of CVD (Brunner et al., 2007; Fletcher & Carey, 2011). In Brunner (2007) literature review was found that PC nurses effectively delivered dietary messages according to the dietary recommendations, with positive health outcomes such as weight loss and reduction in total cholesterol and LDL cholesterol and blood pressure. Additionnally, it seems that general practitioners are of the idea that nurses (RNs or NPs) in their offices play an important role in advising patients on recommended dietary modifications, since patients commonly look to nurses for dietary advice, as they are in constant contact with patients and may feel more comfortable to talk about diet (Brotons et al., 2003). As is the case with FPs, limited information exists on how DA is being conducted by nurses, particularly in Canadian PC settings.

2.3.4.3. Clinical pharmacists.

Evidence exists that another important group of health providers, clinical pharmacists, are involved in the delivery of preventive care and management of patients with nutrition-related diseases. The increased prevalence of diabetes and other common chronic conditions in the population, and the emphasis placed by health providers on health promotion and disease prevention activities have led clinical pharmacists to join team-based care models in PC (Heaton & Frede, 2006; Pottie, et al., 2008). As part of their curricula, pharmacists are using nutrition-related guidelines and other related documents to help teach patients how to adopt a healthy lifestyle and diet (Lenz, 2005). In the PC setting, clinical pharmacists play a key role in the
administration of pharmaceutical medications and in giving advice on the use of nutritional supplements, such as Omega-3 fatty acids, vitamin D, and calcium, which have gained considerable attention among patients and health providers (Ishita, Deepak, & Harish, 2004). As well, in Ontario, in interdisciplinary care, clinical pharmacists are collaboratively providing care, particularly in the management of diabetes, with other health providers for example, RDs or physicians (Barrett et al., 2007). Nevertheless, similar to the case with other health professionals, the role of clinical pharmacists in conducting DA for their patients has been understudied.

2.3.4.4. Registered dietitians (RDs).

RDs are health providers uniquely trained to advise patients and other health professionals on diet, food and nutrition (Royall & Brauer, 2009). By definition, RDs translate the science of nutrition into practical information for consumers. In clinical counselling, is recommended the use Nutrition Care Process (Academy of Nutrition and Dietetics, 2013), a detailed description of the assessment, counselling and evaluation process that is analogous to the five-A’s approach. This information helps individuals make healthy food choices throughout the life cycle.

While RDs have practiced in some Community Health Centres for over forty years in Ontario, they have only recently become accepted as members of interdisciplinary teams in PC (Royall & Brauer, 2009; Valaitis, Elrich, O’Mara & Brauer, 2010). In an effort to articulate the roles and responsibilities of RDs in team-based care, a Delphi process was undertaken, with 11 RDs and twelve non-dietetic health providers (Brauer et al., 2006). There was consensus that the dietitian of the team had the following duties: nutrition resource person for the various health practitioners; in-depth nutrition counsellor for patients; and custodian of reliable nutrition resource materials. In the collaborative context, there was no consensus for the statement “only RDs will do nutrition counselling for diabetic clients.” Thus, although RDs are recognized as the most qualified to provide nutritional services compared to the rest of the team, these services are shared with other health providers, in particular physicians and nurses.

Today, RD services are still not routinely available in many PC settings across Canada (Crustolo, Ackerman, Kates & Schamehorn, 2005; Royall & Brauer, 2009). However, the majority of FHTs do have a dietitian as part of their team. As such, RDs in FHTs normally work part-time or full-time in multiple clinics (I.C. Bonilla, personal communication, June 2010). Recent studies have shown that RDs have multiple roles in team-based care, including active
involvement in the design and implementation of newer approaches such as group visits and a variety of group classes (Brauer 2010; Royall & Brauer, 2009). Some examples of group-based programs with group counselling led by RDs include Healthy You-Weight Management Program and Living Well with Diabetes program in Hamilton’s FHT (Hamilton Family Health Team, 2013). Group-based programs are designed to allow for peer support and interaction, while providing an efficient mechanism for teaching the skills needed to improve the adoption of lifestyle changes, including dietary modifications.

Walters et al. (2009) conducted a survey with 91 RDs in FHTs to assess the current nutrition practices delivered by RDs in FHTs in Ontario. The study reported that as many as 78% of participants were using some type of electronic-based software to support their practice, 55% were using e-mails to communicate with patients about their care, and 93% were using EMRs in their offices. Furthermore, 59% of participants reported that they were involved in chronic-care management or self-care program activities at their FHT. RDs are not only more qualified to address nutrition-related issues than other health providers, they are also exposed to a range of DA methods in training and use DA skills daily. According to this study, RDs are using electronic-based tools to support their practice and are thus likely to use e-DA tools. Thus, the RDs’ opinions on and experiences with DA practices, benefits, challenges, and potential use of e-DA are important to gather, as part of the development of e-DA.

In conclusion, patients at risk of developing nutrition-related diseases are often seen at the PC level (National Physician Survey, 2010; Rosser, 2003; Truswell et al, 2003). In addition to the conventional roles that physicians, RNs, NPs, and pharmacists play in patient care, overlapping roles in practice are common, as seen, for example, when all the health providers offer dietary advice and/or nutrition counselling to patients (Brauer et al., 2006). Evidence exists that dietary interventions by general practitioners or FPs usually target reduced saturated fat and salt intake and increased fruit and vegetable, whole grain, and fish intake (Brunner et al., 2007). Furthermore, health providers are more likely to obtain dietary information from patients who have weight issues, CVD, diabetes, hypertension, and hypercholesterolemia (Sinclair et al., 2008; Wynn, et al., 2010).

By improving patients’ nutritional status and overall health, health providers can potentially reduce some direct costs to the health system (Health Council of Canada, 2007). Yet, there are
many challenges in conducting DA and delivering adequate nutritional counselling, and these are similar among all health providers, such as limited time in providing DA, limited knowledge and skills in how to assess diet, and limited specialized human resources (e.g., RDs and nutritionists) in PC to conduct DA and counselling. Some of these challenges can be overcome through the use of IT that has been shown to improve care. Examples of IT are the use of EMR in PC and web-based portals in FHTs to communicate with patients. To this end, in dietetics, e-DA tools can be used to assist in the evaluation of food intake and the identification of nutritional deficiencies or imbalances. The extent of the utilization of e-DA tools in PC in team-based care is still largely unknown, and the current study will help address this gap in the literature. The following section will define e-DA tools and classify them according to recently published literature, as well as provide an overview of their advantages, disadvantages, and potential use in PC.

2.4. Electronic Dietary Assessment Tools

Electronic-based DA (e-DA) refers to the use of technology that assists in dietary evaluation, such as personal computer software, websites, and mobile devices; for example, Personal Digital Assistants (PDAs), Smartphones, tablets, or specialized digital cameras and smart cards (Lieffers & Hanning, 2012; Ngo et al., 2009). To date, e-DA tools have been used to support DA in clinical and research environments. e-DA tools can be grouped into stand-alone or online applications. They are used to collect dietary information along with conventional tools such as 24-hour food recalls, FFQs, diet histories, or a combination of these. Many e-DA tools have been validated against personal interviewing of clients by RDs, recording of weights of all food and beverages consumed over a three- to seven-day period, or video recording of mealtimes and snack times to obtain accurate food intake information (Beasley, Riley, & Jean-Mary, 2005; Calfas et al., 2002; Ngo et al., 2009; Probst & Tapsell, 2007; Edwards et al, 2007; Yon, Johnson, Harvey-Berino & Gold, 2006; Wang, Kogashiwa & Kira, 2006; Zoellner, Anderson & Gould, 2005). Overall, the comparison of e-DA and non-electronic DA tools indicates correlation coefficients that range from low to moderate depending on the tool (Lieffers & Hanning, 2012). The e-DA questionnaire is commonly completed by the client/patient (self-DA) or completed with the assistance of a health provider (Bergamin, 2007; Probst & Tapsell, 2005). As well, e-DA tools have been utilized in the evaluation of diet in healthy individuals and those with clinical conditions (Beasley, 2007; Kikunaga, Tin, Ishibashi, Wang, & Kira, 2007; Bergamin,
Evidence to date suggests they are as good as other methods of self-monitoring, and may be superior in some circumstances (McCabe-Sellers et al., 2008; McCabe-Sellers, 2010; Thompson et al., 2010). Detailed evaluation of the various e-DA tools is beyond the scope of this study, as they are changing rapidly. Instead, the classes of e-DA tools will be reviewed, as this is most relevant to their use in PC. Ngo et al. (2009) published a systematic review of e-DA tools in which they were classified into the following four main categories: 1) computerized and web-based tools; 2) PDAs; 3) cameras with digital photography; and 4) smart cards. Of note, this author did not include DA in mobile applications (apps) such as Smartphones or tablets in his systematic review; however, they are added as a fifth category in this review.

2.5. Computer and Web-based DA tools.

2.5.1. Computer-based tools.

The oldest versions of e-DA were computer-based or stand-alone applications created to analyze DA information without a connection to the Internet or any other electronic transmission, and with the use of floppy disks or CD-ROM disks. Commercial software such as ESHA Food Processor has been used for many years in various research studies (Vance et al., 2009; Forbes et al., 2009). The Food Prodigy tool which is an especial companion of Food Processor tool that allows clients to enter dietary intake from personal computers to a web server; it is utilized by some RDs and their clients in FHTs (personal communication, Guelph FHT, June 2010). Yet, information about the overall use of this tool in PC is still limited.

Below are presented a few recent studies published in the medical literature that included new computer-based e-DA tools, some of which are potentially more relevant to PC. Of note, this is not an exhaustive review of the literature but a general overview of e-DA tools.

A computer-based DA program was tested in an evaluation study using an electronic version of a FFQ in a multi-ethnic population of young individuals (Wong, Boushey, Novotny, & Gustafson, 2008). This study evaluated calcium intake using food photographs and narrative audio. The reliability of two electronic FFQs was compared with two 24-hour food recalls collected by two trained interviewers using the multiple-pass method (MPM). The MPM is a
five-step approach that takes advantage of the typical way people cognitively retrieve information. First, a list of all foods and beverages consumed in the past 24-hour period is collected, followed by probing for foods forgotten. Then, the list is reviewed for the time and eating occasion for each food. Finally, details of food cooking methods, brands and amounts consumed are collected; probing for anything else that was consumed. The overall correlation of two electronic FFQs and two 24-hour food recalls was moderate with a Pearson correlation of $r=0.56$ for calcium. The advantages of using computer-based tools in this study were better estimation of portion sizes by using food photographs, the capacity to more accurately include and analyze ethnic foods, and positive participant feedback about the colourful food photographs and easy-to-identify portion sizes. It was suggested that the audio narration increased participant attention and encouraged survey completion. Unfortunately, no further information exists on the use of this tool at the community level or in PC clinics.

In another study, a computer-assisted touch screen and audio-based diet history questionnaire was designed to evaluate the dietary intake and lifestyle information of an Alaskan community in the U.S. (Edwards et al, 2007). The software was designed to be used at the point of care at the physician’s office. The computer-based tool used quality control checks at different points of the questionnaire to increase the accuracy of food reporting. The researchers reported that the advantage of using this tool was that it was possible to administer the questionnaire in English and other languages (two native languages). The majority of the study participants found that the instrument was easy to complete and enjoyable to use. However, older, unemployed, and less educated people found it harder to use the computer-based tool; authors concluded that additional instructions would be needed to correctly complete the questionnaire. Another disadvantage found in this study was that the electronic instrument has not undergone validity or reliability testing; as well, its potential use in PC could be limited.

### 2.5.2. Web-based tools.

Web-based or online applications can only run using an Internet connection and they do not require the use of floppy disks or CD-ROM disks. They are utilized to analyze dietary information in conjunction with conventional methods of DA such as 24-hour food recalls, FFQs, and/or diet histories. Similar to computer-based DA tools, these tools utilize portion sizes and food photographs to facilitate food entry, but web-based tools have the advantage that
records of nutrition-related information can be made from any computer or other electronic device. Other advantages are that these tools are usually less costly than those that are computer-based, as no CD-ROM disk is needed, and some web-based DA tools also offer the possibility of sharing results electronically with another person (for example, a health provider). It is important that web-based tools are validated, though, to improve accuracy of results. Many web-based tools have been designed over the past decade; some of them use the Canadian Nutrient File (CNF) such as eaTracker (eaTracker, 2013) and ESHA Food Processor and Food Prodigy (ESHA research, 2013). The extent of the use of these tools in Canadian PC is still unknown, as they have not been widely studied.

A few examples of web-based tools published in scientific studies will be presented and will be compared for general characteristics, validity and cost. The Automated Self-Administered 24-hour Recall (ASA24) is an example of a web-based DA tool that uses a 24-hour food recall to assess and self-report one’s dietary intake. The National Cancer Institute (NCI) and the U.S. Department of Agriculture (USDA) developed ASA24 for nutrition policy and promotion activities (Subar et al., 2010; Zimmerman et al., 2009). ASA24 uses an automated MPM, including multimedia digital photography, prompts, and animated characters that are intended to aid in accurately reporting portion sizes. The food database is frequently updated with the most current version of the USDA food and nutrient database and with enhanced food photographs and portion sizes (Moshfegh et al., 2008). Researchers, teachers and clinicians do not need to pay to use ASA24, (http://www.riskfactor.cancer.gov). An effort to develop a Canadian version of ASA24 was announced in 2010, and is still being worked on (S. Kirkpatrick, personal communication, April, 2013).

eaTracker is a free online tool created by Dietitians of Canada. eaTracker uses the 24-hour food recall and the most recent Canadian Nutrient File (CNF) database. eaTracker allows for self-monitoring of one’s dietary intake and physical activity (eaTracker, 2013). Other advantages of eaTracker besides DA, are that individual food intakes are compared with the Canadian Food Guide (CFG) serving recommendations which are age specific, and it is free of cost. In 2013 an app version of eaTracker was announced on its website; however, no release to date has been given.
A third example of a web-based DA tool is Food Prodigy that was designed by Elizabeth Stewart Hands and Associates (ESHA research, 2013). Food Prodigy uses a conventional 24-hour food recall method to collect dietary information. If purchased in Canada, Food Prodigy utilizes the CNF database for nutrient analysis. The cost to access this tool is high, approximately $1000 US/year for three computer licences. An advantage of this tool is that anthropometric measurements such as height and weight and physical activity can be tracked online, as well as some health metrics such as glucose levels and blood pressure. Food intake can be converted into CFG food servings. DA results are summarized in tables and graphs and can be saved as an Excel document. There are some FHTs in Ontario currently using Food Prodigy for DA and self-monitoring of the diets of individuals attending group sessions, such as diabetes or weight loss programs (I.C. Bonilla, personal communication, June 2010).

DietAdvice is an example of a web-based tool that combines the two methods of DA, namely diet history and FFQ questionnaire. Although this is an Australian tool which uses an Australian food database, DietAdvice is one of the few web-based tools designed particularly for PC use that has undergone validity and reliability testing as well as cognitive interviews in a group of people with metabolic syndrome (Probst & Tapsell, 2007). In a RCT including patients with Type 2 diabetes in PC, DietAdvise has shown repeatability of measures specifically for energy, total fat and saturated fatty acids in a two-week period when using food records and DietAdvise, Pearson’s correlations ranged from \( r = 0.31–0.52 \) for those nutrients (Probst et al, 2008). These results were similar to those with paper-based three-day food records or dietitian-led interviews (Gibson, 2005). Of note, however, is the fact that DietAdvice is not adapted to a Canadian context (e.g., adapted to CNF).

2.5.3. Mobile diet assessment tools.

2.5.3.1. Personal digital assistants (PDAs).

PDAs are an older form of handheld computer. They have been used for DA purposes in the medical field for over fifteen years, but with new mobile devices on the market such as Smartphones and Tabloids, the use of PDAs for DA is expected to decrease. As is done with other e-DA tools, the interviewee enters the foods and beverages consumed by scrolling down through a list of items. After portion sizes are selected, the data are stored and can be reviewed at any point in time. Some PDA devices have digital cameras to take pictures of meals before and
after consumption. In addition, some PDAs have mobile cards to send the dietary information online to a health provider for future discussion (Beasley et al, 2005; Burke et al., 2011; Kikunaga et al., 2007; Yon et al., 2006; Wang et al, 2006).

There are a number of studies that can demonstrate how PDAs were used for DA and self-monitoring purposes. In one study, a group of healthy adults used a PDA device for DA using the Wellnavi software. The Wellnavi instrument was validated against weighed food records for five days as a reference method (Kikunaga et al., 2007). Significant correlation coefficients were obtained comparing the two DA methods with Spearman rank correlations that ranged from $r=0.33–0.78$ for the majority of nutrients, except for iron, sodium, magnesium, and vitamin E ($r=0.08-0.32$). Participants using Wellnavi reported that this instrument was less burdensome and time consuming than paper-based food records. When the sample was divided into obese and non-obese subjects, results indicated that underreporting of DA occurred in obese men but not in obese women.

PDAs have been widely used to assess dietary intake and dietary changes in overweight and obese individuals attending weight loss programs. DietMatePro is a PDA dietary assistant tool that was evaluated against one 24-hour food recall in an RCT with overweight and obese participants (Beasley, 2007). Pearson correlations for energy ranged from $r=0.50–0.77$ for all nutrients including energy. The DietMatePro group reported maintaining better adherence to dietary prescriptions for energy, total fat, and saturated fat in comparison to the paper-based diary group (43% compared to 28%). Another example is an RCT that evaluated diet self-monitoring in overweight and obese individuals using PDA Calorie King diet analysis software versus paper-based diaries (Yon et al., 2006). No significant differences were found in the two groups for weight loss or frequency of diet self-monitoring. Of note is the finding that as diet self-monitoring became more frequent, weight loss in both groups also increased.

2.5.3.2. Digital photography cameras.

Food analysis can be done with the help of a digital video camera. Foods, beverages, and plate waste can be photographed from the same angle to accurately estimate portion sizes. The information is then stored for future analysis by interested personnel (Williamson et al., 2003). These types of devices have been developed and used for research purposes only, and their commercialization has been limited (Sun et al, 2010).
2.5.3.3. **Smart cards.**

Smart cards are used for meal pre-payments by allocating monetary value to the card so that the money can be spent in participating cafeterias and restaurants (Ngo, 2009). The food on the tray is immediately recorded at the cash desk when the meal is paid for using the smart card and the record is sent to a central computer in a research laboratory. Subsequently, the data are stored in a computer to be linked to a nutrient database. Similar to the case with digital photography cameras, smart cards have mostly been used in controlled research studies.

2.5.3.4. **Diet assessment applications (apps) in Smartphones and tablets.**

The newest categories of mobile devices for DA are small multipurpose electronic tools that contain enhanced computer-like capabilities. Examples of these mobile devices are Smartphones such as Blackberries, iPhones, Androids, and iPods, and tablets such as iPads and Androids. Computer applications designed for these devices are commonly known as “apps.” Apps are the latest form of e-DA tools. Using apps, diet information can be entered into a personalized online account and stored and/or analyzed in a few seconds. Today, there are numerous options of DA apps and the majority of them use nutrient databases with food photographs and easy to identify portions sizes. In many cases, apps also provide nutrient data for dishes from brand-name restaurants.

The study of use of apps in Smartphones or tablets for self-monitoring of diet in healthy or sick individuals is still limited. While few examples exist today, it is expected that this will greatly increase in the coming years. One study evaluated the adherence to self-monitoring of diet and a physical activity routine (Cushing, Jensen, & Steele, 2011) with the aid of an iPod app (http://www.livestrong.com). The study included only three obese adolescents who were attending a behavioural change program. Results showed that easier and more frequent self-monitoring of diet and physical activity was seen with the app tool in comparison to paper-based records used at the beginning of the study. This was likely due to an alarm that went off as a reminder to record food intake just before each meal. There was improved dietary self-monitoring for meals consumed outside of home; use of a mobile device proved to be more convenient than paper-based records and led to increased incidence of self-monitoring. In addition, adolescents are used to and prefer using technology, thus the use of apps are more appealing to them than paper-based records of food and other health-related behaviours. The
biggest limitation with this study was its small sample size and the long intervention period of twelve consecutive weeks of self-monitoring diet and physical activity. Authors of the study also did not provide any information about dietary or body weight changes after the intervention.

A recent RCT was conducted assessing the use of Podcast, mobile DA, and Twitter messages delivered to overweight and obese individuals in a weight loss program (Turner-McGrievy & Tate, 2011). Groups were divided into Podcast + mobile app (FatSecretCalorieCounter.com) and Podcast-only intervention. Weight loss occurred at six months in both groups, but there was no significant difference between the two groups Podcast + mobile app \([n = 47, \text{mean} – 2.7 \% (\text{SD 5.1 \%})]\) vs. Podcast-only intervention \([n=49, \text{mean} – 2.7 \% (\text{SD 5.6 \%})]\). The two groups also showed similar changes in the reduction of energy and fat intake as well as increased nutrition knowledge and increment in physical activity. Of interest was the finding that the Podcast + mobile app group was 3.5 times more likely than the Podcast-only group to use an app to self-monitor diet \((p< .01\). Podcast-only participants used web-based (34 \%) or paper-based (29 \%) questionnaires instead to monitor their diets. A statistical difference between mobile DA and paper-based records was seen in the frequency of self-reporting of diet \((p= .03)\). In summary, the study also showed that adherence to self-monitoring of diet seems to be more important for weight loss regardless of whether mobile, web-based or paper-based DA tools were used.

After reviewing several studies using new e-DA tools (web-based or mobile devices), the following can be noted:

a) the frequency of self-monitoring of diet has the greatest impact on successful weight loss regardless of whether electronic instruments are used or not. This finding is further supported with a new systematic review published by Burke et al. (2011), which included articles on individuals that self-monitored diet, physical activity and body weight for weight loss purposes. This author found a significant and consistent association between the self-monitoring of these measurements and weight loss. Authors suggested broader use of diet self-monitoring in clinics, hospitals, and other public locations such as schools, libraries, and community centres, as this may lead to healthy changes.

b) e-DA tool format differs depending on whether it is in the form of a 24-hour food recall, FFQ, or dietary history questionnaire
c) the nutrient database is often U.S.-based but some are Canadian-based; some e-DA tools translate food intake into food servings

d) the cost of e-DA tool applications ranges from being free to costing up to $1000CAN

e) e-DA tools range from not being validated at all to being validated against interviews by a well-trained dietitian(s) along with food records or 24-hour food recalls in which food is weighed for its portion size. The correlation coefficients for all nutrients often range from low-to-moderate.

Advantages of using e-DA tools are many, including the following:

a) improved accuracy in recording food items, as these tools contain food photographs and clear indications of portion sizes and also provide clues or reminders to record all foods and beverages consumed;

b) faster recording of food intake and portion sizes and almost immediate dietary analysis;

c) reduced interview bias due to direct reporting of food at the time of consumption;

d) increased frequency in diet self-monitoring due to its appeal to adolescents, young adults, and anyone who is comfortable with technology; and

f) increased access to DA and dietary self-monitoring at all times, as no health practitioners are required to complete the DA.

On the other hand, e-DA usage has its limitations including the following:

a) one needs a computer device and/or Internet access;

b) one needs to have some degree of typing and computer literacy skills;

c) certain populations such as older adults, those with low education, or new immigrants with limited language skills may not be able to use-DA tools without guidance;

d) results may be inaccurate due to underreporting of nutrition-related information in obese people and over-reporting of the intake of “healthy” foods such as fruit and vegetables in women, but some authors have argued that the under-reporting of self-monitoring may be irrelevant for weight loss purposes (Shay, Seibert, Watts, Sbrocco, & Pagliara, 2009).
As the use of e-DA tools in mobile devices and web-based tools in healthy and sick individuals is still evolving, there are certain gaps identified in the literature that will need further research. For example, studies are lacking among various ethnic populations, as the majority of existing studies have been conducted with white people who live in the U.S. This is especially important for Canada due to its fast-growing, multicultural population. Studies are also needed using e-DA tools by those of low income or education and by recent immigrants, all of which are vulnerable populations for nutrition related CD. Lastly, to date no studies were located that investigated the extent to which e-DA tools are utilized by health providers and patients in PC settings. If e-DA tools are used in these settings, it is unknown for what purposes and for which types of patients. As well, it is important to learn the opinions of health providers regarding the benefits, barriers, and potential applications of e-DA tools in team-based PC. The current study has addressed some of these gaps from a provider perspective.

2.5.4. The Ottawa Model of Research Use (OMRU).

Previous research in the area of knowledge translation (KT) has found that in order to increase the acceptability and adoption of technological innovations in PC, the following is necessary: the innovation must be accessible to health providers; technological programs must have scientific credibility; efforts must be made to understand the needs and current practices of potential adopters; and the innovation must fit into the needs of health providers’ day-to-day practice (Hayward, 2004; Holroyd, Bullard, Graham & Rowe, 2007; Straus, Tetroe & Graham, 2009; Truswell et al., 2003). The description of “diffusion of innovation” was first introduced by Rogers (1995) from the rural sociology research tradition and refers to something that is new for the potential adopter, but not necessarily to other individuals (already adopters) (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Rogers, 1995).

The diffusion of innovation in service organizations, particularly by health practitioners is not a straightforward process. It is, in fact, a complex and multiphase process (Greenhalgh et al., 2004; Holroyd et al., 2007; Kitson, 2009; Mazurek, Rycroft-Malone & Bucknall, 2004; Rycroft-Malone, 2004). One of the main reasons for this is that health practitioners cannot possibly review and evaluate all the published literature in a given field due to the large volume of information (Hayward, 2004). Hence, different models, such as the KT frameworks, have been developed to facilitate the process of effectively transforming and implementing research into
practice (Logan, et al., 1999; Graham & Logan, 2004; Straus et al, 2009). The “knowledge translation” or “knowledge transfer” concept was developed by the Canadian Institutes of Health Research (CIHR) in 2000 (Graham & Logan, 2004). A similar process is “implementation research” popular in the United Kingdom and Europe (Bhattacharyya, Reeves & Zwarenstein, 2009). Since the creation of the KT concept, various groups of health professionals have designed their own KT models or frameworks (Ward, House & Hamer, 2009). The differences between the various KT models stem from the differences in the number of components and actions involved in the KT process, the detail of information and/or actions that should be evaluated in each of the framework components, and the final purpose of the KT model (Straus et al., 2009; Dobbins, Ciliska, Cockerill, Barnsley & DiCenso, 2002).

After carefully reviewing a number of KT models and taking into consideration the current early stages of development of e-DA tools in PC as well as its possible limited knowledge especially in non-RD health providers of FHTs, the OMRU framework was chosen as the theoretical framework that assisted to address the elements to investigate in potential adopters about the use of e-DA tools including current practice and future recommendations. Other models have been recommended to assess an innovation in health care, such as the diffusion of innovation theory a linear model that includes five stages of the adoption model (Rogers, 1995). In comparison to diffusion of innovation theory, the OMRU framework is a more contemporary model conceptualized in 1998 and revised in 2004 (Logan et al., 1999; Graham & Logan, 2004) that stresses the importance of considering research as a “dynamic process” and uses a non-linear scheme with six interconnected components seen as opportunities to participate in research studies (Appendix A). In comparison to linear models that use more static processes, with the use OMRU framework section assessment of potential adopters investigators can go back to the previous component to modify the innovation attributes according to research findings to better accommodate the needs of potential adopters. Another advantage of using this framework in the present study was that at the time of the research proposal, investigators didn’t know exactly what elements were important to assess in focus groups with potential adopters, and the OMRU framework guided the research questions of focus group. The components of the OMRU framework are described below.
2.5.4.1. **Assessment of barriers and supports.**

*a) Evidence-based innovation.* An innovation interacts with potential adopters inside as well as outside of the health organization. Therefore, policy makers should be involved in the development processes and innovation itself to evaluate how perceptions of the attributes of the innovation may affect potential adopters’ decision to use the innovation.

*b) Potential adopters.* The OMRU framework aims to identify all “potential adopters” or “target audiences” for an innovation. It is recommended to investigate the potential adopters’ awareness, attitudes, knowledge and skills, concerns, and current practices. For example, positive or negative attitudes towards the adoption of new technology may act as barriers or supports to adopting change and should be assessed before attempting diffusion and implementation strategies.

*c) The practice environment.* This element directs attention towards identification, description, and assessment of the factors that influence the practice environment. These factors include the beliefs and values, norms, practices, rules, policies of the organization, the organization’s resources, economic state and any other related initiatives. These characteristics may be seen as factors that contribute to the adoption of research evidence.

2.5.4.2. **Monitoring intervention and degree of use.**

d) **Transfer strategies.** This component represents the planned strategies for getting the innovation to potential adopters while encouraging them to implement its use. As described by Rogers (1995) transfer strategies could include three elements: diffusion, a passive effort of transfer such as dissemination of the innovation in a research journal; dissemination, an active effort to targeting the information for a particular audience though workshops and electronic newsletters; and implementation, a systematic effort to ensure continue adoption and use such as continuing health education. This is particularly useful for innovations that involve a long learning curve or diverse groups of adopters (Greenhalgh et al, 2004).

e) **Adoption of the innovation.** The evaluation of intention and use of the innovation is determined by whether the innovation is used as it was intended. To evaluate adoption of the innovation it is necessary to determine the extent to which the innovation has been spread.
throughout the organization, the strategies that need to be changed and/or additional strategies that may be required.

2.5.4.3. Evaluation of outcomes.

f) Outcomes resulting from implementation of the innovation. Evaluation of outcomes should include the evaluation of practitioners, patients and the health system. The OMRU framework is depicted using a linear process and interactions between the components of the OMRU framework can be uni- or bi-directional as needed (Dobbins et al., 2002; Ward et al, 2009). This means that re-evaluation of each of the components can occur at any point in time during the study in order to address the identified barriers.

The OMRU framework has been widely used to guide successful implementation of innovations. Some examples in the literature include: the assessment of barriers and supports for innovations in PC teams (Légaré et al., 2008); assessment of barriers and supports to implement an inhaler for asthmatic patients in paediatric units (Scott et al., 2009); assessment of users’ needs for a web-based health decision support system at the organizational level (Dredger et al., 2007); and understanding the barriers and supports for implementing patient decision aids in clinical practices (O'Donnell et al., 2006). However, to date, it does not appear that the OMRU framework has ever been used to implement nutrition service initiatives in PC.

Potential adopters in this research were FHT clinicians, such as FP, RN, NPs, pharmacists, and RDs, interested in conducting DA and nutrition counselling with their patients. These are early stages for the full adoption of e-DA in PC and investigators recognize the importance of not only evaluating potential use of e-DA tools by FHT health providers but also by other groups involved in design and adoption of e-DA tools such as IT designers, administrative staff of FHTs and patients (although this is beyond the scope of this study).

2.6. Mixed Methods (MM) Research: Exploratory Sequential Design

Mixed methods is a research model that combines elements of quantitative and qualitative research in one study. Researchers in the area of health often utilize mixed methods approaches to enhance or understand a certain topic of interest. Overall, this approach can be applied in particular circumstances that can be summarized as follows: a) when there is a need to use more than one research method (qualitative or quantitative) because the use of only one source of data
is insufficient to grasp the whole picture of a particular topic; b) when a need exists to enhance a research study with a second method of data collection because the first study did not provide enough information on a specific topic of interest; c) when there is a need to explain the initial results of a study and a second method is embedded or nested within the primary study; and, d) when researchers want to understand a research objective through multiple research phases usually conducted over a long period of time (Creswell & Plano-Clark, 2007; Creswell, 2007).

In this study, the use of a mixed methods research approach was chosen for the first reason given above, namely that the use of an e-DA tool in team-based PC is a new topic of research interest and little information exists in this area from health providers other than dietitians. Hence, researchers felt that it was necessary to use both qualitative and quantitative research approaches to fully explore the use of e-DA tools in FHTs from an interdisciplinary perspective.

One of the critical defining characteristics of mixed methods research is explicit consideration of how the qualitative and quantitative methods are combined either concurrently or sequentially. Creswell & Piano-Clark (2007) describe the major prototypes of the combination of the two methods over time. These prototypes are known as convergent parallel design, explanatory sequential design, exploratory sequential design, embedded design, transforming design, and multiphase design. The exploratory sequential design seems to fit best with the main objective of this study. In this design, the qualitative and quantitative research methods are implemented “sequentially” by starting with a qualitative method of data collection and analysis to explore the topic, followed with a quantitative method.

The first purpose of exploratory sequential design is to generalize the qualitative results of a study from a small sample size of participants to a larger sample, often with the use of a questionnaire (Creswell & Plano-Clark, 2007). A qualitative study was undertaken to aid in the understanding of the two research topics of interest; consequently, the findings obtained from the qualitative study were merged into the quantitative questionnaire, and this was the base of mixing the two research studies. Figure 1 illustrates the exploratory sequential design that was used for this study.
2.6.1. Focus group interviews.

A qualitative research method is recommended when investigators want to explore a new concept or want to come up with new ideas and thoughts related to a particular topic of interest (Creswell, 2007; Green & Thorogood, 2009). Amongst the various methods of qualitative inquiry, focus group, in-depth individual interviews, and observation are the most common (Daly, 2007).

To explore the current DA practices and the use of new e-DA tools in FHTs, focus groups were chosen. The main reasons for this decision were that, although there is agreement in the literature that health providers should promote the adoption of healthy diets to prevent nutrition-related diseases in PC (Bhattacharyya, Estey, Cheng & Canadian Diabetes Association 2008, 2009; Lau et al., 2007; Lawton, 2004; Padwal et al., 2009), a gap still existed in the knowledge on how and when health providers in interdisciplinary PC were obtaining dietary information from their patients. Teams in PC were not common in Canada until fairly recently. Particularly, FHTs are team-based PC settings interested in health promotion and disease prevention activities that work as a unit by utilizing one single patient medical record. The types of disease(s) or condition(s) health providers are treating when they are assessing diets, the questions and type of DA methods they are using to assess diets, and the extent to which they share nutrition-related information with other team members were not known. Similarly, there was a gap in the knowledge in relation to the use of new e-DA tools in interdisciplinary team-based care. For example, it was unknown if health providers were aware of the new e-DA tools and the main
facilitators and barriers in their use, and whether or not they were considering adopting e-DA tools in team-based health settings.

One of the main advantages of using interdisciplinary focus groups in this study was the opportunity of electing open discussions on the two topics of interest expressed above by obtaining insight on the multi-vocality of everyday life in FHTs, obtain a more clear idea of the needs and level of information required in DA by diverse health professions, and overall ideas of benefits, barriers, and recommendations of DA tools all these for the development of a survey to obtain a large number of responses; these advantages wouldn’t not be possible by using other methods of data collection such as indepth interviews. However, one of the main disadvantages of focus groups is the possibility of suppresing less powerful voices, especially in people with less experience on the topic of interest (e.g., RD in this case). To address this potential issue, investigators tried to accommodate a limited number of participants per focus group (three to five) and the moderator made a concious effort to ask and obtain information from each participant on their own thoughts with respect and not interruptions by moderator or another participant.

2.6.2. Web-based surveys.

Web-based surveys have become an increasingly popular way for researchers to obtain information because of their double advantage of providing faster and less costly results than paper-based surveys (Dillman, Smyth & Christian, 2009). Besides cost, one key question that researchers often ask is whether web-based surveys have better response rates than traditional paper-based surveys sent by mail. For example, in a study conducted at the Michigan State University of 19,890 students with full Internet access enrolled in different programs looked at whether web-based questionnaires have comparable response rates to paper-based questionnaires (Klapowitz, Hadlock & Levine, 2004). The results showed that, on average, there were no significant differences between the response rates of web-based questionnaires without an advanced notification as compared to paper-based, mailed questionnaires. Interestingly, if a pre-notice letter was sent to participants prior to sending the web-based questionnaire, response rates were greater than for paper-based questionnaires or web-based questionnaires alone. Yet, reminder postcards sent to non-responders do not result in increased response rates. The cost of
web-based questionnaires was modest (~$2US per participant) in contrast to paper-based mailed questionnaires (~$11US per participant).

The results of the study presented above as well as the increased popularity of web-based surveys to collect health-related information in recent years (Dillman, Smyth & Christian, 2009, National Physician Survey, 2010) were seen as advantages for this study due to its convenience to rapidly access, complete and send the questionnaire on-line. Therefore, investigators of this study selected a web-based survey as the second method of data collection to assess the use of e-DA tools in FHT members.

2.7. Summary of Literature Review.

The prevalence of nutrition-related diseases in Canada has grown, particularly in the past 40 years. The majority these patients are seen in PC, which is usually the first point of health care contact. FHT is one of the team-based models with a special focus on health promotion and disease prevention activities, and implements IT to facilitate and improve patient’s care.

DA is one of the four elements of nutrition assessment. Various DA methods exist to evaluate diet; the more formal DA methods utilized in clinical practice are 24-hour recall(s), FFQs, food records and diet history. Brief DA questionnaires have been also recommended, particularly to support physicians and nurses in busy PC offices. However, barriers to conducting DA occur at the health providers, patients and health care system levels.

Besides RDs in PC, other disciplines of health provides are evaluating diet and providing dietary advice to patients. The new e-DA tools such as web-based and apps in Smartphones and tablets have been utilized mostly for research purposes and have only recently been promoted to self-monitor diet in PC patients. Many advantages have been identified over the traditional methods of DA, while disadvantages exist too.

The OMRU framework recommends the assessment of barriers and supports for potential adopters. Potential adopters’ awareness, attitudes, knowledge and skills, concerns, and current practices are all relevant. This model can be considered as ideal to provide general information on overall positive or negative attitudes towards the adoption of new technology, such as use of e-DA tools in team-based PC.
The exploratory sequential design is a mixed method design that includes qualitative and quantitative research methods implemented sequentially by starting with a qualitative method of data collection and analysis to explore a new topic of research interest followed with a quantitative method. Interdisciplinary focus groups were chosen among other qualitative methods of data collection (e.g., personal interviews) to generate an interdisciplinary discussion of DA and find common ideas for a further investigation in the questionnaire.

Today, web-based questionnaires have gained popularity because they achieve comparable or higher response rates among educated participants, and are convenient and cheaper methods to collect data. Hence, a web-based survey was chosen as the method of data collection for the second part of the study. The results of the study will clarify key aspects of current practice and guide future directions for the use of e-DA tools in team-based PC.
Chapter 3: Research Objectives and Reflexivity

3.1. Research Purpose and Research Objectives

The increasing development of and access to information technology (IT) in the health system has led to new tools in the area of dietetics; an example is electronic dietary assessment (e-DA) tool(s) that could potentially facilitate dietary assessment (DA) practices in team-based primary care (PC). The objective of this study was to explore current DA practices and the potential use of new e-DA tools in an interdisciplinary PC context of Family Health Teams (FHTs), using a mixed methods design with interdisciplinary focus groups and a short web-based survey.

The specific research questions addressed in the study were:

1) What are the current DA and e-DA tools practices of health providers in FHTs?

2) What are the opinions of health providers on the use of new e-DA tools in FHTs, particularly benefits and barriers to their use and recommendations for development?

3.1.1. Main objective of the study.

To explore current DA practices and potential use of new e-DA tools by various disciplines of health providers in an interdisciplinary PC context of FHTs.

3.1.2. Specific objectives.

• To explore current DA practices and use of new e-DA tools by various disciplines of health providers in FHTs using interdisciplinary focus groups.

• To describe the frequency of DA, method of DA and use of e-DA tools, its benefits, barriers and recommendations by health providers in FHT using a web-based survey.
3.2. Personal Reflexivity

Reflexivity recognizes that the self cannot be separated from the research process (Daly, 2007). Hence, by conducting a self-reflexive exercise, researchers become more aware of the role that they may play starting from the early planning stages of the study and how this could affect the research outcome. The following section presents a reflection and discussion on how my personal experiences with DA could have an influence on this research study and my epistemological reflexive assumptions about the topic of this doctoral research endeavour.

My first meaningful exposure to dietetics was during my undergraduate training in medical school, when I became aware of the importance of nutrients and dietary patterns and how they positively or negatively affect the health status of humans. Following my graduation as a physician, I enrolled in a program to obtain a Master’s degree in clinical nutrition with an emphasis in paediatrics. It was during this program that I acquired a much deeper understanding of the existing DA methods and the challenges faced by health practitioners when using them in clinical settings. It was also around this time that I was hired as a Clinical Research Assistant at the Cardiovascular Research Institute (CRI) of the University of Guadalajara, Mexico. My main responsibilities at the CRI consisted of providing medical treatment to patients suffering from nutrition-related chronic conditions. As such, obtaining and evaluating dietary information and providing nutrition advice were key responsibilities in my day-to-day clinical practice. However, despite being specialized in the treatment of cardiovascular-related diseases, neither I nor any other team member at the CRI used any formal type of tool or method to assess diet. Dietary information was randomly gathered from patients through unstructured methods. If dietary issues persisted or patients had any conditions that required dietary intervention, the practice was to refer patients to a dietitian in another unit within the same hospital.

It is through my substantive health education as a physician, my Master’s degree in clinical nutrition, and over six years as a clinician that I developed not only an appreciation for the importance of assessing diet but also the opinion that the majority of health providers, other than RDs, lack expertise in DA methods. My experience with DA and my opinion about its use sparked my interest in discovering what the DA situation in Canada was like and whether the quality of DA would be the same, better, or worse if it was performed in a PC setting. In addition, I wanted to explore whether or not any new techniques to assess diet, for example e-DA
tools, were typically used in the clinical environment and whether their use would have any
effect on improving the quality of the DA. It is important to note that because my clinical
experience has not been in PC, I can be more neutral on how DA and e-DA tools are perceived
and reported by focus group respondents.

As far as my ontological and epistemological stance, prior to my doctoral degree, my
education as a clinical researcher had been very scientific, as both my undergraduate and
Master’s degrees were obtained in traditional, biological science-oriented medical programs.
However, after completing the doctoral degree coursework and dissertation, I have started to
understand that reality can be socially constructed with factors such as culture, language and
history; thus, my self-awareness has shifted towards a relativist ontological position. From the
epistemological point of view, this research project is undertaken with a post positivist
perspective by accepting that reality exists and is independent from one’s knowledge and that
reality exists not only with the involvement of material objects, but socially constructed with
ideas and discourses that have an effect on one’s perceived reality. Thus, I recognize that the true
reality of how DA is conducted by interdisciplinary teams may never be known, at least within
this study, as observations and measurements may be limited by participant and/or researcher
bias. In an attempt to minimize bias, an exploratory sequential design was used, by utilizing
focus group interviews and web-based surveys as instruments to understand the research topic
within this project.

Another important point for consideration is the fact that prior to my enrolment in this
doctoral program, my experience in conducting and analyzing focus groups was practically non-
existent. Hence, the design of the interview questions used in the focus groups, although
consistent with the established knowledge translation model (OMRU) for potential adopters and
survey questions, was strongly driven by the comments and expert recommendations of my
thesis committee team consisting of four professors.

As far as my influence on the focus group participants’ responses, it should be noted that my
first contact with focus group participants was on the day of the interview and there was no
previous contact either by email or phone. Furthermore, in all of the focus groups except for
three, I was not the moderator of the interview; rather the moderator was a person with a social
science background. My direct contact with participants was limited to a five-minute
introduction and a demonstration of new methods to assess diet during each focus group session. For this reason, I think that my personal influence as investigator on focus group participants’ responses was minimal. In order to reduce increase participants’ comfort level and familiarity with the setting, all focus group sessions were conducted at the participants’ worksite during their lunch hour and complimentary food and beverages were supplied. I did not notice any signs of discomfort, such as stiffness or refusal to participate in the interview, among participants. Rather, participants appeared comfortable during the interviews, as they were laughing and joking with each other.

I perceived these research participants to be skilled and confident individuals, who were focused on the topic right from the beginning and were able to share their opinions without hesitation. However, there may be some limitations with the focus group responses because approximately half of the participants did not have previous experience in using e-DA tools.

My epistemological stance could have influenced the use of a mixed methods research in this study. For example, the post positivism worldview embraces reductionism and this element is echoed in the methods sections of this document by my tendency of narrowing down the main research questions of the study and focusing on investigating and analyzing specific variables of interest, as well as their relationship. Detail observations and measurements are elements of post positivism worldview; in this case, I was interested in conducting a mixed methods design in an effort to gather as much information as possible to understand the research topic. The research questions of the study were answered with the use of instruments that went through a systematic process, in the case of the web-based questionnaire face and content validity were done including health providers involved in the field, sample size calculations used as well as statistical analysis to find statistical differences. Similarly, the thematic analysis went through a series of steps to ensure rigour and fixed questions were used in both studies with research participants.

Determinism is another characteristic of post positivism worldview, where cause and effect explanations are the norm. However, in this regard, I recognize that some processes of this world are undetermined and predisposed to change. Therefore, my position as investigator in this project is not to find fixed scientific explanations to my findings, but be able to absorb as much as possible the general concepts of current DA practices and use of e-DA tools by recognizing the undetermined regularities of this world.
Chapter 4: Methods

Mixed methods research combines elements of quantitative and qualitative methods of data collection and analysis in a study. Due to the novelty of the topic, a mixed methods exploratory sequential design was used in the present study. The qualitative research method of focus groups interviews was the foundation for first exploration of both current dietary assessment (DA) activities and potential use of electronic dietary assessment (e-DA) tools. Then, based on the focus group results, a web-based survey was developed to confirm and expand on key insights from the focus groups.

The following section describes in detail the methods used to complete this study. Beginning with the focus groups, recruitment procedures will be described followed by data collection and data analysis approaches. This will then be replicated for the web-based survey.

4.1. Methods for Focus Group Interviews

4.1.1. Recruitment of participants for focus groups.

A convenience sample of different disciplines of health providers was invited to participate in focus group interviews. Family physicians (FPs), registered nurses (RNs), nurse practitioners (NPs), registered dietitians (RDs), and pharmacists were previously identified as professions likely to “share similar experiences” in conducting nutrition counselling and DA activities in primary care (PC) (Brauer et al., 2006). Thus, these providers were especially targeted to participate in interdisciplinary focus groups. Participants of the study were included independently of their previous experience with the use of e-DA tools because investigators wanted to obtain basic information from front line health providers on current e-DA tools use, perceived benefits, barriers and recommendations of its use in Family Health Teams (FHTs). Also, a convenience sample of health proviers was chosen for the study, among other types of sampling, because investigators wanted to obtain as much feedback as possible on potential use of e-DA tool in FHTs from good informants as opposed to using a random sample of health providers that may or may not be potentially interested on the topic under investigation, and the risk of obtaining poor information on this topic.

To ensure interdisciplinary discussion, at least three different health professions were requested to participate in each focus group.
4.1.2. Number of focus groups and number of participants.

Advice on recruitment of health providers in FHTs was sought from three executive directors (EDs) involved in local FHT networks. These EDs had organized local groups for information sharing among FHTs. During telephone interviews, CB and PhD thesis supervisor were advised that the best method of contacting health providers in FHTs was through formal invitations via email to the EDs of the FHTs. Public information on the locations and telephone numbers of the FHTs was found on the Ministry of Health and Long-Term Care (MOHLTC) webpage (http://www.health.gov.on.ca). An undergraduate student called these FHTs and created a contact list with email and name of EDs of 102 FHTs. The contact list included FHTs from different regions of Central, Eastern, GTA area, Northern and Southwester Ontario, all 102 ED were invited to participate in focus groups. Other FHTs had not given permission to the MOHLTC to post their name and contact information.

Based on previous studies in PC, six to eight focus groups were generally sufficient to obtain saturation of ideas such as general patterns of experiences and variation of these experiences in participants attending to interdisciplinary focus groups studies. The number of participants per focus group differed from four to twelve, some of them within the same health profession (Delva, Jamieson & Lemieux, 2008; Sargeant, Loney & Murphy, 2008; Soklaridis, Oandasan & Kimpton, 2007; Xyrichis & Lowton, 2008). Hence, a minimum of eight focus groups were seek to obtain sufficient interdisciplinary perspective from the two main topics under investigation.

Investigators created a detailed semi-structured interview guide (Appendix B) and details will be described in the next section. EDs of FHTs were contacted two times (one week apart) by email with letters of invitation to participate in the study. See Appendix C for an example of the first letter and Appendix D for an example of the second letter of invitation to ED and members of FHTs.

In addition, the ED of the provincial Quality Improvement and Innovation Partnership (QIIP), an organization created to work with FHTs on quality improvement initiatives, was contacted and an advertisement for the study was placed on their webpage (Appendix E). The Association of Family Health Teams of Ontario (AFHTO) advertised the study online on their webpage (Appendix F). Email messages about the study were also sent to the voluntary FHT RD listserv.
4.1.3. Development of the semi-structured questionnaire for focus groups.

The development of the questionnaire of focus groups was a multiphase process involving a research team. First, the Ottawa Model of Research Use (OMRU) model was reviewed to identify the main aspects that needed consideration when exploring the use of e-DA tools in FHTs. Then, one-on-one interviews were conducted with 11 health providers working in two FHTs of Ontario to develop an understanding of current DA practices in FHTs (I.C. Bonilla, personal communication, June 2010). The 11 providers included four RDs, four nurses (one NP and three RNs), two family physicians, and one clinical pharmacist. Results of these interviews were summarized and presented to PhD thesis committee members for discussion. A semi-structured interview was developed to provide organization and structure during focus groups and maintain researchers focused on the two main research questions. It was noted during these interviews that health providers, other than RDs, were frequently not aware of new e-DA tools. Thus, a short demonstration of these tools was considered important to ensure all discussants could provide informed opinions about their potential use in clinical practice. In addition to the one-on-one interviews, advice was sought with the three key informant EDs on the overall organization of the focus groups. EDs advised investigators that time should be limited to one hour maximum during lunch hour and space may or may not be in a meeting room with electronic equipment. A short demographic questionnaire was designed to give an idea of who was participating in the focus group interviews (Appendix G).

4.1.4. Demonstration of electronic dietary assessment (DA) tools.

The demonstration of e-DA tools employed high quality pictures on paper for maximum flexibility to different meeting rooms.

Web-based DA tools: After a thorough review of the e-DA tools available on the market via google.com, and after obtaining the results of the one-on-one interviews, two web-based DA tools appeared to be the most appropriate for the Canadian PC context: eaTracker (eaTracker, 2013) and ESHA Food Prodigy (ESHA research, 2013). These e-DA tools are high quality, comprehensive, are already being used by some RDs, and use the Canadian Nutrient Database. There are advantages and disadvantages to both these tools. For example, the ESHA research Food Prodigy allows the health provider to send a link to interested patients/clients so that they can complete their food intake questionnaires and record their physical activity patterns and
weights online, at their own convenience. Once the DA has been completed, the information can be directly sent back to the health provider(s) in an Excel file, and ESHA research Food Prodigy can then be used to evaluate nutrient content. Using eaTracker, patients can enter their diet information in the same fashion as they do using ESHA research Food Prodigy. eaTracker then evaluates food intakes for nutrient content and compares the diet to CFG. One disadvantage of using eaTracker, however, is that dietary results cannot be sent directly back to health providers, except for RDs were a coach function is currently available.

DA in Mobile Devices: As was done with web-based DA tools, a thorough search on the available e-DA tools in apps at that time was conducted using google.com. Over 20 e-DA tools in mobile devices for Smartphones were found; yet, only three were chosen and included in the DA presentation for the focus group interviews. Those that were chosen were popular and had clear and colourful photographs. Only one photograph of a Personal Digital Assistant (PDA) was chosen for the focus group interviews, as PDAs have now been largely replaced with e-DA tool apps in new mobile devices but some health providers may be familiar with these devices. (see Appendix B for more details of what was shown during the focus group).

4.1.5. Piloting of focus group questions.

Pilot testing of focus groups is an important part of the data collection process as it allows researchers to assess the flow of questions, evaluate the level of comprehension of the questions, and check that all of the questions can be answered in the given time limit (Green & Thorogood, 2009; Morgan, 2002). For this study, the time limit was 60 minutes maximum in line with the length of providers’ lunch break.

Four health providers participated in the pilot test including one physician, one nurse practitioner, one pharmacist, and one dietitian. The focus group interview in the pilot followed the same procedures and ethical standards as described in the section above. Immediately after the pilot test, CB reviewed the interview in full for completeness on the digital recorder, and then the digital data was sent to a professional transcriber. Only one question was modified since it was not clearly understood by participants. The original question was “how do you share dietary information with your team?” and it was slightly changed to “Are you somehow sharing any dietary-related information with your team by using an electronic medical record or another venue?”
4.1.6. **Procedures for focus group interviews.**

On the day of the interview, the focus group moderator and the note taker arrived early to arrange the table with a recorder at each end and with packages for each participant. The packages contained the consent form, high quality pictures of e-DA tools, the demographic questionnaire, and blank paper. Refreshments were served.

CB participated in all focus group interviews as a note taker (eight focus groups) or moderator (three focus groups). A professional moderator was hired for the day and moderated eight focus groups and CB moderated the final three focus groups to gain experience as moderator and decrease moderator’s compensation. When CB moderated the focus groups, an undergraduate (sociology) student was hired as a note taker for the day. These fieldnotes included important ideas expressed by health providers, new ideas for future questions, and concerns expressed by the group. Non-verbal communication was not documented. After the focus groups, the field notes were summarized. Digital data were immediately uploaded to a secure site for professional transcription (Clearpane Services, University of Guelph).

4.1.7. **Data analysis.**

Thematic analysis was the analytical technique used to identify, classify, and report the data obtained from interdisciplinary focus groups. One of the benefits of thematic analysis is its flexibility, as this technique can be applied across a wide range of theoretical and epistemological approaches. Thematic analysis is also a useful method for an exploratory study of a health topic, because it is considered a basic qualitative analysis method, in comparison with more complex analysis such as the use of grounded theory research. Nonetheless, thematic analysis is a method that can provide a rich and detailed report by including both descriptive and interpretative data (Braun & Clarke, 2006).

Authors Braun & Clarke (2006) developed a guideline that outlines the steps that should be followed when conducting thematic analysis from transcribed documents. The guideline is informed by several qualitative researchers. This document was used in the current study for the analysis of focus groups as described below.
4.1.7.1. **Familiarization with the data**

*Fieldnotes:* Notes were taken during in all focus groups. The information was divided into the two main topics investigated in the current study, namely DA practices and use of e-DA tools. After each focus group, CB reviewed the fieldnotes for any initial ideas and patterns among the data. For each focus group, these initial ideas were summarized and subsequently incorporated into the overall initial coding of the study.

*Transcriptions:* Audio recordings were transcribed verbatim in a Word document, using the conventions of Green and Thorogood (2009) (Appendix J). To protect identity, the health profession of participants was identified only; for example, pharmacist (Phar), nurse practitioner (NP), physician (Phys), registered dietitian (RD), or social worker (SW) and each of them received an ID number.

Right after receiving the verbatim transcription, CB reviewed each transcript in detail against the recorded interview for accuracy, confidentiality and quality of the data (Krueger, 2006). Next, cleaned transcripts, without participants’ names, were sent to the research team made up of PB, CB, and second analyst (SA), a RD with Master in Sciences. This was for PB and SA the initiation of familiarization with the data. Individual readings of the transcripts were made in an “active way” as recommended by Braun and Clarke (2006) in order to search for initial ideas, connections, and/or potential patterns before starting the generation of the initial codes.

4.1.7.2. **Generation of the initial codes**

*First draft of the codebook:* This phase involved the identification and creation of initial codes with all the dataset by coding interesting features of the data (Braun & Clarke, 2006). Following their own initial familiarization with the data, CB, PB and SA used an inductive, or data-driven, method to start identifying possible codes. They first looked at the data as a whole, independently if they were related or not to the section “potential adopters” of the OMRU framework or if the data was related or not to a specific health discipline. However, as Braun & Clarke (2006) acknowledge, “researchers cannot be free themselves of their theoretical
commitments.” Hence, although the generation of codes was made inductively, the process was enhanced with the theoretical approach of the study, namely the OMRU framework.

An important decision was made at this point about whether or not to code the whole transcript by health discipline. It was decided that to help investigators of this study understand the two topics under investigation from an interdisciplinary perspective point of view, it would be best if the coding and themes were not completed according to health discipline. Instead, the ideas and details of the entire team were included together.

For each new statement, if an important idea appeared, a code or label was generated and placed in the right-hand margin of the Word document. This phase was a manual and detailed process and the Track Changes feature was used in the document containing the transcripts. It is important to note that at this early stage, almost all of the data appeared important; therefore it was captured and labelled for further analysis by PB, CB, and SA.

After the initial coding, the research team met for the first time to discuss the coding process of the data from the first focus group. In this meeting, the entire transcript was read and reviewed line by line, so that the team could discuss the process and compare and contrast the names of codes. In an effort to ensure that the name of a particular code in fact represented a particular idea and was not repetitive, three questions were asked during this process: Does everything in that particular quote correspond to the given code? Should this particular code be re-named or deleted? Can some codes be combined? As a result of this meeting, numerous discrepancies in coding were found. For example, different words were used to name the same codes, and there were some potential codes that could be identified by one or two people in the group, but not by all three. As well, although quotes describing the same idea were generally grouped under the same thematic code, the same data were sometimes included in more than one thematic code if two main ideas were expressed in the same extract.

The research team, CB, PB and SA met three times to discuss the coding of data from the first focus group before they were satisfied enough to move on to do the same for the data from the remaining focus groups. The research team coded the first four focus groups, individually and then as a group. CB collected the coded transcriptions of these focus groups and created the first draft of the codebook containing a list of thematic codes and sub-codes. A memo table was also created in Excel. This table contained all codes and sub-codes and included the excerpts
exemplifying these codes. These two documents were reviewed and refined by the research team before moving to the second draft of the codebook.

*Second Draft of the Codebook:* Once the first draft of the codebook was completed with the first four focus groups, CB met with thesis committee member Dr. Keller for direction and advice for finalizing the codebook. Dr. Keller provided several recommendations at this point summarized in Appendix K. Due to the type of questions and answers obtained during the interdisciplinary focus groups; data in the transcripts were both descriptive and interpretative.

Descriptive data refer to specific and self-explanatory information that can be summarized with the use of tables and/or bullets. In comparison, interpretive data are sometimes not self-explanatory in nature, as they contain more complex or contextual ideas expressed by the participants and it often requires a deeper level of analysis in an attempt to understand the phenomenon (Thorne, Reimer & O’Flynn-Magee, 2004). Hence, interpretive data were converted into active codes that formed the basis of initial themes for further analysis. Codebook and memo tables were created separately for descriptive and interpretive data.

After creating the codebook of the first four focus groups as a group and following Dr. Keller advise, CB continued alone coding the data from the remaining seven focus groups. Data saturation was seen when data from transcripts were returning no new information into codes and subcodes; this situation started to occur after focus group six and on. Once the coding of all eleven focus groups were completed, CB met with PhD thesis advisor Dr. Keller to review and refine the entire codebook.

*Reliability of the codebook:* The procedures followed in the current study to achieve intercoder reliability were those recommended by Creswell (2007). To complete this phase, the two coders (PB and CB) randomly selected transcripts from two focus groups, groups six and 11 (18.18% of the total focus group sample) and manually completed individual coding. The two coders met to evaluate the concordance with the coding and discuss any discordance. At this meeting, the two coders thought that it was more important to agree on similar names of coding rather than exactly code the same text segment(s). Thus, the two coders did not code the text segments exactly in the same way, but in a very similar way. To calculate the percentage of agreement on code names, the two coders met and asked each other whether they agreed or not.
on the names of the coded segments. At the end of this process, the two coders obtained a 90% agreement on their coding.

4.1.7.3. Searching for themes

This phase begins when all of the transcribed data have been initially coded and a long list of codes is obtained. During this phase, it is important that investigators focus the analysis at a broader level by identifying candidate themes within the data (Braun & Clarke, 2006). To do this, CB looked at all coded data and started looking for patterns, similarities, or differences between the codes using the codebook and concept mapping to make relationships among codes. At this stage, some codes were combined into one code, some were re-named, and some were deleted. Due to the richness of data collected, there was a great deal of coded data that did not relate exactly to DA practices or use of e-DA tool, such as health provider discussions about how participants collect anthropometric measurements from patients and details of their individual and group dietary counselling strategies. The data that did not relate to DA were placed in a “miscellaneous” category. At the end of this phase, CB completed the organization of all of the codes into the candidate themes.

4.1.7.4. Reviewing candidate themes

This phase involves the refinement of candidate themes (Braun & Clarke, 2006). At this point, some of the candidate themes were broken down into two or more individual themes, some were combined into one larger theme, and some did not have enough information to support the naming as a unique theme, so the proposed theme was deleted. As Braun & Clarke (2006) suggest, the first level of review involves the revision of candidate themes by reviewing each coded data extracts for “coherence and accuracy.” Thus, CB checked the memo table containing the extracts of the coded transcripts and compared this against each candidate theme. Some of the codes were re-named to better represent what participants were saying. The second level in this phase involved reviewing the accuracy of individual candidate themes in addressing the two topics of the study. To do this, CB read the entire dataset to make sure that all data extracts fit into the particular theme in which it had been placed.

CB re-read the entire dataset and all the potential themes numerous times to identify the “essence” of each theme individually and together. Some of the candidate themes were re-named or combined with other themes. For example, current DA practices initially had seven candidate
sub-themes. After CB read the entire coded data (interpretive data), candidate sub-themes were reduced to four and then to two sub-themes. Of note, after finishing the first analysis of all focus group data, three participants of focus groups volunteered to review and provide feedback on the accuracy of the results (member checking). Only a few comments were made from this review, such as adding more information on the common topics or health issues in DA and nutrition tools (Tables 7 and 8 of results).

4.1.8. Research ethics of focus groups.

A package was presented to the Research Ethics Board (REB) of the University of Guelph. A certification of ethical acceptability of research involving human participants was obtained from REB with the number 11MR014 (Appendix H). The informed consent form was also included (Appendix I).

4.2. Methods for Web-Based Surveys

4.2.1. Recruitment of participants.

As was done for recruitment of participants for the focus groups, multiple recruitment strategies were used to encourage participation. Invitations were emailed to EDs and administrative leaders of 112 FHTs to share with the health providers in their setting, the FHT-pharmacist listserv and FHT-RD network. In the summer 2012, a convenience sample of FPs, RNs, NPs, RDs, and pharmacists working in Ontario FHTs were contacted through their executive director (ED) to participate in a web-based survey. Other disciplines of health providers for example, health educators and medical residents, received the online invitation as well, and responded to the survey.

The web-based survey was placed online in SurveyMonkey® (http://www.surveymonkey.com) and consisted of eighteen open-ended and closed questions and one open question for additional comments (Appendix M for details). ED and/or administrative leaders of the FHTs were contacted twice, once at the beginning of the study and a second time one week apart, after the first letter of invitation was sent out. All invitations were sent at the beginning of the survey and a second letter one week apart after the first letter. The web-based survey was opened online from August to October 2012.
4.2.2. Sample size of web-based survey.

The sample size calculation was based on confidence intervals and the estimation of interest in using e-DA tools by the health profession. The nQuery Advisor software, version 4.0 (http://www.statistical-solutions-software.com), was used to calculate the sample size. A two-sided, 95% confidence interval of ±0.10 was calculated for a single proportion interested in e-DA tools (for example, if half of the participants were interested in using e-DA tools, the 95% CI would be 0.4 to 0.6) using the large sample normal approximation, and was adjusted for a finite population of different sizes in the five groups of health providers, namely FPs, RNs, NPs, pharmacists, and RDs.

The expected proportions of respondents interested in e-DA tools was based on preliminary estimates of 0.75, 0.30, 0.25, 0.30, and 0.25 for the groups of RDs, FPs, RNs, NPs, and pharmacists respectively. The required sample size for RDs was n= 53 (total in FHTs N=212) (L. Sergeant, personal communication, September, 2010). Similarly, the required sample sizes for the other health providers were as follows: FPs: n=75 (total in FHTs N=1,912) (Improving Access to Family Health, 2010); RNs: n=65 (total in FHTs N=624); NPs: n= 41 (total in FHTs N=80) (Health Force Ontario, 2009); and pharmacists n=38 (estimated total in FHTs N=80) (Clinical Pharmacist of Guelph FHT, personal communication, April 2012).

4.2.3. Questionnaire development

4.2.3.1. Content and face validity of web-based survey.

The web-based survey queried mostly descriptive aspects of the use of e-DA, based on the descriptive aspects of the focus group analysis. Feasibility of data collection was a major concern, so the number of questions was limited to allow for completion in less than 10 minutes.

Validity refers to the nature of the question of “what is being measured” in the construct (Trochim & Donnelly, 2007). In this case, the main construct of the survey was the use of e-DA tools in FHTs. There are several types of validity that exist, but in the current study, face and content validity were used to operationalize the e-DA tools construct in the short web-based survey.

Face validity, the lowest level of validity, is a concept that refers to the degree to which the construct of interest “seems like” a good translation of knowledge (Trochim & Donnelly, 2007).
Experts in the field of nutrition, including thesis supervisor and PhD thesis committee members were involved in reviewing the survey questions several times for face validity.

Content validity, in comparison, is obtained when the questionnaire matches the knowledge base of the field and investigators carefully select the items of the questionnaire (Trochim & Donnelly, 2007). In the current study, after obtaining the results from the first four focus groups, a second version of the web-based survey was created and was presented to PhD thesis committee members, considered as subject matter experts, for detailed review of each question in comparison to the main elements of the OMRU model, section potential adopters. After these two steps, the paper-based questionnaire was transferred online via SurveyMonkey® and cognitive interview were conducted.

Cognitive interview is a well-known part of the Cognitive Aspects of Survey Methodology (CASM) (Willis, 2005). This technique has been used in the past to assess the validity of newly developed questionnaires to detect items that are “not understood by respondents” as intended by the survey developer. In general terms, there are two forms of conducting cognitive interviews, namely the verbal probing technique and the think-aloud technique (Presser et al., 2004; Willis, 2005). The verbal probing technique was used in the cognitive interviews used in the current study to ensure that the web-based questionnaire was appropriate and sufficient to answer the research question.

CB guided the one-hour cognitive interview with six RDs using the online web-based survey in SurveyMonkey®. RDs were considered as expert informants on the two main topics under investigation; in addition, a NP and PhD student (CB) with medical background reviewed the questionnaire for content and face validity. However, the fact that only RDs were included in the cognitive interviews could be seen as a limitation in the study. Cognitive interviews helped CB to detect issues in the length of the survey, format, style of the questions and possible answers. CB kept notes and interviews were digitally recorded to allow CB to go back and clarify any concepts missing from her written notes. The instructions of the cognitive interview can be found in Appendix N.

Various errors in the web-based platform were identified in the cognitive interviews, namely grammatical errors, incomplete questions and incomplete possible answers. All of these errors
were corrected after each cognitive interview. The final questions of the web-based survey is found in Appendix M.

4.2.4. Data analysis of web-based survey.

Data from the web-based survey were automatically collected and stored in SurveyMonkey®. Only CB and PB had access to the web-based survey using their IDs and passwords. Once the web-based survey was closed, all of the data were transferred and cleaned in Excel for further analysis. The total numbers and frequencies were analyzed using Excel.

The data were first analyzed as a whole by including all groups of health providers who participated in the survey. Afterwards, the data were divided into two health discipline groups, RDs and non-RDs, in order to examine possible relationships between the groups. Contingency tables were made to compare variables and a Pearson’s chi square test was applied to find differences in categorical data using SPSS software, version 20.0 (SPSS Ind., Chicago, IL, USA). An alpha level of $p<.05$ was used for all statistical analysis. Significance was not adjusted for multiple tests.

4.2.5. Research ethics of web-based survey

The web-based survey received ethical clearance from the University of Guelph Research Ethics Board (REB) (Appendix O for more details).
Chapter 5: Results

The following chapter presents the findings of the mixed methods study. It begins with a summary of the demographic data obtained from the focus groups and web-based survey participants. This section is followed by presenting the overall descriptive data found in the study, specifically on current dietary assessment (DA), electronic dietary assessment (e-DA) practices and use of new e-DA tools in FHTs, its benefits, barriers and health providers’ recommendations. Lastly, the interpretive themes based on focus group data are presented along with illustrative quotes.

5.1. Demographic Data of Focus Group and Web-Based Survey Participants

In total, fifty health providers participated in 11 focus groups. Each focus group included participants from one single Family Health Team (FHT). There were three to 11 participants in each group. Nine of the 11 Family Health Teams (FHTs) were located in urban areas and two in rural areas of southern Ontario. One hundred and two executive directors (EDs) were invited, but because of the various methods of advertising, it is not known with certainty what proportion of FHTs participated in a focus group. The interviews lasted from 46 to 65 minutes (56 minutes average).

A total of 112 ED of FHTs were contacted by email to request participation in the web-based survey. The number of FHTs represented with at least one respondent was 89 (79% of the 112 FHTs approached); 68 (76%) of the FHTs were located in urban areas and 21 (24% in rural areas). Although two hundred and thirty-one people participated in the survey, data from those with no clinical background, those who were not seeing patients at the time of the survey, for example clinical clerks or EDs, and three participants were identified as incomplete respondents of the survey (≥ 80% of survey not completed) were not analysed, leaving data from 191 participants. The top three FHTs with the highest numbers of respondents were located in the Greater Toronto Area (GTA) and accounted for 21% of the sample.

5.1.1. Age and gender.

Table 5.1 shows the age and gender of participants in the study. For focus groups, 40% of participants were in the category of 36-45 years of age and 84% were female. In the web-based
survey, 38% of participants were in the category of 20-35 years of age and 89% were female. Thus, a wide age range contributed to both studies, dominated by females.

### Table 5.1. Age and gender of focus group and web-based survey participants.

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<thead>
<tr>
<th>Age in Years</th>
<th>Focus Groups</th>
<th>Web-based Survey</th>
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<td></td>
<td>Participants</td>
<td>Gender (M/F)</td>
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<td>2/12</td>
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</tbody>
</table>

Review of the data suggested that sample sizes were sufficient to explore possible differences by age and health discipline categories. Hence, the total Web-based survey sample was divided into two professional groups, namely registered dietitians (RDs) and non-RD health providers, and age groups younger health providers (<35 years old) and older health providers (>36 years old). Other health providers included family physicians (FPs), registered nurse (RNs), nurse practitioner (NPs), registered practical nurses, health educators, pharmacists, social workers (SW), physician assistant, mental health counsellor, and medical resident. Of the 191 respondents, 73 (38%) were RDs and 118 (62%) were non-RD health providers.

After stratifying the groups, 99% of RDs were female and 62% were ≤ 35 years of age, as shown in Table 5.2. This is compared to the non-RD health provider group where 83% were female and only 24% were ≤ 35 years of age. The frequency of RD and non-RD group in the category ≤35 years of age was compared using Pearson’s chi-square test. The result of this test was statistically significant ($\chi^2 (1) = 27.457$, $p < .001$) and indicates that the RD group was significantly younger in comparison to the non-RD group.
Table 5.2. Web-based survey: age and gender of health providers.

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>RDs n (%)</th>
<th>Non-RDs Health Providers n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female (RDs)</td>
<td>Male (RDs)</td>
</tr>
<tr>
<td>72 (99)</td>
<td>1 (1)</td>
<td>73 (100)</td>
</tr>
<tr>
<td>20–35 44 (61)</td>
<td>1 (1)</td>
<td>45 (62)</td>
</tr>
<tr>
<td>36–45 14 (19)</td>
<td>0 (0)</td>
<td>14 (19)</td>
</tr>
<tr>
<td>46–55 9 (13)</td>
<td>0 (0)</td>
<td>9 (12)</td>
</tr>
<tr>
<td>56–65 4 (6)</td>
<td>0 (0)</td>
<td>4 (5)</td>
</tr>
<tr>
<td>≥66 1 (1)</td>
<td>0 (0)</td>
<td>1 (1)</td>
</tr>
</tbody>
</table>

Note. Proportions with differing superscripts (a, b) are significantly different at p<.001. Percentage (%) is within health provider group.

5.1.2. Professional background.

At least three health providers including a RD, NP, and RN were present in all focus groups. Ten health disciplines were represented in the focus groups (n=43) as shown in Table 5.3. The groups also included six administrative staff (ED or team coordinators) with a background in health sciences and one dietitian intern. Almost one quarter (24%) of health providers participating in focus groups were RDs. In the web-based survey, ten health disciplines were represented, administrative staff was not included, one respondent was a student, and 38% of participants were RDs.
Table 5.3. Distribution of health disciplines: focus groups and web-based survey participants.

<table>
<thead>
<tr>
<th>Health Provider</th>
<th>Focus Groups Participants N= 50 (%)</th>
<th>Web-based Survey Participants N= 191 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Dietitians</td>
<td>12 (24)</td>
<td>73 (38)</td>
</tr>
<tr>
<td>Registered Nurses</td>
<td>9 (18)</td>
<td>Family Physicians 33 (17)</td>
</tr>
<tr>
<td>Family Physicians</td>
<td>6 (12)</td>
<td>Registered Nurses 31 (16)</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>6 (12)</td>
<td>Nurse Practitioners 20 (10)</td>
</tr>
<tr>
<td>Administrative Staff</td>
<td>6 (12)</td>
<td>Pharmacists 11 (6)</td>
</tr>
<tr>
<td>Nurse Practitioners</td>
<td>5 (10)</td>
<td>Social Workers 8 (4)</td>
</tr>
<tr>
<td>Registered Practical Nurse</td>
<td>1 (2)</td>
<td>Registered Practical Nurses 6 (3)</td>
</tr>
<tr>
<td>Kinesiologist</td>
<td>1(2)</td>
<td>Health Educator or Promoters</td>
</tr>
<tr>
<td>Social Worker</td>
<td>1 (2)</td>
<td>Medical Residents 1 (0.5)</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>1(2)</td>
<td>Physician Assistant 1 (0.5)</td>
</tr>
<tr>
<td>Clinical Nutritionist</td>
<td>1 (2)</td>
<td>Mental Health Counsellor 1 (0.5)</td>
</tr>
<tr>
<td>Dietetic Intern</td>
<td>1(2)</td>
<td></td>
</tr>
</tbody>
</table>

5.1.3. Number of FHTs with Registered Dietitian (RD).

The number of FHTs with and without RDs was also explored in the web-based survey and the majority of participants said to have a RD in their team. Results are shown in Table 5.4.

Table 5.4. Number of FHTs with RDs.

<table>
<thead>
<tr>
<th>Number of RDs n (%)</th>
<th>Number of non-RDs n (%)</th>
<th>Number of FHTs n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, the FHT has a Registered Dietitian 73 (100)</td>
<td>96 (81)</td>
<td>77 (87)</td>
</tr>
<tr>
<td>No, the FHT does not have a Registered Dietitian 0 (0)</td>
<td>20 (17)</td>
<td>10 (11)</td>
</tr>
<tr>
<td>I don’t know 0 (0)</td>
<td>2 (2)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Total 73</td>
<td>118</td>
<td>89</td>
</tr>
</tbody>
</table>

Note. Percentage (%) is within health provider group and FHT.

5.1.4. Years in practice.

Most participants were experienced health practitioners; for example, in the focus group 30 (60%) and in web-based survey 109 (57%) participants had worked as health providers for ten years and more. Table 5.5.
Table 5.5. Years of professional practice focus groups and web-based survey participants.

<table>
<thead>
<tr>
<th>Years of Practice</th>
<th>Focus Groups N= 50 (%)</th>
<th>Web-based Survey N= 191 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–&lt;2</td>
<td>5 (10)</td>
<td>23 (12)</td>
</tr>
<tr>
<td>2–5</td>
<td>8 (16)</td>
<td>33 (17)</td>
</tr>
<tr>
<td>6–9</td>
<td>7 (14)</td>
<td>26 (14)</td>
</tr>
<tr>
<td>10–16</td>
<td>16 (32)</td>
<td>30 (16)</td>
</tr>
<tr>
<td>17–&lt;25</td>
<td>6 (12)</td>
<td>38 (20)</td>
</tr>
<tr>
<td>≥25</td>
<td>8 (16)</td>
<td>41 (21)</td>
</tr>
</tbody>
</table>

The RDs and non-RD participants were categorized according to their years of work experience as shown in Table 5.6. In total, 67% of the RD group had less than ten years of work experience in contrast to 28% of the non-RD health providers. The years of experience less than ten years of RDs and non-RD groups were compared using a Pearson’s chi-square test. The result of this test was statistically significant ($\chi^2 (1) = 28.224$, $p < .001$) and indicates that the RD group had significantly less years of experience in comparison to the non-RD group.

Table 5.6. web-based survey: total years of experience of health providers.

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>RDs n (%)</th>
<th>Non-RD Health Providers n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 35 years</td>
<td>46 (63)</td>
<td>27 (37)</td>
</tr>
<tr>
<td>&gt; 36 years</td>
<td>4 (5)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Total</td>
<td>73 (100)</td>
<td>29 (42)</td>
</tr>
<tr>
<td>≤ 35 years</td>
<td>45 (98)</td>
<td>26 (90)</td>
</tr>
<tr>
<td>&gt; 36 years</td>
<td>4 (15)</td>
<td>7 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>49 (67)</td>
<td>33 (76)</td>
</tr>
</tbody>
</table>

Note. Proportions with differing superscripts (a,b) are significantly different at $p<.001$. Percentage (%) is within age and health provider group.

In summary, after the analysis of demographic data of the two studies, participants came from ten disciplines, and in their majority were female. RDs were the most prominent profession represented, as would be expected, given the topic. The RD group was younger and had less experience as health providers. In contrast, the non-RD group was older and had more experience as health providers. Based on these findings, the web-based survey was further
analyzed by age and health profession only (RD and non-RD) to explore differences in the frequency of DA, methods of DA and current use or not of e-DA tools in FHTs.

5.2. Current Dietary Assessment Practices in Family Health Teams: Descriptive Data

Focus groups began by exploring how the various health professions conducted DA and whether the methods used differed for different conditions. This served as the foundation for the conversation on e-DA for focus groups and provided the content and descriptors used in the web-based survey.

5.2.1. Dietary assessment: focus groups.

Health providers first specified the most common circumstances in which they review their patients’ dietary intakes. This information was predominantly descriptive and the results are summarized in Table 5.7.

Table 5.7. Common topics or health issues in dietary assessment.

<table>
<thead>
<tr>
<th>Type of concern</th>
<th>Examples</th>
<th>Particularly interested in</th>
</tr>
</thead>
</table>
| Healthy patients of all ages | Physical examination in women | - Pregnant women  
- Young women <50 years of age: iron and vitamin B intake  
- Women >50 years of age: calcium and vitamin D intake |
|                  | Physical examinations in men | - Vegetable & fruit intake  
- Breakfast consumption |
|                  | Well baby visits | - Introduction of solids  
- Food preparation  
- Changes in diet |
|                  | Physical examinations in children | - Picky eaters  
- Food allergies |
| Patients of all ages diagnosed with nutrition-related disease(s) and any related risk factors | Diabetes and/or pre-diabetes | - Healthy plate  
- Vegetable & fruit intake  
- DASH diet  
- Skipping breakfast |
| | Heart disease | |
| | High cholesterol | |
| | High blood pressure | |
| | Renal disease | |
| Overweight and obese adults | - Weight gain or loss  
|                           | - Weight management referrals |
| Overweight and obese children |                            |
| Prevention and treatment of osteoporosis | - Bone health |
| Pain management |                            |
| Depression |                            |
| Trauma |                            |
| Smoking | - Smoking cessation |
| Alcohol consumption |                            |
| Gastrointestinal conditions | - Food restrictions  
|                           | - Food allergies and intolerances |
| Vitamin and mineral deficiencies | - Especially iron, calcium, Vitamin D deficiencies |
| Review of relationship between diet and medications (done mostly by pharmacists) | Identification and explanation of possible relationship between diet and medication for all patients |
|                           | - Use of warfarin and Vitamin K  
|                           | - Use of insulin or changes in diabetic drugs  
|                           | - Drug use in chronic disease management (CDM)  
|                           | - Use of multiple drugs and diet in geriatric population |
| Patient-initiated nutrition-related questions by all patients | When patients ask questions about |
|                           | - Dietary changes due to use of warfarin  
|                           | - Dietary changes due to use of high cholesterol medications  
|                           | - Sources of calcium, Vitamin D, and Omega-3 fatty acids and use of supplements  
|                           | - Dietary changes due to diabetes  
|                           | - Explanation of carbohydrates |

5.2.2. **Types of tools in dietary assessment: focus groups.**

Participants in focus groups discussed the DA methods that they are currently using to obtain and assess diet information from patients. RDs in particular recalled using well-known DA methods such as 24-hour dietary recalls or food histories. In general, health providers mentioned conducting DAs with the assistance of other nutrition-related tools.
Table 5.8. Use of nutrition-related tools for dietary assessment (DA) by focus group participants.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Type of Tool</th>
<th>More Details of type of tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>Canada’s Food Guide (CFG)</td>
<td>- Vegetable and fruit intakes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Foods rich in calcium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Foods rich in vitamin D</td>
</tr>
<tr>
<td></td>
<td>Calcium Calculator</td>
<td>- Osteoporosis Canada Website</td>
</tr>
<tr>
<td></td>
<td>Plate division/healthy plate</td>
<td>- Canadian Diabetes Association</td>
</tr>
<tr>
<td></td>
<td>Food models</td>
<td>- Portion and serving sizes</td>
</tr>
<tr>
<td></td>
<td>DASH diet and salt intake</td>
<td>- In hypertension to assess salt and processed foods intake and foods groups</td>
</tr>
<tr>
<td></td>
<td>Carbohydrate counting</td>
<td>- Canadian Diabetes Association Website tools</td>
</tr>
<tr>
<td>Children</td>
<td>Canada’s Food Guide (CFG)</td>
<td>- Assessment of juice and soda intake</td>
</tr>
<tr>
<td></td>
<td>Rourke Baby Record food intake</td>
<td></td>
</tr>
</tbody>
</table>
5.2.3. Frequency of dietary assessment: web-based survey.

The frequency of DA was explored using the web-based survey. According to survey participants, DA is commonly done in their practices. As shown in Figure 5.1, 64% of participants indicated that they conducted DAs either every day or almost every day.

Figure 5.1. Web-based survey: I assess patients’ diets or eating habits.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don’t assess/obtain</td>
<td>5 (3%)</td>
</tr>
<tr>
<td>information from my</td>
<td></td>
</tr>
<tr>
<td>patients/clients.</td>
<td></td>
</tr>
<tr>
<td>I almost never assess</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>diet</td>
<td></td>
</tr>
<tr>
<td>Less than 1 time/month</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>1-3 times/month</td>
<td>8 (4%)</td>
</tr>
<tr>
<td>1-2 times/week</td>
<td>11 (6%)</td>
</tr>
<tr>
<td>3-4 times/week</td>
<td>38 (20%)</td>
</tr>
<tr>
<td>Every day (or almost every</td>
<td>121 (64%)</td>
</tr>
<tr>
<td>day)</td>
<td></td>
</tr>
</tbody>
</table>

The sample was divided by type of health provider and age in relation to frequency of DAs as shown in Table 5.9. Notably, RDs indicated that they conduct DAs every day or almost every day 66 (90%) in comparison to 55 (47%) non-RDs. To determine whether an association existed between the frequency of daily DA by health profession, a Pearson’s chi-square test was used ($\chi^2 (1) 37.267, p<.001$). This result indicates that a higher proportion of RDs conducted DAs every day than non-RDs. The same was explored in the 3–4 times/week the category, but there was a not statistically significant (NS) difference ($\chi^2 (1) 1.690, p<.146$).

In relation to age, the frequency of DA was very similar in the RD group independently of age. However, in the non-RDs group, a difference in age was noted as 11 (39%) of $\leq$35 years old and 44 (49%) of $>$36 years old conducted DAs. After Pearson’s chi-square test, the result was NS ($\chi^2 (1) .791, p<.251$).
Table 5.9. Web-based survey: “I assess patients’ eating habits in my practice”.

<table>
<thead>
<tr>
<th>I Assess Patients’ Eating Habits in My Practice</th>
<th>RDs n (%)</th>
<th>Non-RDs health providers n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 35 years</td>
<td>&gt; 36 years</td>
</tr>
<tr>
<td></td>
<td>73 (100)</td>
<td>24 (91)</td>
</tr>
<tr>
<td>Every day (or almost every day)</td>
<td>42 (91)</td>
<td>24 (89)</td>
</tr>
<tr>
<td>3–4 times/week</td>
<td>4 (9)</td>
<td>3 (11)</td>
</tr>
<tr>
<td>1–2 times/week</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>1–3 times/month</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>≥1 time/month</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>I almost never assess diets</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>I don’t assess diets</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Note. Proportions with superscripts (a, b) are significantly different at p<.001

The frequency of DAs by discipline of non-RD health providers was also explored. Appendix P. Table P1.- Web-based survey: frequency of DA use in non-RD health providers by age. Overall, FPs and NPs indicated they frequently conducted DAs every day or almost every day.

Furthermore, some non-RDs indicated that they do not have RD(s) in their FHT and the frequency of DA in this group was explored. Appendix P. Table P2.- Frequency of DA in non-RDs with and without RD in FHTs. Although the sample size of this group was small (10% of total), health providers without RDs in their FHTs seemed to offer DA as frequently as as those with RDs in their FHTs.
5.2.4. Dietary assessment method(s): web-based survey.

Health providers in focus groups, in special non-RDs, mentioned that they offer DA briefly and with a few dietary-related questions. This information was corroborated with the web-based survey as shown in Table 5.10, were the majority of respondents (78%) indicated that they ask “a few pointed questions” to obtain dietary information. Other more formal methods of DAs were also used, but less frequently.

Table 5.10. Web-based survey: how do you obtain dietary or eating habit information?

<table>
<thead>
<tr>
<th>I usually obtain dietary or eating habit information from the majority of patients by (check all that apply):</th>
<th>Participants</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking a few pointed questions such as what they eat, what time(s) they eat, etc.</td>
<td>142</td>
<td>78</td>
</tr>
<tr>
<td>Asking their usual intake such as what do they usually eat for breakfast, lunch, dinner, times, amounts and/or food brands</td>
<td>116</td>
<td>64</td>
</tr>
<tr>
<td>Having patients write down what they eat for a few days (food record)</td>
<td>82</td>
<td>45</td>
</tr>
<tr>
<td>Conducting a mix of food records, 24-hour recall and detailed usual intake (diet history)</td>
<td>68</td>
<td>37</td>
</tr>
<tr>
<td>Conducting a detailed recall of food consumed in the past day (24 hour recall)</td>
<td>61</td>
<td>34</td>
</tr>
<tr>
<td>Completing a checklist of foods assessing certain nutrients (e.g., foods rich in calcium and vitamin D). This is also called a food frequency list</td>
<td>39</td>
<td>21</td>
</tr>
<tr>
<td>I do not assess diet; the dietitian in the team does this</td>
<td>14</td>
<td>8</td>
</tr>
</tbody>
</table>

Respondents 182 100

Note. Percentage (%) of total in columns are more than 100% due to multiple responses. Non-respondents n=9 (5%).

The degree to which health providers assess diet and the methods they choose to use have implications for team practice. Health provider training and age were analyzed for the type of DA method used, namely formal, informal, or a combination of both. It would be expected that level of education would be a predominant factor in determining which DA methods one would choose, but age may or may not have an effect. Informal DA methods were considered to include: asking a few pointed questions such as what patients eat and when, or asking patients to describe their usual food intake at meals and snacks and the times they eat. Formal DA methods were considered to include 24-hour food recalls, food frequency questionnaires (FFQs), food records, and diet histories.
Table 5.11 indicates that RDs tend to ask patient’s usual food intake and use of food records as the most common methods of DA. However, it was noted through focus group discussions that only one quarter of patients return their food records. In contrast, non-RDs tend to ask few pointed diet-related questions and use of food records as the most common methods of DA.

Both RDs and non-RDs indicated use of few pointed diet-related questions to assess diet; a Pearson’s chi-square test was used to compare the two groups. A significant statistical difference was found ($\chi^2 (1) 3.135, p=.05$) meaning that a higher proportion of non-RDs use a few questions to evaluate diet in comparison to RDs. In contrast, the use of asking usual intake was also compared in the two groups and the Pearson’s chi-square test was statistically significant ($\chi^2 (1) 24.635, p<.001$). This result means that a higher proportion of RDs ask the usual intake to their patients in comparison to non-RDs. There were also significant associations in the use of formal DA methods by RDs such as 24 hour recalls, FFQs, food records and diet history. Table 5.11.

A Pearson’s chi-square test was also used to calculate differences in health provider’s age ($\leq$ 36 years old) and the use of asking few questions for DA. A significant statistical difference was found when comparing the RDs and non-RDs >36 years old ($\chi^2 (1) 7.287, p<.05$); this result indicates that a higher proportion of non-RDs >36 years old use a few questions for DA in comparison to RDs. A Pearson’s chi-square test was not possible for the rest of the variables (e.g., use of usual intake, 24 hour recall, etc) when compared by age, because some cells had less than five elements. Yet, it seems that overall RDs use more sophisticated DA methods at times, compared to non-RDs, as would be expected. There is very high use of informal methods of DA by all group.
Table 5.11. Web-based survey: DA methods analyzed by type of health provider and age.

<table>
<thead>
<tr>
<th>Dietary Assessment Method</th>
<th>RDs ( n ) (%)</th>
<th>Non-RD Health Providers ( n ) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \leq 35 ) years</td>
<td>( &gt;36 ) years</td>
</tr>
<tr>
<td></td>
<td>73 (100)</td>
<td>27 (25)</td>
</tr>
<tr>
<td>Informal DA Methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asking a few pointed questions such as what they eat, what time(s) they eat, etc.</td>
<td>36 (78)</td>
<td>17 (63)</td>
</tr>
<tr>
<td>Asking their usual intake such as what they usually eat for breakfast, lunch, dinner, eating times, and food amounts and/or brands.</td>
<td>42 (91)</td>
<td>21 (78)</td>
</tr>
<tr>
<td>Formal DA Methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conducting a detailed recall of food consumed in the past day (24 hour recall).</td>
<td>30 (65)</td>
<td>14 (52)</td>
</tr>
<tr>
<td>Completing a checklist of foods assessing certain nutrients (e.g. foods rich in calcium and vitamin D). This is also called a food frequency list.</td>
<td>12 (26)</td>
<td>12 (44)</td>
</tr>
<tr>
<td>Having patients write down what they eat for a few days (food record).</td>
<td>40 (87)</td>
<td>20 (74)</td>
</tr>
<tr>
<td>Conducting a mix of food records, 24-hour recall and detailed usual intake (diet history).</td>
<td>37 (80)</td>
<td>19 (70)</td>
</tr>
<tr>
<td>I do not assess diet.</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Note. Proportions with superscripts (a, b) are significantly different at p< .05. Proportions with superscripts (e, f) are significantly different at p< .01. Proportions with superscripts (c, d) are significantly different at p< .001. Percentage (%) of total in columns are more than 100% due to multiple responses.

The use of different DA methods by non-RDs health providers with and without RD(s) in FHTs was explored. Health providers without RDs conduct DA similarly to those with RDs in their FHT as shown in Appendix P. Table P3.-DA methods in non-RDs with and without RDs in FHT.
A further analysis was done to determine the number of health providers using formal and informal DA methods, or a combination of these methods. As shown in Table 5.12 RDs almost equally used a combination of formal and informal DA methods. Very few RDs were using formal or informal DA methods solely. Interestingly, almost none of the total sample of health providers used the formal methods alone, and numbers were too low to consider any differences by profession. Almost half of non-RDs conducted informal DAs alone, whereas one third of non-RDs used a combination of DA methods and a few didn’t conduct DA at all.

A Pearson’s chi-square test was used to evaluate if an association existed between the use of informal DA methods and age in the non-RD group (≤35 or >36 years old). The result was NS ($\chi^2 (1) .400 \ p=.342$).

A Pearson’s chi-square test was used to assess if a difference existed in use of combined DA methods by RDs and non-RDs. The result was statistically significant ($\chi^2 (1) 44.222, \ p<.001$) and showed that more RDs were using combined DA methods in comparison to non-RDs.
Table 5.12. Web-based survey: use of informal, formal, or a combination of DA methods by health provider type and age.

<table>
<thead>
<tr>
<th>Dietary Assessment Method</th>
<th>RDs n (%)</th>
<th>Non-RD Health Providers n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 35 years</td>
<td>&gt; 36 years</td>
</tr>
<tr>
<td>Informal dietary assessment methods only</td>
<td>1 (2)</td>
<td>2 (7)</td>
</tr>
<tr>
<td>Formal dietary assessment methods only</td>
<td>1 (2)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>A combination of formal and informal dietary assessment methods</td>
<td>44 (96)</td>
<td>24 (89)</td>
</tr>
<tr>
<td>I don’t conduct dietary assessments</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Note. Proportions with superscripts (a, b) are significantly different at p<.001. Percentage (%) is within age and health provider group.

5.2.5. Challenges of current dietary assessment.

Health providers who participated in the focus groups also discussed the many difficulties they experienced when assessing patients’ diets. This information was analyzed descriptively and organized as challenges at the level of health provider, patient and existing tools.
Table 5.13. Current challenges in obtaining diet information for focus group participants.

<table>
<thead>
<tr>
<th>Challenges for Health Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lacking time to obtain and analyze diet information and provide feedback when there are other important issues that need to be covered in clinical visits</td>
</tr>
<tr>
<td>Lacking knowledge and skills to interpret diet information for non-RDs</td>
</tr>
<tr>
<td>Lacking appropriate tools to obtain diet information</td>
</tr>
<tr>
<td>Lacking accurate diet reports</td>
</tr>
<tr>
<td>Experiencing difficulties in obtaining diet information for children and seniors</td>
</tr>
<tr>
<td>Lacking time or ability to adequately manage diabetic patients</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Challenges for Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracking diet using DA questionnaires requires skill, motivation, and time</td>
</tr>
<tr>
<td>Lacking interest in completing dietary food records (one in five patients return the food record)</td>
</tr>
<tr>
<td>Poor memory for actual dietary intake</td>
</tr>
<tr>
<td>Not being ready to accept that dietary changes are necessary (possibly a problem of denial)</td>
</tr>
<tr>
<td>Not being adequately educated about diet (particularly a challenge for seniors)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Challenges with Current Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lacking appropriate tools for initial diet evaluation and follow-up</td>
</tr>
<tr>
<td>Lacking ability to connect DA data with EMRs.</td>
</tr>
<tr>
<td>Not knowing where to store food records electronically or non-electronically.</td>
</tr>
</tbody>
</table>

The current difficulties in obtaining and analyzing dietary information were very similar to those reported in the literature review of this document, except for the lacking of ability to connect DA results with EMR. This barrier was further stated when participants discussed the barriers to utilize e-DA tools in FHTs; more details are provided in the following paragraphs under the title “overcoming barriers with use of e-DA tools”.

The next section presents the results obtained with the use of e-DA tools in FHTs. Of note, the web-based survey did not ask about challenges of current DA in FHTs, as its focus was on use of e-DA tools only.
5.3. **Use of e-DA tools in FHTs: Descriptive Data.**

5.3.1. **Awareness and use of e-DA tools in FHTs: focus groups.**

After exploring current DA practices in the focus groups, participants received a five-minute presentation on new e-DA tools, namely web-based tools and mobile devices. Following the presentation, health providers were asked one by one by focus group moderator whether they were aware of e-DA tools or not. Of the participants, 22 (45%) stated that yes, they were aware of the existence of new e-DA tools and 27 (55%) were not aware of them. All of the RDs knew about these e-DA tools. One focus group participant did not answer this question. (See Appendix P. Table P4.- Focus group participants’ awareness of e-DA tool Existence). Focus group participants also identified the e-DA tools that they or their patients used; these are listed in Appendix P. Table P5.- Focus group participants’ list of e-DA tools used. Some of these e-DA tools were also identified in the web-based survey, as described below.

5.3.2. **Use of e-DA tools in FHTs: web-based survey.**

5.3.2.1. **Health provider use of e-DA tools in FHTs.**

Respondents were asked if they were using one or more of the new e-DA tools to evaluate patients. Of 191 responses, 38 (20%) of the survey respondents stated that “yes” they were using e-DA tools; of those, 33 (87%) were RDs and 5 (13%) other health providers.

Respondents of the web-based survey were also asked to identify which web-based tool(s) and/or apps in mobile device(s) they were using (if any) to assess patients’ diets or food intakes. While the majority indicated they were not using any web-based tool or an app to assess diet, one fifth of respondents used eaTracker and some used MyFitnessPal, Table 5.14.
Table 5.14. Web-based survey: e-DA tools use by survey participants.

<table>
<thead>
<tr>
<th>I am using at least one of the following web-based tool(s) and/or apps in mobile device(s) to assess the diet or food intake of my patients/clients (check all that apply):</th>
<th>Participants</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am not using a web-based tool or an app to assess diet.</td>
<td>117</td>
<td>64</td>
</tr>
<tr>
<td>eaTracker (Dietitians of Canada) web-based Tool</td>
<td>34</td>
<td>18</td>
</tr>
<tr>
<td>MyFitnessPal web and mobile app</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>ESHA web-based Tool</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Calorie Tracker web and mobile app (by Livestrong.com)</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Weight Watchers mobile app</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Calorie Count web and mobile app</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>SelfNutritionData web-based Tool</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>HelpDiabetes carb counter mobile app</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Nutra basic web-based Tool</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>LoseIt mobile app</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Fast Food calorie counter mobile app</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fooducate mobile app</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MyNetDiary web and mobile app</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>40.30.30 mobile app</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LowGI Diet mobile app</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>*If other(s) please specify</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Respondents</td>
<td>184</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Percentage (%) of total in columns are more than 100% due to multiple responses. Non-respondents n=10 (5%).

*Other e-tools that health providers were using are: SparkPeople and FITDAY apps. Calorie King TM (http://www.calorieking.com) an electronic food database; Osteoporosis of Canada–calcium calculator (http://www.osteoporosis.ca); and the Diabetes and You Kit (http://www.diabetes.ca/cpg-toolkit) from the Canadian Diabetes Association website.

RD and non-RDs were divided by age and use or not of individual e-DA tools, as shown in Table 5.15. A Pearson’s chi-square test was used to assess if a difference existed in use of e-DA tools by health provider group. The result indicates that a higher proportion of RDs were using any e-DA tool in comparison to non-RDs ($\chi^2$ (1) 36.981, $p<.001$). In addition, a higher proportion of non-RDs >36 years old reported not using e-DA tools in comparison to RDs >36 years old ($\chi^2$ (1) 12.069, $p<.01$). The proportions of RDs using eaTracker were notable in comparison to non-RDs, but these proportions were not statistically compared due to the number of cells less than five in the non-RD group. A higher proportion of RDs reported use MyFitnessPal in comparison to non-RDs ($\chi^2$ (1) 8.622, $p<.01$). Among the non-RD group, only a few used e-DA tools such as MyFitnessPal, although this was the e-DA tool used most often by
this group. Overall, the use of e-DA tools did not differ by age of health provider (≤35 and >36 years old) within the RD and non-RD group.

Table 5.15. Web-based survey: health provider use of e-DA tools by age.

<table>
<thead>
<tr>
<th>I Am Using e-DA in My Practice</th>
<th>RDs n (%)</th>
<th>Non-RD Health Providers n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 35 years</td>
<td>&gt; 36 years</td>
</tr>
<tr>
<td>I am not using a web-based tool or a mobile device app to assess diet</td>
<td>46 (63)</td>
<td>27 (37)</td>
</tr>
<tr>
<td>eaTracker (Dietitians of Canada) web-based tool</td>
<td>21 (48)</td>
<td>11 (41)</td>
</tr>
<tr>
<td>MyFitnessPal web and mobile app</td>
<td>10 (22)</td>
<td>4 (15)</td>
</tr>
<tr>
<td>ESHA web-based tool</td>
<td>3 (7)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Calorie Tracker web and mobile app (by Livestrong.com)</td>
<td>1 (2)</td>
<td>2 (8)</td>
</tr>
<tr>
<td>Weight Watchers mobile app</td>
<td>1 (2)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Calorie Count web and mobile app</td>
<td>1 (2)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>SelfNutritionData web-based tool</td>
<td>3 (7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>HelpDiabetes carb counter mobile app</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Nutra basic web-based tool</td>
<td>1 (2)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>LoseIt mobile app</td>
<td>1 (2)</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Fast Food calorie counter mobile app</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Fooducate mobile app</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Note. Proportions with superscripts (a, b) are significantly different at p<. 01. Proportions with superscripts (c, d) are significantly different at p<. 001.
Percentage (%) is within age and health provider group.
Percentage (%) of total in columns are more than 100% due to multiple responses.
5.3.2.2. Patients’ use of e-DA tools in FHTs.

Survey respondents also indicated that their patients were using e-DA tools to track their dietary intakes. Of 188 responses, 98 (52%) indicated that yes, at least some patients were using e-DA tools; of those, 67 (69%) were RDs and 31 (32%) were other health providers.

According to the web-based survey, the patients are mostly entering their diet information on their own rather than the health provider or a combination of the two, as shown in Figure 5.2. However, 68 (36%) respondents didn’t answer this question.

*Figure 5.2. Web-based survey: when using e-DA tools, how is diet information entered?*

![Bar chart showing diet information entry methods](image)

Web-based survey participants were also asked which web-based tool(s) and/or apps in mobile device(s) their patients were using. Table 5.16 shows a wide ranges of e-DA tools were identified as being used by patients.
Table 5.16. Web-based survey: e-DA tools use by patients.

<table>
<thead>
<tr>
<th>My patients are using at least one of the following web-based tool(s) and/or apps in mobile device(s) to assess their diet or food intake (check all that apply):</th>
<th>Participants</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients are not using a web-based tool or an app to assess diet</td>
<td>76</td>
<td>42</td>
</tr>
<tr>
<td>MyFitnessPal mobile app</td>
<td>73</td>
<td>40</td>
</tr>
<tr>
<td>eaTracker (Dietitians of Canada) web-based Tool</td>
<td>55</td>
<td>30</td>
</tr>
<tr>
<td>Weight Watchers mobile app</td>
<td>37</td>
<td>19</td>
</tr>
<tr>
<td>Calorie Tracker web and mobile app (by Livestrong.com)</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Calorie Count web and mobile app</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>LoseIt mobile app</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>LowGI Diet mobile app</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>SelfNutritionData web-based Tool</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>MyNetDiary web and mobile app</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Fast Food calorie counter mobile app</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>HelpDiabetes carb counter mobile app</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>40.30.30 mobile app</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>ESHA web-based Tool</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Nutra basic web-based Tool</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fooducate mobile app</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>* If other(s) please specify</td>
<td>32</td>
<td>1</td>
</tr>
<tr>
<td>Respondents</td>
<td>181</td>
<td>95</td>
</tr>
</tbody>
</table>

Note: Percentage (%) of total in columns are more than 100% due to multiple responses. Non-respondents: n=10 (4%).

*Other tools that were used included SparkPeople (http://www.sparkpeople.com); FITDAY (http://www.fitday.com); my healthy weight action plan from the Heart & Stroke Foundation of Canada (https://ehealth.heartandstroke.ca/heartstroke); Fatsecret Canada (http://www.fatsecret.ca); and sodium101 Canada (http://www.sodium101.ca).

RDs and non-RDs were divided by age and indication of patients’ use or not of e-DA tools. As shown in Table 5.17, it was remarkably that one quarter of RDs reported that patients were not using e-DA tools. When the RD and non-RD groups were compared a statistical significant difference was found ($\chi^2 (1) = 15.087, p<.001$). This indicates that patients of non-RDs were less likely to use e-DA tools than those of RDs, perhaps this was due to the lack of knowledge of the existence of e-DA tools by this group of health providers. In addition, patients of non-RDs >36 years old were more likely to not use e-DA tools than those of RDs >36 years old ($\chi^2 (1) = 9.648, p<.01$).

RDs and non-RDs indicated that patients use MyFitnessPal. These groups were compared, and the Pearson’s chi-square test was statistically significant ($\chi^2 (1) = 40.319, p<.001$). Thus, a higher proportion of RDs reported that their patients use MyFitnessPal in comparison to non-
RDs. The difference of MyFitnessPal was analyzed by age of health provider; a higher proportion of RDs ≤35 years old reported that their patients used MyFitnessPal in comparison to non-RDs ≤35 years old ($\chi^2 (1) = 22.887, p < .001$). Also, a higher proportion of RDs >36 years old used MyFitnessPal in comparison to non-RDs >36 years old ($\chi^2 (1) = 12.287, p < .001$).

eaTracker was reported as the second most used e-DA tool, and a higher proportion of RDs reported that their patients use this tool in comparison to non-RDs ($\chi^2 (1) = 56.507, p < .001$). Reportedly, patients of RDs >36 years old were more likely to use eaTracker than those of non-RDs >36 years old ($\chi^2 (1) = 37.309, p < .001$). Lastly, the third most used e-DA tool was Weight Watchers app, but the proportion of RDs and non-RDs who reported patient use was NS ($\chi^2 (1) = 2.347, p > 1.26$).
Table 5.17. Web-based survey: patient use of e-DA tools by age and health provider.

<table>
<thead>
<tr>
<th>My patient is using… (check all that apply)</th>
<th>RDs n (%)</th>
<th>Non-RDs Health Providers n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 35 years</td>
<td>&gt;36 years</td>
</tr>
<tr>
<td></td>
<td>73 (100)</td>
<td>108 (100)</td>
</tr>
<tr>
<td>MyFitnessPal app</td>
<td>34&lt;sup&gt;a1&lt;/sup&gt;</td>
<td>16&lt;sup&gt;a2&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(74)</td>
<td>(59)</td>
</tr>
<tr>
<td>Patients are not using a web-based tool or an app to assess diet</td>
<td>12</td>
<td>6&lt;sup&gt;c1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(26)</td>
<td>(22)</td>
</tr>
<tr>
<td>eaTracker (Dietitians of Canada) web-based Tool</td>
<td>27</td>
<td>18&lt;sup&gt;a1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(59)</td>
<td>(67)</td>
</tr>
<tr>
<td>Weight Watchers app</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>(20)</td>
<td>(37)</td>
</tr>
<tr>
<td>Calorie Tracker app (by Livestrong.com)</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(15)</td>
<td>(19)</td>
</tr>
<tr>
<td>Calorie Count web and mobile app</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(13)</td>
<td>(22)</td>
</tr>
<tr>
<td>LoseIt mobile app</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>(21)</td>
<td>(26)</td>
</tr>
<tr>
<td>LowGI Diet mobile app</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(15)</td>
</tr>
<tr>
<td>SelfNutritionData web-based tool</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(7)</td>
</tr>
<tr>
<td>MyNetDiary app</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(4)</td>
</tr>
<tr>
<td>Fast Food calorie counter app</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
<td>(0)</td>
</tr>
<tr>
<td>HelpDiabetes carb counter app</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>(4)</td>
</tr>
<tr>
<td>40.30.30 app</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>ESHA web-based tool</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>(0)</td>
</tr>
<tr>
<td>Nutra basic web-based tool</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(2)</td>
<td>(0)</td>
</tr>
</tbody>
</table>

Note. Proportions with superscripts (a1, b1, a2, b2) indicate the comparisons are significantly different at p < .001. Proportions with superscripts (c1, d1) indicate the comparisons are significantly different at p < .01.

Percentage (%) is within age and health provider group.
Percentage (%) total in columns are more than 100% due to multiple responses.
5.3.2.3. **Benefits of use of e-DA tools in FHTs**

Focus group and web-based survey participants identified the benefits of using e-DA tools for both patients and health providers. Most of the benefits described by focus group participants are provided in the thematic analysis of focus groups in a separate section.

In the web-based survey, as shown in Table 5.18, the most frequently identified benefit that respondents saw for patients was the potential use of e-DA tools for self-monitoring of their diet, nutrient intake and eating behaviours (identified by 87% of respondents). The most frequently identified benefit they saw for health providers was that e-DA tools could facilitate the initial assessment of nutrient intake and/or eating behaviours at their offices. These findings matched with the results of focus groups. It is important to note that few respondents saw no benefit to the use of e-DA tools.

*Table 5.18. Web-based survey: benefits of using e-DA tools in FHTs.*

<table>
<thead>
<tr>
<th>I think that some of the potential benefits of using e-DA tools in my practice are or could be (check all that apply):</th>
<th>Participants</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-DA tools can potentially be used for self-monitoring nutrients, foods and eating behaviours</td>
<td>154</td>
<td>87</td>
</tr>
<tr>
<td>e-DA tool(s) may be an educational or learning tool because they may allow patients/clients to self-reflect about their own diet</td>
<td>150</td>
<td>85</td>
</tr>
<tr>
<td>e-DA tools might motivate people to track what they eat because of the rapid and visual results</td>
<td>148</td>
<td>84</td>
</tr>
<tr>
<td>e-DA tools facilitate initial assessment of food intake and/or eating behaviours</td>
<td>117</td>
<td>66</td>
</tr>
<tr>
<td>e-DA tools can help me in tracking specific intake of nutrients (e.g., vitamin K, calcium, sodium, potassium) for food-medication interactions or management of a chronic condition</td>
<td>107</td>
<td>63</td>
</tr>
<tr>
<td>e-DA tools may provide more accurate results (vs. paper and pencil) because e-DA tools may use food photographs, potions sizes of foods, and ask about some food habits</td>
<td>100</td>
<td>56</td>
</tr>
<tr>
<td>e-DA tools provide more detailed information on diet intake than is currently available</td>
<td>69</td>
<td>39</td>
</tr>
<tr>
<td>e-DA tools can decrease the time and cost of personnel in conducting DAs</td>
<td>63</td>
<td>36</td>
</tr>
<tr>
<td>No benefits</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Respondents</td>
<td>177</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note.* Percentage (%) total in columns are more than 100% due to multiple responses. Non-respondents: n=17 (9%).
The web-based survey was also used to assess whether e-DA tools would be of value in the treatment of specific health conditions. Survey participants stated that there were various conditions that could benefit from the use of e-DA tools as part of their assessment and management, especially in the case of overweight/obese patients and diabetes, as outlined in Table 5.19.

Table 5.19. Web-based survey: the value of using e-DA tools by various health conditions.

<table>
<thead>
<tr>
<th>I think the use of New Electronic Dietary Assessment Tools is or could be valuable in (check all that apply):</th>
<th>Participants</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overweight/obesity without other conditions</td>
<td>168</td>
<td>94</td>
</tr>
<tr>
<td>Diabetes with or without other conditions</td>
<td>165</td>
<td>93</td>
</tr>
<tr>
<td>Heart disease</td>
<td>142</td>
<td>80</td>
</tr>
<tr>
<td>General health promotion over the lifecycle (e.g., pregnancy, children, women)</td>
<td>138</td>
<td>78</td>
</tr>
<tr>
<td>Gastrointestinal (GI) issues</td>
<td>123</td>
<td>69</td>
</tr>
<tr>
<td>Any combination of dyslipidemia and hypertension, not including diabetes or heart disease</td>
<td>111</td>
<td>62</td>
</tr>
<tr>
<td>Wellness check-ups or annual physical examinations (in adults and/or children)</td>
<td>104</td>
<td>58</td>
</tr>
<tr>
<td>Cancer</td>
<td>63</td>
<td>35</td>
</tr>
<tr>
<td>None</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>*Other condition(s)</td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Respondents</td>
<td>178</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: Percentage (%) of total in columns are more than 100% due to multiple responses. Non-respondents: n=16 (8%).

* Other beneficial uses of e-DA tools include the following: allergies; cessation of smoking; eating disorders such as anorexia and bulimia; mindful eating; appetite changes due to depression or anxiety; arthritis; hepatitis C; HIV; Celiac disease; vegan diets; osteoporosis; fatigue; headaches; and renal disease.

5.3.2.4. Overcoming barriers with use of e-DA tools: focus groups and web-based survey.

In focus groups health providers extensively discussed the perceived barriers that were encountered with the use of e-DA tools and how these could be overcome. This information was mostly descriptive in nature, and was listed and divided into barriers for health providers and patients, as is shown in Table 5.20. Most of the barriers for health providers are time constrains and technological barriers whereas for patients a combination of technological and personal were mentioned barriers.
Table 5.20. Barriers for adopting e-DA tools as perceived by focus group participants.

<table>
<thead>
<tr>
<th>Perceived Barriers for Health Providers</th>
<th>Example Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking time to explain</td>
<td>RD/FG#7: “We would have to have time for training the participants who were using it.”</td>
</tr>
<tr>
<td>Taking time to train</td>
<td>NP/FG#7: “I would need somebody just to help me figure that out at the beginning.”</td>
</tr>
<tr>
<td>Lacking technological skills</td>
<td>NP/FG#7: “I mean, cause I have a general idea but, you know, I don’t even have an iPhone so I’m not even familiar with these apps.”</td>
</tr>
<tr>
<td>Wrong interpretation of results</td>
<td>RD/FG#2: “Issues may arise as a result of offering counselling based on results without adequate training in nutrition. This currently happens.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Perceived Barriers for Patients</th>
<th>Example Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lacking motivation</td>
<td>SW/FG#11: “Well, again it comes back to motivation…with depression; They may not be motivated to do that.”</td>
</tr>
<tr>
<td>Lacking time</td>
<td>Phys/FG#6: “I think that the challenge is time.”</td>
</tr>
<tr>
<td>Incorrect data entry</td>
<td>Web-based survey/respondents #103: “People may enter incorrect foods, beverages, and portion sizes.”</td>
</tr>
<tr>
<td>Forgetting entering food and beverage</td>
<td>Phys/FG#8: “We all have purchased things that look cool and then we use them for a bit and you just think, ‘I forgot to do it yesterday, oh I forgot again today’.”</td>
</tr>
<tr>
<td>Lacking comfort with use of technology</td>
<td>Phys/FG#11: “There are challenges with a lot of our patients as a lot of our patients are not computer literate.”</td>
</tr>
<tr>
<td>Lacking technological equipment</td>
<td>NP/FG#6: “Some of them don’t have a computer to use, so that is an issue.”</td>
</tr>
<tr>
<td>Getting bored/losing interest</td>
<td>CN/FG#5: “I actually have used the fitness pal on my phone and I used it for a couple of weeks and I got tired of it so.”</td>
</tr>
<tr>
<td>Cost of mobile device or computer</td>
<td>RD/FG#3: “They have to have money to have the computer or an iPhone right?”</td>
</tr>
<tr>
<td>Access to Internet.</td>
<td>NP/FG#10: “The trouble with Internet here [rural area] is actually a lot of places you can only get dial up Internet just because of how rural we are.”</td>
</tr>
<tr>
<td>Low potential use of e-DA tools in only mobile devices.</td>
<td>RN/FG#11: “There is a very small percentage of the people I see who even care about the apps.”</td>
</tr>
</tbody>
</table>
### Specific Barriers of e-DA Tools

<table>
<thead>
<tr>
<th>Type information captured by e-DA</th>
<th>RD/FG#7: “I do an assessment of behaviours around foods, and meal balance in a more macro-nutrient assessment.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limitation in reporting dietary patterns</td>
<td>RD/FG#11: “They go by day by day by day, like you don’t get the sense of pattern, like if you have a USB glucometer, a, b, c, and all the jazz, boom you see patterns immediately.”</td>
</tr>
<tr>
<td>Incompleteness of food database.</td>
<td>RD/FG#5: “You cannot always find what you are looking for so I think it would be frustrating for patients …so making sure it has a good database with a lot of options.”</td>
</tr>
<tr>
<td>Inconsistent with Canadian recommendations.</td>
<td>Web-based survey/respondent 67: “Serving sizes differ from CFG and this causes confusion in education and interpretation of results.”</td>
</tr>
<tr>
<td>Accuracy of results.</td>
<td>Phys/FG#7: “Well they never fit exactly what you’re eating.”</td>
</tr>
<tr>
<td>Not knowing how to download DA results from mobile devices</td>
<td>NP/FG#8: “I don’t know how we would put it into the EMR. We have now Practice Solutions, so I don’t know how you would take that information from a patient’s mobile phone ..and put it into our records and our charting…”</td>
</tr>
<tr>
<td>Some nutrients are irrelevant in the summary of results.</td>
<td>RD/FG#10: “So I mean I guess for me for the most part I probably wouldn’t need to know how much manganese someone’s taking in a typical day.”</td>
</tr>
<tr>
<td>Printing results especially from mobile devices.</td>
<td>RD/FG#11: [talking about e-DA tools in apps] “I have no idea how to print this information off, so there was a technological barrier.”</td>
</tr>
</tbody>
</table>

The e-DA barriers were also explored in the web-based survey, and most cases these limitations confirmed what was found in focus groups. One the four most common barriers identified in the survey were patient-related and the other three were technological-related barriers as it is shown in Table 5.21.
Table 5.21. Barriers for adopting e-DA tools as perceived by web-based survey participants.

<table>
<thead>
<tr>
<th>In my opinion, some barriers to the use of e-DA Tools in my Practice are (check all that apply):</th>
<th>Participants</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of motivation by patients to complete dietary assessment</td>
<td>141</td>
<td>80</td>
</tr>
<tr>
<td>Patients’ lack of comfort with use of technology</td>
<td>133</td>
<td>75</td>
</tr>
<tr>
<td>Time taken by patients to fill out the e-DA tool</td>
<td>115</td>
<td>65</td>
</tr>
<tr>
<td>Training time or education for patients to learn how to use an e-DA tool</td>
<td>109</td>
<td>62</td>
</tr>
<tr>
<td>Cost to Family Health Team to purchase access to web-based tool ($500-700 total/year)</td>
<td>91</td>
<td>51</td>
</tr>
<tr>
<td>Current inability to download dietary data directly into the EMR</td>
<td>86</td>
<td>49</td>
</tr>
<tr>
<td>Potential misinterpretation of results by patients (for example, the day-to-day variability of the diet)</td>
<td>83</td>
<td>42</td>
</tr>
<tr>
<td>Training time or education for health providers to learn how to interpret e-DA data</td>
<td>75</td>
<td>42</td>
</tr>
<tr>
<td>Unknown validity/ reliability of the tools</td>
<td>75</td>
<td>43</td>
</tr>
<tr>
<td>Time taken by health provider to offer counselling after conducting dietary assessment</td>
<td>73</td>
<td>41</td>
</tr>
<tr>
<td>Many foods are not listed in the databases</td>
<td>60</td>
<td>34</td>
</tr>
<tr>
<td>Compensation for taking the time to conduct DA and counselling (provider)</td>
<td>40</td>
<td>23</td>
</tr>
<tr>
<td>Patients’ lack of comfort with disclosure of diet information</td>
<td>37</td>
<td>21</td>
</tr>
<tr>
<td>Potential misinterpretation of results by health providers (for example, the day-to-day variability of the diet)</td>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td>Safety and confidentiality issues</td>
<td>33</td>
<td>19</td>
</tr>
<tr>
<td>No barriers</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>* If other barrier(s) please specify:</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>Respondents</td>
<td>177</td>
<td>10</td>
</tr>
</tbody>
</table>

*Note. Non-respondents: n=14 (7%). *Other barriers: incorrect data entry (correct portions, specific foods/brands, combo meals), ethnic/traditional foods and dishes, clients not sufficiently literate (either with spoken/written English), and finding aging population with interest, access and comfort with technology.

This survey question had an open-ended option for general comments about e-DA tools. Twenty five (13%) participants made comments that were incorporated into Tables 5.20 and Appendix Table P7. Recommendations of focus groups for increasing e-DA tools usage in FHTs. Lastly, the web-based survey was also used to evaluate the participants’ interest in learning more about the e-DA tools. One hundred and nine (89%) participants stated that they would be open to learning more about e-DA tools and only nine (5%) stated that they do not want to learn more.
5.4. Thematic Analysis of Current Dietary Assessment and use of e-DA Tools in Family Health Teams

As seen in the descriptive analysis, there was a substantial range of experience with e-DA tools, which informed the focus group discussion. When describing themes, quotes from providers currently using e-DA tools were identified and labelled as “[current e-DA tool user]”.

Four main themes were identified after conducting the thematic analysis of focus groups.

Figure 5.3. Themes of focus groups.

<table>
<thead>
<tr>
<th>Improvement of patients’ eating habits with use of e-DA tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Opening patient’s eyes</td>
</tr>
<tr>
<td>- Increasing patient motivation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Support of health providers with use of e-DA tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Improving the quality and quantity of diet information</td>
</tr>
<tr>
<td>- Improving time effectiveness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Integration of e-DA tools into FHTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Balancing electronic media with face-to-face interactions</td>
</tr>
<tr>
<td>- Tailoring the DA tool</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment of diet in an interdisciplinary fashion</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Varying dietary assessment by professional focus</td>
</tr>
<tr>
<td>- Working together to provide nutrition care</td>
</tr>
</tbody>
</table>

5.4.1. Theme: assessment of diet in an interdisciplinary fashion.

DA emerged as a core activity performed by all of the health providers in the FHT. This theme re-groups the main ideas and comments on the details of current DA practices as expressed by all of the health providers including the following: when and how diet information is obtained and analyzed; what the current barriers to completing the DAs are; and how health providers communicate with other team members about diet. DA was discussed both by
individual health provider(s) and by the FHT teams as a whole and is divided into two subthemes as shown below.

5.4.1.1. *Varying diet assessment by professional focus.*

Focus group participants described diet as a widely discussed topic in their everyday clinical practice, as diet is related to many prevalent diseases and dietary information is regularly obtained as part of physical examinations in adults and children. Participants described DA as an activity that is often, but not always, done when providing dietary or treatment advice to their patients. As one pharmacist stated: “Basically, I think every visit; I think when you talk about lifestyle you bring up food, like diet.” (Phar/FG#7).

Additionally, Table 5.7 (above) provides details of the situations and conditions under which health providers assess diet in healthy and sick clients.

Patients are increasingly interested in knowing more about their own diet and about diet information in general. Patients ask their health providers nutrition-related questions one-on-one and in group sessions, even when the session topics are not nutrition-related. One physician explained: “The majority of the questions at the first women's health group were all about diet, such as calcium supplementation and all this kind of stuff. No one asked about mammogram frequency or colorectal screening.” (Phys/FG#8).

In order to keep up with patient demand, a variety of group classes is offer to patients in FHTs that address healthy eating habits and disease management with a focus on nutrition. Health providers recognized that they have the need to keep up-to-date on general nutrition and specific medical conditions, as well as to have useful information available for their patients to take home.

Health providers assessed diet differently with a particular professional focus and for different purposes. Typically, DA was done because of a specific health concern in patients with a newly diagnosed condition or in patients who were new to the clinic. For instance, clinical pharmacists commonly reported that they conducted a brief evaluation of diet when reviewing interactions between diet and medications for specific health issues. Some examples of pharmacist involvement in DA were review of carbohydrate intake for those on insulin, vitamin K intake for those on anticoagulants, fat and carbohydrate intake for those on cholesterol-
lowering medication, and sources of calcium-rich foods for those asking about supplements. One pharmacist stated “When patients ask me: how much should I be taking of calcium or vitamin D? or am I taking enough? I usually say, well you have to tell me what you eat first.” (Phar/FG#1).

In comparison, NPs, RNs, and health educators conducted brief DAs in patients with specific needs, such as pregnant women, infants, overweight and obese children, and seniors, to name a few.

DA was initiated either at the suggestion of the health provider or at the request of the patient. Focus group participants explained that it was important to identify the reason for the DA, as part of the treatment of a specific health issue is different than one done for general assessment. This can be illustrated by the following words of an RD: “If somebody’s coming in to talk about cholesterol, my assessment of their diet will be completely different to binge eating or Crohn’s or colitis or something along those lines”. (RD/FG#8).

Of note was the fact that participants, independent of the health profession, indicated that DA(s) are usually brief. One physician explained: “I am much more informal and my consultations are relatively fast. Normally, I would try to get them to tell me a little bit about what their eating habits were in the last twenty-four hours and the last week.” (Phys/FG#8).

The RDs stated that it is preferable not to offer an in-depth DA, but rather to conduct a more global assessment by asking about the usual intake of patients or collecting food records. It was identified for all professions that DA is often conducted by asking a couple of questions or by asking for verbal recalls rather than by using more formal methods of DA such as 24-hour food recalls, FFQs, or diet history. Most commonly, questions were asked to obtain information about eating habits and dietary patterns, for example, the frequency of eating out, skipping breakfast, and/or consuming late meals at night.

Health providers also mentioned the importance of obtaining diet information by involving patients’ relatives such as a spouse, parent, or adult child, especially for patients who are children or seniors. Often times, after a brief evaluation of diet, health providers familiarize their patients with the Canada’s Food Guide or other guides such as the DASH diet (Table 5.8 for more information) and are using posters, pamphlets, or websites. In cases where a more detailed DA is needed, a second visit is usually scheduled, and the dietitian may recommend the use of an e-DA
tool, such as eaTracker or Food Prodigy and one RD mentioned use food photographs send through Smartphones to evaluate patients’ eating habits.

5.4.1.2. Working together to provide nutrition care.

Health providers stated that they work together in a collaborative fashion in order to provide better service to their patients. In diabetic clinics, for example, clinical pharmacists and RDs often work together with their patients. As stated by one RD, “In terms of the diabetes team, we work really, really hard, so we interface and we overlap. It could be a registered nurse (RN) and I in the room, it could be a pharmacist, RN and I in the room.” (RD/FG#2). Pediatric nutrition is another example of when an NP, RD, and physician work collaboratively to resolve nutrition-related issues such as childhood obesity. One RD explained, “Nurses and nurse practitioners are pretty knowledgeable in nutrition…and if someone has been seen by one of them for several appointments before they get to see me, I know that important information has already been touched with the client.” (RD/FG#10). Thus, collaboration with trust and reliance on other health providers to provide nutrition care, including DA, exists among FHT members. Other types of collaborative work are taking place in the form of individual or group session co-counselling by two or three health providers for the treatment of disease and to address dietary issues in general.

Another form of working together to provide nutrition care was seen in two of the focus groups, health providers identified that for patients “talking diet is easier with a non-RD.” One clinical pharmacist explained [when talking about patients]:

Some are a little resistant to being honest, to seeing the dietitian because they feel like they are going to be under a microscope. … I think they sometimes feel more at ease with somebody like me because they think I don’t know anything, right? (Phar/FG#4).

When patients talk about their diet with a non-RD team member, they are usually more relaxed and open to reveal diet information, and perhaps more comfortable to ask nutrition-related questions (e.g., what is a carbohydrate?). One RD stated, “I think people get a bad impression of a dietitian, and they think that we are perfect and I don’t eat pizza and I don’t eat burgers.” (RD/FG#4).

Besides the unwillingness to disclose dietary information, another important problem was the lack of motivation for DA in patients. Due to this lack of motivation, non-RDs indicated they
work with patients first for a couple of visits before making a referral to a RD. Once the patient seemed ready and motivated for a dietary intervention, a referral was made. As stated by one social worker:

We will work on some grounding techniques …I teach them about staying in the moment and paying attention to their body. There are some people who just can’t engage in that process, and sometimes I will see people for months and months and then finally when I think they are more ready, I’ll refer to him [dietitian]. (SW/FG#11).

Grounding techniques are used to make patients aware of what they are eating and it is thought that this will increase self-regulation and ultimately change dietary behaviours. RDs and health educators are aware of this, and they see the honest disclosure of dietary intake as a process that takes time and effort from both patients and health providers. It is essential that the patient feels comfortable and has a relationship with the health providers before the latter try to obtain diet information from them. In the words of a nurse health educator:

If they [patients] are being referred to myself for the first time, it may not be until the second or third time that patients come in and say ‘by the way, that is not the full story of what I really eat’ and then they’ll disclose the full information. It’s their readiness that matters. (Nurse health educator/FG#9).

Health providers also described obtaining diet information from their patients through probing. A RD stated, “There are a lot of people that don’t like to tell me what they’re eating. So estimating what people are actually eating is really difficult– it takes a lot of probing.” (RD/FG #9). Therefore, questions related to dietary intake and dietary behaviours are asked in different ways and with high frequency so that maximum diet information can be obtained.

While health providers have basic knowledge regarding DAs and seem interested in conducting them, focus group participants emphasized that it is the RDs that play an important role in DA, as they are the experts in this field. RDs have the specific training, education, and experience to conduct DA. Furthermore, they have more time to discuss diet as they are meeting with patients specifically for this purpose. In comparison, other health providers are providing additional services and therefore have less time for diet counselling. Including a dietitian in the FHT was seen as an advantage as one provider explains: “I know that she [dietitian] has quite a few resources; thus sometimes I will knock on the dietitian’s door, and say -hey do you have
something that I can hand out to this patient?” (Phar/FG#4). Thus, physical proximity to a dietitian is an advantage in team-based practices, because besides sharing their expertise, RDs have access to specialized nutrition-related tools, resources, and information, which provide increased nutritional support for patients.

Another advantage of having a dietitian on the team was that they could educate other health professionals on the newest and most relevant DA techniques and provide information on any other nutrition-related topics. RDs are imparting information by participating in FHT educational rounds or by meeting informally for “hallway consultations.” One pharmacist was quoted as saying, “I have been coached by RDs just to stress the Canada Food Guide and healthy choices.” (Phar/FG#6). The provision of this nutrition-related knowledge increases team capacity and promotes better patient service.

Communicating with other team members is another example of working together to provide nutrition care; this topic was frequently discussed in all of the focus groups. Health providers participating in the interviews were all working with EMRs, which are considered to be very convenient and effective tools for collecting and sharing dietary information and nutrition plans with all of the team members. EMRs also facilitate the spread of dietary information entered by RDs or other health providers among the team thereby aiding the team members to learn from each other. As a physician stated: “Everybody uses the same medical record. So, everybody in the clinic has access to that information. And the dietitian could see the mental health counsellor’s notes, and vice-versa and that allows for some cross-fertilization of ideas.” (Phys/FG#7).

Participants also emphasized that they are using the EMR system as a method to report nutrition-related information. Nutrition-related information includes salt consumption for hypertensive patients, changes in body weight and diet, lab results for specific nutrients (e.g., vitamin B12, iron, and/or calcium), history of smoking, and alcohol intake. One RD reported that with the use of EMRs, there can be innovative forms of communication with team members: “So, we have verbal communication, we have instant messages, we have our electronic chart, and we have our hallway consults.” (RD/FG#2). Instant messages (IMs) are short messages for other health providers or questions for them that are placed in the EMR. Frozen notes created as
reminders to calculate body measurements in adults and children and send referrals for nutrition classes as needed are also included in the EMRs.

5.4.2. Theme: improvement of patients’ eating habits with use of e-DA tools

This theme stems from the focus group participants’ main ideas and comments regarding the use of e-DA tools as a method of facilitating patients’ adoption of healthy eating habits. Overall, participants thought that e-DA tools could be used to create awareness, educate patients about diet, and increase patient motivation for self-monitoring diet and making recommended dietary changes. This is because when patients record their food intakes, they obtain rapid DA results and they can visualize the characteristics of the food consumed and learn about their own eating habits. This theme is divided into two subthemes, as discussed below.

5.4.2.1. Opening patients’ eyes

e-DA tools can be very effective in helping patients become aware of the quantity and quality of foods they consume as well as the frequency of food consumption over time. As stated by one RD:

It is meant to be a tool for awareness. Most people come back and go holy smokes! I had no idea I was doing this or doing that. Yeah! It’s an eye opener that is how we get the sense of awareness. (RD/FG#11) [Current e-DA tool user].

In other words, e-DA tools facilitate patients’ ability to explore their overall eating habits and dietary patterns. In some instances, patients think that their diet is healthy when, in fact, it is not, and by self-monitoring their diet using e-DA tools, they can clearly recognize problem areas. One pharmacist stated, “I think that at one time I had too much sodium, and I wasn’t adding salt to foods or anything, and I thought Wow! So it is an eye opener.” (Phar/FG#4) [Current e-DA tool user]. Another aspect mentioned by participants was the use of e-DA tools in collaborative care patient-provider, one nurse practitioner stated, “[it] Puts the responsibility back onto the patient and it gets them to identify more of what they’re eating and how their activities are working” (NP/FG#2). As part of self-management of a health condition, patient and provider partnership can be increased with the use of these tools. In conclusion, e-DA tools can potentially work as self-learning tools to educate people on diet. By self-monitoring their diets, people become more aware of nutrient contents of the food they eat and overall eating habits.
Once this happens, they become empowered to make educated decisions on what to eat in order to get the right amount of nutrients and on how much and how often to eat. Over time, patients may no longer need e-DA tools to self-monitor their diets, as they may permanently adopt healthier eating habits.

### 5.4.2.2. Increasing patients’ motivation.

Participants noted that e-DA tools provide convenient access to diet information and assessment any time and almost anywhere, so long as the necessary technology is available, all with a high degree of privacy. This may lead to an increase in patients’ use of dietary self-monitoring and in their sense of self-efficacy for DA. Through e-DA, patients can have a greater awareness of the quality of their eating habits and may be able to meet dietary recommendations. Furthermore, patients may be more likely to use e-DA tools than traditional tools due to the novelty and trendiness of mobile devices and the fact that their use is currently in vogue. As well, e-DA tools allow patients to enter diet information with the help of pictures and portion sizes potentially anywhere they, unlike the traditional hand-written food records. Results are often more interpretable for the client with presentation using colourful and visually appealing tables and diagrams.

These potential advantages of e-DA tools may increase patients’ motivation to self-monitor their diets and adopt healthy eating habits. As stated by one RD, “I think they would be motivated to see those results …they would like to see those patterns and graphs.” (RD/FG#1). Additionally, the ability to make a logical connection between dietary modification and goal achievement provides patients with an ability to establish more realistic nutritional goals and monitor these in a more timely way. In the words of one RD:

...And they’ve got that sense of self-control, because oh, look what happens when I take out a teaspoon of sugar every day! I have lost some calories from my intake. Now, look at the carbs and my blood sugars improving. (RD/FG#9) [Current e-DA tool user].

As stated above, the lack of motivation for dietary self-monitoring was identified via the focus group discussions and the web-based surveys as one of the major problems in conducting DAs. Two FHT focus groups specified that approximately one in five patients complete and return the paper-based DAs. As well, it was noted that it is difficult to evaluate the diets of those who are not very motivated, especially those with chronic conditions such as diabetes, obesity,
hypertension, and dyslipidemia. Health providers hoped that the use of e-DA tools would motivate people to self-monitor their diets, become more aware of their own diet, and make necessary changes to their behaviour. Furthermore, participants commented that e-DA tools could be used as indicators of how motivated patients are to adopt dietary recommendations. One RD said, “I think that it is also an assessment tool of how motivated people are, because if they are going to do it, then, that shows that they are ready to take that next step.” (RD/FG#9) [Current user of e-DA tool]. This participant further suggested that, in her experience, patients who complete an e-DA can often be considered as more likely to be ready to adopt dietary changes and more receptive to receiving and using additional nutrition-related resources and services.

5.4.3. Theme: support of health providers with use of e-DA tools

This theme summarizes the main ideas and comments regarding the way e-DA tools can increase the DA proficiency of FHT health providers. e-DA tools offer many advantages to non-RDs in FHTs in that they can improve their understanding of patients’ diets and offer dietary guidance information, such as details of nutrient and other dietary recommendations. As well, e-DA tools help identify which nutrition-related issues need to be raised by health providers and their patients during FHT clinic visits, leading to a more efficient use of time. This theme had two subthemes outlined below.

5.4.3.1. Improving the quantity and quality of diet information.

The use of e-DA tools can give health providers an effective way to learn more about their patients’ dietary patterns and specific nutrients of interest. Results are available immediately, as compared to current DA methods such as verbal or paper-based diet questionnaires that take time to analyze. Focus group participants stated that if they have the results presented using colourful graphics and tables, the identification, interpretation, and discussion of patients’ unhealthy dietary patterns can be facilitated during consult visits. One of the RDs stated:

It’s a new tool and its very visual…I would be able to explain it to the patient in a way that they could visualize it now and why are we saying, you’re not getting enough fruits and vegetables, or you need more calcium in your diet. (FG#3/RD3).
e-DA tools can easily pinpoint changes in eating patterns from weekdays to weekends and can identify the frequency of skipping meals, eating out, and eating late meals known as “the 10:00 o’clock trip to the refrigerator.” Some e-DA tools also provide details of the recommended food guide servings, which can be useful for non-RD health providers who may be less familiar with these recommendations. As stated by one pharmacist, “Even just in a normal visit, you might have somebody say ‘what is a recommended daily intake of...?’ I might not know off the top of my head.” (FG#4/Phar) [Current e-DA tool user]. As well, e-DA tools could help identify whether patients need future diet counselling to help them start/continue following the dietary recommendations. One RD explained: “they can sort of look at something and they may learn something by doing it, and so say ‘can you help me with this?” (FG#1/RD). In case patients are interested in further improving their eating habits, health providers can provide additional corrective actions in the form of further counselling visits or referral to others in the FHT. Lastly, e-DA tools can facilitate patients’ visits because consults are more interactive and data-driven.

5.4.3.2. Improving time effectiveness.

Time constraints that prevent one from providing adequate nutritional care are well documented as a problem in FHTs. The use of e-DA tools is relatively easy to implement and can be a low cost solution to this problem. With the use of e-DA tools, health providers can save time when conducting and analyzing diet records either prior to or during patient visits. As one RD said:

Even planning before an appointment sometimes is difficult because you are spending a lot of time assessing in the first appointment with patients, and then not as much time for education… (RD/FG#9) [Current e-DA tool user].

The e-DA tool can be recommended to patients in preparation for a consultation with members of the FHT, for example, a nurse educator, clinical pharmacist, or dietitian, so that both the patient and the health provider have access to the e-DA results before the visit. In this way, patient DA results are reviewed prior to meeting with the health provider for the first time and he or she can focus more on dietary counselling, setting dietary strategies and goals, and providing overall nutrition education in a more effective time frame. In the words of another RD:
I would really like it, to almost use it at the beginning…If I could only convince them to do it for three days to get a really good summary and when they actually come in to see me for the first time we can look at it and have a thorough assessment. (RD/FG#1).

The use of an e-DA tool can be especially beneficial when meeting patients with newly diagnosed conditions whose management has a nutrition component, such as impaired glucose tolerance, diabetes, or high cholesterol. It is not always necessary to complete a three-day DA, as sometimes it is sufficient for patients to quickly track common foods consumed, realize their nutrient content, and become more aware of dietary changes that need to be made prior to coming to the FHT. One physician stated:

I say not to track every single thing, but if you can tell a patient who’s recently been diagnosed with high cholesterol you know, go online, look at this tool, punch in a few things that you commonly eat… (Phys/FG#8).

If a full three-day DA is necessary, it can also be recommended. In addition, participants of two focus groups commented that the newest 2010 Osteoporosis of Canada guidelines highlight the importance of calculating calcium and vitamin D intakes first before recommending any supplementation. In this context, clinical pharmacists emphasized that their patients often overuse supplements, and e-DA tools can be used to provide proper advice on use or not of supplements in a more time-effective manner by obtaining a complete on-line food record.

5.4.4. Theme: integration of e-DA tools into FHTs.

The focus groups generated recommendations for increasing the use of e-DA in FHTs. These were analyzed both descriptively and thematically. Patient skillsets that would make them more likely to use e-DAs and specific suggestions for increasing the use of e-DA tools in FHTs were first descriptively analyzed and are listed in Appendix P. Table P6.- Focus group participants’ viewpoints to increase likelihood of using e-DA tools.

This thematic analysis expands on the details of how health providers envision the use of e-DA tools in their practices taking into account the type of patients they have, the required level of DA detail they want, security and confidentiality issues, and making these tools more user friendly for themselves and their patients. As well, this theme provides information on the
tension that exists between patients and health providers in trying to balance the use of technology with face-to-face interventions. Two main subthemes were evident.

5.4.4.1. **Balancing electronic media with face-to-face interactions.**

The majority of health providers liked the idea of accessing e-DA results electronically using the web based e-DA tool page, e-mail, or the FHT portal because it allowed for a convenient and rapid way to communicate with their patients. One RD stated:

I use a lot of email with my patients, and there is no reason why they shouldn’t just send me the email of their findings. Okay you keep track and then we will meet again, and I could look at them…maybe easier for the patient. (RD/FG#11) [Current e-DA tool user].

Health providers described the patients’ characteristics that would increase the likelihood of using e-DA tools. Of note is that age was not necessarily considered a barrier for e-DA recommendation, but patient’s comfort with technology, as is shown in Appendix P. Table P6.- Focus group participants’ viewpoints to increase likelihood of using e-DA tools. They also stated that e-DA tools could be integrated into the EMR system in a similar way to that of other current e-tools that track patients’ blood pressure, glucose levels, body weight, and glycemic index. However, this study found that not all FHT members considered electronic communication with patients to be attractive, and in some cases, they intentionally avoided providing their patients with email contact information. In the words of one physician: “we haven’t opened up our office to email access by our patients…and that’s been an intentional one, because patients don’t often realize which is the most appropriate venue to be using our services.” (Phys/FG#7).

Some FHT members preferred that only the patients would use e-DAs and that patients would bring their results to the clinic for face-to-face meetings. Others were concerned that they would not have enough time to access and review patients’ electronic information prior to their visits. While some really liked the idea of adopting the e-DA tool in FHTs and have had the opportunity to use them, others could not see much utility in the clinical management context. Another physician stated:

I’m sure there are obviously a subset of patients that would really benefit from using any one of these things, but I think in general it’s more of a tool for patient’s information rather than clinical management, you know? (Phys/FG#7).
Although health providers recognized that self-monitoring of one’s diet can be enhanced with the use of e-DA tools, they also emphasized the importance of delivering personal guidance in a one-on-one or group setting in order to move patients in the “right direction” towards meeting their personal nutrition goals. For example, one nurse practitioner stated, “I think it could be a good element, but it’s not going to help unless there is some kind of counselling involved here.” (NP/FG#2). Without sufficient guidance from a health professional, there is the potential risk that patients will not remain motivated to make necessary dietary modifications. In other words, there will be a situation of “losing the patient within the e-DA tool” (RD/FG#11) [Current e-DA tool user]. For example, if patients consistently receive negative feedback from the e-DA tool, whether it is perceived as negative or not, it is possible that they could become disappointed in not meeting their caloric, weight, cholesterol, or any other nutrition-related goals. If this occurs, patients could become frustrated, less motivated and less likely to continue with their recommended treatment plans. In the words of one RD:

I think the potential issue with some of this tool is exactly what happens when people aren’t face-to-face if they get all the information they don’t want to hear about, they may just not want to continue being treated… (RD/FG#11) [Current e-DA tool user].

Based on the above findings, electronic devices such as e-DA tools should be seen as an enhancer rather than a replacement or substitute for face-to-face consultations with health providers. It is important that communication continues between FHT members and their patients and that adequate follow up and support is given so that patients can be properly educated about nutrition and can achieve positive outcomes. In general, then, the adaptability and usability of e-DA tools in FHTs should be at the health providers’ discretion, according to their particular needs, preferences, and available resources.

5.4.4.2. Tailoring the e-DA tool.

Focus group participants also discussed the overall e-DA tool format and identified the elements that best could suit their practice. The majority of participants thought it was important that the diet summary would have colorful graphs and tables that would identify dietary patterns, would have the option of providing more or less diet information depending on the need, and would be presented using software that was compatible with existing office software, such as Excel or PDF, that could easily be printed. One RD stated:
The dietary device needs to have that ability to print off and get the big picture, see patterns immediately instead of looking at day by day. If it prints out nice summaries, then I could see how it could be useful. Something that could fit into one summary sheet and collects all data. (RD/FG#11) [Current e-DA tool user].

Also, of particular importance was that the e-DA tools would be easily accessible, free of cost after the initial purchase price, and have user-friendly questionnaires that patients could complete with little or no assistance. Furthermore, to increase usability of e-DA tools in FHTs, focus group participants suggested that e-DA tools should be available in more than one mode, for example, having both web-based and mobile options.

Health providers emphasized that they were also interested in evaluating patterns, and saw a great opportunity to gather information on other important health-related behaviours often associated with poor diet such as physical inactivity, smoking, poor sleeping habits and mood. Being able to integrate this lifestyle information with e-DA data was considered an asset, as stated by one physician: “it doesn’t say anything about other lifestyle issues like sleep, mood, exercise, that’s huge… definitely alcohol and smoking too” (Phys/FG#7).

The population seen at a FHT is varied, thus health providers were interested in having an e-DA tool that could reach different audiences, for example, adults and children. It would be beneficial to be able to choose the appropriate level of e-DA for ones’ needs. For RDs, however, it would be better to have access to a more detailed e-DA. As one RD stated:

It might be interesting or good to have different levels. So they have the very simple level for the basic user. So that okay, this is level one, and it is all the introductory, the basic stuff for some people. But there is also an additional piece you can download to do more sophisticated things, or something like that. (RD/FG#11).

In most cases it is the basic e-DA that non-RD health providers want and not a more detailed version, as they only are interested in becoming aware of poor eating habits in general. The e-DA tool could also be tailored to professional group(s) needs, because for some, mostly RDs, obtaining detailed and accurate DA results is very important whereas for others, such detail is not needed. This was echoed by a RN who stated:
…the accuracy, I probably haven’t had that problem but I don’t get into detail as dietitian would. For me it is just an awareness and raising awareness to try and make sure that they understand that’s where they can make some small changes, without trying to get into the actual nitty gritty. (RN/FG#1).

In other cases, health providers may want to tailor the e-DA tool results’ format to the patients’ level of sophistication and their interest in calorie counting. The RDs discussed that it was important to “avoid assessing only calories when doing DAs” RD FG#2. Instead, DA should focus on food patterns, number of food servings, portion sizes, and food preparation. As well, one of the nurse practitioners stated:

I don’t talk calories, I don’t like talking in calories, I like the idea of you look at your meal and see what is balanced or not, and look at serving sizes and portion sizes, especially when I work with young girls, I’m not talking calories. (NP/FG#2) [Current e-DA user].

It is often problematic to mainly focus on calories in DAs, especially in young people, women with eating disorders such as anorexia and bulimia, or those with weight issues. For this reason, it was noted by participants that e-DA tools had to be flexible in the type of assessment and analysis which can be then tailored to the needs of the patient. One suggestion by focus group participants was to have the option of omitting calories from the e-DA summary of results that is sent to the patients in order to avoid emphasizing caloric intake instead of general nutrition and healthy eating habits.

Another issue discussed in the focus groups was security and patient confidentiality when using e-DA tools. Although most participants recognized that many patients do not regard diet information as private, this is not the case for others. Secure access to e-DA information with a protected password can ensure secure communication with patients. As stated by one RD:

I am going to be communicating with people, I just don’t want to be emailing them you know, through their Sympatico or Gmail account… the aspect of security or firewall protection I think is important. (RD/FG#7) [Current e-DA tool user].

Thus, the security and privacy of patient and provider information with e-DA tools are important components that need to be addressed before the implementation of these tools.
5.5. Summary of results.

The general characteristics of the sample in the two studies were somehow similar, as health providers interested to participate in the study were from ten disciplines and notably female. In the web-based survey, the RD group had <35 years old in comparison to non-RD group >36 years old with more than ten years of experience as health provider.

In focus groups health providers specified the most common situations in which they review patients’ dietary intake, these were physical examination(s), patients diagnosed with nutrition-related disease(s) and any related risk factors, and when pharmacist evaluate dietary-related medications. These results were corroborated in the web-based survey, as respondents indicated that e-DA tools would be valuable for patients with diagnosed nutrition-related diseases and health promotion over the lifecycle.

Health providers in focus groups also described that besides using well-known DA methods, they were also utilizing other nutrition-related tools with a dual purpose: obtaining dietary information and providing dietary counselling in clinical visits.

Participants of focus groups stressed the high frequency of DAs by individual health providers and as a team, and communicate this information in person or through EMRs. This information was somehow corroborated with the web-based survey, as most participants indicated that DAs were conducted every day or almost every day. RDs conducted DAs as a main job activity in comparison to non-RDs health providers.

Different methods of DA were reported in both studies, from a few pointed diet-related questions to more formal methods depending on the patient’s issue, motivation, time constraints and health profession discipline. The web-based survey confirmed that RDs were more likely to use informal and formal DA methods compared to non-RDs, using informal methods only.

In relation to use of e-DA tools, in the focus groups almost half of the participants stated that they were aware of these tools. In the web-based survey, almost one quarter of respondents, mainly RDs, indicated the use of one or more new e-DA tools. The most common e-DA tools used by RDs were eaTracker, a web-based tool and MyFitnessPal app. Similarly, RDs were more likely to report that their patients were using these tools. The most popular were MyFitnessPal app, eaTracker web-based tool, and the Weight Watchers app.
Both web-based survey and focus group participants identified a similar set of potential benefits on the use of e-DA tools. These included the use of e-DA tools for self-monitoring of diet, helping patients to adopt healthy eating habits and use of e-DA tools for initial DA.

The perceived barriers with the use of e-DA tools included current DA barriers previously identified in the literature review of the document and confirmed in the present study. Some barriers were patient-related, such as the lack of time and poor motivation and skills to effectively record dietary intake. For providers, the limited time to conduct DA was a predominant issue.

New barriers in relation to use e-DA tools were also identified in both studies. For example, time will be needed to educate patients in how to use e-DA tools; it’s currently difficult to send information of DA results to health providers by printing or transferring data directly onto the EMR, or another electronic method; most e-DA tools were not using the CNF or convert foods to current food recommendations (CFG); and security and privacy of information in e-DA tools were also identified as issues.
Chapter 6: Discussion and Conclusion

This study was conducted to explore current dietary assessment (DA) practices and the potential use of new electronic dietary assessment (e-DA) tools in an interdisciplinary primary care (PC) context of Family Health Teams (FHTs) using a combination of qualitative and quantitative data collection methods with interdisciplinary focus groups and a short web-based survey. Particularly, two specific research questions were addressed in the study: 1) What are the current DA and e-DA tool practices of health providers in FHTs?; and 2) What are the opinions of health providers on the use of new e-DA tools in FHTs, particularly their benefits and barriers to their use, and recommendations for development?

This chapter provides an integrated discussion of the main findings of the study with consideration of the most robust findings in comparison to the related literature. The chapter begins with a discussion of DA in PC and FHTs from an individual and a team perspective. Then, it discusses the current use of e-DA tools in FHTs, including how these tools could help patients adopt healthy eating habits, how these tools enhance DA by health providers, barriers from the provider perspective, and how these tools can be integrated into FHTs. Lastly, the chapter concludes with the strengths and limitations of the study, use of the Ottawa Model for Research Use model in the study and future directions for research.

6.1. Current Dietary Assessment in FHTs

Dietary assessment is needed before any dietary intervention and is identified as an important part of nutrition assessment (Davidson et al, 2007). By obtaining specific information on current eating habits, health practitioners can guide and tailor their advice. It is recommended that DA is done on the initial visit by a health provider in order to aid in overall nutrition planning and follow up and provide patients with required support (Ammerman, Lindquist, Lohr, & Hersey, 2002). However, in current medical literature, there is little information on what and how DA occurs in team-based PC settings. Previous studies in this area suggest that health providers who are not RDs or nutritionists, such as family physicians and PC nurses, are counselling their patients on diet (Brauer et al., 2006; Sargent, Forrest & Parker, 2012). Information has been collected in the majority of research studies through surveys in Canada (Sinclair et al., 2008; Temple, 1999; Wynn, 2010) and elsewhere (Duff & Livingstone, 1997; Folgeman, 2002; Kuppersmith & Wheeler, 2002; Mihalynuk, Knopp, Scott, & Coombs, 2004; Verheijden & Kok,
These studies have targeted PC physicians and nurses, and sometimes their patients, but have not investigated DA; rather they have looked at the frequency, interest, knowledge, recommendations and barriers to overall dietary counselling in their practice. Diet counselling in PC is an under-studied area overall. The reasons for not exploring DA, per se, can be explained by many factors, perhaps most importantly by the fact that obtaining and analyzing patients’ dietary information can be much more complicated for busy PC practitioners than assessment of other lifestyle factors, such as frequency of smoking or alcohol intake, which health providers find easier to counsel patients on (Amoroso, Hobbs, & Harris, 2005; Ampt et al, 2009). The many barriers to conducting DA and providing dietary counselling have been previously described; among the most common are that family physicians and PC nurses lack of time and/or confidence to do so (Calfas et al, 2002; Helman, 1997); many physicians and nurses do not think that DA is part of their role or competencies (Ampt et al, 2009). As well, some PC physicians are under the impression that they will not be successful in changing patients’ diets; hence they do not want to devote much time to this and refer patients to registered dietitians (RDs) or nutritionists for DA or they do not do it at all (Moore, Adamson, Gill, & Waine, 2000).

In the present study investigators found that health providers were often offering DA to their patients at FHTs, but due to the lack of time physicians and nurses normally focus on providing general, non-specific DA and advice. According to a systematic review of dietary advice given by physicians and nurses at the community level including PC settings to decrease cardiovascular risk (Brunner et al, 2007). authors found that the intervention of these health providers in dietary advise increase the average intake of fruit and vegetables, dietary fiber, reduction of total dietary fat and saturated fat intake in a period of 3 to 24 months. Of note, health providers involved in the studies received nutrition training that varied from 40 minutes to 40 hours provided by a RD or clinical nutritionist. Therefore, the provision of nutrition training to health providers, other than RDs, can increase the likelyhood of offering DA and dietary advise in PC.

Nutrition scientists and nutritional epidemiologists have extensively studied DA methodology, and it is well known that all methods have limited capacity to characterise the whole diet. The validity of asking PC patients a few nutrition-related questions in order to identify key issues is still controversial and understudied. For example, the idea of using short FFQs or rapid screeners, such as REAPS, WAVE, or the SNAP framework has developed over
time. The REAP tool has undergone some validity and reliability testing using medical students and physicians, but not patients (Gans et al., 2006). In the case of the Australian SNAP tool, feasibility studies have been conducted with physicians and nurses, rather than testing the validity or reliability of the tool. In feasibility studies health providers have reported that SNAP is a useful tool in clinical practice, but recognized that it is sometimes complicated to follow due to time constraints, especially in the area of nutritional assessments (Amoroso, Hobbs, & Harris, 2005; Ampt et al, 2009; Harris et al, 2005). Thus, further investigation needs to be done to identify and test feasible and effective DA methods for PC environments.

6.1.1. Dietary assessment by individual health provider.

The current study found that health providers from the included disciplines assessed and discussed diet frequently, for the following purposes: as part of the management of the high prevalence of nutrition-related diseases and their risk factors; as part of routine physical examinations of children and adults; to answer patients’ nutrition-related questions; and as part of the review of diet-medication interactions by pharmacists.

In Canada, approximately 20% of PC consultations reportedly include a nutritional component (Eaton, Goodwin, & Stange, 2002; van Weel, 1997; Witt, Brauer, Dietrich & Davidson, 2006). Most of the prevalent diseases in this country are nutrition-related, for example, heart disease and diabetes, and risk factors such as obesity, dyslipidemia and high blood pressure (Shields et al, 2011; Tjepkema, 2006; National Physician Survey, 2010). Consistent with the literature, this study found that DA is provided every day in clinical practice for health promotion and disease prevention and as part of the management of CD(s). Thus, DA is important to overall PC practice and more work is needed to develop methods that can be used by different professions. Two studies were identified reporting the frequency of DA by family physicians in PC: one indicated that 27% routinely offered DA to patients (Secker-Walker et al., 1991) while the other indicated that 66% offered it occasionally (Duff & Livingstone, 1997). Both studies were surveys including physicians only and did not provide further details on which type of patients most often received DAs or which method of DA was used. Indirect evidence on DA in a PC team-based practice comes from a study that included physicians, physician assistants, and NPs (Levy et al., 2010); this study indicated that 68% of health providers were likely to speak about nutrition with patients “most of the time”. In comparison, in three non-team
Based on PC studies, it was found that family physicians said to provide dietary counselling to their patients 23% to 42% of the time (Anis et al., 2008; Fogelman et al., 2002; Kushner, 1995).

In Canada, two studies in PC were identified including only patients. The first study by Brauer et al. (2012) revealed that 37% of patients who attended Family Health Networks (FHNs) in Ontario received diet counselling from their family physicians in the past three years. The second study by Sinclair et al. (2008) reveals that 38% of patients in Nova Scotia received diet counselling from their family physician. Indirect information from these two studies provided an idea of the frequency of diet counselling in PC in Canada. The results of the web-based study, reported that more than half of health providers in FHTs conducted some form of DA on their patients, but the percentage of patients receiving assessment was not estimated. This study also included a high percentage of RDs and is known that this group of providers are specialized in conducting DAs and also, participants in the study may be more interested in nutrition topics than other health professionals. The sample is likely not representative of all health providers in FHTs.

According to the findings of this study, health providers are under the impression that their patients are increasingly interested in knowing more about their own diets, and patients often ask nutrition-related questions in one-to-one consultations and group classes. This is congruent with a study of family physicians in the U.S. by Mihalynuk et al. (2004) that demonstrated that diet questions commonly asked by patients in PC are mainly related to dietary recommendations for heart disease, diabetes, weight loss, vitamin supplementation, and herbal and botanical interactions. Additionally, in PC, consistent information exists that patients are of the opinion that their health providers, particularly family physicians and nurses, should be more involved in discussing diet and offering dietary counselling to them (Befort et al., 2006; Ruelaz et al., 2007; Wadden et al., 2004).

Team-based care offers opportunities for a variety of health services, and results from the current study provide baseline information on DA in the FHT environment. Time pressures are prominent reality in clinical practice, and DA is typically offered with a few pointed questions, in comparison to the traditional comprehensive DA methods used only by RDs. Each health provider assesses diet differently according to their background, skills, motivation, and time and the information attained is utilized for different purposes, although the main focus remains on
specific health issues. For example, clinical pharmacists in PC are often involved in the management of diabetes and other common chronic conditions such as dyslipidemia and osteoporosis, and place special emphasis on health promotion and disease prevention (Heaton & Frede, 2006; Pottie et al., 2008; Santschi, Chiolero, Paradis, Colosimo, & Burnand, 2012). The interventions of clinical pharmacists in diabetes care leads to positive health outcomes as seen in improved glycemic control and reduced blood pressure and cholesterol levels (Simpson et al., 2011). Clinical pharmacists also play a key role in the administration of dietary supplements such as Omega-3 fatty acids, vitamin D, and calcium, which have gained considerable attention among patients and health providers (Ishita et al., 2004). Thus, the evaluation of patients’ current diets by clinical pharmacists provides necessary information for their practice. However, it is best if clinical pharmacists have access to easy to use and adapted DA tools. To date, the role of clinical pharmacists in conducting DA itself has not been well investigated and the present study suggests that clinical pharmacists could be interested in adopting new electronic forms for DA. However this topic needs further research.

RDs in PC and other health providers use well-known methods of DA such as usual intake, 24-hour diet recalls and food records (Brauer et al., 2007), but research on specific DA methods in PC dietetic practice has been limited to date. Assessment of diet is actually quite difficult due to wide day to day variation in food intake, the large variety of food products and many challenges in recording. Prior work has attempted to guide non-RD PC practitioners on how to obtain dietary information from their patients using a limited number of questions or FFQs. Recommended questions were somehow similar to the questions discussed in this study by focus groups participants and the evaluation of the usual intake by RDs in the web-based survey (Hark & Deen, 1999; Miller & Greffen, 2005; Paxton, Strycker, Toobert, Ammerman, & Glasgow, 2011). For example, Hark & Deen (1999), recommended 11 questions to routinely ask patients during medical visits. Comparable questions were also found in brief DA tools specifically designed for PC practitioners (Calfas et al, 2002; Gans et al., 2003 & 2006; Little, 1999). If health providers asked these recommended questions, they would spend ten to fifteen minutes doing so, but in reality, as this study found, most DA conducted by non-RDs occurs in only a couple of minutes. Family physicians (FPs) specifically provide dietary advice in one to three minutes (Eaton et al, 2002; Glanz, Lewis, & Rimer, 1997). Therefore, new more efficient methods of DA such as e-DA tools may support and improve practice, these methods can be
particularly more efficient if the DA tool uses validated questionnaires tested with various groups of health professions in PC such as FPs, registered nurses (RN) and nurse practitioners (NPs); this topic needs further investigation.

The Eating Well with Canada’s Food Guide (CFG) is a well-known document produced by Health Canada to guide the Canadian population on the recommended foods and portion sizes that should be eaten to be healthy and avoid the risk of nutrition-related diseases. An interesting finding of the current study was that health providers in general are briefly assessing diets and teaching healthy eating habits simultaneously with the assistance of nutrition-related tools such as the CFG or the Diet Approaches to Stop Hypertension (DASH). Although the frequency of use of the CFG in PC is unknown, it has been documented that the CFG is the second most requested government document in Canada, after income tax forms (Health Canada, 2011). This would suggest that both the public and non-RD health providers are aware of the CFG and are using it to understand healthy eating recommendations. The use of the DASH eating plan in PC settings has successfully led to reduced blood pressure, weight loss, and improved insulin sensitivity in comparison to usual care (Ard et al., 2004; Karanja, Erlinger, Pao-Hwa, Miller, & Bray, 2004). Information regarding the use of popular tools such as the CFG in interdisciplinary care is limited. Future studies should consider methods to maximize the effectiveness of diet assessment and/or teaching by different health professions. CFG is currently the default tool, but may or may not be the most effective way to promote healthy eating in the PC context.

6.1.2. Dietary assessment by the interdisciplinary team: dietitians as experts.

As the movement towards the adoption of healthy eating habits and other related lifestyles continues to grow, the roles that physicians, nurses, and pharmacists play will be interrelated with overlapping responsibilities. The involvement of multiple disciplines in the delivery of patient care has been previously described in interdisciplinary team practice (Barret et al, 2007; Kuppersmith & Weeler, 2002; Jacobson, 2012). Nutritional care is not an exception, and the current study found that participating health providers were working together in a collaborative fashion to provide better care to patients with nutrition-related diseases and its risk factors. Previous reports have found that in team-based care, the demand for nutritional care is high, while the number of RDs in team-based care is still low (Crustolo et al, 2005). Therefore, collaboration to provide nutritional care by other health professionals is common. This is
especially true in chronic disease management where more than one practitioner is frequently needed to help patients manage their conditions to reach the desired health outcomes (Jacobson, 2012). Evidence exists that in team-based PC settings, collaborative care is a common activity where the dietitian, nurse and physician all provide the care, particularly in diabetes management (Barrett et al., 2007; Primary Care Interprofessional Team Toolkit, 2012). Examples of collaborative work in nutrition were found in the current study where two or three health providers were in the same room co-counselling or various team members addressed nutrition-related diseases during group classes. To this end, positive interprofessional collaboration has been found to increase patient and provider satisfaction and patient knowledge and skill, improve glycemic control, and reduce the cost of hospitalizations (Barrett et al, 2007; Jacobson, 2012).

Among team members, the team dietitian was recognized as the “expert” in DA and health providers considered the close physical proximity of RDs in the teams to be an advantage for them. The current study findings mirror those found in two previous studies by Brauer et al. (2007) and Cantwell et al. (2006). Brauer et al. (2007) used a Delphi process to investigate the roles and responsibilities of PC RDs from an interdisciplinary perspective. Participants reached consensus in the following statements: “the dietitian will be the custodian of reliable nutrition resources and materials” and “the dietitian of a team will act as a nutrition resource to various health practitioners.” Cantwell et al. (2006) completed a visioning exercise among RDs and this support role to the team was considered integral to PC practice: “The Registered Dietitian will be well resourced to provide nutrition education and/or services related to prevention, promotion, and treatment, and act as a nutrition resource to the team.” In the current study, the role of RDs as educators for other team members was discussed and was seen as an advantage. Overall, the focus group results supported the vision that interprofessional practice for diet counselling was feasible and was felt to improve patient care. The current work provides an excellent basis for future development of interprofessional diet counselling studies to define “best practices” in team-based care (Barrett et al, 2007; Crustolo et al, 2005; Davidson et al, 2007).

6.1.3. Communicating with team members.

Communicating with other team members electronically through the electronic medical record (EMR) was a central theme of discussion in the majority of focus groups in the current study. Some authors have noted the benefits of using electronic health records in general
nutrition care emphasizing that these technological devices facilitate the storage and access of information (Jenkins et al., 2006; Powers, Burke-March & Evert, 2008), EMRs also offer the opportunity of advanced quality of care due to interdisciplinary interaction, collaborative care and avoiding duplication of effort through consistent documentation of assessment, diagnosis, intervention, and outcomes (Goldman, Meuser, Rogers, Lawrie, & Reeves, 2010; Ragaz, Berk, Ford, & Morgan, 2010). In the current study, participants indicated that the use of EMRs provides an opportunity to share diet information and enhance their knowledge in clinical nutrition, as they can see the RD’s notes. On the other hand, previous studies have identified some disadvantages with the use of EMRs or other electronic forms of communication (SMS) including that computerization in PC can create overload for health providers, limited connectivity with external resources and fear of losing electronic information (Fisher & Dickinson, 2011). Nonetheless, negative comments about the use of EMRs in nutritional care were not reported in the current study. Instead, more innovative forms of communication among team members were discussed, such as using quick instant messages (IMs) or frozen notes created as reminders. The percentage of health providers using EMRs in FHTs is growing and all focus group participants were working with the EMR system. This finding is congruent with AFHTO that indicated 79% of FHTs are using EMRs at their clinics (AFTHO, personal communication, June 14, 2013). Thus, there is an ongoing need to create electronic tools that have the option to connect information through EMRs, one example is e-DA tool, flexible enough to match the needs of both health providers, patients and the overall health organization.
6.2. Use of e-DA Tools in FHTs


Information with respect to the use of commercial and non-commercial e-DA tools in PC is still limited (Burke, 2011; Lieffers & Hanning 2012; Probst & Tapsell, 2012). Similar studies evaluating facilitators, barriers, and recommendations of new e-DA tools in web-based computers and mobile phone applications from an interdisciplinary perspective were not identified, and to the author’s knowledge, this is the first study investigating this topic. Some data exist from a series of studies comparing the use of the well-known Weight Watchers program in overweight and obese patients attending PC settings in Australia, Germany, and U.K. to usual care (Jebb, 2012; Jolly, 2011). Participants in the Weight Watchers program were encouraged to self-monitor diet with the Weight Watchers mobile app. At one year, the Weight Watchers group had a statistically significantly greater weight loss and greater reduction of waist circumference and fat mass than the group that received usual care. It was reported in a post-evaluation study, sending patients to the Weight Watchers program was cost effective, as calculated by the cost per kilogram of weight loss (Fuller et al., 2013). However, it is very likely that this success may be attributed to the multi-intervention strategies, for example, the evaluation of patients’ stages of behavioural change, goal setting, peer support, and progress, which patients received in combination with self-monitoring of diet. Thus, the use of e-DA tools in PC in combination with other tools and interventions could have positive results on patients’ health.

Not surprisingly, the current study showed that RDs had significantly higher awareness and use of e-DA tools compared to non-RD health providers, independent of age. The author of the current study went further to investigate the types of e-DA tools that health providers were using, and found that RDs stated that eaTracker, a web-based tool; MyFitnessPal, a web and mobile app; and the Food Prodigy from ESHA research, a web-based tool, were among the most common. Nonetheless, the use of e-DA tools by RDs and non-RDs was still reportedly low. The reason for this finding can be explained by the lack of adaptability of these tools to clinical practice. For instance, the Food Prodigy from ESHA research (ESHA research, 2013) is a well known as web-based nutrient analysis software that is commonly used in research studies to calculate dietary intake (Vance et al., 2009; Forbes et al., 2009). The analysis of results can be
seen online by health providers by entering the ESHA research webpage, but cannot be sent and kept electronically by EMR or web-portal methods. In order to obtain electronic copies of e-DA findings, nutrient analysis results have to be transported to an Excel spreadsheet, scanned, and saved in online format. Obviously, performing this series of activities is time consuming and may discourage any busy PC health provider. In comparison, eaTracker is a cost-free, web-based tool created by Dietitians of Canada (eaTracker, 2013). In eaTracker, foods eaten are entered in a nutrient analysis database and this information is compared to the person’s recommended dietary intake for age and gender according to CFG. Users can sign up to have a registered dietitian “coach” them to achieve their goal. eaTracker use is widely recommended by Dietitians of Canada. However, the current study found that its use in PC remains low, perhaps due to the following: its limited functionality as there is no option to send results online; the mobile app option is said to be available on the website (http://www.eatracker.ca), but is still in development; and the number of options in the food database is limited in comparison to other e-DA app tools. The limited number of foods in electronic database may decrease the overall accuracy of the DA and create a feeling of frustration for users who may consequently decide to switch to a more user-friendly and complete e-DA tool (Weight Matters, 2007).

According to the current study, users of e-DA tools are looking for highly accessible tools, free of cost to very low cost, that can be adapted to both web-based and mobile devices and with large food databases including mixed dishes, homemade or purchased from brand-name restaurants and fast food chains. Some examples of e-DA tools discussed in this study include MyfitnessPal (http://www.myfitnesspal.com) and SparkPeople (http://www.sparkpeople.com). While these e-DA tools were not intended for PC use, they have the general advantages of e-DA tools stated above, as well as the option of “peer support” by adding friends who are then able to see users’ food records and participate in blogs and/or chat rooms. In a systematic review, Brouwer et al. (2011) concluded that online peer support with friends or health professionals is an important element for the success of health promotion interventions delivered over the Internet. Therefore, the development of user-friendly and updated instruments that satisfy the needs of users is especially important in providing good care management.

The use of e-DA tools has just started to flourish in PC settings. In the course of this study, two Ontario-based FHTs were identified where RDs are recommending that their patients track their diet and physical activity with e-DA tools (Prime Care Family Health Team, 2012; Guelph
Family Health Team, 2012). Others may exist, but formal surveys have not been done. It is expected that more FHTs will advise the use of these tools as they become better known and are adapted to suit the needs of health providers in PC. Both of these FHTs noted that there is a high level of interest by health providers in using e-DA tools, particularly in the management of excess weight and obesity, cardiovascular disease, mood disorders, and other diseases such as inflammatory conditions including arthritis. The findings of the current study support those of other studies focused on interdisciplinary clinical practice, which found that, for some patients, the use of technological devices is seen as an opportunity to be informed and supported outside of a health organization (Brouwer, 2011; Powers et al, 2008). Since many patients are interested in using e-DA tools and may seek their health providers’ advice on which e-DA tools they would recommend, health providers must be familiar with these tools and their use. Additional studies of the use of e-DA and their impact on medical care are needed (Lieffers & Hanning, 2012).

### 6.2.2. Helping patients to adopt healthy eating habits with e-DA tools.

Self-monitoring of diet, self-education and motivation to adopt healthy eating habits were identified as three main benefits of using e-DA tools in FHTs. Behavioural self-monitoring has been identified as one of the first and foremost elements in behavioural change theories and adult education principles, in particular, the Cognitive Behavioural Theory (CBT), the Transtheoretical Model and the Social Cognitive Theory (SCT) (Spahn et al., 2010). For instance, the SCT introduces the construct of self-efficacy, which refers to “beliefs in one's capabilities to organize and execute the courses of action required” (Bandura, 1998). In the SCT, the importance of self-monitoring is that it encourages people to pay attention to their own actions, the conditions under which they occur, and its consequences in the short and long term. According to this theory, perceived self-efficacy and motivational support are bi-directional; with increases in either the other is also improved. The involvement of a health professional is highly recommended to support skill development, goal setting, reinforcement, and feedback, and to promote increased motivation for dietary change (Spahn et al., 2010). In this context, e-DA tools can facilitate self-monitoring of diet, patient skill development, goal setting, and motivation, and can lead to increased awareness of general key terms and concepts of nutrition and specific information about the nutritional value of the foods they consume, as well as their own eating habits. To this end, it would be expected that patients become empowered to make relevant and more educated decisions regarding the quantity and quality of food they consume.
Interdisciplinary team-based models are becoming increasingly interested in using electronic tools as a method to support collaborative care and patient self-management education, as seen in the well-known Chronic Care Model (CCM) by Wagner (Bodenheimer et al., 2002; Bodenheimer, 2003; E-health Ontario, 2010; Siminerio, 2010). Collaborative care and self-management education refers to increasing patient confidence and placing the responsibility of one’s health on oneself with the provision of a patient-provider partnership. This collaboration is particularly valuable in chronic disease management (Bodenheimer, 2003; Lyles, 2011; Taylor, Shaw, Dale, & French, 2011). Consistent results were found in a qualitative study investigating the attitudes of patients and health providers who accessed a secure password-protected website using a mobile phone in an effort to monitor patients’ heart failure (Seto et al., 2010). Patients and providers identified that the mobile app supported self-care, and increased patient motivation, assurance and accountability, since they felt more closely watched by their health providers. One patient expressed: “You learn about your foods and your exercise, smoking, drinking…this would kind of give you motivation …it's almost like a trainer” (Table 3. Perceived benefits by patients and clinicians). In this regard, e-DA tools could support collaborative care and self-management education by having more actively involved patients because, as our study found, these tools could help to initiate and facilitate nutrition-related conversations between patients and their health providers; help to identify nutrition-related issues and goals; and perhaps even increase patients’ confidence and capacity to make dietary changes.

The use of e-DA tools as instruments to improve the health of those with nutrition-related diseases is still under examination. The majority of studies looking at self-monitoring of diet with e-DA tools have included web-based software or mobile devices using PDA instruments. The new generation of mobile devices includes mobile phones such as BlackBerry, Smartphones, Androids and tablets, such as iPads. These devices contain multimedia capabilities including telephone, Short Message Service (SMS), photos, music, and video. Besides being portable, they are small, lightweight, and highly popular worldwide (Free et al., 2013). Hence, it is expected that these devices will become one of the most popular ways to communicate with patients and deliver care including health promotion and disease prevention activities.

Today, the available literature supports the idea that when e-DA tools are used for self-monitoring purposes, the acceptability, convenience, and user satisfaction are superior to that found when using paper records (PRs). This is especially consistent in overweight/obese
individuals participating in weight loss programs and those with Type 2 diabetes or food allergies (Beasley et al., 2005, Beasley 2007; Bergamin, 2007; Burke et al., 2011 & 2012; Fukuo, 2009; Probst et al., 2008; Probst and Tapsel, 2007; Turnin et al., 1992; Wang et al., 2006; Yon et al., 2006). e-DA tools in mobile phones are trendy and are convenient, due to their high accessibility almost anytime and anywhere and relative ease of use, as portion sizes and foods can be chosen with the aid of high resolution pictures. Their capacity to access large food databases and provision of real-time detailed nutrient analysis summarized in easy to understand diagrams and tables; all within in a private environment, further enhances their appeal. All of these features will likely increase user satisfaction and improve food memory capacity; patients report that they want to continue using e-DA tools because they are socially accepted and less burdensome than PRs. The above stated benefits have been identified by adolescents (Cushing et al, 2011), seemingly healthy individuals (Lieffers & Hanning, 2012), overweight/obese individuals (Burke et al, 2009 & 2011; Carter et al., 2013) and those with diabetes (Probst et al., 2008 & Probst & Tapsell, 2012; Rollo et al., 2011). Studies testing e-DA tools in web-based and mobile devices, predominantly in PDAs, are heterogeneous, but, in general, it has been reported that in comparison to PR users, e-DA tool users have significantly increased adherence to dietary self-monitoring, decrease of waist circumference, body fat decreased and body weight that could be explained to a decrease in dietary intake of total energy, energy from fat, and saturated fat (Burke et al., 2009 & 2011; Carter et al., 2013; Lieffers & Hanning, 2012). In a recent published RCT (Carter et al, 2013), a Smartphone DA app was compared with a web-based DA tool and PR in overweight volunteers. At six months, self-monitoring adherence, weight loss, and a decrease in body fat were statistically significant in the Smartphone group. The mean weight change at 6 months was -4.6 kg (95% CI –6.2 to –3.0) in the Smartphone app group, –2.9 kg (95% CI –4.7 to –1.1) in the diary group, and –1.3 kg (95% CI –2.7 to 0.1) in the website group. Feedback by text message, goal setting and physical activity self-monitoring were provided in the Smartphone group only. Thus, it was difficult to evaluate if it was the self-monitoring with the Smartphone that caused the final outcomes or if it was the combination of other related interventions (e.g., feedback and goal setting). In general, mobile and web-based e-DA tools have reported correlations that run from moderate to good when compared with dietitian’s interviews, three day PRs, and various 24-hour-recalls (Lieffers & Hanning, 2012). Dietary self-monitoring seems to decline over time, especially after a three-week period. However, compared
to PR, dietary self-monitoring adherence decreases less in those who are using e-DA tools (Burke, 2011).

However, results obtained from studies evaluating the use of e-DA tools are not always consistent. For example, in the study by Yon et al. (2006), no difference was found in self-monitoring adherence between the group using e-DA tools and that using PR. In an RCT by Shay et al. (2009), no difference was found in individuals’ weight loss in those using web-based e-DA, PDA diaries, and PRs. Thus, the researchers concluded that it was the adherence of self-monitoring of diet itself the one responsible for the weight loss (Kukunaga, 2007). One explanation to this result was that participants were not using their preferred DA method to self-monitor diet.

Interestingly, age and previous experience with e-DA tools have not been found to be associated with self-monitoring adherence (Lieffers & Hanning, 2012; Probst & Tapsell, 2007). This is congruent with the results of the current focus group study, namely that health providers stated that other factors such as acceptability and comfort with technology would be more related to patient use of e-DA tools rather than age.

**6.2.3. Barriers of e-DA tools use for patients.**

Participants in the current focus group study discussed the many barriers that their patients could encounter by using e-DA tools. The majority of these barriers have been previously identified in independent research and systematic review (Burke, 2011; Lieffers & Hanning, 2012; Probst & Tapsell, 2012; Slattery et al, 2008). The most remarkable limitations in conducting DA for healthy individuals or PC patients and dietary self-monitoring by this population include the following: insufficient time; poor motivation; difficulty in estimating usual portion sizes; mistakes in reporting mixed dishes; omissions of foods and supplements from report; and conscious or unconscious underreporting and/or over reporting of dietary intake particularly in women, obese people, and those with low levels of education. It has been estimated that over 20 % of the population underreport energy intake in commonly used DA methods, for example, 24-hour recalls, FFQs, or food diaries.

Electronic forms of data entry are a potential means of overcoming the challenges of traditional paper-based DA methods. One initiative to increase DA accuracy is the use of mobile cameras with digital photography that electronically estimates portion sizes without food
recording. Nonetheless, use of these instruments is still at the preliminary stage, as these devices only been tested under well controlled research environments with young participants (Sun et al, 2010; Williamson et al., 2003; Weiss, Stumbo, & Divakaran, 2010). Photographs are already being used by some RDs to assess overall meal patterns as expressed in a focus group, but their use has not been formally studied.

In addition to limited research, another difficulty with the use of e-DA tools in PC could be the inappropriate use that perpetuates negative health behaviours, such as extreme calorie counting in individuals with eating disorders. Although diet self-monitoring is part of the management of some eating disorders (Hildebrand & Latner, 2006), there is a possibility to create an obsession with tracking food and their health condition could be aggravated. Thus, in certain individuals, cautious consideration is needed before recommending their use.

The difficulty that patients experience in disclosing dietary information, either consciously or unconsciously, for DA has been previously described (Gibson, 2005; Coulston et al, 2001). According to participants of the current study this is a process that takes “time and effort” and “takes a lot of probing” from health providers. One important reason for the difficulties seen in obtaining accurate nutrition-related information from patients is their perceived or real stigmatization, which can create a sense of denial of a problem and can consequently lead to decreased patient motivation for DA or dietary self-monitoring. In a systematic review of interventions delivered through the internet (Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006) it was found that electronic systems offered privacy and a reduction of stigmatization, especially in those with chronic conditions such as mental illness, diabetes, and women with eating disorders, who often feel judged, even by health providers, because of their condition. These conditions are all nutrition-related and are often seen in PC (Khan, McIntosh, Sanmartin, Watson, & Leeb, 2008). Furthermore, in a systematic review and meta-analysis (Free et al., 2013) of chronic disease management, mobile interventions were found to be one of the preferred models of communication for patients, and are recommended to increase data collection, increase self-efficacy of health-related behaviours, including diet, and improve overall disease management. In the current study, RDs described that only about one quarter of patients ever return their dietary PRs. If the reason for this is a lack of privacy, a secure password protected e-DA tool could solve this problem by offering a mechanism to increase patient
privacy of information. In this case, patients may feel less stigmatized and more motivated to reveal accurate dietary information. Participants in the current study also noted that e-DA can be used as a discriminatory instrument to evaluate patient motivation to adopt healthy eating habits or not. However, further research is required in this area.

6.2.4. Support of health providers with e-DA tools.

Improving the quality and quantity of dietary information obtained during DAs and improving the efficiency of health providers’ time were two main aspects identified as facilitators of the use of e-DA tools. In line with previous studies, the current study found that e-DA tools could provide more detailed information about dietary intake than standard clinical methods. For instance, health providers can obtain real time results as these e-DA tools automatically calculate nutrient contents of diets and some e-DA tools present food recommendations in summary tables with optional colourful graphics (Burke et al., 2005; Kolhemeir, 1997; ESHA research, 2013; eaTracker, 2013). The quantity and quality of food entries for nutrient analysis is improved with a large food database that contains homemade and prepared foods from large restaurants and common fast food chains. As well, it is less likely to have missing data when e-DA tools are used since many of them include immediate checks for incomplete responses and clear portion sizes displayed in food photographs. There is also a decrease in interview bias with the use of e-DA tools due to the ability to directly report food without the need for a health practitioner to be present to complete the DA (Boushey et al., 2009; Kolhemeir, 1997; Moshfegh et al., 2008; Probst & Tapsell, 2005; Probst et al, 2008; Wong et al., 2008). In a qualitative study using mobile phones in patients with heart failure (Seto, 2010), health providers identified the benefits in clinical care that the e-DA tool offered, including the ability to obtain more and better information on salt and fluid intakes from patients than without e-DA tools. Health providers used the information obtained by the mobile app to make more accurate clinical decisions, such as identifying when patients needed help. Thus, it is very likely that with the benefits outlined above, e-DA tools could assist health professionals in FHTs with the identification, interpretation, and discussion of patients’ dietary intakes and patterns during clinical visits.

In two literature reviews aiming to investigate Internet-based interventions in PC to deliver health promotion and weight management (Brouwer, 2011; Butryn, webb, & Wadden, 2011)
health provider support was crucial for adopting healthier lifestyles including diet and weight management. Support from health providers and peer support, for example, forums and chat rooms, were both related to a longer duration of website use, whereas offering feedback by contacting patients by phone or email was related to a higher frequency of website log-ins. In an independent study by Tate et al. (2006), obese patients that received health provider feedback and support significantly increased the submission of electronic dietary reports. Also, in a mixed methods study with both survey and focus groups (Gorton et al., 2011), participants expressed that they wanted regular feedback and encouragement from PC providers when delivering weight loss intervention through mobile phones. Hence, by having an improved quality and quantity of information, providers are able to provide their patients with effective, tailored feedback quickly. This, in turn, results in timely identification of dietary patterns and increased effectiveness of nutrition-related interventions, giving health providers the opportunity to better adjust patient care.

In the current study, the time advantages of the assistance of e-DA tools in conducting DA was identified, especially for RDs and nurse educators. In a study published by Probst et al. (2008) with Type 2 diabetes patients and another by Probst & Tapsell (2012) in which a RCT was done involving patients with at least one or more characteristics of metabolic syndrome, the usability of a web-based DA tool was investigated. The study concluded that RDs spent less time on DA and more time on diet education and counselling when they used e-DA tools. This finding supports that of Weiner (2012) which identified that electronic communication in the health context can serve as a “triage process” between the patient and the delivery of care that can be utilized before the direct patient-doctor encounter, allowing health providers the advantage of extra time to prepare for the clinical visit in advance. Free et al. (2013) identified that the use of mobile technology systems could benefit health providers by becoming better informed of their patients’ health and concerns, as patients can send images, SMS text messages, as well as more detailed information about their condition. As well, health providers can send patients reminders and results using e-DAs. Mobile technology is currently used to support assessment, screening, management, and treatment of many health conditions. In this context, e-DA tools can be used before the first visit with the dietitian, nurse educator, RN, NP and FPs if required, or before subsequent visits to monitor dietary changes in a more time efficient manner.
6.2.5. Barriers of e-DA tools use for health providers.

The limitations for health providers in the use of e-DA tools have been previously described and include the following: the training time required for providers to learn how to access and use e-DA, and interpret its results; the lack of time to properly explain to patients how to use e-DA tools and offer patients advice; and compensation for the time spent providing dietary advice or counselling (Boushey-Keer 2009; Ammerman et al, 2002; Probst & Tapsell, 2012). It has been reported, however, that training and continuous support to health providers are key elements to increasing the knowledge, skills, and confidence of technological device users and these elements are suggested to have positive influences in the perception and acceptance of the use of IT in clinical environments (Holden & Karsh, 2010). Furthermore, in the qualitative study by Seto (2010), the security and confidentiality of patient information was of concern for providers, as well as the medico-legal implications of using mobile devices. For example, in some cases health providers do not respond to patients when they were contacted by the electronic tool, leading to a possible deterioration of patients’ health. At present, the issue of medico-legal implications of using mobile devices warrants future investigation.

6.2.6. Integration of e-DA tools into FHTs.

In the area of knowledge translation and IT, the literature highlights the importance of understanding the needs and current practices of potential users. The innovation must be easily accessible, must suit health providers’ day-to-day practice, and must provide a certain level of comfort when it is used in order to increase its successful implementation (Ganesh, 2004; Hayward, 2004; Holroyd et al., 2007; Powers et al, 2008; Straus et al., 2009). Likewise, in a systematic review and evaluation of web-based tools for the management of diabetes and cardiovascular risk (Yu et al., 2011), the main factors that affected the adoption of web-based tools in clinical practice were clinical usefulness, usability, and sustainability. By definition, a useful electronic tool is one that provides practical solutions and is easy to access and read. In this regard, participants of the current study’s focus groups stated that they would recommend a particular e-DA tool if it was user-friendly, easily accessible, free of cost, and if it guided patients to complete DAs electronically with little or no assistance from the health provider. Usability is defined as the extent to which a tool can be used to complete a specific task successfully, with high user satisfaction. Regarding usability of e-DA tools, patient and health
provider satisfaction are equally important. Participants of the current study noted that e-DA tools must incorporate a variety of interactive options to help them to deliver more tailored dietary advice according the characteristics of the FHT organization, provider preferences and patient needs. Some of these options include the following: having the ability to include patient’s e-DA results into EMRs or in a web-portal; being available in both web-based and mobile format; having the ability to recommend a basic or detailed DA to patients; having different DAs for adults and children; and having the ability to tailor feedback to specific issues or behaviours. For example, one provider wanted to hide caloric intake from patients, for example, from those with eating disorders. While such an approach would not be recommended, designing different approaches for those with a tendency to obsessive recording would be an important feature to consider in design. To increase the usability of e-DA tools, the use of “tutorial” and “help” buttons, text enlargement options, spelling aids, free-text option boxes, “copy-paste” features, and navigation bars have also been recommended (Slattery et al., 2008).

The results of a literature review by Yu et al. (2011) and a systematic review by El-Gayar, Timsina, Nawar, & Eid, (2013) evaluating the use of mobile applications for self-management of diabetes have stressed that to increase usability applications, the information should be updated, interactive, offer feedback, and provide the option of peer support. The common errors of web-based tools for diabetes management were related to navigation issues and limited visual elements. Thus, to increase the usefulness and usability of e-tools in PC, they should not only be evaluated quantitatively, but also qualitatively with usability testing, and incorporating the differing disciplinary perspectives of health providers, patients, health administrators, and experts in informatics (Probst & Tapsell, 2007; Weiner, 2012; Holden & Kash, 2010). Lastly, sustainability is defined as the degree to which an innovation continues to be used until secure adoption is complete (Yu et al., 2011). Electronic DA from CD-ROM disks have been available for many years, but has been too complex and time-consuming to be routinely used. However, newer e-DA tools have definite advantages. Since they have only been used for PC purposes for a short time, sustainability of these tools has not been evaluated to date and further research is needed in this area.

Previous studies using e-DA tools to self-monitor participants’ diets have also used a more comprehensive health behaviour approach by including self-monitoring of other factors including physical activity, body weight, water consumption, and mood among the most
Congruent with the current study, health providers saw a need for monitoring these factors along with other important information often associated with poor quality diets, for example, sleeping patterns. It is recommended, then, that future developers of e-DA tools for PC use consider incorporating these other lifestyle issues in a whole-person approach.

6.3. Methodological Strengths and Limitations of the Study.

6.3.1. Strengths of the study.

The research design of this study has a number of strengths. Previous qualitative studies in interdisciplinary PC using focus groups have included similar numbers of participants and focus groups to obtain saturation of ideas in health providers (Delva et al, 2008; Sargeant et al, 2008; Xyrichis & Lowton, 2008). In the web-based survey, the response rate was not calculated because investigators didn’t know exactly how many health providers were contacted by EDs. Nonetheless, of the 112 FHTs contacted the number of FHTs represented with at least one respondent was 79%. Since the topic of study (use of e-DA tools) was new, a mixed method sequential design allowed for exploration of ideas and concepts in interdisciplinary focus groups and confirmation of these findings were found with a larger and more diverse group of providers via a survey.

Another methodological advantage of the study was its focus particularly on DA; researchers believe that it is very likely that previous studies investigating nutrition advice and/or nutrition counselling in PC have also included information on aspects of DA, but DA has not been evaluated as a separate topic. Therefore, no comparable studies were found, especially in team-based practice.

One of the major strengths of the study was the inclusion of various disciplines of health providers with similar numbers in both data collection arms; this supports the interdisciplinary perspective of current DA practices and potential use of e-DA tools. In both focus groups and the web-based survey the majority of participants were RDs, followed by FPs, RN, pharmacists and NPs. The interest of these professions in volunteering to participate in our study can be explained by the higher number of these health professions working in FHTs, in comparison to other health
professions e.g., Kinesiologist; their frequent contact with patients suffering from nutrition-related diseases in their practice (Khan et al., 2008; National Physician Survey, 2010); and likely of greatest importance, their personal interest and stake in this topic. While participants were a biased subsample of all providers who are interested in diet, as a first study the use of two diverse methods of data collection added strength to the study and results are highly consistent.

Lincoln & Guba (1985) have suggested the term “trustworthiness” as a criterion for determining validity in qualitative studies. In the current study, reflexivity, credibility and dependability were the major elements used to enhance trustworthiness of this study. My personal reflexivity has been summarized in Chapter 3.

Triangulation is considered to enhance credibility of results in a particular study by diminishing investigator(s) bias or beliefs. The use of different methods of data collection is recommended to address common methodological limitations that may affect the findings of a research study (Shenton, 2004). The current study collected information on use of e-DA tools using focus group interviews and web-based surveys, two accepted forms of data collection for both qualitative and quantitative research paradigms. Credibility of findings can be also supported by the inclusion of various disciplines of health professions working FHTs within different sites, in both of the studies. Debriefing sessions and multiple coders involved me and my PhD thesis supervisor, as well as thesis revisions and suggestions of PhD thesis committee members. These collaborative meetings brought various perspectives and great ideas from the overall initial steps of the project to the final presentation of results. After finishing the first analysis of results of focus group transcripts, three volunteers reviewed and provided feedback on the results of the study with very few changes; thus member checking was achieved, which also supports the credibility of results in focus groups. Lastly, dependability was another strength of the study, as the research design and analysis of the two studies have been described in detail through this document, so that another researcher could repeat the study.

6.3.2. Limitations of the study.

A methodological shortcoming of the study was that both focus group interviews and web-based surveys are types of data collection that solicit the perspectives of participants rather than measuring their actual behaviours around DA. Both methods may not reflect actual current practice and are subject to possible social desirability bias (e.g., health provider personal
perception of frequently offering DA). Direct observation of practice would be a logical method for determining actual DA practice. The opinions of health providers on the use of e-DA tools were collected in both studies, but current DA practices were mostly investigated in the focus group study. Given the diversity of current practices, more work on current DA practices is needed. This was not recognized in the original development of the proposal, and should be the focus of additional studies. Logically, use of e-DA needs to be placed in the context of overall DA, so that its proper use can be developed. Furthermore, this study collected information from health providers only, and the opinions of patients and administrative staff of FHTs as potential users of e-DA tools remains unknown.

The two samples may not reflect the age, gender, and years of experience distribution that is generalizable to other PC locations and health systems. The majority of participants were notably female, less than 45 years old and had worked as health providers for more than 10 years. The majority of RDs in team-based practice in Ontario have previously been reported to be young and female (Walters et al., 2009; Royall and Brauer, 2009). Thus, results need to be considered in context.

Another limitation of the study was participant bias, as participants who agreed to participate in the study did so because they were likely interested in DA and/or use of e-DA tools. This is a common limitation of focus groups and those who take the time to complete surveys (Trochim, & Donnelly, 2007). One example was the identification of low proportion of RDs reporting that patients do not use e-DA tools to track their diets. The use of a different question(s) would be desirable to better understand this topic. While efforts were made to include as many participants as possible in the web-based survey, a relatively small sample size was obtained, which was largely made up of <35 year old RDs (38%). Challenges in soliciting broader interest among the provider community are shared across many topics, in spite of efforts to limit the length of the survey and seek advice on best approaches and market the survey.

In addition, the majority of FHTs included in both studies were from urban areas of the province. The extent to which limited access to specialized personnel exists in rural areas, such as RDs, is unknown, but thought to be relatively high (Witt et al, 2006). It is likely that needs and opinions may differ in rural areas, especially where Internet access is limited or slow.
6.4. Recommendations for Future Research

The use of e-DA tools in team-based practice is a relatively new topic under investigation. The OMRU framework is part of the KT models recommended to facilitate the process of implementing an innovation into clinical practice. (Logan et al., 1999; Graham & Logan, 2004). The three major components that comprise this framework are the Assessment of barriers and support of the innovation, Monitoring and Evaluation of outcomes (AME) and the present study evaluated the first component of the OMRU framework to understand the potential facilitators and limitations of the use of e-DA tools in FHTs. Two more components constitute the assessment of barriers and support of the OMRU framework such as the assessment of evidence-based innovation and practice environment. Hence, researchers interested in this field could evaluate the practice environment component by including the opinions of patients and administrative staff on the use of e-DA tools during pilot test studies as well as the evaluation of structural factors of the organization such as rules and regulations of use of e-DA tools in FHTs. These research initiatives could seek funding from Dietitians of Canada, College of Physicians and Surgeons, private IT companies or FHT organization(s).

Although the present study didn’t investigate the practice environment element, this section was unintentionally explored during interdisciplinary focus groups. For example, RDs of the FHT were considered as experts in DA and their decision to adopt, or not, an e-DA tools in team-based practice would have a direct impact on the efforts of promoting use of e-DA tools. Thus, as recommended by Greenhalgh et al, (2004) efforts should be made to target groups of most interested “potential adopters” for further research such as the monitoring and evaluation of outcomes with e-DA tools as well as diffusion, dissemination, implementation of this initiative in PC.

The evidence-based innovation of the OMRU framework is another opportunity for research in this area. New or adapted DA tools for PC use can be designed and evaluated according to its attributes. Based on Rogers (1995), the authors of the OMRU framework recommend the evaluation of certain attributes that would affect positively or negatively the adoption of the innovation, in this case the e-DA tool, and include: the complexity of using an e-DA tool in clinical environments by health providers and patients; compatibility of the e-DA tool with current EMR or other IT systems currently in use by FHTs; trialability of the innovation by
conducting pilot-testing studies to evaluate feasibility and desired outcomes with patients, health providers, and/or interested personnel; reinvention, which means that potential adopters could, if necessary, modify and adapt the tool to suit their own needs. According to the literature review conducted by Greenhalgh et al (2004), these attributes had a strong to moderate influence on the decision to adopt an innovation in health service organizations.

Other areas of future research stemming from this project are, for example, the exploration of current DA practices of FHTs in the present study was done through focus groups mostly, since the main focus of the research study was originally dedicated to investigate the use of e-DA tools. Hence, the investigation of current DA practices by different health professions using other methods of data collection such as direct observation and surveys are opportunities for research that would extend and confirm the research findings of the study.

Based on our results, various health professions are currently using nutrition-related tools to deliver current dietary recommendations to their patients at the time that they obtain and assess diet. Thus, to facilitate implementation, future e-DA tool(s) for PC use should incorporate dietary recommendations resulting from their individualized DA assessment. Similarly, new e-DA tools should consider the inclusion of other related lifestyle factors such as physical activity, smoking, and alcohol consumption to provide more holistic advice to patients. New e-DA tools should be flexible to adapt to the needs of health providers (basic versus detailed DA), patients (children versus adults) and the organization (low cost or free tools, incorporation into EMR). Thus, there is an opportunity for future research to adapt e-DA tools to suit the requirements made by health providers in the study and pilot test in FHTs with different health professions (e.g., RDs, RNs, NPs, pharmacist) and environments (e.g., rural and urban areas).

Today, the available literature investigating e-DA tools use in clinical settings has had an especial focus on overweight/obese individuals involved in weight loss programs. Opportunities for research include the use of e-DA tools to support patient-care and self-management as e-DA tools could increase self-awareness, motivation of dietary change and self-monitoring of diet over time. The use of e-DA tools to adopt healthy eating patterns could be investigated in other prevalent diseases such as diabetes, heart disease, food allergies, depression, dyslipidemia and hypertension, as well as for prevention of weight gain and general health promotion in pregnant women, adults and parents with small children identified as fussy eaters. The medico-legal
implications of apps utilized for patient care remain as a topic for further investigation. In addition, there is a need to evaluate the acceptability and feasibility of use of e-DA tools in males, in those different levels of education and income, and different ethnicities. The evaluation of e-DA tools by different ethnicities is especially important for Canada due to its fast-growing multicultural population.

6.5. Conclusions and practical implications

The findings of the present study are novel since no previous study, to our knowledge, has focused on current DA activities and use of e-DA tools from an interdisciplinary PC point of view. The study findings have implications for practice and contribute to the literature in four ways:

a) The individual and interdisciplinary context of DA. It seems that DA in team-based care is a frequent interdisciplinary activity that is not exclusive of RDs only. PC health providers in FHTs offer DA for different purposes, from apparently healthy individuals to part of the management of nutrition-related diseases and its related risk factors. Besides, there is a special interest from many patient subgroups to learn more about their own diet. As this study revealed, health providers obtain patient’s dietary information “individually” and/or as “a team” with more than one health provider involved. DA is commonly offered very briefly, with a few diet-related questions in a more informal manner, whereas RDs solely, use a combination of informal and formal DA methods. This study contributes to the literature, because by recognizing current practices of DA leaders of FHTs, PC organizations, interested researchers and app developers can now develop better strategies to support health provider’s needs in relation to DA, dietary advice and counselling. One idea for practice is to develop a new DA tool(s) or adapt an existing tool that support the need of health providers for rapidly obtaining and summarizing patient’s DA according to current dietary recommendations for that particular individual. Another idea is that due to the high prevalence of chronic conditions in the country and the shortage of RDs within the system (Royall & Brauer, 2009), there is a need to provide continuing education with workshops and e-news letters for interested health providers in relation to how to better conduct DA in PC, the different methods of DA that exist, as well as the existing electronic and non-electronic tools to evaluate diet.
b) **e-DA can benefit providers and patients.** Based on the findings of this study, the overall awareness of new e-DA tools is low in the majority of health providers, except by the group of RDs. However, according to participants, mainly RDs, patients are using e-DA tools to track their diets with eaTracker, a web-based tool and MyFitnessPal, an app for mobile device(s). The benefits of using e-DA tools in FHTs took two directions in the study: benefits for patients and benefits for health providers. For patients, e-DA tools can help them to adopt healthy eating habits by raising awareness of their own diet, increasing motivation for dietary change and facilitating self-monitoring of diet over time. These elements contribute to the current literature, and they are congruent with Cognitive Behavioural Therapy (CBT) concepts of facilitating the adoption of dietary change (Spahn et al., 2010). For providers, e-DA tools could facilitate the evaluation of overall diet and specific nutrients of interest because results from e-DA tools are usually in the form of summary table(s) with colourful graphics. Time effectiveness during consult visits can improve with use of e-DA tools, as providers could obtain dietary record results either prior or during clinical visits in one-on-one interviews or in group classes offered at FHTs, reserving time for educational-related activities. There is also an opportunity to test the benefits of e-DA tools in clinical practice. For example, the utilization of an e-DA tool, or a similar tool, to support better clinical decisions related to diet (e.g., self-monitor salt and fluid intake in patients with heart failure) (Seto et al., 2010).

c) **Overcoming barriers with e-DA tools.** Barriers were divided at the health provider, patient and e-DA tool levels. Some of these challenges were similar to those previously reported in various recent research studies (Burke et al, 2011; Lieffers & Hanning, 2012; Probst & Tapsell, 2012, Slattery et al, 2008). Amongst the most common were the lack of time during clinical visits to address diet, lack of motivation for patients to complete DA and lack of training of providers and patients in how to use e-DA tools. Due to the PC context of the study, this study provides insight into the lack of knowledge about the existence of these tools in health providers working at FHTs, except for the group of RDs, lack of adaptability of e-DA tools to team-based PC and the specific recommendations to make an e-DA tool feasible for health providers working at FHTs.

d) **Practitioners are interested in e-DA as a means of improving care.** Lastly, participants in the web-based survey indicated that they are interested in learning more about new e-DA tools. The vast majority of health providers recognized the value of these tools to be part of the
management of specific health conditions commonly seen at their offices, such as patients who are overweight/obese, have diabetes, heart disease, or as part of the assessment for general health promotion in children and adults, among others. These findings can reflect in general terms the enthusiasm of health providers in PC team-based care to adopt an e-DA tool adapted to their particular needs.

In conclusion, the present study expands on the current knowledge of DA as it reveals that DA is a common activity in FHTs that involves various health professions besides the RD(s) of the team. The methods to obtain dietary information are diverse depending on professional focus and patient’s health concern(s). The use of e-DA tools in PC has just started to flourish, and health providers are interested in using these tools or similar tools in their offices. With the recommendations of participants, e-DA tools can be adapted to an existing tool or a new one can be created. Therefore, there is an excellent opportunity for further research in this area.
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Appendices

Appendix A: The Ottawa Model of Research Use

Appendix B: Sequence of Events During the Focus Groups Interviews

Participants: Family physicians, family registered nurses, PHC nurse practitioners, pharmacists, registered dietitians and other healthcare providers working at FHTs in Ontario.

Moderator: Dr. XXX University of Toronto.

Note taker: C.B. PhD Candidate, University of Guelph.

Introduction:

Good afternoon everyone, we want to thank you for attending this focus group (FG). My name is XXX from University of Toronto and the note taker is Carolina Bonilla, a physician and PhD candidate from the University of Guelph. We are interested in first explore how dietary assessment is carried out in your practice and second we want to hear your thoughts about the use of new electronic dietary assessment tools in your team.

Setting the rules for FG discussion:

1) Please try to not leave the room, unless is extremely necessary.

2) Please try to not interrupt and let participants express their ideas in full and speak one at the time.

3) To better identify you in the transcription of the FG, I will ask you to provide your first name before sharing your opinions, for example I am Marie or you may use your first and last names.

4) We ask that you keep all comments made in this group confidential.

Before starting with the FG discussion, I want you to take a look at the inform consent forms. Please take your time to read the form and please feel free to ask any questions.

After obtaining your consent, I will ask you to fill out a short demographic questionnaire with five questions to have an idea of who is participating in the FGs; it is optional to provide your personal information.
**Part I: Current dietary assessment practices in members of FHTs.**

*Introduction to the topic:* the adoption of healthy diets is an important part in the prevention and/or management of nutrition-related conditions such as diabetes, obesity, high cholesterol and hypertension. Thus, in the context of obtaining dietary information from your patients we (research team) are interested in knowing:

1) *How do you obtain dietary information* from your patients? Probes - For what type of people do you usually assess diet? For what type of diseases or conditions do you do you usually assess diet? E.g., pregnant women, children, diabetes, obesity hypertension, etc?

2) Are there any challenges or current gaps in obtaining such information? Are you somehow sharing any dietary-related information in your team by using the patient’s electronic medical record? E.g. Sharing that diabetic patient regularly skips meals and does not consume fibre, etc.

**Part II. New electronic dietary assessment (e-DA) tools.**

*Introduction:* - Electronic Dietary Assessment Tools use information technology (IT) to self-monitor dietary related information. There are currently three new main groups of tools to assess diet electronically, these are: web-based dietary assessment tools or also called computer-assisted tools; personal digital assistants (PDAs) and new mobile devices such as apps for iPhone, Blackberry, or Androids. I will pass around the table some examples of e-DA tools. (CB passes the copies around the table). Please be aware that these are not the only tools to assess diet electronically online, but rather these are the main three examples. Some examples are: A) Software and Websites. - Dietary information can be entered ‘on-line, results could or could not be printed and/or be sent ‘online’ such as ESHA research Food Processor, as software and web-based tool (http://www.esha.com) or eaTracker a web-based tool from Dietitians of Canada (http://www.eatracker.ca). B) Another example of e-DA tools are Personal Digital Assistants (PDAs). And, the third example C) are Mobile Devices in Dietary Assessment Apps.

**Part III. Exploratory questions about the use of electronic-based dietary assessment tools in clinical practices.**

*Introduction:* after looking at the three main examples of new electronic dietary assessment tools, we (researchers) would like to know:
2) Where you aware of the existence of these tools? Which ones? What would be the potential challenges of using a dietary assessment tool in your clinic? What would be the potential benefits of using electronic-based tools to self-monitor the dietary information in your patients? Probes – Can you see any benefits for providing a closer counselling in dietary changes?

3) Do you think there is a need to adopt e-DA tools to improve your practice? How? Any recommendations or ideas you want to add to this topic?

Thank you very much for sharing your thoughts with us today. This interview will be translated verbatim and thematic analysis (a qualitative research method) will be conducted. In case you want to see a copy of the transcriptions and preliminary results, please contact Carolina by e-mail at ibonilla@uoguelph.ca (Carolina will provide her business cards). In addition, in the event that researchers need to clarify anything related to this topic, you will be contacted by e-mail or by phone.

Thank you again,

Bye.
Appendix C: First Email Invitation to Executive Directors and Members of Family Health Teams


Dear Executive Director __________________ (name),

We are requesting your assistance in recruiting FHT providers for an upcoming focus group study, being conducted by a PhD student, Carolina Bonilla, under the supervision of Paula Brauer from the University of Guelph. Paula was on the original FHT Advisory Steering Committee, representing dietitians. The study is being funded by the Primary Health Care System, part of the Applied Health Research Networks of the Ministry of Health and Long-term Care. It has been reviewed by the Research Ethics Board of the University of Guelph. The study participants are the FHT providers. No patients are to be involved.

The study may be of interest to your team as the focus is new forms of diet assessment and the approach is team-based. We have been promoting the study via various listservs, QIIP and AFHTO. The project funds refreshments and the professional moderator. We will organize the session once a team, through the ED, has committed to participation. The FHT will need to communicate with members through reminder, and provide a meeting space. One contact within each FHT to facilitate organization will be preferred. Note that to calculate the number of respondents and non-respondents in the study; we will need to ask you the number of providers by profession in your FHT.

We are kindly asking you to advertise the focus group study among your team members. To facilitate recruitment we have prepared the email below for possible forwarding to the team.

In the following days you will receive a second letter of invitation with more detailed information about the study. If you want to obtain more information about this study please contact researchers directly:
Dear FHT Team,

Dr. Paula Brauer and her PhD student, Carolina Bonilla, from the Department of Family Relations and Applied Nutrition of the University of Guelph are recruiting for a team focus group study to assess interest in new web-based and smart-phone diet assessment tools.

The study consists of a one-time, one-hour interdisciplinary focus group during lunch hour held at the FHT or nearby. At least three different professions (e.g., physician, dietitian, registered nurses, nurse practitioner, pharmacist, health promoter, kinesiologist) must agree to participate to ensure a team discussion.

Refreshments will be provided and a professional moderator with experience in primary care team discussions will conduct the session. Focus groups will be held during the summer 2011.

Please contact Dr. Carolina Bonilla directly at ibonilla@uoguelph.ca if you are interested in participating or have any questions. Provide your profession and name of the FHT to make future arrangements for the meeting.
Xxxx

Executive Director

To contact the researchers:

Paula Brauer PhD, RD
Associate Professor
pbrauer@uoguelph.ca
519-824-4120 x54831
(Please leave message)

Carolina Bonilla MSc, MD
PhD Candidate
jbonilla@uoguelph.ca
519-824-4120 x56174
Appendix D: Second Email: Invitation to Executive Directors and members of Family Health Teams


Dear Executive Director _________________ (name),

You were previously contacted about the above study. We are now following up to see if your FHT may be interested in participating. We appreciate that FHTs get many requests to participate in research, but we hope that the limited time commitment and topic may interest the team. Provider input is critical to ensure development of useful tools to improve lifestyle management in interdisciplinary primary care.

As previously indicated, this research study consists of a one-time one-hour interdisciplinary focus group with a mixed group of health care providers (at least three different healthcare professions). Focus groups will be conducted during the summer 2011 at lunch hour or another agreed time. Refreshments will be provided and a professional moderator with experience in FHTs discussions will conduct the focus groups.

We are kindly asking you to distribute a second letter of invitation among your team members. Members of the FHT will communicate their decision to participate in focus groups directly to Dr. Carolina Bonilla. In the event that more than five members express their interest in participating, Carolina will contacted you to arrange day, time and space for the meeting.

Please note that to calculate the number of respondents and non-respondents in the study; we will need to ask you the number of providers by profession in your FHT.
Thanks for your consideration of this study.

Paula Brauer PhD, RD
Associate Professor
pbrauer@uoguelph.ca
519-824-4120 x54831
(Please leave message).

Carolina Bonilla MSc, MD
PhD Candidate
bonilla@uoguelph.ca
519-824-4120 x56174
Appendix E: Online Invitation for the Quality Improvement and Innovation Partnership (QIIP) Website

Banner at Top of QIIP website. www.qiip.ca Brenda Frasser, Executive Director.

Recruiting Now for Team Focus Groups. New Ways of Assessing Diet. For more information click on the link:

Linked to pdf below.

Department of Family Relations and Applied Nutrition

Diet questions come up frequently in practice. We wish to assess possible interest in new web-based and smart-phone tools by Family Health Team members. Please encourage your team to consider participating.

Official invitations will be sent to Executive Directors of each FHT.

The study consists of:

One-hour focus group discussion during lunch time at the FHT. We will come to your location. Refreshments will be provided and an experienced moderator will guide discussion.

At least three different professions (e.g., physician, dietitian, nurse, nurse practitioner, pharmacist, health promoter, kinesiologist) must agree to participate to ensure a team discussion.

Potentially interested? Please contact co-investigator Dr. Carolina Bonilla at ibonilla@uoguelph.ca to find out more.

Paula Brauer PhD, RD Carolina Bonilla MSc, MD
Associate Professor PhD Candidate
pbrauer@uoguelph.ca ibonilla@uoguelph.ca
519-824-4120 x54831 519-824-4120 x56174
Appendix F: Online Invitation for the Association of Family Health Teams of Ontario (AFHTO) Website

Recruiting Now for Team Focus Groups - New Ways of Assessing Diet

Diet questions come up frequently in practice. Investigators at the University of Guelph, Department of Human Nutrition want to assess possible interest in new web-based, smartphones, and other e-tools by FHT teams. Potentially interested? Please contact researcher Dr. Carolina Bonilla to find out more at ibonilla@uoguelph.ca or 519-824-4120 x56174 (please leave message).
Appendix G: Demographic Questionnaire of Interdisciplinary Focus Groups in Family Health Teams

1) My age (years):
   □ 20-35
   □ 36-45
   □ 46-55
   □ 56-65
   □ >66

2) My gender is:
   □ Male
   □ Female

3) My years in professional practice:
   □ 0-<2 years
   □ >2-5 years
   □ >6-9 years
   □ 10-16 years
   □ 17-<25 years
   □ >25 years

4) My current health profession at the FHT:
   □ Family physician
   □ Pharmacist
   □ Family Registered Nurse
   □ Primary Health Care Nurse Practitioner
   □ Registered Dietitian
   □ Internship (specify) __________
   □ Other: _______________

5) My contact information is (Optional)
   Name:____________________________________________________
E-mail: ______________________________
Phone number: ______________________
Thank you,
Paula Brauer PhD, RD
Associate Professor
pbrauer@uoguelph.ca
519-824-4120 x54831

Carolina Bonilla MSc, MD
PhD Candidate
ibonilla@uoguelph.ca
519-824-4120 x56174
Appendix H: REB Approval of Interdisciplinary Focus Groups

<table>
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<tr>
<th>UNIVERSITY OF GUELPH</th>
<th>RESEARCH ETHICS BOARD</th>
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<td>Certification of Ethical Acceptability of Research Involving Human Participants</td>
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- **APPROVAL PERIOD:** May 2, 2011 to May 2, 2012
- **REB NUMBER:** 11MR014
- **TYPE OF REVIEW:** Delegated Type 1
- **RESPONSIBLE FACULTY:** PAULA BRAUER
- **DEPARTMENT:** Family Relations and Applied Nutrition
- **SPONSOR:** ONT. MIN. OF HEALTH & LONG TERM CARE
- **TITLE OF PROJECT:** Exploring Dietary Assessment Practices and Use of Electronic Based Dietary Assessment Tools in Family Health Team, Ontario.

The members of the University of Guelph Research Ethics Board have examined the protocol which describes the participation of the human subjects in the above-named research project and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. The REB requires that you adhere to the protocol as last reviewed and approved by the REB. The REB must approve any modifications before they can be implemented. If you wish to modify your research project, please complete the Change Request Form. If there is a change in your source of funding, or a previously unfunded project receives funding, you
must report this as a change to the protocol. Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Responsible Faculty, the safety of the participants, and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-council Policy Statement requires that ongoing research be monitored by, at a minimum, a final report and, if the approval period is longer than one year, annual reports. Continued approval is contingent on timely submission of reports.

Membership of the Research Ethics Board: M. Bowring, CME; F. Caldwell, Physician (alt); J. Clark, PoliSci (alt); J. Dwyer, FRAN; M. Dwyer, Legal; D. Dyck, CBS; D. Emslie, Physician; M. Fairburn, Ext.; J. Hacker-Wright, Ethics; G. Holloway; CBS (alt); V. Kanetkar, CME (alt); L. Kuczynski, FRAN (alt); S. Lachapelle, COA; L. Mann, Ext.; J. Minogue, EHS; P. Saunders, Alter. Health Care; S. Singer, COA (alt); L. Son Hing, Psychology; V. Shalla, SOAN (alt); L. Spriet, CBS; L Trick, Chair; T. Turner; SOAN; L. Vallis; CBS (alt).

Approved: Sandra Auld

Date:

Chair, Research Ethics Board
Appendix I: Informed Consent Form for Interdisciplinary Focus Groups

Appendix I: Informed Consent Form for Interdisciplinary Focus Groups


Diet plays an important role in the development of nutrition related diseases. The introduction of technological devices may improve access to and effectiveness of dietary services. Professor Paula Brauer and Dr. Carolina Bonilla (PhD student) from the University of Guelph are conducting this research study to understand providers’ opinions about the use of electronic nutrition assessment tools in an interdisciplinary practice context.

Purpose of the Study

The purpose of the study is to understand nutrition assessment practices and the use of electronic nutrition assessment tools for patients with nutrition-related diseases.

Procedures

A sixty-minute interdisciplinary focus group will be conducted with a moderator. The conversation will be audio-taped.

The following procedures are planned for today:

1. Completion of a short demographic questionnaire (five questions).
2. Discussion about dietary assessment practices in your office.
3. Demonstration of various dietary assessment tools (five minutes).
4. Discussion about potential uses of electronic-based dietary assessment tools.

Audio data will be stored in an encrypted laptop and transcribed by a professional transcribing service to a Word document. After review for accuracy, audiotapes are destroyed. The text will then be analysed. Speakers will only be identified by an ID number according to their health profession on transcripts. Personal contact information including your full name, address and phone number will be kept confidential and separate from the transcripts. We may
need to contact you to confirm information on the transcript, after focus group is finished. Dr. Carolina Bonilla will contact to you by e-mail or telephone.

A hard copy of the transcripts in a CD will be stored securely at MINS B41 University of Guelph Department of Family Relations and Applied Human Nutrition for five 5 years after research publication, at which time it will be destroyed. Thematic analysis (a qualitative method) will be the method to analyze this information.

Possible Risk or Discomfort

This research project does not address personal sensitive topics; however, by participating in focus group discussion people may feel shy or embarrassed to openly provide their opinions. Another possible risk is feeling annoyed or upset as part of the discussion.

Possible Benefits

This is an excellent opportunity to influence the future development of tools that may improve dietary monitoring and management of patients suffering from nutrition-related conditions. It is an opportunity to participate in novel research as a team.

Confidentiality

Every effort will be made to ensure confidentiality of any identifying information that is obtained in connection with this study. Since you will be in a focus group, it is important to ensure confidentiality by refraining from any discussion of who took part or what was said once you leave the focus group. You will not be identified by name in the focus groups discussion. The information obtained from the interview will not be released to any other party for any reason. You have the right to review or edit the transcripts upon request to the investigators via e-mail at ibonilla@uoguelph.ca. The transcripts will be kept confidential and only the researchers will have access to the transcripts. Confidentiality will be assured in the study, but not anonymity.

Participation Withdrawal

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. If you withdraw from participation, it may or may not be possible to exclude comments already made in the focus group from the transcript. Exclusion of such comments will be at the researcher’s discretion.
You may also refuse to answer any questions you don’t want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise that warrant doing so.

Rights of Research Participants

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have questions regarding your rights as a research participant, contact: University of Guelph Research Ethics Coordinator Telephone: (519) 824-4120, ext. 56606, e-mail: sauld@uoguelph.ca. Fax: (519) 821-5236

Signature of Research Participant

I have read the information provided for the study ‘Exploring Dietary Assessment Practices and Use of Electronic-Based Dietary Assessment Tools in Nutrition-related Conditions in Family Health Teams, Ontario’ as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study.

I have been given a copy of this form.

____________________________________  ______________________________
Name of Participant (please print)          Signature/Date

____________________________________  ______________________________
Name of Witness (please print)              Signature/ Date

Investigators:

Paula Brauer PhD, RD
Department of Family Relations
and Applied Nutrition
University of Guelph
50 Stone Road East
Guelph, Ontario N1G2W1
e-mail: pbrauer@uoguelph.ca
519-519-824-4120 Ext 54831
Fax number: 519-766-0691

Carolina Bonilla MD., MSc
Department of Family Relations
and Applied Nutrition
University of Guelph
50 Stone Road East
Guelph, Ontario N1G2W1
e-mail: ibonilla@uoguelph.ca
519-824-4120 Ext 56174 (please leave message.
Fax number: 519-766-0691
## Appendix J: Transcript Conventions

<table>
<thead>
<tr>
<th>Word(s)</th>
<th>Suggested transcript conventions by Green and Thorogood (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use of line numbers in the document</td>
</tr>
<tr>
<td>I</td>
<td>Start new utterance of interviewer</td>
</tr>
<tr>
<td>R</td>
<td>Start of new utterance by respondent</td>
</tr>
<tr>
<td>[?? Time elapsed]</td>
<td>Beginning of utterance by unclear or undecipherable speaker</td>
</tr>
<tr>
<td>[words]</td>
<td>Words in square brackets transcriber guess an unclear word.</td>
</tr>
<tr>
<td>[laugh]</td>
<td>One participant is laughing</td>
</tr>
<tr>
<td>[laughs]</td>
<td>More than one participant in laughing</td>
</tr>
</tbody>
</table>
Appendix K: Second Draft of Codebook: Summary of Comments

a) It was clear that due to the nature of the semi-structure interview of the focus group, descriptive and interpretive data were collected in codebook. Thus, Dr. Keller recommendation was to identify the descriptive interpretive codes.

b) Identify the descriptive codes and place them in a list or table.

c) Identify the interpretive codes and transform them into ‘active coding’.

d) Code the transcripts of remained focus groups (5-11) using the new codebook with descriptive and interpretative thematic codes. Identify any absent codes and add to the codebook. *Finalize the codebook.*

e) Now, with the new codebook re-code the initial FGs 1-6. Send to second analysis (10% of the sample) for reliability purposes and modify accordingly.

f) Identify how codes and sub-codes can go together, identify potential themes, describe, and elaborate a diagram of results. Re-check again and think about how themes are connected; lastly, identify the overarching theme that ties all themes together.
Appendix L: Letter of Invitation Sent by Email to Executive Directors of FHTs
(Web-based survey)

Re: Electronic dietary assessment tools-survey

Dear Executive Director,

As part of our work to improve team nutrition services in FHTs, we are asking your help in advertising the availability of a short online survey on use of new web-based and smart-phone diet assessment tools by team members from different professions. The purpose of the survey is to assess prevalence of use of different approaches. This survey builds on previous focus groups held in the Fall 2011 by the University of Guelph, department of Applied Nutrition.

Your participation in this study is very important to us to obtain interdisciplinary perspectives. We are requesting your assistance in distributing the attached e-mail among physicians, dietitians, nurses, nurse practitioners, pharmacists, health educators and other interested team members.

The web-based survey consists of only 18 questions and it takes about 5 minutes to complete. All information will be confidential and no individual FHT will be identified in any publications, but the number of FHTs who participate will be tracked. Participants are asked to complete the survey only once and to choose the number for their FHT from the drop-down menu.

We ask you send the invitation attached to this e-mail in the next few days, as the survey link will be active only until September 15, 2012.

The link to the survey is: http://www.surveymonkey.com/s/EDATools
If you have any questions or comments regarding the study, don’t hesitate to contact Dr. Carolina Bonilla at ibonilla@uoguelph.ca. The results of the study will be published in a scientific journal and participants can receive an electronic copy of publication.

Yours truly,

Paula Brauer PhD, RD
Associate Professor
pbrauer@uoguelph.ca
519-824-4120 x54831

Carolina Bonilla MSc, MD
PhD Candidate
jbonilla@uoguelph.ca
519-824-4120 x56174
Appendix M: Questions included in the Web-based survey

The following questions were included in the web-based survey:

1) I have read the information provided above and I agree to participate in this study.
2) Please provide the name of your FHT listed in alphabetical order below:
3) My age is between:
4) I am:
5) My total years practicing as healthcare professional are/is:
6) My current health profession at the FHT is (check one):
7) I am a Registered Dietitian or I have one or more Registered Dietitian(s) (RD) working at my FHT:
8) I assess clients/patients diets or eating habits in my practice:
9) I usually obtain dietary or eating habit information from the majority of patients by (Check ALL that apply):
   New Electronic Dietary Assessment (e-DA) Tools refers to the use of web-Based Software (E.g., eaTracker) and/or Apps in Mobile Devices (E.g., MyDietPal, Loseit, Calorie Tracker, etc) in iPhone, Blackberry, Androids, iPad, or tablet computers that can assist in the evaluation of diet.
10) I am currently using one or more new e-DA tools to evaluate at least some of my patients:
11) Some of my patients are using e-DA tools to track their dietary intake:
12) The dietary information is being entered by:
13) I am using at least one of the following web-based tool(s) and/or apps in mobile device(s) to assess the diet or food intake of my patients/clients (Check ALL that apply):
14) My patients/clients are using at least one of the following web-based tool(s) and/or apps in mobile device(s) to assess their diet or food intake (Check ALL that apply):
15) I think that some of the potential benefits of using Electronic Dietary Assessment Tools in my practice are or could be (Check ALL that apply):
16) I think the use of New Electronic Dietary Assessment Tools is or could be valuable in (Check ALL that apply):

17) In my opinion, some barriers to the use of Electronic Dietary Assessment Tools in my practice are (Check ALL that apply):

18) Would you be open to learning more about New Electronic Dietary Assessment Tools?

19) Are there any comments you would like to provide?

Appendix N: Cognitive Interviews

The cognitive interview of the web-based survey was prepared according to the four stages model for survey responses recommended by Wills (Willis, 2005). The model is the following:

1) Comprehension of the question: what does respondent believes the question is about? Assessment of clarity, wording, technical or vague terms about the question asked. For example, what does the term ‘dietary assessment’ mean to you? What are other possible answers that should be included in this question?

2) Retrieval from memory and relevant information: what type of information does the respondent need to recall in answering a particular question? For example, in the dietary assessment question, interviewer can ask: please tell me, how did you arrive at this answer?

3) Judgment and estimation process: how much mental effort the respondent devotes to answer a question. Does he/she keep motivated during the questionnaire? Are there irrelevant questions? Are there sensitive or social desirable issues in the questions?

4) Response process: can the respondent formulate a concrete answer given the format provided by the interviewer? And if not, explore what else is needed? For example, in this question you look a little unsure. Can you tell me why?

The discussion and analysis of the cognitive interviews was documented in writing and digitally recorded by the interviewer (CB). Modifications of the questions were made accordingly.
Appendix O: REB Approval of Web-based survey

UNIVERSITY OF GUELPH

RESEARCH ETHICS BOARD
Certification of Ethical Acceptability of Research Involving Human Participants

APPROVAL PERIOD: June 18, 2012 to June 18, 2013
REB NUMBER: 11MY010
TYPE OF REVIEW: Delegated Type 1
RESPONSIBLE FACULTY: PAULA BRAUER
DEPARTMENT: Family Relations and Applied Nutrition
SPONSOR: ONT. MIN. OF HEALTH & LONG TERM CARE


The members of the University of Guelph Research Ethics Board have examined the protocol which describes the participation of the human subjects in the above-named research project and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement.

The REB requires that you adhere to the protocol as last reviewed and approved by the REB. The REB must approve any modifications before they can be implemented. If you wish to modify your research project, please complete the Change Request Form. If there is a change in your source of funding, or a previously unfunded project receives funding, you must report this as a change to the protocol.
Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Responsible Faculty, the safety of the participants, and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-council Policy Statement requires that ongoing research be monitored by, at a minimum, a final report and, if the approval period is longer than one year, annual reports. Continued approval is contingent on timely submission of reports.

Membership of the Research Ethics Board: B. Beresford, Ext.; F. Caldwell, Physician; C. Carstairs, COA; S. Chuang, FRAN (alt); K. Cooley, Alt. Health Care; J. Clark, PoliSci (alt); J. Devlin, OAC; J. Dwyer, FRAN; M. Dwyer, Legal; D. Dyck, CBS; D. Emslie, Physician (alt); B. Ferguson, CME (alt); H. Gilmour, Legal (alt); J. Goertz, CME; B. Gottlieb, Psychology; S. Henson, OAC (alt); G. Holloway, CBS (alt); L. Kuczynski, Chair; S. McEwen, OVC (alt); J. Minogue, EHS; I. Newby-Clark, Psychology (alt); A. Papadopoulos, OVC; B. Power, Ext.; L. Robinson, CBS; V. Shalla, SOAN (alt); J. Srbely, CBS (alt); T. Turner, SOAN; K. Wendling, Ethics.

Approved: Date: ________________ Chair, Research Ethics Board
Table P1. Web-based survey: frequency of DA use in non-RD health providers by age.

<table>
<thead>
<tr>
<th>I assess diet</th>
<th>Daily or almost every daily</th>
<th>3–4 times/week or less</th>
<th>I Almost Never/Never Conduct DAs</th>
<th>Grand Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55 (47)</td>
<td>54 (46)</td>
<td>9 (7)</td>
<td>118 (100)</td>
</tr>
<tr>
<td>Family Physician</td>
<td>21 (38)</td>
<td>11 (20)</td>
<td>2 (22)</td>
<td>33 (28)</td>
</tr>
<tr>
<td>Registered Nurse</td>
<td>13 (24)</td>
<td>16 (30)</td>
<td>2 (22)</td>
<td>31 (26)</td>
</tr>
<tr>
<td>Nurse Practitioner</td>
<td>14 (25)</td>
<td>6 (11)</td>
<td>0 (0)</td>
<td>20 (17)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>4 (7)</td>
<td>7 (13)</td>
<td>0 (0)</td>
<td>11 (9)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>3 (5)</td>
<td>4 (7)</td>
<td>1 (11)</td>
<td>8 (7)</td>
</tr>
<tr>
<td>Registered Practical Nurse</td>
<td>0 (0)</td>
<td>4 (7)</td>
<td>2 (22)</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Registered Nurse working in Health Education</td>
<td>4 (7)</td>
<td>1 (2)</td>
<td>1 (11)</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Medical Resident</td>
<td>0 (0)</td>
<td>1 (2)</td>
<td>0 (0)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Physician Assistant</td>
<td>1 (2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Mental counselor</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (11)</td>
<td>1 (0.5)</td>
</tr>
</tbody>
</table>

Note. Percentage (%) is within age and health provider group.
Table P2. Frequency of DA in non-RDs with and without RD in FHTs.

<table>
<thead>
<tr>
<th>Assess Patients’ Eating Habits in My Practice and Not have RD</th>
<th>No, the FHT does not have RD 20 (17)</th>
<th>Yes, the FHT do have RDs 96 (81)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day (or almost every day)</td>
<td>9 (45)</td>
<td>46 (48)</td>
</tr>
<tr>
<td>3–4 times/week</td>
<td>6 (30)</td>
<td>25 (26)</td>
</tr>
<tr>
<td>1–2 times/week</td>
<td>0 (0)</td>
<td>11 (11)</td>
</tr>
<tr>
<td>1–3 times/month</td>
<td>2 (10)</td>
<td>4 (6)</td>
</tr>
<tr>
<td>&lt;1 time/month</td>
<td>0 (0)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>I almost never assess diets</td>
<td>0 (0)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>I don’t assess diets</td>
<td>3 (15)</td>
<td>2 (2)</td>
</tr>
</tbody>
</table>
Table P3. DA methods in non-RDs with and without RDs in FHT.

<table>
<thead>
<tr>
<th>Dietary Assessment Method</th>
<th>No, the FHT does not have RDs 20 (10)</th>
<th>Yes, the FHT do have RDs 96 (81)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asking a few pointed questions such as what they eat, what time(s) they eat, etc.</td>
<td>16 (80)</td>
<td>73 (75)</td>
</tr>
<tr>
<td>Asking their usual intake such as what do they usually eat for breakfast, lunch, dinner, times, amounts and/or food brands</td>
<td>11 (55)</td>
<td>42 (43)</td>
</tr>
<tr>
<td>Having patients write down what they eat for a few days (food record)</td>
<td>9 (45)</td>
<td>13 (13)</td>
</tr>
<tr>
<td>Conducting a mix of food records, 24-hour recall and detailed usual intake (diet history)</td>
<td>3 (15)</td>
<td>8 (8)</td>
</tr>
<tr>
<td>Conducting a detailed recall of food consumed in the past day (24 hour recall)</td>
<td>5 (25)</td>
<td>12 (12)</td>
</tr>
<tr>
<td>Completing a checklist of foods assessing certain nutrients (e.g., foods rich in calcium and vitamin D). This is also called a food frequency list</td>
<td>4 (20)</td>
<td>11 (11)</td>
</tr>
<tr>
<td>I do not assess diet; the dietitian in the team does this</td>
<td>3 (15)</td>
<td>10 (10)</td>
</tr>
</tbody>
</table>

*Note:* Percentage (%) of total in columns are more than 100% due to multiple responses.

Table P4. Focus group participants’ awareness of e-DA tool existence.

<table>
<thead>
<tr>
<th>Health Providers</th>
<th>Aware</th>
<th>Not Aware</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Dietitians</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Pharmacists</td>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Nurse Practitioners</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Registered Nurses</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Practical Nurses</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Family Physicians</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Physicians’ Assistants</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Health Educators</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Social Workers</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Administrative Staff</td>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Clinical Nutritionists</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Dietetic Interns</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Table P5. Focus group participants’ list of e-DA tools used.

<table>
<thead>
<tr>
<th>e-DA Tools Use by Focus Groups Participants</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MyFitnessPal–app</td>
<td></td>
</tr>
<tr>
<td>Calorie Counter–app</td>
<td></td>
</tr>
<tr>
<td>Calorie Tracker–app by Live Strong.com</td>
<td></td>
</tr>
<tr>
<td>Weight Watchers–app</td>
<td></td>
</tr>
<tr>
<td>MyNetDiary–app</td>
<td></td>
</tr>
<tr>
<td>DailyBurn–app</td>
<td></td>
</tr>
<tr>
<td>eaTracker diet analysis and coach function–web-based software</td>
<td></td>
</tr>
<tr>
<td>Diet Analysis Plus–installed computer software</td>
<td></td>
</tr>
<tr>
<td>NutriBase–installed computer software</td>
<td></td>
</tr>
<tr>
<td>NutribasicTM–installed computer software</td>
<td></td>
</tr>
<tr>
<td>ESHA- web-based and installed computer software</td>
<td></td>
</tr>
<tr>
<td>Dietary Assessment App with free food coupons (no name specified)</td>
<td></td>
</tr>
<tr>
<td>Pictures of food or meals sent by Smartphones</td>
<td></td>
</tr>
<tr>
<td>Calorie King TM–electronic food database</td>
<td></td>
</tr>
<tr>
<td>USDA nutrient database</td>
<td></td>
</tr>
</tbody>
</table>

*Note: List is not provided by order of frequency.*
<table>
<thead>
<tr>
<th><strong>Patient Skillsets</strong></th>
<th><strong>Participant Quotes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence with use of technology.</td>
<td>“...And there are some pretty computer savvy patients out there...a lot of the seniors are right into the computers, which I thought would be a real hard thing to accomplish, but I have seen a lot of elderly patients that are very um, interested in the newest and the latest. So I think they are good tools personally.” (Phar/FG#4).</td>
</tr>
<tr>
<td>Independent of age</td>
<td>“I think we are discriminating if we say ‘oh well you’re old so you’re not on the Internet’; eighty-seven year-old mothers are on the Internet, so we can’t do that ageism.” (RD/FG#2).</td>
</tr>
<tr>
<td>Good with numbers.</td>
<td>“People who like numbers (e.g., accountants) because some of patients who enter everything, they’re the accountants, they’re the engineers and they want to know exactly how much they consume of everything, So, I use their Blackberry or iPhone for different things. It works.” (RD/FG#2).</td>
</tr>
<tr>
<td>Currently using other self-management tools.</td>
<td>“And if they’re checking anything else I think they’re much more likely to do this. Patients that are checking their blood sugar regularly are much more likely to check their blood pressure if they have hypertension than those that are not checking anything cause they’re already doing something; it’s a bit of a prompt and they just do it at the same time.” (Phys/FG#3).</td>
</tr>
</tbody>
</table>
Table P7. Recommendations of focus groups for increasing e-DA tools usage in FHTs.

<table>
<thead>
<tr>
<th>Ways to Increase e-DA Acceptance in Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure that technology supports the e-DA and that access to Internet is reliable and consistent.</td>
</tr>
<tr>
<td>Ensure that e-DA tool is user friendly for patients and health providers. e-DA tools should not require that excessive, non-relevant information is entered and they should provide visually appealing food photographs, graphs, and tables.</td>
</tr>
<tr>
<td>Ensure patients do not have to pay for using e-DA tools.</td>
</tr>
<tr>
<td>e-DA tools should consider specific diseases or medication used by patients (either prescription or over the counter).</td>
</tr>
<tr>
<td>e-DA tool can calculate glycemic index of foods (useful for diabetes).</td>
</tr>
<tr>
<td>e-DA tool can have a visual system, for example, a green, yellow, and red traffic light, to easily identify foods that should be included or avoided depending on patients’ health situation.</td>
</tr>
<tr>
<td>e-DA tools could educate health professionals on dietary assessment and healthy eating</td>
</tr>
<tr>
<td>Include voice activation, if possible, to facilitate data entry.</td>
</tr>
<tr>
<td>Include video camera to increase accuracy of portion sizes of recorded foods and beverages.</td>
</tr>
<tr>
<td>Include bar code of common foods in supermarket to avoid manual data entry</td>
</tr>
<tr>
<td>Include soluble and insoluble fiber in dietary analysis.</td>
</tr>
<tr>
<td>Include option of adding notes in food record so that patients can describe their emotions regarding foods.</td>
</tr>
<tr>
<td>Include option to match DA with the top five nutrition-related conditions in primary care.</td>
</tr>
<tr>
<td>e-DA tools could educate health professionals on dietary assessment and healthy eating.</td>
</tr>
</tbody>
</table>