

*Novice, Generalist, and Expert Reasoning During Clinical
Case Explanation: A Propositional Assessment of Knowledge
Utilization and Application*

by

Margalit Mariasin

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Abstract

Objectives: The aim of the two exploratory studies presented here, was to investigate expert-novice cognitive performance in the field of dietetic counseling. More specifically, the purpose was to characterize the knowledge used and the cognitive reasoning strategies of expert, intermediate and novice dietitians during their assessment of clinical vignettes of simulated dyslipidemia cases.

Background: Since no studies have been conducted on the expert-novice differences in knowledge utilization and reasoning in the field of dietetics, literature from various domains looking at expert-novice decision-making was used to guide the studies presented here. Previous expert-novice research in aspects of health such as counseling and diagnostic reasoning among physicians and nurses has found differences between in the way experts extract and apply knowledge during reasoning. In addition, various studies illustrate an intermediate effect, where generalist performance is somewhat poorer than that of experts and novices.

Methods: The verbal protocols of expert (n=4), generalist (n=4), and novice (n=4) dietitians were analyzed, using propositional analysis. Semantic networks were generated, and used to compare reasoning processes to a reference model developed from an existing Dyslipidemia care map by Brauer et al, (2007, 2009). Detailed analysis was conducted on individual networks in an effort to obtain better understanding of cue utilization, concept usage, and overall cohesiveness during reasoning.

Results: The results of the first study indicate no statistical differences in reasoning between novices, generalist and experts with regards to recalls and inferences. Interesting findings in the study also suggest that discussions of the terms “dietary fat” and “cholesterol” by individuals in each level of expertise had qualitative differences. This may be reflective of the information provided in the case scenarios to each participating dietitian. Furthermore, contrary to previous studies in expert-novice reasoning, an intermediate effect was not evident. The results of the second study show a statistical difference in data driven (forward) reasoning between experts and novices. There was no statistical difference in hypothesis driven (backward) reasoning between groups. The reasoning networks of experts appear to reveal more concise explanations of important aspects related to dyslipidemia counseling. Reasoning patterns of the expert dietitians appear more coherent, although there was no statistical difference in the length or number of reasoning chains between groups. With previous research focusing on diagnostic reasoning rather than counseling, this finding may be a result of the nature of the underlying task.

Conclusion: The studies presented here serve as a basis for future expert-novice research in the field of dietetics. The exploration of individual verbal protocols to identify characteristics of dietitians of various levels of expertise, can provide insight into the way knowledge is used and applied during diet counseling. Subsequent research can focus on randomized sample selection, with case scenarios as a constant, in order to obtain results that can be generalized to the greater dietitian population.

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CHAPTER 1: Introduction

1.1 Overview

Investigation of the clinical reasoning processes and knowledge utilization by domain experts and novices allows researchers to understand more about the acquisition of expertise in knowledge-based fields, such as physics, mathematics, computer science, and health. The study of knowledge usage, case cue utilization, and conceptual coverage, as well as knowledge application during counseling tasks, can provide insight into the fundamental processes used by novice, generalist and expert dietitians. The question of what separates an expert from a novice is central to many areas of research, guiding this exploration of two interrelated aspects, namely knowledge use and reasoning strategies, as employed by a sample of participating dietitians. Exploring the nature of these processes may uncover interesting findings about why experts and novices reason the way they do, and what this says about possible gaps in novice reasoning. Finding the elements that make experts perform at a higher level than novices may also improve training and learning techniques among beginners and intermediates. This, in turn, can increase efficiency in counseling, and promote excellence in dietary practice.

This thesis consists of two studies. The aim of the first study was to investigate the knowledge used during clinical counseling by dietitians at three levels of expertise. To this aim, an examination was conducted of the recalls and inferences generated when novice, generalists, and experts reasoned through and explained their method of care for hypothetical dyslipidemia cases. The study focused on factors such as cue utilization and concept usage to better understand the knowledge underlying expert, novice, and generalist problem-solving, where the question of what knowledge is used by these dietitians is addressed.

The aim of the second study was to further investigate the reasoning strategies through the application of knowledge by looking at the directionality of reasoning. By measuring the length of reasoning chains generated by each participating dietitian, and looking at their overall reasoning patterns in comparison to a reference model of clinical care guidelines, it was possible to address the question of how certain knowledge was applied by individual dietitians.

Based on expert-novice research in several domains, it is possible to identify whether the findings are consistent with current literature. The intent of the aforementioned studies is to contribute to the existing literature on expert-novice reasoning, with a specific focus in the field of dietetics.

1.2 Study Rationale

Currently, there is a dearth of studies on expertise in the field of dietetics. Using semantic-analytic methods, the study of medical and health cognition has served to characterize the knowledge used in clinical tasks and to uncover differences in the knowledge and clinical reasoning used by novices and experts due to factors such as the development of scripts, differences in cognitive organization, and the role of experience and knowledge on understanding and solving clinical problems. Although semantic analysis of conceptual structures and reasoning has been applied to various aspects of medical and health tasks, especially diagnosis, it has never been applied to counseling in the field of dietetics. This analysis is focused on the detailed characterization of the knowledge used and the application of such knowledge to clinical cases by participating dietitians during dietetic counseling.

Using semantic methods, such as propositional analysis, to investigate verbal protocols allows for a detailed semantic investigation of the knowledge structures as well as the reasoning

processes deployed by individuals in content domains. The application of this approach emphasizes unique variations in knowledge use and reasoning, and highlights specific differences among individuals in terms of the following questions:

- What knowledge is used during clinical case explanation by expert, novice, and generalist dietitians?
- Is there a difference in the recall and inference patterns of expert, generalist, and novice dietitians?
- How do novice, generalist and expert dietitians reason through dietetic counseling? Do they use the same reasoning strategies?
- What concepts do novices, generalists, and experts use when discussing factors in the classification of metabolic syndrome?
- What patterns can be found with regards to overall cohesiveness of reasoning when comparing expert, novice and generalist dietitians?

In summary, this research is aimed at characterizing the knowledge and the reasoning processes utilized by a sample of novice, generalist and expert dietitians during dietetic counseling of dyslipidemia cases.

CHAPTER 2: Literature Review

This chapter is organized as follows: First, a review of the study of expertise in professional and other domains is described. Following this, a brief explanation is provided of medical knowledge, including schemas and illness scripts. Next, is a discussion regarding what is currently known about the reasoning process during clinical diagnosis and counseling, with particular emphasis on directionality of reasoning. The final paragraphs are devoted to a brief description of dyslipidemia and the counseling task, and treatment options available.

2.1 Expertise

Investigation of performance in knowledge domains has been mostly carried out under the expertise methodological approach. This comparative method consists of the contrasting of individuals at various levels of experience where typically domain-related performance of novices, such as students or recent graduates, are compared to individuals with many years of training and experience in practice settings.

Although various definitions of expertise have been advanced in the literature (Patel & Groen, 1992), the the basic premise of expertise can be defined in two ways (Chi, 1997): Absolute expertise and relative expertise.

2.1.1 Absolute Expertise

Absolute expertise can be found in the performance of outstanding individuals; those who possess exceptional abilities or who have “greater minds”, so to speak. These individuals have been shown to possess greater domain-dependent memory capacity, and may rely on more powerful heuristics (Ericsson & Smith, 1991; Ericsson, 1996; Chi, 1997, 1981; Gobet &

Charness, 2006). The assumption here is that there is something fundamentally different about certain individuals in that they are more remarkable than the average person beyond what practice and domain-related experience may provide (Chi, 1997). Absolute expertise is typically measured by the level of performance of the individual, using rating scales or tournament scores, such as in music and sports.

2.1.2 Relative Expertise

Relative expertise refers to the attainment of a higher level of proficiency and knowledge in a particular domain, where this knowledge is structured and organized. Here, it is assumed that expertise is on a continuum, and that novices can achieve a high level of proficiency simply by acquiring greater knowledge and skill in that domain. Studies of relative expertise are typically conducted by comparing novices to experts (Boshuizen & Schmidt, 1992; Schmidt & Boshuizen, 1993a; Patel & Arocha, 1995; Arocha, Wang & Patel, 2005; Coderre, Harasym, Mandin & Fick, 2004; Ritter, 2003; Simmons, Lanuza, Fonteyn, Hicks & Holm, 2003), where experts show more knowledge and skill than novices and those intermediate between novice and expert. However, it is important to note what has become known as the “intermediate effect” in the expertise literature. This refers to the finding that intermediate subjects between the novice and the expert sometimes appear to perform more poorly than novices, showing a non-monotonic expertise curve rather than an incremental increase of performance (Rikers, Schmidt & Boshuizen, 2000; Groves, O’Rourke & Alexander, 2003; Schmidt, Norman & Boshuizen, 1990; Patel, Evans & Groen, 1989; Wimmers, Schmidt, Verkoijen & Van De Wiel, 2005). The intermediate effect suggests that expertise is not characterized as the steady acquisition of

knowledge and skill, but a process punctuated by the presence of performance decrements until knowledge becomes stabilized, presumably at the peak of expertise.

2.2 Previous Research on Expertise

There is a long-standing history of research on expertise in cognitive psychology. Theories suggested that experts were more intelligent than less-than-expert individuals, or that they possessed an outstanding memory that regular individuals lacked. To test this notion, de Groot (1946, 1978) conducted a study which aimed to identify the fundamental differences between Grand Master chess players and less skillful players. In a typical study, participants were given a short period of time to memorize positions of chess pieces on a playing board. When chess pieces were placed in deliberate and legal patterns, the Grand Master players were able to replicate the positions more rapidly and with greater accuracy than less skilled players. However, when the chess pieces were placed in random positions, the Grand Master players' performance was similar to that of less skillful players. The conclusions from this study showed that expertise in chess was not a function of the intellectual superiority of the grand masters, but rather the experts' ability to better structure and organize previously acquired chess-specific knowledge and experience. Therefore, the experts' superior performance was limited to the task domain (de Groot 1946, 1978). This research highlighted that the difference separating experts and non-experts was the powerful role of domain experience and practice in the acquisition of expertise (Chase & Simon, 1988; Simon & Chase, 1973; Schulz & Curnow, 1988; Gobet & Charness, 2006).

A study conducted by Larkin et al, (1980) compared the performance of expert and non-expert physicists when solving physics problems. Using think aloud methods to record verbal

interpretations, the study showed that experts, having more experience, were able to solve a basic physics problem with more speed and accuracy than novices. Furthermore, the experts used a more sophisticated problem-solving strategy, developing more abstract illustrations and extracting the most relevant information (Larkin et al, 1980). This result showing the experts' superiority was observed only when the problem was routine and familiar, supporting the claim that expertise is a function of practice and experience in that particular domain.

In the field of health, Hoffman et al (2009) conducted a study comparing expert and novice nurses' cue acquisition during clinical decision-making. A sample of four novice and four expert nurses working in an intensive care unit, were given patient scenarios in which they had to explain their reasoning strategies concurrently and retrospectively. The authors aimed at identifying the number and range of cues collected, as well as the patterns in which cues were clustered during decision-making and patient care. The results showed that expert nurses collected a greater number and broader range of cues, resulting in a richer and more meaningful network of clusters accessed during clinical decision-making (Hoffman et al, 2009). The expert nurses' ability to cluster and relate salient cues together further confirms the notion that expertise is acquired within specific domains and that experts show performance superiority within their specific domain, regardless of the task (e.g., problem solving, comprehension, decision making).

The factor that has been highlighted as responsible for much of expert performance in most studies of expertise is the amount and structure of domain-specific knowledge. Thus, the investigation of expert-novice differences focused on knowledge usage and application during reasoning, encompassing the questions of how much of the acquired information is used during problem-solving, as well as how the information is structured and organized.

2.2.1 Schemas

In the field of cognitive psychology, schemas are described as structures that allow an individual to call upon previous knowledge and experience while trying to interpret a current situation (Boshuizen & Schmidt, 1992, Schmidt & Boshuizen, 1993a; Charlin et al, 2000; Norman, 2005; Norman, Young & Brooks, 2007; Coderre et al, 2004; Rikers et al, 2000; Rikers et al, 2005; Schmidt et al, 1990; Woods, 2007, Woods, Brooks & Norman, 2007). In other words, a cue from the present situation is recognized from a previous experience which triggers a knowledge structure from memory which has served to account for similar situations in the past, which is the essence of pattern recognition. This is frequently the case for typical situations where memory recall is rapid and subconscious (Boshuizen & Schmidt, 1992; Schmidt & Boshuizen, 1993; Charlin et al, 2000; Patel & Arocha, 1995). This solution strategy is based on the organization of prior ideas and knowledge. Thus, increased knowledge and acquired experience lead to a more efficient method of retrieval of salient information in new situations (Schmidt & Boshuizen 1992, Schmidt & Boshuizen, 1993; Arocha, Wang, & Patel, 2005). Individuals who show organized long-term memory information into schemata, and have a large database of stored knowledge and experience are considered experts (Arocha, Wang, & Patel, 2005). As knowledge and relevant ideas get presented, the individual must “filter out” the unimportant ideas from important ones. The important ideas are first sorted in immediate working memory (WM) and then linked to context in long-term stored memory (LTM) (Ericsson, 1991, 1996; Patel, Arocha & Kaufman, 2001; Gobet & Charness, 2006). Schemas act as conceptual organizers, or retrieval structures, that allow an individual to access information stored from previous experiences quickly and efficiently (Norman et al, 2007; Norman, 2005;

Schmidt & Boshuizen, 1993; Boshuizen & Schmidt, 1992; Charlin et al, 2000; Arocha, Wang, & Patel, 2005) and apply it to the problem at hand.

A form of schema in the health domains is the illness script. Similar to schemas, individuals can develop illness scripts that store information from previous experiences in a health field, such as nursing or medicine. Illness scripts are commonly applied to clinical practice (e.g., clinical medicine) and can be described as narratives that allow the individual to keep important information in memory. These scripts also act as organizers that allow clinicians to summarize and retrieve information efficiently (Charlin et al 2000; Boshuizen & Schmidt, 1992; Schmidt & Boshuizen, 1993). In the most studied task, i.e., diagnosis, the broad process of acquisition according to Charlin et al (2000, 2007) is as follows: First, the clinician gathers data from the patient, which in turn activates one or more illness scripts. This process is labeled as “script triggering” and is an unconscious event. The clinician must then make inferences that confirm or rule out scripts until it is narrowed down to the most appropriate diagnosis. This process is labeled as “script processing” and is a semi-conscious event. In such cases where two or more illness scripts are activated simultaneously, or an illness script cannot be fit, deeper reasoning must occur calling upon biomedical knowledge (Charlin 2000, 2007; Boshuizen & Schmidt, 1992; Schmidt & Boshuizen, 1993). Illness script generation varies from clinician to clinician, since their experiences are unique in absorbing relevant information from a particular scenario. More formally, scripts can be described as structures that have “slots” that correspond to attributes. The attribute with the greatest probability of occurrence becomes the ‘default value’, and these slots are filled with default values until the script is activated and the clinician has gathered enough evidence to make a diagnosis (Coderre et al, 2004; Charlin et al, 2000, 2007). When all of the slots are occupied with default values, it is referred to as a “prototypical

version” of the illness, which is essentially much easier to recognize than an atypical version. In the event that an insufficient number of slots are filled, or if the values are unacceptable, the illness script is rejected.

Illness scripts and schemas are important structures, and are fundamental elements in the acquisition of expertise in health. Although the discussion about these cognitive processes has been steered in the direction of biomedicine and diagnostics, schemas and illness scripts are also considered important constructs used by clinicians during patient management and treatment counseling. The next section will focus on a more general view of the expert-novice clinical reasoning processes, while differentiating between the diagnostic and counseling tasks.

2.3 Clinical Reasoning in Counseling and Diagnostics

A significant amount of research has been conducted on the clinical problem solving of physicians, clinicians, counselors and nurses to identify the characteristics of expertise in the medical field. Although the majority of studies in the health field concerning expert-novice differences in reasoning relate to clinical diagnostic reasoning (Arocha, Wang & Patel, 2005; Boshuizen & Schmidt, 1992; Patel, Arocha & Zhang, 2005; Custers, Boshuizen & Schmidt, 1998; DeBruin, Van De Wiel, Rikers & Schmidt, 2005; Rikers, Schmidt & Boshuizen, 2000; Ritter, 2003; Schmidt, Norman & Boshuizen, 1990; Wimmers, Schmidt, Verkoeijen & Van De Wiel, 2005), several studies have focused on expert-novice performance in the realm of counseling and psychology (Goodyear, 1997; O’Byrne & Goodyear, 1997; Hillerbrand & Claiborn, 1990; Lichtenberg, 1997; Locke & Covell, 1997). In addition, reasoning has been analyzed as a central component in physiotherapy, occupational therapy, as well as nursing (Smith, Higgs & Ellis, 2008; Jensen, Resnick & Haddad, 2008; Jones, Jensen & Edwards, 2008;

Chapparo & Ranka, 2008; Lamond & Farnell, 1998). The underlying reasoning structures involved during problem solving in counseling are akin to those used in clinical diagnostics, namely, the application of previously acquired knowledge and schemas to particular patient problems. The differences lie in the task and the desired outcome, where the goal is to provide a solution path consisting of a plan, rather than a diagnosis.

Higgs and Jones (2008), describe the decision making processes that are involved in counseling and diagnosis using three core dimensions of reasoning. The first dimension is the acquisition of knowledge, both theoretical as well as experiential knowledge. The second dimension consist of the cognitive and thinking skills involved in reasoning such as analysis, synthesis, and evaluation of data. The third dimension is metacognition which bridges knowledge to cognition, allowing a clinician or counselor to identify their limitations during reasoning and practice (Higgs & Jones, 2008). These dimensions are applicable in both the diagnostic task and the counseling task. For instance, as expertise progresses, experiential knowledge becomes more salient in the diagnosis of clinical cases as well as in the treatment or conseling of patients. Similarly, analyzing, synthesizing, and evaluating clinical information becomes fine-tuned as expertise is acquired in either diagnostic or treatment and counseling tasks. Finally, expert diagnosticians and counselors are quicker to identify problems where known solutions might not work.

Other aspects of clinical reasoning, such as collaborative decision-making and narrative reasoning, seem to be particularly fitting for the counseling task and subsequent patient management. Here, the clinical reasoning process is described as being less analytical and deductive, because it involves a process that extends beyond diagnosis (Jensen, Resnick & Haddad, 2008). Some authors (Trede & Higgs, 2008) believe that narrative reasoning is a key

element of the clinical reasoning process, where the involvement of clients and their story in treatment, management, and care, serves to produce a unique and supportive relationship between health professional and client (Atkins & Ersser, 2008).

Expert-novice studies have been conducted that looked at the differences in this type of clinical reasoning between physiotherapists and occupational therapists. A study by Smith, Higgs and Ellis (2008), was aimed at determining various factors that influence clinical problem solving in physiotherapy. One such influencing factor is the level of expertise. When assessing the differences between expert and novice reasoning of physiotherapists, they concluded that experts appeared to reason at a faster rate, and with greater accuracy than novices, suggesting the possession of highly automated schemas. In addition, expert physiotherapists were more specific with their treatment, infusing a greater amount of creativity in a more refined treatment approach geared toward individual client needs. This is consistent with research in medicine, where schemas are not only more efficiently applied but are more easily fine-tuned to the specifics of particular cases. Experts also displayed the possession of a greater knowledge base, including more experience-based knowledge (Smith et al, 2008). These expert physiotherapists were more aware of their limits, and were more flexible, adaptive and better able to predict outcomes. In contrast, novice physiotherapists were more inclined to follow the widely accepted rules in treatment and management, wavering less from university based guidelines (Smith et al, 2008). This is in keeping with studies in clinical reasoning in medicine where medical students are capable of solving clinical problems that are consistent with textbook descriptions but are unable to deal with cases with atypical findings (Arocha, Patel, & Patel, 1993). In these two instances (typical vs atypical cases), different reasoning strategies are employed.

2.3.1 Data Driven and Hypothesis Driven Reasoning

The reasoning process typically occurs in two directions: From data to hypothesis and from hypothesis to data (Patel & Groen, 1986; Simmons et al, 2003; Groves, et al, 2003; Charlin et al, 2000; Patel, Arocha & Kaufman, 2001; Arocha, Wang, & Patel, 2005). *Data-driven* reasoning consists of a process that starts from the data given in the problem to a hypothesis generated by inference from the data. For instance, a primary care physician may form a particular diagnosis from the verbal description of a problem given by a patient. Similarly, an ICU nurse may decide to apply a respirator to a patient after seeing the vital signs in an ICU patient monitor. Also, a dietitian may quickly form a plan of action after looking at the items listed in a food diary brought by a client to a dietetic counseling session. In all these cases, the data presented are sufficient to trigger the possible solution to the problem.

Hypothesis-driven reasoning consists of moving from a hypothesis, suggested from prior knowledge, to account for the data in the problem. For instance, a physician may question a patient looking for symptoms that, if present, would provide a diagnosis to the patient condition. Similarly, a nurse may think of various sources of pain and try several alternatives to relieve a patient from suffering. Also, a dietitian may ask a client questions related to eating disorders after seeing a sign of bulimia. In all of these cases, the clinician generates a hypothesis, either from formal learning (e.g., textbooks) or from experience and uses that hypothesis to further looking for data that would support the hypothesis.

Several authors have suggested that purely data-driven reasoning pathways are seen only in expert clinicians in typical scenarios. Similarly, purely hypothesis-driven reasoning is seen in novices and less-than-expert individuals when they are unsure of the solution to a problem (Patel & Groen, 1986; Arocha et al. 1995; Arocha, Wang, & Patel, 2005). The majority of expert

clinicians use data driven reasoning primarily, and often follow by using hypothesis driven reasoning to tie up loose ends or ideas (Charlin et al, 2000; Patel, Arocha & Kaufman, 2001; Patel, Kaufman & Arocha, 2002; Patel & Groen, 1986; Patel et al, 1990; Arocha, Wang, & Patel, 2005). Therefore, even though purely data-driven reasoning is typically only seen in experts, most expert clinicians mainly use data driven reasoning, and follow with hypothesis driven reasoning to confirm or refute their hypothesis. This is related to task specificity- a characteristic of interaction between the problem solver and the problem, and it depends on the case and the interpretation of the case. In other words, a seemingly familiar case (whether actually seen before or not) is going to be interpreted using forward reasoning. Therefore, experts tend to find things more familiar because of their previous experiences, whereas novices tend to find things less familiar. Based on the above information, it is evident that data driven reasoning is characteristic of expert clinicians, but the use of both data driven and hypothesis driven reasoning is common.

2.4 Dyslipidemia

Dyslipidemia is an umbrella term for lipid disorders, and is one of the most important risk factors for coronary heart disease (CHD), cardiovascular disease (CVD) and atherosclerosis (Rader, 2005; Bamba & Rader, 2007; Varady & Jones, 2005; Smith, 2007; Maki, 2007). It is typically characterized by elevated levels of Low Density Lipoprotein blood cholesterol (LDLc), triglycerides (TG), as well as decreased levels of High Density Lipoprotein blood cholesterol (HDLc) (Bamba & Rader, 2007; Varady & Jones, 2005; Smith, 2007; Rader, 2005; Gau & Wright, 2006). Blood LDLc promotes cholesterol accumulation, resulting in atherosclerotic build-up. Blood HDLc acts to reverse this accumulation, therefore inhibiting the build-up of atherosclerosis (Bamba & Rader, 2007; Rader, 2005). The lipoprotein patterns can vary among

dyslipidemia patients, as some individuals have isolated high LDLc levels, while others have moderate levels of LDLc, in combination with high triglycerides and low HDLc levels. Similarly, other risk factors such as body weights also vary in individuals. Patients that present with cardiovascular risk factors such as smoking, diabetes, obesity, high blood pressure and abnormal levels of LDLc, are screened and their long term risk for CVD is assessed (Genest et al, 2009). Based on various calculations and the presence of the risk factors aforementioned, individuals are considered at high, moderate, or low risk, and are referred for diet therapy and possibly pharmacological treatment. At the high risk category, most clients present with diabetes, evidence of atherosclerosis, and are calculated to have a greater than 20% risk of CVD in the next ten years. For individuals in this category, the target therapy includes the reduction of blood LDLc to less than 2 mmol/L as well as intensive lifestyle modification and the introduction of pharmacotherapy (eg. statins) (Genest et al, 2009). Individuals that fall into the moderate risk category present with a blood LDL-c value greater than 3.5 mmol/L, and are calculated to have a ten year CVD risk of 10-19%. In many cases, statins will be prescribed only if lifestyle modification and diet therapy have been unsuccessful at reaching target levels – a blood LDLc less than 2 mmol/L (Genest et al, 2009). Low risk individuals are calculated to have less than 10% risk of CVD in the next ten years, and may present with several risk factors such as high blood pressure, obesity, and abnormal blood lipid levels. In those clients considered low risk whose blood LDLc levels are above 5 mmol/L, it is recommended to initiate statin therapy (Genest et al, 2009). In addition to modifying blood LDLc levels, it is recommended that blood HDLc levels be increased by individuals through smoking cessation, increase in physical activity, weight loss, and diet changes; since higher levels of HDLc are shown to decrease the chance of heart disease (Health Canada, 2005). According to several authors, 80% of lipid

disorders can be attributed to unhealthy diet and sedentary lifestyle, while only 20% are due to genetic causes (Smith, 2007; Genest et al, 2003, 2009). Thus, unhealthy diet and lack of exercise account for the majority of dyslipidemia.

2.4.1 Treatment Options

Several approaches exist to reduce dyslipidemia, CVD, CHD and atherosclerosis. Diet therapy, although complex, is typically the first line of treatment. Firstly, a reduction in saturated fat and overall caloric intake can potentially reduce blood LDLc levels by 10-15% (Gau & Wright, 2006). Triglyceride levels can be reduced by 20-40% (Gau & Wright, 2006). In addition to dietary modification, it is suggested that exercise be included in this therapy (Genest et al, 2003, 2009). Another combination therapy, which has received particular attention, is the use of nutritional supplements such as fish oil, oat bran and naturally occurring plant substances called ‘sterols’ in conjunction with exercise (Varady & Jones, 2005). The effectiveness of these approaches has been the focus of various studies. Although the success of combination therapies has been established, it appears that diet therapy is most effective in the highly motivated individual (Gau & Wright, 2006). Individuals who do not benefit from the therapies briefly described, or who are considered high risk for CVD, usually require pharmaceutical intervention (Genest et al, 2009).

‘Statins’ are among the most popular drugs sold in the world (Smith, 2007). The use of statins significantly reduces CHD, cardiovascular events and strokes resulting from atherosclerosis (Smith, 2007; Genest et al, 2003; Maki, 2007). Although these drugs can shift blood cholesterol levels to desirable levels, long-term use may result in various safety concerns. A substantial minority of statin-users experience muscle pain (myopathy) and cannot tolerate

high doses of medication (Varady & Jones, 2005). Several other drawbacks of statins include their limited effect on TG levels and blood HDLc levels. Even on the highest doses, some individuals do not reach their optimal level of cholesterol (Rader, 2005).

2.4.2 Dietetic Counseling

In terms of dietetic counseling, a dietitian counseling patient with dyslipidemia assesses the client in regards to individual biological markers such as anthropometric measurements and clinical data, in addition to family and medical history, socio-economic status, psycho-social support, ethnicity, and level of physical activity (Hanning, Diaz, & Brauer, 2002). The dietitian also considers issues related to diet behaviour, including meal patterns, whole grains, nutrient and fat consumption, intake of legumes, as well as fiber (vegetables and fruits). The goal of the dietetic counseling is not to reach a diagnosis for the client, but to provide diet counseling with the aim of identifying those aspects that may act as barriers to lifestyle changes. The approach is to guide the client to make small but important changes, for example, in his or her behavior toward implementing healthful food choices, such as encouraging a more balanced diet, increasing intake of fiber, increasing exercise, and reducing intake of saturated fats.

According to the most recent clinical dyslipidemia guidelines (Genest et al, 2009), it is recommended that a diet low in sodium and simple sugars, with an increase in fruit and vegetable intake, is beneficial for individuals with dyslipidemia. In terms of caloric intake, it is recommended that alcohol should be consumed in moderation, and a healthy body weight be achieved with a calorie-restricted diet, which replaces unhealthy saturated and trans fats, with healthy unsaturated fats (Genest et al, 2009). Physical activity is an integral part of treatment, as it is encouraged for 30-60 minutes daily, in an effort to reach a health body mass index (BMI) of

less than 25 kg/m². Aside from dietary changes, the most important health behaviour intervention is considered smoking cessation.

The consequential effects of dyslipidemia and all related lipid disorders create an increasing burden of morbidity, mortality and medical costs (Genest et al, 2003, 2009; Smith, 2007). Two different and effective approaches, diet therapy and pharmaceuticals, can be implemented to lower the risk of CHD, CVD, and atherosclerosis in the population. With this existing knowledge about diagnostic reasoning and dyslipidemia, it is possible to analyze the cognitive thought processes of dietitians as they apply to dietetic counseling.

CHAPTER 3:

*Recall and Inference Generation Among Expert, Generalist, and Novice Dietitians During
Clinical Case Explanation*

To be submitted to Advances in Health Sciences Education

Overview

Objective: The aim of this exploratory study is to characterize reasoning during dyslipidemia clinical case explanations of novice, generalist, and expert dietitians. To that aim, the focus is on knowledge use; in particular, on recalls and inferences, case cue utilization, and concept coverage.

Background: Previous research in the medical domain has demonstrated expert-novice differences in that experts show lower levels of recall of case information and generate more general hypotheses to account for clinical cases. Furthermore, this research shows that, when processing clinical cases, experts use fewer case cues, suggesting unique capabilities among expert clinicians, with various studies illustrating an intermediate effect for generalist practitioners.

Methods: In this study, participants (n=12) were asked to describe their method of care for a randomly selected simulated client scenario using a combination of think-aloud protocol and explanation task. The transcriptions were analyzed in terms of number of recalls and inferences generated by each participant, coverage of given data as well as discrete concepts. Moreover, by calculating the frequency of words used during verbalizations, it was possible to identify and further investigate two highly discussed concepts, ‘fat’ and ‘cholesterol’, and their usage.

Results: The results indicate that there were no significant differences between the recall and inference generation between the groups. In addition, statistical analysis showed no differences between groups in terms of case cues used. In terms of specific use of the terms “fat” and “cholesterol”, several interesting findings suggest possible qualitative differences in the

application of the terms. Statistical differences were found between experts and generalists in discussing LDL cholesterol.

Conclusion: Thus, it can be concluded that there were no statistical differences between experts, generalists, and novices with regards to recalls, inferences and case cues used. As a result, no intermediate effect of generalist practitioners was found in this particular study, which is contrary to previous studies in the field of expert-novice research and cognitive reasoning. Further studies should be conducted to confirm these findings. Furthermore, studies investigating the application of specific terms should look at the reason behind the use of these terms by various levels of expertise.

3.1 Introduction

Since the pivotal research by de Groot (1946, 1978) in chess, the study of expert-novice differences has expanded to numerous areas of the health domain. Aside from the medical and clinical diagnostic field (Arocha, Wang & Patel, 2005; Boshuizen & Schmidt, 1992; Patel, Arocha & Zhang, 2005; Custers, Boshuizen & Schmidt, 1998; DeBruin, Van De Wiel, Rikers & Schmidt, 2005; Rikers, Schmidt & Boshuizen, 2000; Ritter, 2003; Schmidt, Norman & Boshuizen, 1990; Wimmers, Schmidt, Verkoeijen & Van De Wiel, 2005), this research has covered a host of other health fields, such as psychological counseling, (Goodyear, 1997; O'Byrne & Goodyear, 1997; Hillerbrand & Claiborn, 1990; Lichtenberg, 1997; Locke & Covell, 1997; Lamond & Farnell, 1997), nursing (Benner & Tanner, 1987; Ericsson, 2007; Reischman & Yarandi, 2002; Fonteyn & Ritter, 2008) physiotherapy, (Doody & McAteer, 2002; Jensen, Gwyer & Shepard, 2000; Jones, 1992), speech therapy, (Hoben, Varley & Cox, 2007) and occupational therapy, (Gibson, Velde, Hoff, Kvashay, Manross & Moreau, 2000; Strong, Gilbert, Cassidy & Bennett, 1995), among others.

The research on expert-novice comparisons has resulted in the identification of a number of characteristics of novice, intermediate, as well as expert individuals. In particular, novices have been said to possess deficiencies in their knowledge and their problem solving abilities. In this sense, the expert was used as the standard for comparison to which non-experts were contrasted. Among the characteristics of less-than-expert individuals were that they (1) possessed fragmented, less coherent, knowledge; (2) focused on the surface features of the problem; and (3) possessed case representations that were less rich than that of experts. Some research studies (Schmidt & Boshuizen, 1993b; Wimmers, et al, 2005; DeBruin, et al, 2005; Patel, et al, 1989; Rikers, et al, 2000; Patel, Arocha, Kaufman 1994; Eva, Norman, Neville, Wood & Brooks, 2002)

observed what became known as the “intermediate effect” where generalist individuals, in terms of their level of expertise, performed somewhat more poorly than either novices or experts.

3.1.1 Dyslipidemia and the Dietetic Counseling Task

The aim of the present study was to explore expert-novice differences to the field of dietetic counseling for dyslipidemia. More specifically, the intent was to characterize case recall and inference generation patterns among expert, intermediate, and novice dietitians during their assessment of clinical scenarios of simulated dyslipidemia cases.

Dyslipidemia is an umbrella term for lipid disorders, and is one of the most important risk factors for coronary heart disease (CHD), cardiovascular disease (CVD) and atherosclerosis (Maki, 2007; Rader, 2005; Bamba & Rader, 2007; Varady & Jones, 2005; Smith, 2007, Genest et al, 2003, 2009). It is typically characterized by elevated levels of blood Low Density Lipoprotein cholesterol (LDLc), triglycerides (TG), as well as decreased levels of High Density Lipoprotein cholesterol (HDLc) (Varady & Jones, 2005; Smith, 2007; Rader, 2005; Bamba & Rader, 2007; Gau & Wright, 2006). Blood LDLc promotes cholesterol accumulation, resulting in atherosclerotic plaque build-up. Blood HDLc acts to reverse this accumulation, therefore inhibiting the build-up of atherosclerosis (Rader, 2005; Bamba & Rader, 2007). Levels of LDL should be lower than 3.4 mmol/L (50-70 mg/mL) for clients having more than two cardiovascular risk factors. HDLc levels should be above 1 mmol/L (50-60 mg/dL). Low levels of blood HDLc (< 1 mmol/L) are shown to increase the chance of heart disease (Health Canada, 2005). However, some individuals present with isolated high LDLc levels, while others present with moderate LDLc, high TG levels and low HDL. Variations between people are seen in various other risk factors as well, including body weight. Thus, the diet therapy that is advised to

these individuals varies according to their cardiovascular disease risk profile. According to Smith (2007), 80% of lipid disorders can be attributed to unhealthy diet and sedentary lifestyle, while only 20% are due to genetic causes. Thus, unhealthy diet and lack of exercise account for the majority of dyslipidemia (Smith, 2007, Genest et al, 2003, 2009). When dyslipidemia presents in conjunction with hypertension and central obesity, it can be generally characterized as metabolic syndrome – increasing the risk of diabetes (Genest et al, 2009; Sorrentino, 2005).

Through diet therapy, the goal is to decrease LDLc levels while elevating or maintaining HDL levels. Even modest improvements in blood LDLc have been associated with decreased morbidity and mortality from CHD and diabetes. Guidelines for the management of dyslipidemia were published and later reviewed and revised (Genest, Grohlich, Fodor, McPherson, 2003, 2009), providing several updates for dyslipidemia care and the prevention of CVD and diabetes. This group of experts, who originally suggested an LDLc target level of 2.6 mmol/L or less for patients with CVD, re-evaluated this value and recommended a level of 2.5 mmol/L or less (Genest et al, 2003; Maki, 2007). Furthermore, they emphasize the importance of diet therapy and exercise in the prevention of CVD and diabetes. More specifically, the authors stated that lifestyle changes including the increase of fruit and vegetable intake, mono- and poly-unsaturated fats intake, in combination with a reduction of saturated fats and trans-fat, would assist in the prevention and management of dyslipidemia, CVD, and diabetes. This information serves to orient and guide the dietetic counseling task, whose main focus is on developing a plan with the client that reduces the risk of obesity and cardiovascular disease within a client-centered approach to behavioural change. In this sense, the dietetic counseling task differs from most tasks studied in the expert-novice approach.

As far as dietetic counseling is concerned, a dietitian examining a patient with dyslipidemia assesses the client in regards to individual biological markers such as anthropometric measurements and clinical data, in addition to family and medical history, level of physical activity, psycho-social support, ethnicity, and socio-economic status (Hanning, Diaz, & Brauer, 2002). The dietitian also considers issues related to food intake, including diet behaviour, meal patterns, nutrient and fat consumption, as well as fiber (vegetables and fruits), whole grains, and legumes. The goal of the dietetic counseling is to identify those aspects that may act as barriers to lifestyle changes, and to guide the client to make those changes, for example, in his or her behavior toward implementing healthful decisions, such as encouraging a more balanced diet, increasing intake of fiber, reducing intake of saturated fats, and increasing exercise. Furthermore, the complexity of the dietetic counseling task lies in other elements such as the assessment of intention, current intake, developing initial strategies and skills to address the lifestyle barriers presented.

3.1.2 Studying Expertise

Various research set-ups have been used to investigate expert-novice clinical performance, varying from artificial laboratory conditions to more naturalistic situations (Chi, 2006a, 2006b). An often used empirical paradigm for data collection consists of the presentation of vignettes, or artificially-constructed scenarios, to which study participants have to respond using some form of verbal protocol, either concurrent or retrospective. Among these data collection approaches, the think-aloud protocol (Fonteyn, Kuipers, & Grobe, 1993; Ritter, 2003; Chi, 1997, 2006a, 2006b) and the explanation protocol (Patel & Groen, 1986; Arocha, Wang & Patel, 2005; Chi, 1997, 2006a, 2006b) have been successfully used in expert-novice research.

The explanation protocol differs from think-aloud protocols in the sense that the clinician is asked to provide an explanation of the case condition—instead of simply verbalizing whatever comes to mind during problem-solving (Chi, 1997, 2006a, 2006b; Arocha, Wang, & Patel, 2005, Patel & Groen, 1986). In the standard experimental methodology, the clinician is first presented with a case, usually in written format as a vignette, and then asked to explain it in terms of the clinician's domain knowledge. The explanation protocol (Patel & Groen, 1986, Arocha, et al, 2005; Chi, 1997, 2006a, 2006b), which consists of asking participants to explain how they would plan and implement care, is the method used here.

3.1.3 Assumptions Underlying the Explanation Protocol

The use of explanation protocols requires the spelling out of some assumptions associated with the explanatory process (Arocha, Wang, & Patel, 2005). One such assumption is that the first information to pass through working memory is the first to trigger retrieval from long-term memory (LTM) (Patel & Groen, 1986; Arocha, Wang, & Patel, 2005; Patel, Arocha & Kaufman, 2001). Likewise, it is assumed that cognitive processes underlying explanations are conducted in a serial manner. In other words, the ideas that are verbalized first are typically thought first. With these assumptions in mind, the study will look at the knowledge used as it occurs during actual case interpretation.

A discourse-analytic method used for analyzing verbal data is propositional analysis (Patel & Groen, 1986; Arocha, Wang, & Patel, 2005; Chi, 1997). This is a method for the investigation of connected discourse and has ample applicability to the study of discourse processes (Frederiksen, 1975), and has been used to analyze and compare verbal responses to

clinical cases at a semantic level (i.e., not literal word-to-word interpretation). This method consists of identifying the idea units underlying verbal data.

The aim of propositional analysis (Arocha, Wang, & Patel, 2005) is to uncover the semantic structure of a piece of discourse such as a written text or a verbal protocol. It does this by identifying idea units, where a proposition consists of a list of numbered n-place relations, where each proposition is composed of a head element followed by a list of tagged arguments. For instance, the sentence "The patient appeared to be dehydrated" can be decomposed into the following 3-place relation, an action (appear), and two labelled arguments ("patient," and "dehydrated"), as follows:

1.1. Appear PAT: patient, ATT: dehydrated, TNS: past;

Where "PAT:", "ATT:" and "TNS:" are tags representing patient, attributive, and tense (past, present, future) information, respectively. As the example shows, propositional analysis provides a markup language with codes used for classifying the listed propositions in terms of a number of semantic tags, such as causality (CAU:), conditionality (COND:), location (LOC:), and attributive relations (ATT:), among others. When analyzing verbal protocols in this analysis, inference generation and recall is determined, where a proposition that is a direct recollection of information from the presented case (i.e., a verbatim statement) is coded as a 'recall,' whereas a proposition that provides information beyond the written case is coded as an 'inference' (Patel & Groen, 1986; Arocha, Wang, & Patel, 2005).

Although the development of semantic representations is the main result of propositional analysis, it is also possible to distinguish surface aspects of the clinical case interpretation from information that is inferred from the case, and that point to the domain knowledge used.

To the authors' knowledge, this is the first study of its kind, as there is no research that has examined the knowledge used and recall and inference generation of dietitians of various expertise levels while explaining dyslipidemia cases. Investigating the verbal responses of this sample of dietitians allows for the analysis and discussion of trends in terms of the numbers of recalls and inferences generated by the expert, intermediate, and novice individuals. The verbal explanations of a small sample of expert, intermediate and novice dietitians are analyzed, and differences are identified. It was hypothesized that there would be differences in terms of the numbers of recalls and inferences generated between the levels of expertise. Consistent with research in other areas of health, it is hypothesized that experts will make fewer recalls and more inferences relative to novices, because of their previous experience in dealing with similar cases. Intermediates, however, make the largest number of inferences than novices and experts, as consistent with the "intermediate" effect (Patel & Groen, 1986; Boshuizen & Schmidt, 1993; Wimmers, et al, 2005; DeBruin, et al, 2005; Patel, et al, 1989; Rikers, et al, 2000). The hypothesis is that intermediate dietitians possess greater knowledge than novices, but weaker organization than experts. Thus, it is expected that the intermediate dietitians in this study will make the largest numbers of both recalls and inferences.

3.2 Methods

3.2.1 Participants

The sample for the present study consisted of 12 dietitians at three levels of expertise: Novice, generalist, and expert specialists. The novice practitioners (n=4) were recent graduates and had been practicing in general nutrition counseling for less than one year; the generalists

(n=4) had been practicing for more than one year in general dietetic settings such as primary care; and the experts (n=4) were specialists working in a specialist cardiovascular clinic as a dyslipidemia counselor for several years.

3.2.2 Materials

Hypothetical case scenarios (vignettes) were developed by Brauer et al (2007, 2009), based on a systematic literature review from which a list of key client characteristics and predictors of diet responses for dyslipidemia was generated. The purpose of developing these scenarios was to compile a collection of diverse profiles for clients typically seen in dyslipidemia diet counseling. A total of twenty-four diverse combinations were gathered as client profiles using statistical methods to generate different scenarios (Brauer, 2007). All of the cases were written in the same format, but included differing characteristics. These combinations were deemed representative of most typical dyslipidemia cases, including variances in body weight (from normal to overweight) as well as fat intake (from ideal to high). A table describing the cases can be found in Appendix A. The range of practice is illustrated through these case profiles, creating a circumstance that may lead a dietitian to reason and advise the client in a particular direction. The client scenarios were reviewed by a steering committee (consisting of members of Dietitians of Canada and experts) for sensibility. Pilot testing revealed that additional information on diet intake was needed to generate discussion (Brauer, 2007, 2009). An example of the type of scenario used in the study is presented in Appendix E.

3.2.3 Procedure

The participants were a convenience sample of local registered dietitians in Southern Ontario (Brauer et al, 2007, 2009). The participating dietitians were interviewed in person individually by one interviewer (DR), who is a dietitian. Each interview lasted approximately 60 minutes. In the interview, participants were asked to describe their suggestions for care, including initial consultation, recommendations and follow-up, for two different case scenarios. Case scenarios were randomly assigned to each of the 12 study participants. Verbalizations were audio taped and later transcribed for cognitive and semantic analysis. Propositional analysis was conducted on the transcriptions. The identities and levels of expertise of the participants were unknown to the analyst (MM) to reduce the possibility of biases. Furthermore, a sample of protocols was independently analyzed by a second analyst (JFA) to check for accuracy, following the method developed by Frederiksen (1975).

Analysis consisted of the following steps: First, once the transcripts were propositionally analyzed, the number of propositions that represented case recalls and those that represented inferences were identified. Every proposition that was explicitly reproduced from the case scenarios was coded as a 'recall', while every proposition not explicitly matched to the case scenarios were coded as an 'inference'. Second, the number of unique propositions was counted for each of the protocols. This calculation omitted repeated propositions and focused purely on the singular concepts discussed by each dietitian. Third, all case data propositions (e.g., "the client's dietary fiber intake is low") were identified in an effort to determine the amount of given case data that was recalled by each participant. Fourth, in order to obtain a better understanding of the actual concepts discussed by the dietitians, specific concepts were also ranked in order of most discussed to least discussed. Statistical analysis was conducted using ANOVA, and further

with t-tests adjusted using the Bonferroni method, to specify statistically significant changes between groups. The study received ethics approval by the Office of Research at both the University of Guelph and the University of Waterloo.

3.3 Results

The results are presented in the following fashion: first, an analysis is presented of unique recalls and inferences generated (omitting repetitions); second, the results regarding case cue utilization are shown; and third, an analysis of specific concepts used (i.e., those of “fats” and “cholesterol”) is provided. Thus, the analysis will focus on the assessment of (1) overall numbers of recalls and inferences generated by the participants; (2) the percentage of case scenario data used; and finally (3) an illustration of the concept usage related to "fats" and "cholesterol." The data are presented in percentages due to the variations in the numbers of propositions generated by each dietitian, which range from 106 statements to 336 statements. The data are illustrated in this format, which allows for the comparison between individuals and groups.

3.3.1 Frequency of Recall and Inference Generation

Unique concepts generated by the study participants were calculated based on the number of specific recalls and inferences during clinical case explanation, excluding repetitions. ANOVA testing shows that there was no statistical significance for differences in recalls [$F(2,9) = 0.17, p = 0.84$], or inferences [$F(2,9) = 1.43, p = 0.29$] between groups. Figures 1a and 1b present box-and-whisker plots generated to show the measures of central tendency and distributional information of unique recalls and unique inferences for expert, novice and

generalist dietitians, i.e., minimum and maximum values, median (+), mean (x), and 25th and 75th percentiles, as suggested by Lane and Sandor (2009).

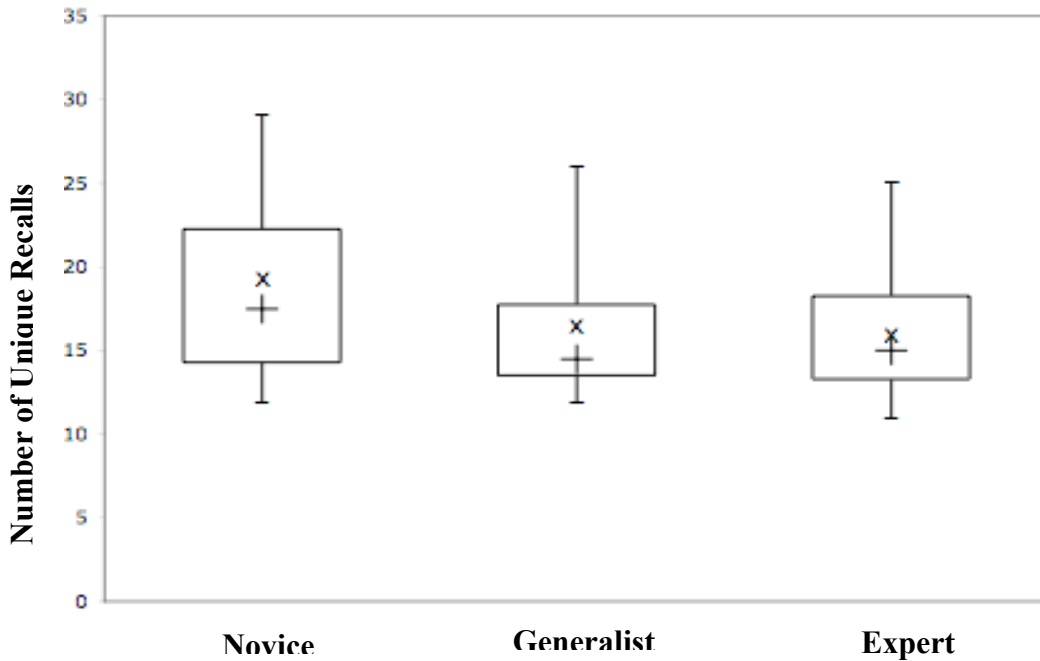


Figure 1a. Distribution of unique recalls, grouped by level of expertise. The median is represented by a plus sign (+), and the mean is represented by an 'x'. The whiskers above and below the box represent the maximum and minimum values, respectively.

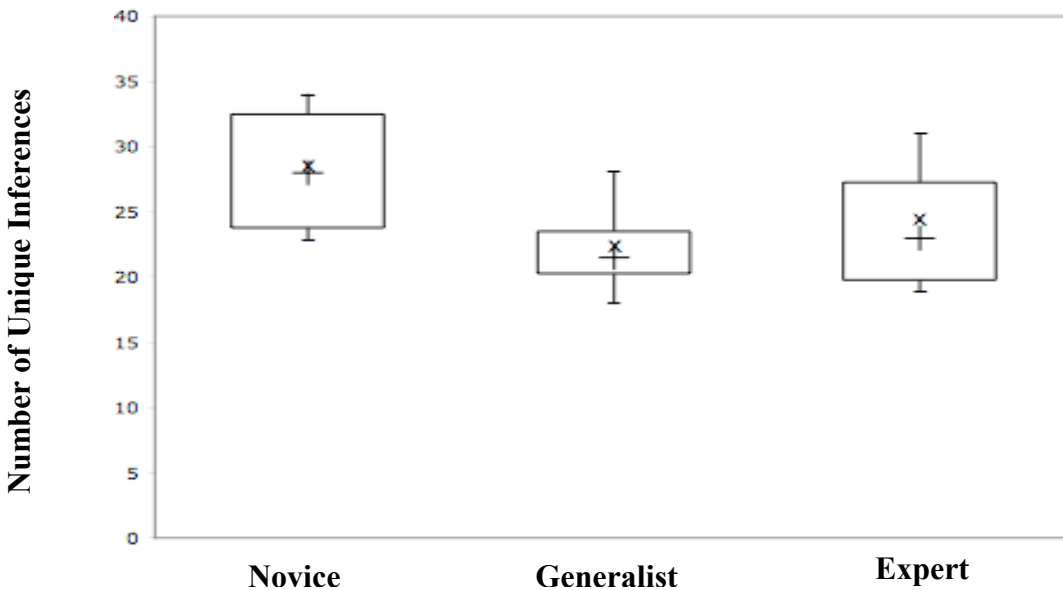


Figure 1b. Distribution of unique inferences, grouped by level of expertise. The median is represented by a plus sign (+), and the mean is represented by an 'x'. The whiskers above and below the box represent the maximum and minimum values, respectively.

Table 1 shows the number and percentage of unique recalls and unique inferences for each individual participant. The table displays these values, ranging from 11 (E02) to 29 (N04) unique concepts recalled, and as can be observed, the individual-level data varies greatly in both numbers and percentages. In contrast to the results in other domains (where typically experts generate the fewest recalls), the greatest percentage of unique concepts recalled was by expert E04 (56%) and novice N01 generated the greatest percentage of unique inferences (73%).

Table 1. Unique Recalls and Inferences Generated by Novice, Generalist and Expert Dietitians

Dietitian	Unique Recalls	Percentage of Unique Recalls	Unique Inferences	Percentage of Unique Inferences	Total
N01	12	27	32	73	44
N02	15	39	23	61	38
N03	20	45	24	55	44
N04	29	46	34	54	63
G01	26	48	28	52	54
G02	14	40	21	60	35
G03	15	45	18	55	33
G04	12	35	22	65	34
E01	16	34	31	66	47
E02	11	30	26	70	37
E03	14	42	19	58	33
E04	25	56	20	44	45

3.3.2 Case Cue Utilization

Case cue utilization refers to how much of the clinical data given in the case descriptions was used in the dietitians' explanations. To obtain the amount of given case cues (i.e., clinically relevant pieces of information presented in the case descriptions) in each scenario, each clinical

data segment in the case scenarios was counted. All pieces of clinical data given in the case scenarios that were also present in the dietitian's explanation protocol were identified and matched to the case data. For instance, if a case scenario describes the client as "a 66-year old male who smokes a pack of cigarettes a day," this was counted as three pieces of case data ("male", "age 66" and "smoking 1 pack of cigarettes a day"). If the dietitian stated in her explanation that "the client smokes a package of cigarettes per day" or "the client is a heavy smoker," then this was counted as one case cue used. In contrast, information in the case descriptions that was not clinical data was not coded as cues used. For instance, a case description statement such as "the client was referred for diet counseling" was not counted as a case cue because it has no clinical significance in itself. The number and percentage of data used were calculated from the propositional analysis that was directly taken from the given scenario, omitting repetitions.

Figure 2 presents a box-and-whisker plot of the percentages of case cues recalled by novice, generalist, and expert groups. The figure shows the distribution, medians, and means of given data recalled during clinical case explanation. The plus symbols (+) indicate the means for each group. On average, experts recalled 76% of the given data, the novices recalled 95% of the given data, and the generalists recalled 80% of the given data. However, these differences were not statistically significant [$F(2,9) = 1.94, p = 0.119$]

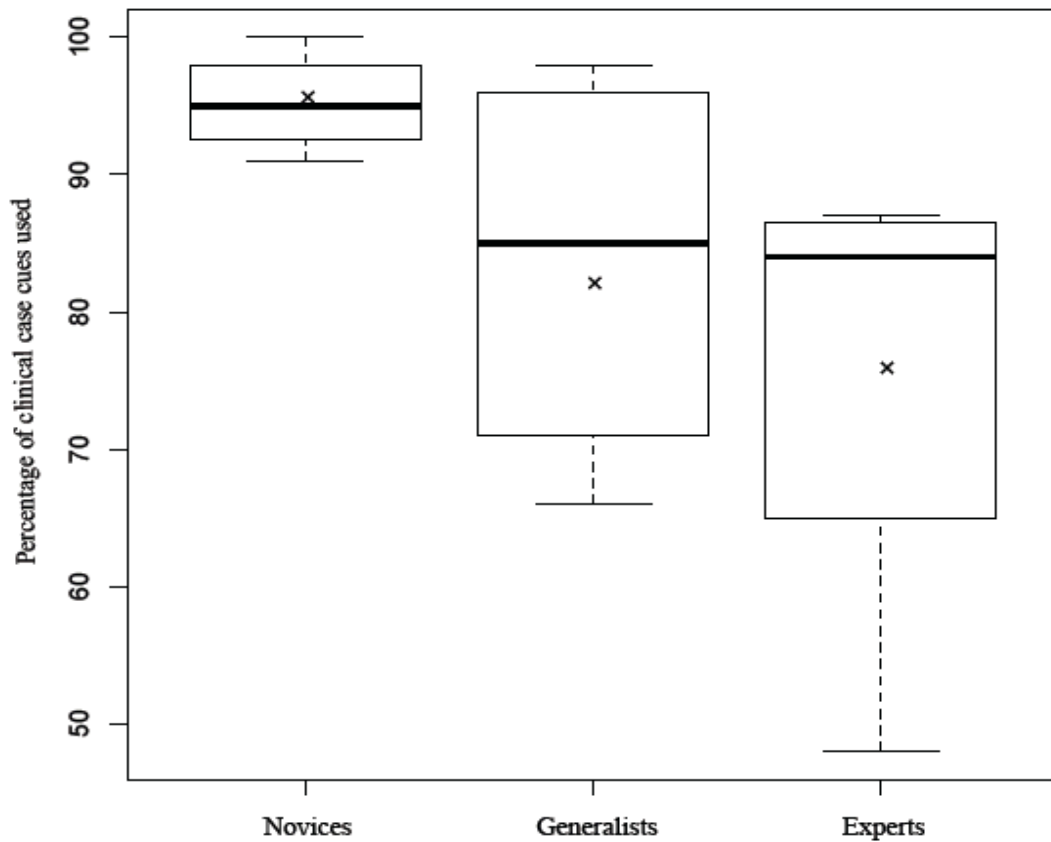


Figure 2. Distribution of percentages of given data recalls, grouped by level of expertise. The median is represented by a bold horizontal line, and the mean is represented by an ‘x’. The whiskers above and below the box represent the maximum and minimum values, respectively.

Table 2 presents clinical cues used by each individual in the study. The number and percentage of recalls were calculated by counting the number of clinically relevant data segments from the propositional analysis that was directly recalled from the given scenario, omitting repetitions. Novice N04 used all clinical cues in the data and was the only participant observed to recall 100% of the data given in the case scenario. Expert E03 recalled the lowest percentage of clinically relevant cues (48% of the given clinical data).

Table 2. Given Case Data Recalled by Novice, Generalist and Expert Dietitians

Dietitian	Given Case Data	Unique Data Recalled	Percent Total
N01	56	51	91
N02	54	52	96
N03	51	48	90
N04	52	52	100
G01	53	52	98
G02	46	35	76
G03	52	49	94
G04	49	25	51
E01	53	46	87
E02	40	33	82
E03	54	26	48
E04	51	44	86

3.3.3 Exploring Individual Concepts: The Case of "Dietary Fat" and "Blood Cholesterol"

Two of the most critical issues in dyslipidemia counseling relate to the control of dietary fat and blood cholesterol. Figure 4 shows the breakdown of the ‘fat’ concept into 4 categories, as discussed, either during recall or inference, by participants.

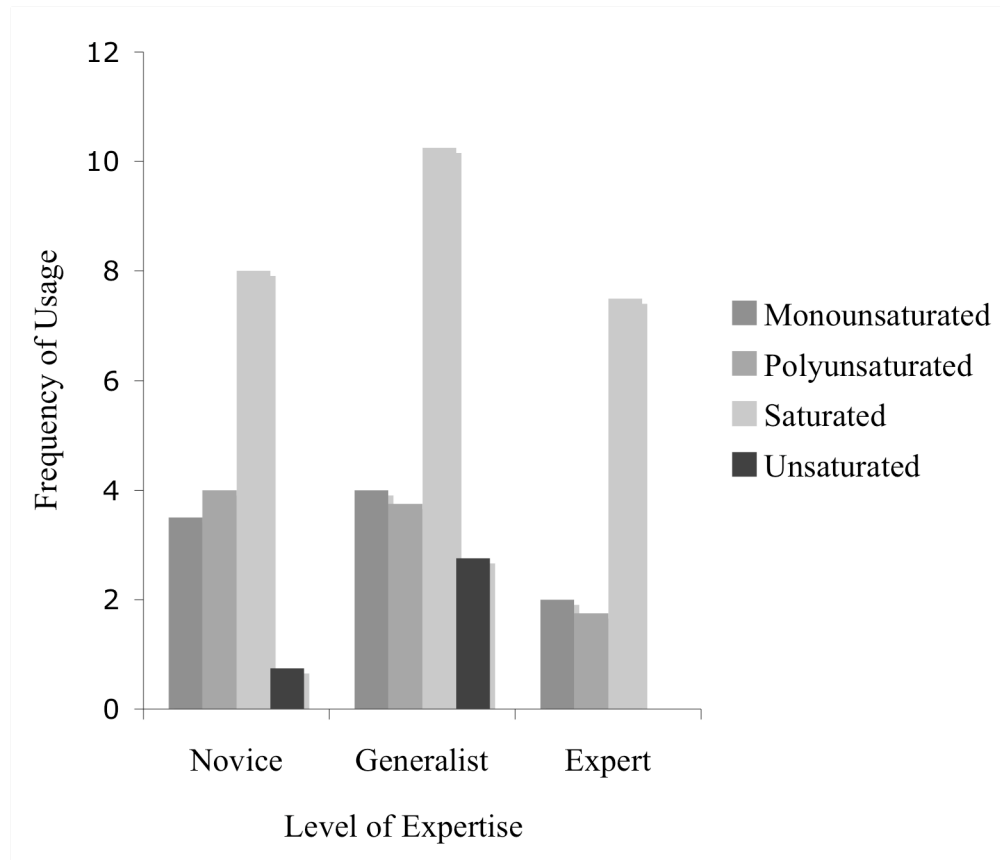


Figure 3. Frequency of concept usage broken down by types of fats discussed on average during clinical case explanation, and grouped by level of expertise.

Figure 3 presents the average number of times that the concepts of ‘monounsaturated’, ‘polyunsaturated’, ‘saturated’, and ‘unsaturated’ fats, were discussed by the participants. Although monounsaturated and polyunsaturated fats fall under the category of unsaturated fats in the context of dietetics, this analysis shows the raw breakdown of each term discussed during interviews. On average, generalist dietitians discussed the fat concept more often than experts or novices, but the difference was not statistically significant [$F(2,9) = 2.66, p = 0.12$]. These concepts were discussed by every dietitian, and were among the ten most frequently used words.

On average, novice dietitians discussed fats 29.75 times during clinical case explanation, while generalists and experts discussed fats 16 and 15.5 times respectively.

Most of the emphasis given in the participants' transcripts was on the notion of 'saturated fat,' while the concept of 'unsaturated' fat was not discussed by any of the expert dietitians.

Figure 4 illustrates a breakdown for the term blood cholesterol into two categories: LDL and HDL.

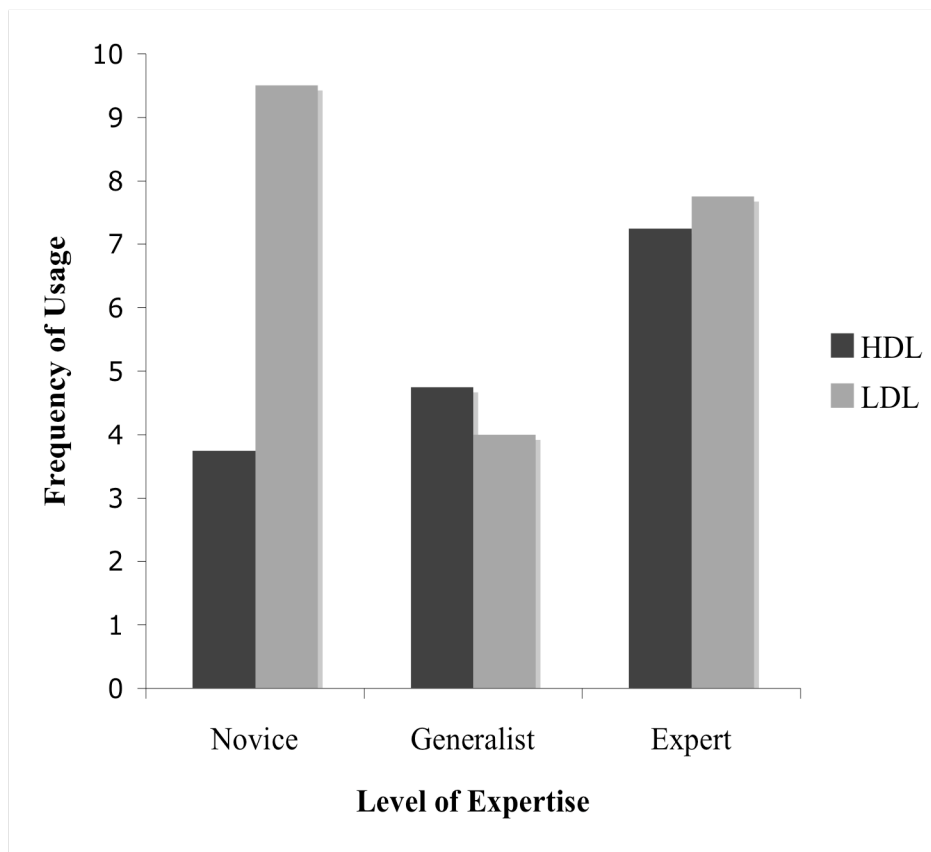


Figure 4. Frequency of concept usage of blood cholesterol categories (HDL and LDL) discussed on average during reasoning by level of expertise.

Novices discussed the general term 'cholesterol' 12.75 times, generalists used the term 11.25 times, and experts used the term 2.75 times on average. Analysis of variance for HDL and

LDL showed that there were statistical differences. There appear to be statistical differences for HDL [$F(2,9) = 4.46, p = 0.045$] and LDL [$F(2,9) = 5.29, p = 0.03$]. Further t-tests however, adjusted with the Bonferroni method, showed that there were no differences between groups ($t=0.053, p=0.05$) for HDL. For LDL, there were statistical differences ($t=0.03, p=0.05$) between experts (9.5, 1.29) and generalists (4.0, 1.15), but not novices (7.75, 3.86).

In summary, the results presented in this section illustrate the concepts discussed most frequently, as well as the breakdown of the dietary fat and blood cholesterol concepts as discussed by novice, generalist, and expert dietitians.

3.3.4 Analysis of Illustrative Protocols in Concept Usage

The focus of this section is on two of the most emphasized concepts, dietary fat and blood cholesterol, where we illustrate their utilization by individual experts, novices and generalists.

When looking at the concept of blood cholesterol, the common aspect among the clients was being given the label of 'high-risk'. An expert dietitian (E01) mentioned the concept of 'cholesterol' nineteen times overall, with the sub-category of 'LDL' mentioned ten times during clinical case explanation. The dietitian mentions the target level for LDL values for high-risk clients, and suggests a way of decreasing the LDL level for this client:

"We say cholesterol ideally should be under 5.2, now other guidelines say 4.5, but most importantly because he is high risk, his LDL should be 2.5 and his is 4.4...because he is at high risk and LDL should be 2.5, I actually would recommend that he have a substitute for butter."

E01 again raised the concepts of cholesterol, LDL and HDL when discussing recommendations for fat reduction and weight loss.

Let us compare the way a dietitian at an intermediate level of expertise (G01) deals with the same concept. This dietitian mentioned the concept of 'cholesterol' 23 times, but 'LDL' only twice. This particular dietitian does not mention a target level for high-risk clients or any target level at all:

"So her total cholesterol would still be considered quite elevated...we would look at what changes she would need to make to improve her LDL cholesterol."

Unlike the expert, this generalist was not as specific about LDL targets or approaches, and how to lower (improve) the client's LDL.

Content analysis of a novice dietitian's verbal response paints a different picture from the one in the generalist's explanation. This dietitian mentions the concept of 'cholesterol' 38 times, but discusses 'LDL' less than five times throughout the interview. Furthermore, cholesterol and LDL are explained in more detail than the generalist dietitian, with explicit mention of the target levels. An excerpt taken from a verbal protocol of N01, including a discussion about how she would educate the client about cholesterol, where the dietitian explains what would be discussed during the counseling session in terms of cholesterol definitions:

"We would be looking at the more aggressive target for a total cholesterol of less than 4.6, LDL less than 2.5...I usually explain what the different types of cholesterol are or the different indicators, and what her targets might be...the difference between the LDL and the HDL, and I talk about the LDL being lousy and that we want it lower, and the HDL being healthy and that we want it higher."

Other concepts that were among the most frequently discussed were those related to fat intake (i.e., the concepts of fat and its sub-categories). The protocols chosen for this content analysis consist of clients that were deemed low-risk for CVD by physicians. Novice 3 recalled all the values for each fat category provided in the scenario, discussing the concepts of fats prior to introducing Canada's Food Guide:

"His total fat is 35%, saturated fat is 15%, so that is high, I would want to try and reduce that a little bit, so his polyunsaturated and monounsaturated are both 10%, so his goal might be to increase his mono a bit and reduce his saturated to 10%...and then talk about the Canada's Food Guide to Healthy Eating and then specifically talk about fat intake and fiber intake."

The dietitian also suggests healthy alternatives such as various oil and margarine options, and emphasizes the importance of available resources concerning mono and polyunsaturated fats:

"...and talk more about the different types of fats and how to emphasize more on the monounsaturated and what type of oil and margarine that they are using... when we were talking about the polyunsaturated and monounsaturated, I know there is a lot of good resources and specifically there is one that I have seen about different fats and the amount of polyunsaturated fats and good choices."

This novice dietitian goes into some depth when discussing types of fats, which is even more evident in the clinical case explanation of the generalist dietitian.

During the interview, a generalist (G04) mentions saturated fat 15 times, and unsaturated fat 7 times – more than any other dietitian. This dietitian also recalls and comments on the break down of fats and the corresponding values:

"Her total fat is 37%, which is high, her saturated fat is 20% of her total calories and that is certainly high, and probably related to the type of food that she is eating at the restaurant. Her polyunsaturated fat and monounsaturated fat are low, so those could actually come up."

Further, this generalist relates the types of fats used by the client to her job at a restaurant, placing focus on oils used for frying. Alternatives suggestions are also given:

"I'm not sure what they are deep frying with, if you could watch to use more of the unsaturated oils, so the Canola oil, the Sunflower, probably not using olive oil but maybe using Canola, sunflower, corn oil even, peanut oil is a little bit higher in the saturated...and again I would go over the same things for her about these are saturated fats, these are unsaturated fats, and again the whole notion of trying to decrease one and trying to bring the other ones up because those are still healthy..."

This type of discussion is in clear contrast to the type of discussion about fats provided by E04. Unlike the novice and generalist dietitians, this dietitian claims that there has been a shift away from calculating percentages of fats, probably from her long personal experience with dyslipidemia clients:

"I am so far away from these percentage numbers, we don't deal with that at all anymore. I don't calculate the amount of fat, I used to years and years ago working in the lipid clinic at the hospital, but we don't look at those kinds of numbers anymore. We simply look at what they are eating, and is that a good fat or a bad fat?"

Additionally, without directly referring to types of fat, this expert provides recipes for alternative options. Further discussion vaguely centers on the reduction of fat values, without mention of an actual target levels:

"Overall her total fat intake was okay, so its more or less changing the types of fats to improve the monounsaturated and polyunsaturated and reduce the saturates."

Based on these excerpts, a distinction can be made between the clinical case explanation of expert, generalist and novice dietitians. It appears that the generalist provided the most in-depth discussion about the types of fats, and elaborated more about low-fat options. The expert dietitian was least expressive about types of fats, and the breakdown of target levels. An explanation for these results will be discussed in the upcoming section.

3.4 Discussion and Conclusions

In the introduction, the issue of relating the study of medical expertise to the field of dietetics was brought up and suggested that dietetic counseling appears to be different than the task of the physician, especially the most investigated task in cognitive and behavioural research,

namely diagnostics. In dietetic counseling, the goal is to generate an overall picture of the client's state, and then guide him or her in making healthful decisions regarding diet and general lifestyle changes, rather than reaching a conclusion about the client's clinical findings. In this regard, the dietetic counseling task is more akin to psychological counseling or psychotherapy, in the sense that the task itself is less well defined than in clinical medicine. In such tasks, expertise is not as easily identifiable (Lichtenberg, 1997) as in other areas of health, such as diagnostics, where knowledge and competence can be more accurately assessed.

Even though this study was aimed at characterizing the performance of novice, generalist, and expert dietitians, it failed to find the types of clear-cut results obtained in other areas of health. It may be that expertise in dietetics can be captured in the more affective aspects of the clinical encounter, such as empathy, attention to non-verbal cues, or use of prior experience to guide the information search (McMurray, 1992), rather than purely cognitive components of clinical performance. However, despite the apparent failure to identify clear differences among the groups, there are suggestions in the data that allow for a more optimistic outlook regarding differences in dietetic counseling.

Assuming that the findings in medical cognition would be replicated to some extent in dietetic counseling, it is suggested that experts would approach the clinical cases in a more general manner, generating the least number of recalls, since one can hypothesize that experts are more capable of discriminating between important and unimportant clinical information, something at which less-than-expert individuals might not be as skillful.

It was also suggested that generalists would produce the largest total numbers of both recalls and inferences in their transcripts, in keeping with the intermediate effect found in other studies (Boshuizen & Schmidt, 1993; Wimmers et al, 2005; DeBruin, et al, 2005; Patel et al,

1989; Rikers et al, 2000; Eva et al., 2002). The results showed that there were no significant differences between the recall and inference generation between the groups. However, further studies may be needed to determine whether generalist dietitians actually behave like intermediates in studies of clinical expertise in medicine and troubleshooting (Van Gog, Pass, and Van Merriënboer, 2005). Furthermore, studies should be aimed at identifying whether a trend such as that found in other domains appears as a result of an intermediate effect.

Experts were expected to generate the lowest percentage of recalls on average, as suggested by the notion that experts approach clinical cases in a more general fashion, using fewer concepts to explain clinical data. The hypothesis was that experts rely less on specific pieces of clinical data, and are able to extract the most important information in order to generate inferences. However, the results showing no statistical differences between the recalls generated by experts, generalists, and novices contradicts the hypothesis and points to an anomaly in the context of dyslipidemia counseling.

In terms of case cue utilization, it was speculated that experts would make use of the fewest clinical data during clinical case explanation due, in part, to the experts' ability to focus on the most relevant data from the case scenarios, and utilize only the information that is most pertinent during counseling. Conversely, it was suggested that novices would make use of more of the clinically relevant data, due to their fewer years of experience in the field and their inability to "filter" less relevant case information. However, analysis showed no statistical differences between groups in terms of case cues used, although interesting findings pertaining to individual participants could be observed. One participant (E03) made use of the fewest pieces of clinical data in her case explanation, which could be due to this expert's particular familiarity

with dyslipidemia cases. This particular expert may not have needed to utilize more of the given clinical data in order to make inferences during clinical case explanation.

Several other interesting findings were observed during analysis. First, regarding the nature of the content being discussed, it was possible to investigate the primary concepts that were of most importance during clinical case explanation. Overall, the concepts of *fat* and *cholesterol* were discussed extensively by all participants. Since the case scenarios were developed in a way to cover the range of various dyslipidemia cases seen in daily practice, there was some variation within the subject's profiles that may have led the dietitians to reason a particular way with regards to these terms.

The term 'fat' was broken down into four sub-categories, and the averages calculated for each level of expertise. One of the findings was that experts made no mention of unsaturated fat during clinical case explanation. This could be explained by these experts' verbalizations being concise and their ability to filter out irrelevant information while focusing on aspects that are of greatest importance. This is further exemplified by novices' use of 'fat' as a general term almost twice as many times as generalists or experts. On average, novices discussed the broad topic of fats almost 30 times, while experts and generalists used the term approximately 16 times. This trend can be attributed to the novices' lower ability to filter out irrelevant formation during clinical case explanation, and perhaps repeating the same concepts excessively. Due to their inexperience, it is possible that novices discuss various aspects about a certain topic in an effort to cover everything regardless of relevance to the case, or in fear of omitting information of potential importance.

In terms of the concept of cholesterol, a similar finding was observed. Experts were much more concise in their discussion about cholesterol than their counterparts. However, experts also

placed emphasis on the sub-category of LDL. This could be explained by the expert dietitians' ability to focus on an aspect of cholesterol that is the most relevant in terms of cholesterol level values and heart health. Furthermore, experts may possess the ability to encapsulate their broad knowledge into smaller fragments, giving them the ability to relay only the most relevant pieces of information to the client during counseling. The case scenarios provided the participating dietitian exposure to a case similar to one seen in daily practice, as though the dietitian was indeed seeing clients in succession. Although the case scenarios are similar in many ways, each scenario described a unique client. As a result, some of the unique characteristics among these hypothetical clients may have directed each dietitian to reason in a particular manner.

In summary, the study highlights individual-level differences among a small sample of dietitians. The purpose of this study was to characterize knowledge generation and utilization among dietitians at various levels of expertise and to analyze and explain the possible trends that emerged among these particular dietitians. Further studies should be conducted to replicate the findings of this study and to search for an explanation as to why knowledge utilization may be different in the case of dyslipidemia or nutrition counseling.

3.5 Limitations and Future Research

To our knowledge, this is the first study using the expert-novice research paradigm in the field of dietetics counseling. Participating dietitians were asked to reason concurrently through a hypothetical case scenario using an explanation task. Including a retrospective discussion about the reasoning process would have increased validity, but it would have introduced a bias in terms of increased opportunity for reflection.

The case scenarios created for the study (Brauer, et al., 2007, 2009) were compiled from a multitude of factors such as body weight, LDLc and HDLc levels, TG values, fat intake and other characteristics most commonly seen in dyslipidemia clients. The variance seen in individual profiles was beneficial for the purpose of capturing the range in types of clients seen in daily practice. However, this variance may have led the dietitian to reason in a particular direction according to the characteristics in the profiles, resulting in a difficulty when comparing dietitians in terms of the knowledge they used, as well as the differences between novice and expert reasoning. Keeping the case scenarios constant would allow for a more accurate assessment of the knowledge among the expertise groups.

The study focused on an in-depth exploration of a small subset of dietitians, and attempted to uncover the knowledge generation and utilization by these dietitians. Thus, although detailed, the purposive nature of the sampling procedure and small sample size do not allow generalizing to a larger population of dietitians.

Finally, the presence of an experienced dietitian as the interviewer may have influenced the participants to behave in a certain manner, thus creating a potential interviewer bias. Future research should collect recall and inference data from a much larger random sample in order to achieve both depth and breadth in analysis, while keeping the case scenario constant for more accurate comparisons. It may also prove beneficial to include a retrospective discussion about the meta-cognitive aspect of reasoning, in an effort to attain a better understanding of the differences between experts and novices during counseling. The collection of such data would enhance current literature and may be useful in strengthening teaching techniques of novices, and improving counseling strategies for efficiency and accuracy in the provision of care.

CHAPTER 4

Directionality of Reasoning and Coherence during Clinical Case Explanation by Novice,

Generalist, and Expert Dietitians

To be submitted to Chronic Diseases in Canada

Overview

Objective: This exploratory study aims to identify the differences in reasoning of novice, intermediate, and expert dietitians during dietetic counseling in terms of directionality, individual analysis of semantic network representations, and length of reasoning chains.

Background: Reasoning among various types of expertise has not previously been explored in the field of dietetics. Previous studies in clinical diagnostics suggest that experts rely primarily on data driven reasoning, while novices rely primarily on hypothesis driven reasoning, and generalists using a mixture of both processes. The number and length of reasoning chains have been associated with the level of cohesion of thought, where experts produce longer chains and a more cohesive explanation as compared to novices and generalists.

Methods: The reasoning processes of twelve dietitians given a dietetic counseling task were analyzed in detail for the current investigation. The results are presented and summarized in graphical format as semantic networks and compared between individual expert, generalist, and novice dietitians. ANOVA and subsequent t-tests were conducted to determine whether differences between groups were statistically significant.

Results: Results showed that there was a statistical difference between novices and experts in terms of data driven reasoning with novices displaying more forward driven thoughts. There was no difference between groups for hypothesis driven reasoning. With regards to chain lengths, there were no statistical differences between the levels of expertise. The semantic networks of individual dietitians were compared, with expert networks showing a more cohesive and structured discussion during interview while novice and generalist networks less organized and cohesive in reasoning.

Conclusion: Based on the findings, it can be concluded that data driven reasoning was more characteristic of novice dietitians, which is contrary to previous expert-novice research. The results also illustrated no difference in the length of chains between levels of expertise. A more cohesive reasoning process was found among the expert dietitians, which is analogous to the current expert-novice reasoning literature.

4.1 Introduction

Research by Elstein and colleagues (Elstein, Shulman & Sprafka, 1978) introduced the notion of expert-novice differences to the realm of health. Since then, the study of expertise has expanded to various facets of medicine (Patel, Arocha & Zhang, 2005; DeBruin, Van De Wiel, Rikers & Schmidt, 2005; Arocha, Wang & Patel, 2005; Boshuizen & Schmidt, 1992; Custers, Boshuizen & Schmidt, 2004; Rikers, Schmidt & Boshuizen, 2000; Ritter, 2003; Schmidt, Norman & Boshuizen, 1990; Wimmers, Schmidt, Verkoeijen & Van De Wiel, 2005), nursing (Ericsson, 2007; Reischman & Yarandi, 2002; Benner & Tanner, 1987), physiotherapy treatment (Doody & McAteer, 2002), and occupational therapy treatment (Mitchell & Unsworth, 2005; Gibson et al, 2000; Strong et al, 1995). To our knowledge, no studies on expert-novice reasoning have been conducted in the field of dietetic counseling. This paper explored the reasoning process in nutritional counseling of dyslipidemia clients.

Studying the underlying characteristics of experts, intermediates and novices clinicians can shed light on the differences in abilities with regards to reasoning. The reasoning process can occur in two directions, data driven and hypothesis driven. Data driven reasoning is associated with diagnostic accuracy, and refers to the formulation of a hypothesis, moving from cue acquisition to an appropriate diagnosis. Hypothesis driven reasoning moves from a possible diagnosis back to the given cues to confirm or refute a hypothesis (Patel & Groen, 1986; Simmons, et al, 2003; Charlin, et al, 2000; Patel, et al, 2001; Arocha, et al, 2005). Some authors suggest that purely data driven reasoning pathways are seen only in expert clinicians in typical scenarios, while purely hypothesis driven reasoning is seen in novices and sub-experts when they are insecure in reasoning through an atypical case (Patel & Groen, 1986; Arocha, Wang, & Patel, 2005). Most expert clinicians, however, use data driven reasoning followed by hypothesis driven

reasoning to tie up any loose ends (Charlin et al, 2000; Patel et al, 2001; Patel & Groen, 1986; Patel, Groen & Arocha, 1990; Arocha, Wang, & Patel, 2005). In other words, although purely data driven reasoning is only seen in expert clinicians, it appears that most expert clinicians primarily use data driven reasoning and may use hypothesis driven reasoning to confirm the hypothesis. Based on the above information, it is evident that the use of both data driven and hypothesis driven reasoning is common, but that data driven reasoning is more characteristic of expert clinicians. Various studies (Patel & Groen, 1986; Boshuizen & Schmidt, 1993; Wimmers, et al, 2005; De Bruin, et al, 2005; Patel et al, 1989; Rikers et al, 2000; Eva, Norman, Neville, Wood & Brooks, 2002) reported on what became known as the “intermediate effect”, where intermediate individuals, in terms of their level of expertise, performed somewhat more poorly than either novices or experts.

The case scenarios developed for the initial studies by Brauer et al, (2007, 2009) are a compilation of various dyslipidemia factors and symptoms, and serve as a central element in the current study. Dyslipidemia is a term used to generally describe lipid disorders, and is one of the primary risk factors for coronary heart disease (CHD), cardiovascular disease (CVD) and atherosclerosis (Genest et al, 2003; Maki, 2007; Bamba & Rader, 2007; Rader, 2005; Varady & Jones, 2005; Smith, 2007). Individuals with dyslipidemia typically present with elevated levels of Low Density Lipoprotein cholesterol (LDLc) and triglycerides (TG) in the blood, as well as decreased levels of High Density Lipoprotein cholesterol (HDLc) (Varady & Jones, 2005; Smith, 2007; Bamba & Rader, 2007; Rader, 2005; Gau & Wright, 2006). Due to the increased levels of LDLc, cholesterol accumulates in the arteries leading to atherosclerotic plaque build-up. To combat this effect, HDL acts to reverse this accumulation, inhibiting the build-up of atherosclerosis (Rader, 2005; Bamba & Rader, 2007). Therefore, individuals should aim to

maintain higher levels of HDLc and lower levels of LDLc to prevent CVD and HD. Levels of LDLc higher than 3 mmol/L (50-70 mg/mL) and HDLc levels below 1 mmol/L (50-60 mg/dL) have been shown to increase the chance of heart disease (Health Canada, 2005). Although elevated LDLc is typical in dyslipidemia, there are variations among individuals. For instance, some individuals may present with moderate LDLc, but with elevated TG levels and low HDLc. Similarly, another individual may present with isolated high LDLc levels. The diet therapy will therefore vary, according to the needs of the individual client, as well as the other variances in risk factors such as body weight. According to Smith (2007), unhealthy diet and lack of exercise account for the majority of dyslipidemia cases (Smith, 2007). Thus, treatment for dyslipidemia mainly consists of diet therapy and physical activity, and is typically the first line of treatment. Firstly, a reduction in saturated fat and overall caloric intake, if the individual is overweight, can potentially reduce blood LDLc levels by 10-15% (Gau & Wright, 2006). Triglyceride levels can be reduced by 20-40%. In addition to dietary modification, it is suggested that exercise be included in this therapy. Another combination therapy, which has received particular attention, is the use of nutritional supplements such as fish oil, oat bran and naturally occurring plant substances called 'sterols' in conjunction with exercise (Varady & Jones, 2005). The effectiveness of these approaches has been the focus of various studies. Although the success of combination therapies has been established, it appears that diet therapy is most effective in the highly motivated individual (Gau & Wright, 2006). Individuals who do not respond sufficiently to the therapies briefly described above usually require pharmaceutical intervention with the use of 'statins' (Genest et al, 2003; Maki, 2007) or other medications.

Based on previous research on diagnostic reasoning, it is hypothesized that there may be differences between expert, intermediate and novice dietitians in terms of their directionality of

reasoning, with experts using more data driven reasoning (from case data to hypothesis), novices using more hypothesis driven reasoning (from hypothesis to case data), and intermediates using a mix of both. Furthermore, as it has been shown in medical domains, where expert clinicians interpret clinical case information at a higher, more abstract, level, expert dietitians make more use of higher-level concepts, creating more cohesive, organized, and linear semantic networks void of loose ends, than intermediate and novice dietitians. When comparing intermediates to novices, we suggest that intermediates will reason in a more cohesive manner than novices. This difference in level of interpretation may result in experts' explanations to be more succinct and cohesive whereas intermediate and novice explanations may be more detailed and disorganized. Due to the nature of the explanation task being counseling, it is of interest to compare the reasoning graphs of novice, intermediate, and expert dietitians in order to understand the individual differences that may exist.

During dyslipidemia counseling, a dietitian will conduct an initial consultation, assessing a multitude of factors including social and genetic factors, laboratory data including blood lipids and anthropometric measurements, medical and family history of hypertension and smoking, if present and diet (Hanning, Diaz & Brauer, 2002). The dietitian typically emphasizes the importance of client understanding of risk factors, by discussing diet matters such as caloric intake, fat, protein, carbohydrate, alcohol, and fibre (vegetables and fruits) consumption. Dietetic and lifestyle recommendations are provided, with the expectation that the client will return for follow-up after several months. The purpose of this exploratory study is to identify and compare data driven and hypothesis driven reasoning patterns of novice, intermediate and expert dietitians. Using transcribed interviews collected from a sample of twelve dietitians of various

levels of expertise, it was possible to break down and analyze the reasoning processes of the participants in detail.

4.2 Methods

4.2.1 Materials

Hypothetical case scenarios (vignettes) were developed (Brauer et al, 2007, 2009), based on a systematic literature review from which a list of key client characteristics for dyslipidemia was generated. A total of twenty-four diverse combinations were compiled into client profiles. These 24 combinations were deemed representative of most typical dyslipidemia cases, and covered a broad range of typical characteristics seen in dyslipidemia client during daily practice. The profiles varied with respect to CVD risk factors, fat intake, LDLc, HDLc, TG levels and other factors. A table describing the variety of risk factors within the profiles can be found in Appendix A. The client scenarios were reviewed by a steering committee (consisting of members of Dietitians of Canada and other experts) to ensure that the broad spectrum of possible typical characteristics was covered. The case scenarios were then pilot tested, and then randomly assigned to participating dietitians for interviews. Additional information was added to create diets that were similar in the types of foods and percent of fat for each scenario.

4.2.2 Participants

The sample for the present study consists of a convenience sample of 12 dietitians of three levels of expertise: Novices, generalists, and expert specialists. The novice practitioners had been practicing for less than one year. The generalists had been practicing for more than one

year in general dietetic settings, such as primary care or outpatient clinics. The experts were specialists working in a dyslipidemia counseling setting such as a cardiology clinic. The researcher was blind to the level of each dietitian's expertise to ensure that no biases and assumptions were present. This was done by obtaining verbal transcriptions and removing all of the information about the participating dietitian.

The dietitians were contacted after answering surveys regarding the development of dietetic practice guidelines, and were recruited through workshops for the first part of the larger investigation aiming to develop a clinical care map for dyslipidemia (Brauer et al, 2007, 2009). The participants were interviewed and their verbal responses were recorded and then transcribed for analysis.

4.2.3 Procedure

The current study involved the analysis and interpretation of the transcribed verbal data used in the initial phase of the larger study. Case scenarios were randomly assigned to each of the 12 study participants. The twelve dietitians were interviewed in person individually, and by one interviewer- each interview lasting approximately 60 minutes. They were asked to reason through two different case scenarios, as if they were providing counseling and recommendations for a client. A researcher (DR) transcribed the audiotapes allowing for cognitive and semantic analysis.

Propositional analysis was conducted on each participant's verbal description. The verbal responses were summarized by graphs using GraphViz (2005) for a visual interpretation of the reasoning process. The detailed analysis focused on two aspects of reasoning (1) directionality of inferences, and (2) length and level of abstraction of inferences. The directionality of inferences

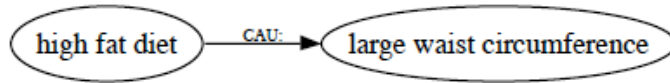
was determined by identifying each chain (concept node linked to concept node) as either data driven or hypothesis driven reasoning. Lastly, the aspect of length and level of abstraction was measured individually for each dietitian based on the length of their thought chains. Statistical analysis was conducted using ANOVA, and further with t-tests adjusted using the Bonferroni method, to identify whether changes between groups were statistically significant.

4.2.4 Propositional Analysis

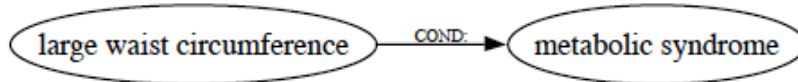
The propositional analysis approach used was developed by Frederiksen (1975) and extensively applied by Patel and colleagues (Patel & Arocha, 1995; Arocha, Wang, & Patel, 2005). The analysis consisted of the breaking down the transcribed verbal protocols into idea units (concept-relation-concept), and tagging each proposition with a semantic code that served to identify the type of proposition. Some of the more common types of propositions are conditional (COND), causal (CAU), locative (LOC), attributive (ATT), agentive (AGT), objective (OBJ), among others. A complete list of semantic tags can be found in Frederiksen (1975). The semantic break down and coding of propositions serves as a basis for further analysis and is an integral element in the development of graphical representations of reasoning in this study.

Upon the completion of the semantic analysis, it was possible to identify the directionality of inferences. If an inference went from a hypothesis back to account for the given cues, then it was coded as hypothesis driven reasoning. For example, in a new client who presents with a large waist circumference (i.e., data), a dietitian, during initial consultation, may suggest that high fat diet (hypothesis) causes the large waist circumference before obtaining a diet recall. Conducting a directionality of reasoning analysis, the inference consists of moving from 'high fat diet' to

account for a ‘large waist circumference’; where the dietitian hypothesized that the client’s intake of fatty foods was the cause of the condition presented by the client, even though the client has not yet outlined his eating habits.



Likewise, data driven reasoning was also identified. For example, a dietitian reasons from ‘large waist circumference’ to a hypothesis of ‘metabolic syndrome’; where ‘large waist circumference’ is the given cue and the dietitian hypothesized a presence of ‘metabolic syndrome’. Analysis of directionality of reasoning was conducted on each participant’s verbal responses.



Following this semantic breakdown, the analysis focused on the length and quality of inferences generated. The lengths of inferences were determined by identifying the number of steps taken to get from the starting point to the end of a particular inference chain. If a dietitian reasons from a condition given in the case scenario directly to the final hypothesis, this was considered a one-step inference. For instance, if a dietitian’s reasoning goes from ‘large waist circumference’ directly to a hypothesis of ‘metabolic syndrome, then we coded this as a inference generated in one step (see example above). In contrast, if there were a number of steps taken to get from the given cue to a hypothesis, it would be considered a longer inference. For example, if

a dietitian reasons from ‘high fat diet’ to ‘large waist circumference’ to ‘metabolic syndrome’, it would be considered a 2-step inference.

The lengths of inferences were also analyzed using the network representations. One aim of this study was to understand the relationship between length of inference chain and abstraction. It was of interest to determine whether the lengths of chains were representative of better or worse understanding assessed by overall cohesiveness, and whether there were trends among levels of expertise. Using the dyslipidemia guidelines as a reference model (Brauer, 2009), it was possible to identify the quality and level of abstraction of inferences generated by the dietitians. After the semantic analysis of verbal responses, a comparison was made between individuals to identify similarities and differences between levels of expertise in the reasoning processes.

4.3 Results

This section is arranged as follows: First, general results by group are presented, focusing on the directionality of the generated inferences; next, the length of the reasoning chains generated during reasoning are shown for each participating dietitian; and finally, illustrative examples of selected study participants are used to describe each participant’s conceptual network.

4.3.1 Data Driven and Hypothesis Driven Statements

Experts generated an average of 37 data driven statements, and 21 hypothesis driven statements; generalists generated an average of 41 data driven statements, and 15 hypothesis driven statements, and novices generated an average of 60 data driven statements, and 16

hypothesis driven statements. An analysis of variance showed a statistically significant difference for data-driven reasoning [$F(2,9) = 4.28, p = 0.0493$], but not for hypothesis driven reasoning [$F(2,9) = 0.45, p = 0.65$]. Further t-tests showed that novices were statistically significant from experts in terms of data driven statements [$t = 2.753, p = 0.05$].

The percentage of data-driven and hypothesis driven reasoning chains by individual participants is presented in Table 3. The results are presented in percentages due to the large variation in the number of propositions generated by each dietitian. Statistical analysis using ANOVA was conducted and showed no statistical difference for percent data driven [$F(2,9)=1.35, p = 0.3$], or for percent hypothesis driven [$F(2,9)=1.35, p = 0.3$] between groups.

Table 3. Percentage of Data Driven and Hypothesis Driven Reasoning by Dietitians of Various Levels of Expertise (n=12)

Dietitian	Percent Data Driven	Average	Percent Hypothesis Driven	Average
N01	73		27	
N02	64		36	
N03	86		14	
N04	79		21	
		76		24
G01	74		26	
G02	70		30	
G03	85		15	
G04	62		38	
		73		27
E01	62		38	
E02	80		20	
E03	45		55	
E04	65		35	
		63		37

The values for percent of data-driven statements range from 45% to 86%, and hypothesis driven statements range from 14% to 55%. N03 generated the greatest percentage of data driven

statements (86%) while E03 generated the greatest percentage (55%) of hypothesis driven statements.

4.3.2 Chain Lengths

Figure 5 presents a box plot regarding the length of reasoning chains by level of expertise. Expert chains consisted of 3.23 links, novice chains consisted of 3.04 links and generalist chains consisted of 3.09 links. However, no statistically significant differences were found [$F(2,9) = 0.20, p = 0.83$]. The distribution of average chain length can be seen in Figure 5.

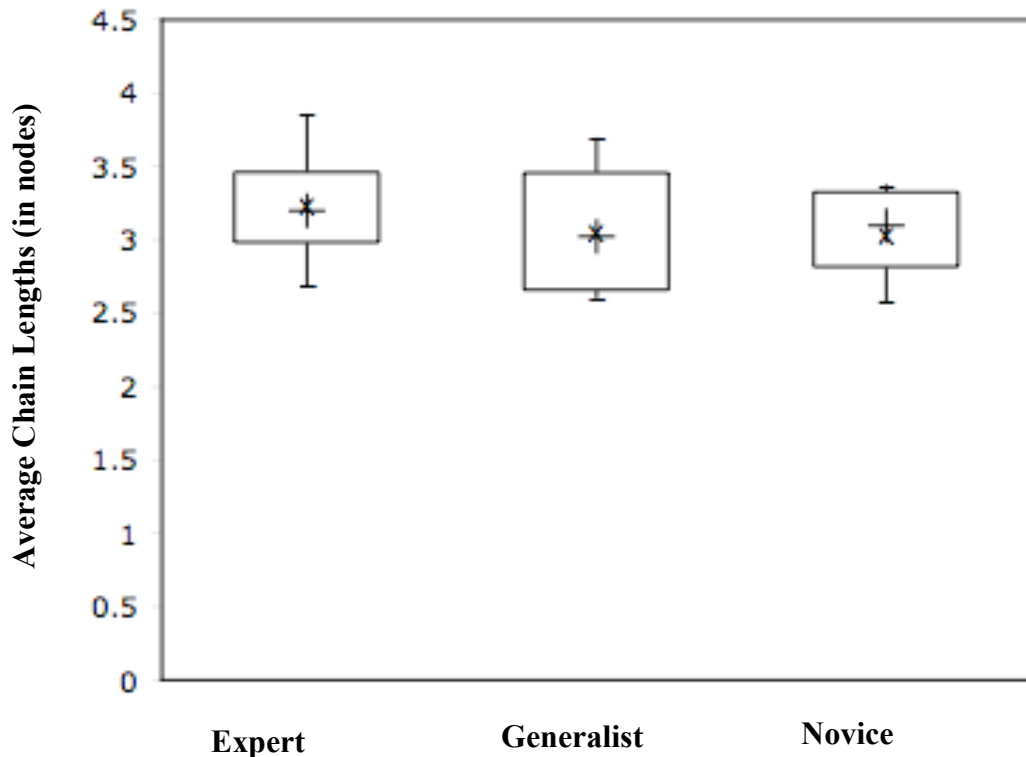


Figure 5. Box-and-whisker plot showing mean, median, minimum, maximum, 25th percentile and 75th percentile of chain lengths by level of expertise.

Table 4 shows each reasoning chain generated (left most column) and the length (number of nodal links) of each chain for the dietitians participating in the study. In total, novice dietitians

had a combined average of 22 chains, experts had an average of 17.25 chains, and generalists had an average of 19 chains, although these differences are not statistically significant [$F(2,9) = 1.22, p = 0.34$].

Table 4. Length and Number of Chains During Reasoning.

Chain	E01	E02	E03	E04	G01	G02	G03	G04	N01	N02	N03	N04
1	2	1	4	1	2	2	1	1	1	1	1	3
2	2	2	4	3	2	1	2	2	2	2	1	3
3	3	1	3	4	2	3	6	2	2	4	4	4
4	3	2	5	2	1	3	6	2	4	3	3	7
5	4	1	5	2	2	3	5	2	1	3	4	2
6	4	3	4	2	3	4	5	1	1	4	3	5
7	5	3	4	2	3	4	4	3	4	4	3	2
8	4	3	4	3	1	5	4	3	3	5	3	4
9	3	6	4	3	2	5	4	3	2	5	3	3
10	4	6	5	3	2	4	3	3	3	4	3	4
11	4	4	5	4	5	3	3	3	1	4	3	4
12	2	5	1	4	3	3	6	4	2	4	3	5
13	5	5	4	4	2	1	4	4	2	4	1	4
14	3	1	4	2	3	1	2	5	5	3	1	4
15	2		1	2	4	1	1	6	4	1	1	4
16			4	4	3	1	3	5	4	2	4	2
17			6	2	5	3		4	3		4	4
18			2	3	2	4		6			4	3
19			4	2		1		5			2	4
20			4	2		1		4			5	4
21						3		3			5	3
22											5	4
23											3	4
24											4	1
25											2	1
26											2	1
27											3	2
28											1	
Avg	3.33	3.07	3.85	2.7	2.61	2.67	3.69	3.38	2.59	3.31	2.89	3.37

4.3.3 Semantic Representation of Individual Protocols

To understand the cognitive reasoning process of dietitians, it is beneficial to examine semantic networks representing the concepts and the directionality of the participants' reasoning.

An analysis and comparison is done for three dietitians, one from each group. A description of each network is presented, and differences discussed in the following section.

Expert 3: The network rendered in Figure 6 (Appendix F: Network 1) is a schematic representation of the reasoning process of expert 3. It involves three clusters outlining several concepts that appear to be of focus. Within the first cluster, “diabetes” is recalled as an attribute of the 64-year-old male client. “LDL” is recalled as a condition of diabetes, yet the actual numerical value (4.5 mmol/L) is not recalled. The dietitian infers that this is a “high” number. The client’s “blood pressure”- numerical value (145/90 mm/Hg) not mentioned- is recalled as an attribute of the client, and is also considered “high”. The high blood pressure is further considered a “risk factor”. Stemming from diabetes, the dietitian infers data driven about “blood sugar levels”, which then directly leads data driven to the idea of “follow-up”, suggesting that the dietitian would discuss this concept at a later appointment. The “blood sugar levels” and “high” nodes lead data driven resulting in “medication”, a recalled notion.

The next cluster focuses on the idea that the client is “overweight”, which is an inference generated by this dietitian based on the given weight of 97 kilograms. It is directly linked in a data driven manner to “medication”. Through this connection, the dietitian explains that a potential decrease in weight could result in a minimization of medication. The concept of “overweight” is described as a condition of the client’s activity level, which is a direct result of dairy farming. The ideas of “activity” and “job” are recalled from the given scenario. Also within this cluster, the dietitian reasons data driven from “overweight” to the notion of “blood cholesterol”, with cholesterol being a condition that is influenced by the client being overweight. The numerical value of cholesterol, 6.5, is not specifically recalled. The node “saturated fat”,

which the case scenario states is 10% of total calories, is described as an inference directly stems from “overweight” as a theme. The “caloric intake of 3000” is recalled from the text, and is linked backward to “overweight”. This implies that a change in the caloric intake may reduce the client’s weight. Furthermore, the dietitian suggests that the ideas of “overweight” and “blood cholesterol” should be monitored and addressed at a follow-up session.

Before moving to the final cluster, it is important to discuss several other attributes mentioned by the dietitian. The idea of “waist circumference” was recalled without the numerical value (103cm). The dietitian inferred that the waist circumference was “large”, and that this should also be followed up. The fact that the client is a non-smoker is recalled, and is not considered a risk factor. The client appears to possess a garden, which is recalled, and this directly leads forward to the recalled notion of “fruits and vegetables” within the diet cluster. Also attributed to this client is the fact that he is a hunter, and this directly leads forward to the recalled notion of “venison meat”, which is a prominent part of this client’s diet.

The third cluster consists of aspects of the client’s diet. The recalled ideas mentioned earlier, “fruits and vegetables” and “venison meat” are both linked back as categories of “diet”. “Fruits and vegetables” link forward as a category of “food groups”. The dietitian speculates about the client’s intake of eggs, suggesting a restriction. Another inference is “low fat dairy”, which directly links backward to “saturated fat” implying that low fat dairy use will reduce the client’s intake of saturated fat. “Low fat dairy” is also linked forward as a category of “food groups”. The dietitian suggests that “food groups” is a category of the broader notion of the “plate model”, which is recommended for this client. Fruits and vegetables are considered equivalent to a fiber source, according to the dietitian. The venison meat eaten by the client is

equivalent to protein. In the form of data driven reasoning, the dietitian also recommends some alternatives such as fish, soy and beans, and labels them as categories of protein.

Generalist 3: Figure 7 (Appendix F: Network 2) depicts the thought process of a generalist dietitian. Three main clusters emerge focusing on diet, anthropometric measurements, and daily intake of fat.

The first cluster primarily consists of several recalled aspects of the client's diet. Wine, a recalled category of diet, leads forward to the question of "how often?" it is consumed. "Fruits" and "vegetables" should be increase, and are recalled ideas that both lead to the theme of "canning". However, "fruits" result in sugar intake, which affects triglycerides (2.5 mmol/L) and ultimately cholesterol (6.8 mmol/L). Another recalled category of the client's diet is "fiber", which should be increased. The dietitian also infers to the idea of a handout, to provide further information about fiber intake. At follow-up, the fiber intake should also be discussed. Fiber also directly leads forward to cholesterol (6.8 mmol/L), as the dietitian implies that an increase in fiber could potentially reduce the client's cholesterol level. All thoughts leading to the idea of cholesterol should be followed up, according to this dietitian. As an inference, the dietitian mentions butter, as a possible aspect of the client's diet. This leads to "alternatives" such as "margarine". The dietitian links margarine to the notion of "portions" and the idea that lowering portions helps with "weight loss". Weight loss should also be discussed at a follow-up session.

Within the second cluster, the dietitian recalls and labels the client's anthropometric measurements. This particular dietitian considers the activity level of the client "acceptable". Her weight is recalled as 79 kilograms. The blood pressure of 155/105 mm/Hg is attributed as "high". A sub-cluster contains the conditions "change", "age" and "estrogen loss" all leading backward

to the recalled notion of “menopause”- an attribute of the client. The three inferences in this sub-cluster also lead forward to “cholesterol 6.8 mm/L” because these ideas can all result in an increase in cholesterol levels. The client’s carbohydrate intake is inferred, and links directly forward to the ideas of “cholesterol”, and “weight loss”. Carbohydrate intake should also be addressed at a follow-up meeting.

Finally, the dietitian recalls the client’s daily intake of fat in the third cluster. The fats are broken down into “monounsaturated 7%”, “polyunsaturated 8%”, “total fat 30%”, and “saturated fat 15%”. Based on these recalled values, the dietitian infers that the client should lower her intake of “saturated fat”.

Novice 2: Figure 8 (Appendix F: Network 3) depicts a novice dietitian’s reasoning process. The client in this scenario is a 63-year-old male. First, the dietitian recalls several attributes. The client does not have diabetes. His blood pressure is 135/90 mm/Hg, and this is equivalent to hypertension. His weight is 80 kilograms, and the dietitian infers forward that this is a healthy weight. The client does exercise, and the dietitian encourages this. Also questioned is the notion of smoking, since it is not mentioned in the original scenario.

The second cluster contains anthropometric measurements that are recalled, as well as inferences by the dietitian. The client’s HDL of 1.4 mm/L is labeled as “pretty good”. The triglycerides value (1.6 mm/L) is considered “relatively low” by the dietitian. It appears that the client’s LDL (5.0 mm/L) is the “main problem”, and the dietitian recommends an improvement in this level, as well as a follow-up of this value. The cholesterol value (7.4 mm/L) is also recalled, and the dietitian mentions a handout to provide more information.

The third cluster primarily consists of recalled categories of the client's diet and recommendations by the novice dietitian. The idea of "handouts" leads to the theme of eggs, which should be limited. Also inferred is the theme of "lean alternatives", suggesting that a handout would help the client with these factors. Meat is recalled and results in the idea of "lean alternatives". The client's intake of chocolate and donuts are considered a "problem", and the dietitian believes that a "diet recall" should be conducted as a result. The diet recall would further involve food models, and should be discussed at a follow-up session. Fruits and vegetables intake are equivalent to the client's fiber source, and the dietitian also recommends cereal as another option. The fiber aspect of this client's diet should also be followed up according to this particular dietitian. In terms of alcohol intake, this is an issue that the dietitian does not recommend be addressed.

Lastly, the final cluster groups together inferences such as "olive oil", "canola oil" and "margarine" as the dietitian questions the usage of these components. This leads the dietitian to verbalize them as themes related to "cooking methods", and suggests that the client use alternatives. Finally, the dietitian wonders whether the client eats out. This graph is not very linear, as only three aspects lead to the idea of follow-up.

4.4 Discussion and Conclusions

The aim of this study was to identify whether differences in reasoning existed among novice, generalist and expert dietitians during clinical case explanation. The study was conducted using an exploratory approach. The results obtained point to some interesting differences between novice, generalist and expert dietitians. One such observation was with regards to directionality of thought, namely data driven and hypothesis driven ideas. Several authors (Patel

& Groen, 1986; Arocha, Wang, & Patel, 2005; Charlin et al, 2000, Patel et al, 2001) suggest that purely data driven reasoning is characteristic of expert clinicians when presented with routine cases, whereas purely hypothesis driven reasoning is characteristic of novices and sub-experts. In the introduction, it was suggested that similar trends may emerge among expert and novice dietitians, even though the reasoning processes of these participants may differ from the reasoning of clinicians in medicine. The findings show that all groups rely heavily on hypothesis driven reasoning, and novices displaying more data driven reasoning than experts or generalists. The statistics showed that although the differences between the groups were not significant in terms of hypothesis driven reasoning, there was a statistical significance between novices and experts in data driven reasoning patterns. The differences between these two groups could possibly be attributed to novices simply making use of more data, generating more thoughts overall. A possible explanation for this phenomenon may also lie in the nature of the dietetic counseling task, as well as the variance within the profiles of the clients resulting in a particular reasoning approach due to the information presented about the subjects.

Since no previous expert-novice research has been done in the field of dietetic counseling, we applied assumptions and previously acquired knowledge from the medical domain. As previously discussed, it appears that dietetic counseling is different than the task of clinical diagnostics, which is performed by clinicians and physicians. Rather than generating various possible differentials that could lead to a fitting diagnosis, the dietitian obtains an overall assessment of the client's eating habits, physical activity patterns, and lifestyle. From this information, the dietitian can counsel the client on healthy food choices and lifestyle changes to combat diet-related ailments, including dyslipidemia. Thus, the nature of the dietetic counseling task resembles psychological counseling more than clinical diagnostic reasoning, making

expertise more difficult to identify. This fundamental difference may account for the primary use of hypothesis driven reasoning among all groups.

Another area explored in our study was the notion of reasoning chains, in an effort to determine whether length and number of chains were related to the level of abstract thoughts. The results show that there was no statistical significance in the differences between novice and expert lengths and numbers of chains. Therefore, it can be said that there were similarities in the number and lengths of chains generated by novices and experts regardless of the variances and diversity within the client scenarios. A study by Hmelo (1998) defined coherence as the number of relational operators (links) that are chained in an explanation. In Hmelo's analysis, an explanation with a longer chain is considered more coherent than an explanation with a shorter chain. Using Hmelo's definition of coherence, it cannot be concluded that the experts in the current study expressed more coherent thoughts by generating longer chains. However, when analyzing the network of an expert dietitian in detail, it was found that expert networks appear more linear, and contain fewer loose ends than novice or generalist networks.

4.5 Limitations and Future Research

This exploratory study consisted of an analysis of the explanations that a small sample size of 12 dietitians provided of clinical dyslipidemia case scenarios. As such, the study has some limitations: First, a small sample size was ideal for in-depth analysis of individual protocols of a select group of dietitians. However, the evidence was statistically not significant, aside from differences in data-driven reasoning between novice and expert participants. Further studies should concentrate on randomly selecting a larger sample size of dietitians from various levels of expertise, in order to increase the power to detect differences among groups.

Second, the case scenarios created for the study (Brauer, et al., 2007, 2009) were compiled using a wide variety of standard characteristics typically seen in clients with dyslipidemia. Although the case scenarios are similar in many ways and were designed to simulate real-life experiences with clients, each scenario described a unique client, creating variability among the cases and making it difficult to make between group comparisons.

Third, the dietitians may have been influenced by the presence of an interviewer who was a well-known dietitian. A more neutral interviewer may have resulted in different outcomes.

Fourth, the use of written case scenarios may not reflect actual dietetic practice in professional settings. Many important behavioural aspects such as interaction, empathy and body language cues could not be measured.

Finally, for a more accurate comparison between individuals and groups, it would be beneficial for future studies to keep the case scenarios constant for all participants, as well as video-taping a simulated interaction between dietitian and client, which may provide information on other, non-verbal, aspects of the dyslipidemia nutritional counseling.

CHAPTER 5: General Discussion, Implications & Future Research

Several questions were raised in the introduction concerning key aspects of the current investigation. First, the question was posed as to the knowledge used by expert, novice and generalist dietitians, during clinical case explanation. After analyzing the recall and inference patterns of a sample of dietitians, the findings of the first study do not show a novice-to-expert gradient, since no statistically significant differences were found in the recall and inference generation between levels of expertise. Although not statistically significant, analysis of the protocols of individual participants showed that at least one expert made little use of case data. Future studies should be conducted to further investigate whether, on average experts, generalists, and novices behave in this regard in a different manner as that found to be the case in other domains (Ericsson & Smith, 1991; Ericsson, 1996; Chi, 1997, 1981; Gobet & Charness, 2006). The fact that we could not replicate findings in other areas may suggest some anomaly that should be investigated in more detail.

A second anomaly lies in the fact that no intermediate effect (Rikers, Schmidt & Boshuizen, 2000; Groves, O'Rourke & Alexander, 2003; Schmidt, Norman & Boshuizen, 1990; Patel, Evans & Groen, 1989; Wimmers, Schmidt, Verkoijen & Van De Wiel, 2005) was found in this study, although there exists reasons for expecting it in dietetic counselling, as it has been the case in medical cognition (Arocha, Patel, & Patel, 1993; Arocha & Patel, 2005). This ties in closely with the second question regarding the progression of reasoning strategies. There is however, at least one case where the intermediate effect failed to show in the medical domain (van de Wiel, Schmidt, & Boshuizen, 1998). It is possible that given the specific nature of the nutritional condition and the complexity of the cases presented, experts and generalists may have used more of their domain-related knowledge, rather than in the more straightforward clinical

cases where the intermediate effect has been shown to exist. It is generally accepted that most research in medical cognition has been conducted with routine cases; that is those that are seen in common clinical practice. In such complex cases, experts and intermediates are known to make use of encapsulated knowledge. Rather than processing cases in a pure pattern-recognition manner, in such cases, experienced clinicians are able to bring to bear knowledge that in routine problems may be remain “dormant.” The idea behind this hypothesis of encapsulation is that clinicians learn fundamental knowledge that remains hidden to awareness in routine practice, but that in certain circumstances, maybe in an unconscious way, they are able to generate and use it to solve complex problems (Schmidt & Rikers, 2007).

Although novices may not possess an expansive knowledge base, possibly due to less experience, they could nonetheless make use of recently acquired knowledge to attempt explaining clinical cases, even though these may be beyond their level of expertise. Further studies would be needed to confirm these findings.

In the individual protocol analysis concerning various characteristics underlying metabolic syndrome, one interesting finding may be tied to experts’ possession of a more expansive knowledge base. One expert dietitian related the current scenario during discussion to a previous client encountered during daily practice. This type of case-based reasoning can be seen in experts who use exemplars or reminders of previous cases, and apply it to a current problem. (Marling, Shubrook & Schwartz, 2009; Bichindaritz & Montani, 2009). The hypothesis is that as experience in a domain increases, one acquires first somewhat static schemas of mostly typical problems, followed by dynamic schemas (i.e., those that include variations on typicality and may involve the use of underlying knowledge such as knowledge of the physiology of nutrition to explain difficult cases), and lastly by a collection of exemplars that

remain in memory as individual cases. The more experience and knowledge an individual possesses, the easier the retrieval and application of previously acquired specific information to a new problem.

The third question shifts to focus on the directionality of thoughts, and the application of knowledge during reasoning. The results found between novices and experts for data driven reasoning, are inconsistent with current knowledge about expert-novice reasoning in the realm of medical cognition (Charlin et al, 2000; Patel, Arocha & Kaufman, 2001; Patel, Kaufman & Arocha, 2002; Patel & Groen, 1986; Patel et al, 1990; Arocha et al, 2005). Experts were found to make less use of data-driven reasoning strategies, while novices used primarily forward reasoning.

The inherent nature of the counseling task is different than clinical diagnostic tasks, thus creating a difficulty in comparing dietitians without an existing and reliable testing method. The dietitians were asked to verbalize a simulated counseling session, with suggestions for lifestyle and diet change, while clinicians and physicians aim to generate a diagnosis and a line of treatment.

Another aspect of the research is that of reasoning chains. These are defined by Hmelo (1998) as relational operators which contribute to the more cohesive knowledge representation of experts. In this light, generalist and novice reasoning should appear more disorganized, generating a greater amount of concepts, with shorter chains, resulting in a less cohesive thought pattern. However, our results do not support the hypothesis of greater use of reasoning chains by experts. Failure to find statistical significance may be due to the nature of the counseling task being different than the diagnostic task, resulting in an outcome that is not analogous to current research in the diagnostic field.

In terms of the discussion about the key concepts related to ‘fat’ and ‘cholesterol’, there appear to be individual differences between the dietitians participating in the study. Overall, no conclusions could be made regarding the trends within levels of expertise. The variety of characteristics covered in the clinical profiles of the case scenarios were likely to direct the dietitian in a particular direction in terms of reasoning about a key concept. For instance, if a case scenario presented a client with normal fat intake, the dietitian would probably focus less on this key concept in their reasoning process. This inclusion of a multitude of factors related to dyslipidemia is beneficial for exemplifying the wide array of symptoms seen in daily practice, and provides a realistic presentation of possible dyslipidemia clients. Conversely, during a comparison between dietitians reasoning through unique case scenarios, it is difficult to identify and establish differences between levels of expertise. Therefore, future studies looking at the counseling task would benefit from emphasizing whether the actual content of discussion was correct, in order to build on this study which looked at what knowledge may have been used during reasoning.

The studies presented here have yielded results that serve as a starting point for developing a research program on expert-novice research in the field of dietetics. Further studies are needed to gain more insight into the realm of expert-novice differences in dyslipidemia counseling. It is important to study the knowledge usage, and application during cognitive reasoning of expert, novice and intermediate dietitians in order to answer significant questions about key characteristics illustrated during counseling. Since no previous studies were conducted on this particular topic, it is intended that these studies contribute to the existing knowledge on expert novice reasoning, as well as serving as a gateway for more fully controlled experimental and naturalistic studies. Furthermore, research aimed at comparing novices and experts, as well as the

acquisition of expertise in dietetics, will potentially influence teaching methods and learning strategies for beginners. Ultimately, a practical goal is to obtain a better understanding of the knowledge usage and application among dietitians of novice, generalist and expert levels, in order to identify possible gaps that may exist in novice knowledge and reasoning. Examining characteristics of expert knowledge and reasoning may hold the key to eliminating gaps or problems that may exist in the reasoning processes of beginner dietitians. This, in turn, can lead to an increase efficiency in all levels of expertise, and subsequently results in the establishment of actions or programs that facilitate the acquisition of expertise.

Group-based studies encompassing a random selection of participants, and a larger sample will allow for the observation of trends in addition to possible statistical generalizations to the dietitian population. More specifically, the collection of data from several dietetic schools and randomly selected practicing dietitians of various expertise levels, may elicit results that are more clear-cut and statistically significant in the contribution to expert-novice research. Asking participants to reason concurrently at a follow-up interview, as well as retrospectively may provide a different facet of interesting information about reasoning during dietetic counseling, increasing reliability and validity of results. Moreover, keeping the case scenarios presented to the dietitians during reasoning constant, would allow for a more accurate comparison within individuals and between expertise groups. Conducting such research will allow for a better comparison of reasoning between groups, and the generalization of results to the greater dietetic population.

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APPENDIX A: TABLE OF SCENARIOS USED IN DYSLIPIDEMIA STUDY

Scenarios used in dyslipidemia study – Oct 8, 2003

Scenario	CVD risk	Age	Sex	Intention	Metabolic syndrome	Saturated fat intake	Physical activity	Income
1	4	3	2	1	1	3	1	2
2	4	3	1	2	3	3	2	3
3	4	2	2	2	3	3	3	2
4	4	1	2	2	1	2	1	1
5	4	1	1	2	2	2	2	2
6	4	1	1	1	3	2	1	3
7	4	1	1	1	1	1	3	2
8	3	3	2	1	3	1	3	2
9	3	3	2	1	1	2	2	1
10	3	3	1	2	1	1	1	2
11	3	2	2	2	2	1	1	3
12	3	2	2	2	1	2	3	2
13	3	2	1	2	2	3	3	1
14	3	1	2	1	3	3	2	3
15	3	1	1	1	1	3	1	1
16	2	3	2	2	2	2	1	2
17	2	3	1	1	2	2	2	3
18	2	2	2	1	3	1	2	1
19	2	2	2	1	1	2	1	3
20	2	1	2	2	3	3	1	1
21	2	1	2	1	2	3	3	2
22	2	1	1	2	1	1	2	1
23	1	3	2	2	3	2	3	1
24	1	3	2	2	1	3	2	3
25	1	2	2	1	2	1	3	1
26	1	2	1	2	3	2	1	2
27	1	2	1	2	1	1	3	3
28	1	2	1	1	1	3	2	2

No. Of levels, Coding

CVDrisk 4 1 2 3 4
age 3 1 2 3
sex 2 1 2
intention 2 1 2
metsyn 3 1 2 3
satfat 3 1 2 3
active 3 1 2 3
income 3 1 2 3

**APPENDIX B: CONCEPT COVERAGE AND CASE CHARACTERISTICS:
ACOMPARISON OF NOVICE, GENERALIST AND EXPERT DIETITIANS**

Overview

The aim of this study is to examine the reasoning of novice, generalist and expert dietitians in terms of (a) concept coverage during initial consultation, recommendations and follow-up stages of dietetic counseling; (b) content of specific concepts covered during explanation task; and (c) individual analysis of small semantic networks pertaining to specific characteristics related to metabolic syndrome. The verbal explanations of twelve participating dietitians from a previous study served as the data for the current analysis. Semantic network representations were created based on the verbal responses, to summarize the reasoning processes of each dietitian. A semantic model was then created based on a clinical care map for dyslipidemia (Brauer et al, 2007), and used as a reference tool in comparing the networks to the clinical guidelines. Each network was analyzed in detail in terms of concepts discussed during explanation. Smaller networks were then generated to illustrate the reasoning of six dietitians as they discussed symptoms found in metabolic syndrome, namely hypertension, HDLc, and triglycerides. For this detailed analysis, the participants were selected so that there was a dietitian from each level of expertise (novice, generalist, expert) in each of the two groups. The dietitians in the heavily weighted group were previously assigned a case scenario in which the metabolic symptoms mentioned above were problematic. The dietitians in the lightly weighted group were previously assigned a case scenario in which only one of the symptoms was heavily weighted, and the others were lightly weighted (within normal range). A descriptive analysis such as this allowed for an expert-novice comparison between the reasoning patterns of dietitians within the same group.

Key Words: concept, counseling, dietetic, dyslipidemia, expert, generalist, novice, reasoning

Introduction

Research on cognitive decision-making and clinical reasoning has been steadily expanding, particularly in the field of diagnostic medicine (Schmidt, Norman & Boshuizen, 1990; Boshuizen & Schmidt, 1992; Ritter, 2003; Custers, Boshuizen & Schmidt, 2004; Rikers, Schmidt & Boshuizen, 2000; Patel, Arocha & Zhang, 2005; DeBruin, Van De Wiel, Rikers & Schmidt, 2005; Wimmers, Schmidt, Verkoeijen & Van De Wiel, 2005; Arocha, Wang & Patel, 2005). It has since also been applied to nursing (Ericsson, 2007; Reischman & Yarandi, 2002; Benner & Tanner, 1987). The clinical reasoning process has been studied primarily in terms of diagnostics, but has recently been explored in a counseling setting within physiotherapy treatment (Doody & McAteer, 2002), and occupational therapy treatment (Gibson et al, 2000; Strong et al, 1995; Mitchell & Unsworth, 2005). To our knowledge, no previous research on expert-novice reasoning have been conducted in the field of dietetic counseling. In this study, we explore the reasoning process of novice, generalist and expert dietitians during nutritional counseling of hypothetical dyslipidemia clients.

Expert-Novice Differences in Reasoning

In the field of cognitive psychology and counseling, schemas are mental structures that use cues from a current situation to retrieve previously acquired knowledge and experience for problem-solving (Schmidt & Boshuizen, 1993; Coderre et al, 2004; Rikers et al, 2000; Rikers et al, 2005; Charlin et al, 2000; Norman, 2005; Norman, Young & Brooks, 2007; Boshuizen & Schmidt, 1992; Schmidt et al, 1990; Woods, 2007, Woods, Brooks & Norman, 2007). Thus, an individual possessing a broader knowledge base and more experience, can be considered an expert capable of more efficiently retrieving and applying salient information in new situations

(Schmidt & Boshuizen, 1993; Arocha, Wang, & Patel, 2005; Schmidt & Boshuizen 1992). The ability to filter out irrelevant ideas from important ones is a crucial skill as well, differentiating novices from experts. An underlying assumption to be addressed in this discussion about clinical reasoning is that experts will likely possess a greater knowledge and experience base due to their daily exposure to cases during practice. Moreover, experts are likely better at formulating and applying schemas in situations that they are familiar with. Thus, in reasoning through dyslipidemia cases, expert dietitians may display greater skill with regards to knowledge retrieval and application.

Dyslipidemia

Dyslipidemia, a condition categorized under the realm of lipid disorders, is seen as one of the greatest risk factors in the development of atherosclerosis, coronary heart disease (CHD), and cardiovascular disease (CVD) (Rader, 2005; Bamba & Rader, 2007; Varady & Jones, 2005; Smith, 2007; Maki, 2007). Elevated levels of Low Density Lipoprotein cholesterol (LDLc), triglycerides (TG), as well as decreased levels of High Density Lipoprotein cholesterol (HDLc), all of which found in the blood stream, are used as criteria for diagnosis (Bamba & Rader, 2007; Varady & Jones, 2005; Smith, 2007; Rader, 2005; Gau & Wright, 2006). Atherosclerotic build-up due to cholesterol accumulation is seen with elevated blood LDLc, whereas blood HDLc acts to reverse this damage to arteries (Bamba & Rader, 2007; Rader, 2005). Along with abnormal levels of LDLc, individuals with diabetes, obesity, high blood pressure, and have a history of smoking are screened for long-term CVD risk (Genest et al, 2009). Genest and colleagues (2009) assessed the presence of risk factors aforementioned and utilized various calculations to classify individuals as high, moderate, or low risk. Clients in the high-risk category typically present with

diabetes, evidence of atherosclerosis, and are calculated to have a greater than 20% risk of CVD within the next ten years. The goal for these individuals would be to reduce their blood LDLc to less than 2 mmol/L using intensive lifestyle modification and the introduction of pharmacotherapy (Statins). Individuals that are found to be obese, have a blood LDLc value greater than 3.5 mmol/L, and are calculated to have a ten-year CVD risk of 10-19% are classified as moderate risk. Low risk individuals are calculated to have less than 10% risk of CVD over the next ten years, and may present with other risk factors mentioned in the high and low risk categories. Any individual, regardless of risk classification, found to have blood LDLc levels greater or equal to 5 mmol/L is recommended to initiate Statin therapy to accompany lifestyle modification (Genest et al., 2009).

For individuals with dyslipidemia, it is recommended that blood HDLc levels be increased by the cessation of smoking, increase in physical activity, weight loss, and diet modification; since increasing levels of HDLc are shown to decrease the chance of heart disease (Health Canada, 2005). Unhealthy diet and lack of exercise account for approximately 80% of dyslipidemia, while the remaining cases are a result of genetic manifestations (Smith, 2007; Genest et al, 2003, 2009).

Metabolic Syndrome

Dyslipidemia, along with hypertension and central adiposity, are diagnostic markers in metabolic syndrome. More specifically, according to the Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (JAMA, 2001), metabolic syndrome consists of these clinical characteristics:

- Abdominal obesity (waist circumference) for men greater than 102 cm (40 in), and for women greater than 88 cm (35 in)
- Triglycerides level greater than 1.69 mmol/L (150 mg/dL)
- HDL cholesterol level for men less than 1.03 mmol/L (40 mg/dL) and women less than 1.29 mmol/L (50 mg/dL)
- Blood pressure greater than 130/85 mm Hg
- Fasting plasma glucose level greater than 6.11 mmol/L (110 mg/dL)

An individual presenting with 3 or more of these risk factors would be diagnosed with metabolic syndrome, and would be at a much greater risk of developing diabetes and cardiovascular disease (Sorrentino, 2005). Dietary modifications, as well as the inclusion of daily exercise are central in the treatment of metabolic syndrome (Sorrentino, 2005; Plodkowski & Krenkel, 2005; Pan, 2007). Behavioural modification in the form of physical activity and subsequent dietary improvement of the individual risk factors including central adiposity, overall obesity, dyslipidemia, and hypertension, act to manage and reduce the risk of metabolic syndrome, diabetes, CVD and CHD.

Treatment Options

To reduce the risk of metabolic syndrome, atherosclerosis, CVD, and CHD, it is recommended that an individual begin with dietary modification as the first and most important approach to treatment. Reducing the intake of saturated fat and calories have been shown to decrease blood LDLc levels by 10-15% (Gau & Wright, 2006). Triglyceride values can be decreased by 20-40% through diet therapy (Gau & Wright, 2006). It is also strongly

recommended that exercise be an integral part of this therapeutic measure (Genest et al, 2003, 2009). Diet therapy is considered the most effective form of treatment in highly motivated individuals with dyslipidemia, whether they are categorized at low, moderate, or high risk for CVD (Gau & Wright, 2006). Some individuals, particularly those in the high risk group, usually require pharmaceutical interventions, such as the introduction of a statin, in addition to dietary counseling and an exercise regimen (Genest et al, 2009).

Statin are a class of drugs that assist in the significant reduction of cardiovascular events, CHD risk, and strokes resulting from atherosclerosis (Smith, 2007; Genest et al, 2003; Maki, 2007). Statin monotherapy can dramatically decrease blood LDL cholesterol levels to desirable target values (less than 2.0 mmol/L), although long-term use may result in various side effects. A small percentage of statin-users experience muscle pain (myopathy) and cannot tolerate high doses of medication (Varady & Jones, 2005). A more severe side effect of statins is seen in the form of muscle tissue breakdown, or rhabdomyolysis (Genest et al, 2009). Even on the highest doses, some individuals do not reach their optimal level of cholesterol (Rader, 2005). In such cases, combination therapy may be suggested. Although these medications are less widely prescribed, the use of a statin in combination with a fibrate, cholesterol absorption inhibitor, or niacin, can further reduce blood LDLc values by 10-15% (Genest et al, 2009). Several other drawbacks of statins include their limited effect on TG levels and blood HDLc levels. To date, the only proven methods of increasing blood HDLc levels in individuals with dyslipidemia are dietary modification, exercise, and weight loss.

Dietetic Counseling

In regards to a patient with dyslipidemia, individual biological markers such as anthropometric measurements, clinical data, family and medical history, socio-economic status, psycho-social support, ethnicity, and level of physical activity are assessed during the initial consultation (Hanning, Diaz, & Brauer, 2002). Issues regarding diet behaviour, including meal patterns, whole grains, nutrient and fat consumption, intake of legumes, as well as fiber (vegetables and fruits) are also discussed. The goal of counseling is to guide the client to make small but important changes in everyday life, not to reach a diagnosis. For example, the client may be encouraged to increase exercise, implement healthy food choices such as a more balanced diet, increase fiber intake, and reduce the intake of saturated and/or trans- fatty acids.

The most up-to-date clinical dyslipidemia guidelines recommend changes in all aspects of living. In terms of caloric intake, a healthy body weight should be achieved with a calorie-restricted diet in an effort to reach a healthy body mass index (BMI) of less than 25 kg/m². Dietary changes should include an increase in fruit and vegetables, minimal intake of sodium and simple sugars, replacing unhealthy saturated and trans fats with healthy unsaturated fats, and moderate consumption of alcohol. In addition, clients are encouraged to add 30-60 minutes daily of physical activity, and most importantly the cessation of smoking through behavioural intervention (Genest et al, 2009).

Dietary changes and pharmaceutical therapy are two different and effective approaches that can be implemented in patients with dyslipidemia to lower the risk of atherosclerosis, and further decrease the morbidity, mortality, and long term medical costs of CVD and CHD (Genest et al, 2003, 2009; Smith, 2007). It is possible to analyze the cognitive thought processes of

dietitians as they apply to dietetic counseling using existing knowledge about diagnostic reasoning and dyslipidemia.

Methods

Participants

Twelve dietitians at three levels of expertise were recruited to participate in the current study. The novice, generalist and expert participants were contacted after answering surveys regarding the development of dietetic practice guidelines, and were recruited for the first part of a larger investigation by Brauer and colleagues (2007, 2009), which aimed to develop a dietetic care map for dyslipidemia. The novice practitioners (n=4) were recent graduates and had been practicing in general nutrition counseling for less than one year; the generalists (n=4) had been practicing for more than one year in primary care dietetic settings; and the experts (n=4) were specialists working in a cardiovascular clinic as a dyslipidemia counselor for several years.

Case Scenarios

The current study involved strategically designed case scenarios, which were randomly assigned to each of the 12 study participants. The case scenarios were developed to illustrate a hypothetical client presenting with typically seen dyslipidemia characteristics, including those factors present in metabolic syndrome. Characteristics were statistically selected (on a scale of 1-4) to be less problematic (light weighting=1), more problematic (medium weighting= 2,3) or a most problematic (heavy weighting=4) within the case scenario. Some cases scenarios were designed so that all of the metabolic abnormalities associated with metabolic syndrome were heavily weighted, while other case scenarios only placed emphasis on one or two metabolic

symptoms. For example, one case scenario was developed placing weight on hypertension, blood HDLc, and triglycerides – where all of these factors were problematic for the client. Conversely, another case scenario was designed to place emphasis on low HDLc levels, while keeping hypertension and triglyceride values normal. The structure and development of the case scenarios is important for this study, since the emphasis of certain characteristics over others inevitably affects the reasoning of each dietitian. The scenarios were reviewed by a steering committee (consisting of members of Dietitians of Canada) to ensure that the broad spectrum of possible predictors was covered. An example of the type of scenario used in the study can be found in Appendix E.

For the acquisition of the verbal responses, twelve dietitians participated in interviews conducted in person by an interviewer - each interview lasting approximately 60 minutes. Two different case scenarios were assigned to each participant, as they were asked to reason through the case as if they were providing counseling and recommendations for a real client. The interviews were audio taped, and then later transcribed by a researcher (DR).

Procedure

Propositional analysis was conducted on each participant's verbal response following the method developed by Frederiksen (1975). The identities and levels of expertise of the participants were unknown to the primary analyst (MM) to reduce the possibility of biases. A second analyst (JFA) randomly selected a sample of protocols for independent analysis to check for accuracy.

Analysis consisted of the following steps: First, the transcripts were propositionally analyzed by identifying idea units using a language of codes used for classifying propositions in

terms of semantic tags, such as attributive relations (ATT:), location (LOC:), causality (CAU:), conditionality (COND:), and temporality (TEM:). The verbal responses of each dietitian in this study were analyzed in this manner, allowing for a further investigation of semantics and reasoning patterns. Upon the conclusion of propositional analysis, each verbal response was visually summarized in a network graph in the program GraphViz (2005). Each semantic network captured concepts that were emphasized more than twice during the interviews, resulting in a summary of the reasoning process, void of repetitions and concepts only mentioned once.

A graphical network (GraphViz, 2005) of the reference model was developed as a procedural frame (Frederiksen, 1975) based on the Dyslipidemia care map (Brauer et al, 2007). The care maps were created using a Delphi process resulting in counseling guidelines that were jointly agreed upon by all dietitians from the initial study. The model consisted of the basic concepts about dyslipidemia and the procedural aspects of dietetic counseling. The model served as a reference to compare the verbalizations and the reasoning process followed by the participants. During comparison, the objective was to look for key concepts covered by each dietitian by identifying key overlapping reasoning chains.

For a more detailed analysis of the concepts covered by each dietitian, smaller networks were created illustrating reasoning patterns with regards to several characteristics of metabolic syndrome. A novice, generalist and expert participants who were assigned case scenarios in which metabolic symptoms (low HDLc, elevated triglycerides levels, and hypertension) were heavily weighted, were selected and analyzed in terms of how each concept was discussed. A similar selection method was applied for a novice, generalist and expert who were assigned case

scenarios in which most metabolic symptoms were lightly weighted (within normal range) and only one was heavily weighted.

Results

First, we look at the concepts covered by the groups in their explanations of the clinical cases, in terms of (a) clinical assessment; (b) recommendations; and (c) follow-up; next, we compare the semantic networks of each dietitian to the reference model in an effort to identify concepts that were covered during counseling; third, a collection of semantic networks illustrate the reasoning of six dietitians with regards to hypertension, triglyceride values, and blood HDLc values, as they relate to metabolic syndrome. A description of each small network will allow for a comparative look at the differences and similarities in reasoning between individuals.

Concept Coverage

Concept coverage refers to the actual ideas that are discussed and referred to more than once by each dietitian during the explanation task. Thus, if an idea was mentioned and followed up in the dietitian's explanation, it is included in the semantic networks. The analysis of concepts that are covered by each participating dietitian can provide insight as to the type of information that is used during dietetic counseling and reasoning.

Clinical Assessment: Concept networks created with GraphViz (2005) were analyzed and compared to each other in terms of concept coverage, areas of focus, and general themes.

Although some of the concepts may have been mentioned during interview, they may not appear in the graph because they were not followed-up on during explanation. A concept was deemed

important to include in the network graphs if the dietitian referred back to it during reasoning more than once. Using these graphs, it was also possible to determine the overall cohesiveness and reasoning pattern of each verbal response. Two tables were developed to compare the concepts covered by each of the dietitians to the graphical model (Brauer, 2007, 2009) designed on the recommendations for dyslipidemia assessment and care.

On average, experts appeared to have followed-up on 23.25 concepts, generalists emphasized 20.75 concepts and novices emphasized 24.25 concepts. Based on these values in Table 1, it appears that generalists covered slightly fewer concepts during reasoning than experts or novices.

Table 1. Average Number of Concepts Covered During Reasoning by Dietitians (n=12)

	Expert	Generalist	Novice
Initial Consult.	12	11.5	12.5
Recommendation	11.25	9.25	11.75
Total Concepts	23.25	20.75	24.25
Follow-up	6	16	14

Table 2 shows the concepts covered during the initial assessment stage of reasoning, where the dietitians were given some assessment data and either did or did not use it during reasoning. The table is reflective of the concepts covered in the reasoning graphs, and not an exhaustive list of the concepts covered during interview. The column on the left illustrates all of the concepts seen in the model. The concepts that were given in the case scenario are bolded. The checked boxes represent concepts that were covered by each particular dietitian in this aspect of the study.

Table 2. Clinical Assessment: Concepts Covered During Reasoning

Concept	E01	E02	E03	E04	G01	G02	G03	G04	N01	N02	N03	N04
Lab data		✓					✓	✓	✓*	✓	✓	✓
Med history/co-morbidities		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Relevant medications			✓	✓	✓	✓		✓	✓			✓
Height, weight, BMI		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Waist circumference	✓	✓	✓	✓	✓	✓		✓			✓	✓
Weight history												
Feelings re: body weight						✓						
Knowledge of CVD diet												
Motivation lifestyle change									✓			✓
Caloric intake	✓		✓	✓	✓						✓	✓
Total fat intake	✓	✓		✓	✓	✓	✓		✓		✓	✓
Sources of dietary fat		✓	✓			✓	✓	✓				✓
Carbohydrate distribution						✓	✓					✓
Sugar /dessert intake							✓		✓	✓	✓	✓
Total fiber intake	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Tot protein intake		✓		✓								
Amount of animal protein			✓						✓			✓
Amount of plant protein	✓	✓										
Vegetable/fruit intake		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Dairy/calcium/Vitamin D	✓	✓	✓						✓			✓
Balanced meals												
Portion sizes	✓		✓	✓	✓	✓	✓	✓				
Snacking behaviour									✓	✓	✓	
Shopping habits												
Cooking methods	✓							✓				✓
Meals eaten out	✓			✓				✓		✓		
Alcohol intake	✓	✓					✓		✓	✓		
Vitamin/mineral supplements		✓		✓	✓							
Physical activity pattern	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Psychosocial issues.												

Specifically, it can be seen that the bulk of the emphasis was placed on lab data and anthropometric measurements, which were given pieces of data. Likewise, all but one dietitian (E04) focused on physical activity patterns. In terms of medical history and co-morbidities, all but one dietitian (E01) emphasized this aspect. All but one dietitian (E03) revisited the idea of total fiber intake. In contrast, several concepts were not focused on during the interview. Only G02 emphasized the idea of feelings regarding body weight. Two novices (N01 and N04) focused on motivation for lifestyle change. No emphasis was placed on weight history, shopping habits, knowledge of CVD diet and psychosocial issues. None of the expert dietitians focused on carbohydrate distribution and sugar intake. Neither expert nor generalist dietitians emphasized snacking behaviour. Similarly, none of the generalist dietitians revisited the idea of animal or plant protein intake.

Recommendations: In a similar manner, Table 3 shows the concepts covered during the recommendations and follow-up stage of reasoning. The boxes also marked with an asterisk represent concepts that were mentioned for follow-up.

Table 3. Recommendations and Follow-up: Concepts Covered During Reasoning

Concepts	E01	E02	E03	E04	G01	G02	G03	G04	N01	N02	N03	N04
Role of the dietitian												
Rationale of therapy												
Understands lifestyle/diet	✓					✓					✓	✓
Understands risk of obesity	✓		✓				✓				✓	✓
Understands risk of WC			✓	✓		✓		✓			✓	✓
Understands benefit of weight loss				✓								
Reduction of calories	✓		✓*	✓*			✓*	✓*			✓*	
Understands types of fats					✓		✓					✓*
Limits total fat	✓			✓	✓						✓	✓*
Limits saturated fat			✓	✓	✓*	✓*	✓	✓			✓	
Includes mono fat				✓	✓	✓*					✓	✓*
Includes poly fat				✓		✓*					✓	✓*
Omega 3												
Low-fat meat	✓		✓		✓			✓		✓	✓	✓*
Increases fruits/vegetables		✓	✓	✓	✓*	✓*			✓	✓	✓	✓*
Increases fiber	✓	✓	✓	✓	✓*	✓*	✓*		✓	✓*	✓	✓*
Decreases sugar							✓		✓	✓*	✓	✓*
Increases low-fat dairy	✓	✓*	✓						✓		✓	✓*
Moderate alcohol use	✓	✓					✓					
Canada's Food Guide			✓			✓*					✓	
Cooking methods	✓	✓						✓*		✓		
Meals 3+ /day												
Recommended snacks		✓										✓
Plate model		✓*	✓	✓	✓					✓		
Portion sizes	✓		✓	✓	✓		✓*	✓				
Modify recipes	✓			✓	✓			✓*	✓	✓	✓	✓*
Select from menu	✓											
Increases physical activity		✓*			✓*	✓		✓	✓	✓	✓	✓
Monitor activity		✓*	✓					✓			✓	✓
Applies label information												

At first glance, it appears that N03 and N04 covered the majority of concepts. Several ideas were not emphasized during reasoning: the role of the dietitian, rationale for therapy, Omega 3 intake, distribution of (3+) meals per day, and the application of label information. A notable gap can be seen in terms of the coverage by N01 and N02 regarding client understanding of the benefits of weight loss, fat consumption and risk of obesity, as compared to the other novices. None of the experts emphasized the client understanding of types of fats, and there little emphasis explicitly on monounsaturated and polyunsaturated fat in the client's diet. Only one expert (E01) revisited the idea of menu selection, and only one expert discussed the benefits of weight loss in detail. Two dietitians (E02 and N04) made specific recommendations for snacks. None of the novices analyzed placed emphasis on portion during reasoning.

Follow-up: On average, expert dietitians only suggested six concepts to be followed up at a subsequent visit, while novices and generalists suggested considerably more concepts for follow-up. Although generalists, on average, discussed 16 concepts for follow-up, N04 discussed follow-up the most (17 concepts). In terms of individual comparisons between individuals, all but one dietitian (E01) who mentioned the reduction of calories to promote weight loss also stated that this aspect should be monitored and discussed at a later visit. One dietitian (N01) suggested follow-up on lab data. Possible reasons behind these trends will be included in the discussion section of this paper.

In summary, the results presented in the previous section depict the various concepts covered by novice, generalist, and expert dietitians during initial consultation, recommendations, and follow-up of dyslipidemia cases.

Individual Protocol Analysis of Reasoning about Metabolic Syndrome Scenarios

The hypothetical case scenarios were strategically designed to incorporate a number of important characteristics that could be used in the classification of metabolic syndrome. As previously mentioned, metabolic syndrome is typically diagnosed as a combination of the following factors: hypertension, low HDL values, elevated triglycerides, and large waist circumference. Case scenarios in which these symptoms of metabolic syndrome were present and were considered problematic were deemed “heavily weighted”. Other scenarios illustrated a client with only one or two of the problematic symptoms, and were deemed “lightly weighted”. Semantic networks were created for six dietitians, as a visual interpretation of their reasoning in terms of blood pressure, HDL, and triglycerides. Analyzing these networks may provide insight into the reasoning processes as they relate to symptoms of metabolic syndrome. The following is an analysis of the networks, and a corresponding comparison between dietitians given scenarios in the lightly weighted and heavily weighted groups.

Heavily Weighted Case Scenarios

Blood Pressure

An expert (E01) reasoned through a case that depicted a 39-year-old male working as a high-pressured stockbroker, who presents with a blood pressure of 130/90 mm/Hg. This expert dietitian describes it simply as being “high”, since the cut-off for metabolic syndrome is 130/85 mm/Hg. The client was described in the case scenario as using alcohol occasionally, and this dietitian speculates that alcohol could be the factor affecting this client’s blood pressure. Therefore, this dietitian recommends a reduction of alcohol to 2 servings. The reasoning pattern illustrating this semantic network can be found in Figure 1a.

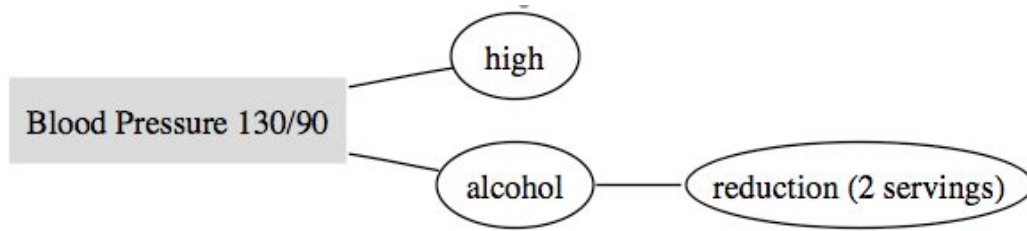


Figure 1a. Semantic network representation of the discussion about blood pressure by an expert (E01).

The case (Figure 2b) given to generalist (G03) was assigned a case in which a menopausal 66-year-old female client presents with a blood pressure of 155/105 mm/Hg, described as being “high” according to the metabolic syndrome criteria. Unlike the expert, however, this generalist did not relate blood pressure to any other factors or symptoms, despite it being highly elevated.

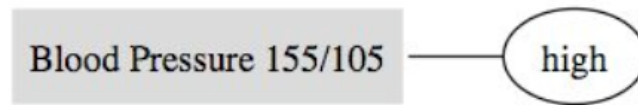


Figure 2b. Semantic network representation of the discussion about blood pressure by a generalist (G03).

The female client, 58 years old, presented to a novice (N01) had a blood pressure of 150/90 mm/Hg. This semantic network can be seen in Figure 2c. First, the concept of “medication” is mentioned as a recall from the case scenario, and that the client would be at high risk for heart disease. Next, the dietitian explicitly discusses the presence of metabolic syndrome in this client. None of the other participating dietitians in the study mentioned this concept. The dietitian goes on to question “how much” and “how often” the client consumes alcohol, since the case scenario only states that she uses alcohol occasionally, and suggests that the alcohol be limited to one drink per day. Lastly, the dietitian inferred the idea of “sodium” as a factor

potentially influencing blood pressure, and suggested rinsing canned vegetables as a way of decreasing sodium intake.

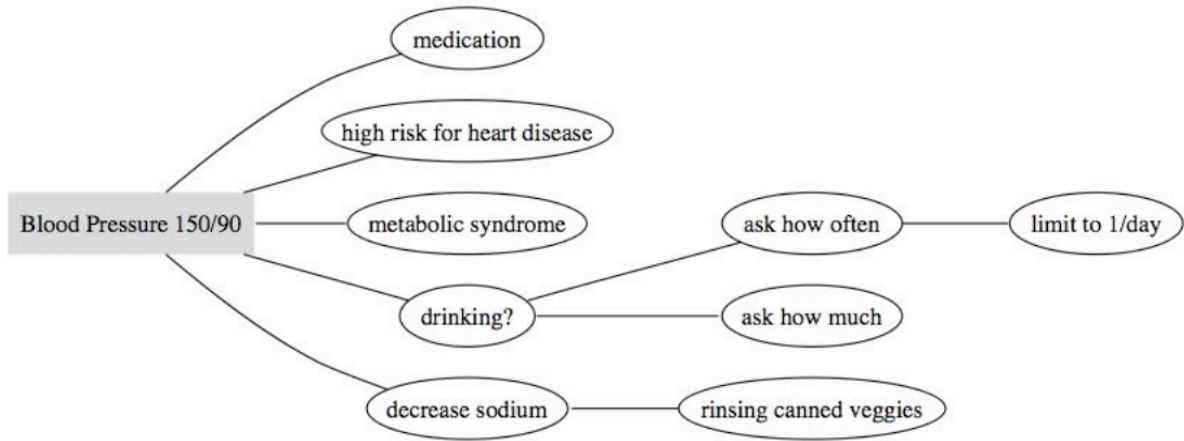


Figure 2c. Semantic network representation of the discussion about blood pressure by a novice (N01).

HDL

The semantic network for HDL is discussed by an expert (E01) and is presented in Figure 3a. The dietitian states that the client’s HDL is low (0.9 mmol/L), and there is certainly “room to work”; especially since the target value is above 1.04 for men. The concept of occasional alcohol use is discussed as a benefit, but the dietitian also mentions the over-consumption of alcohol having a negative effect on triglyceride values. This expert dietitian recommends exercise for approximately 30 minutes daily for this obese client, in order to lose weight and raise HDL values.

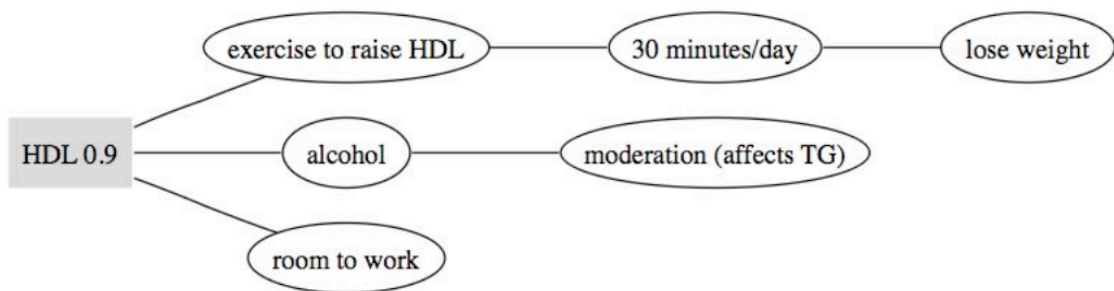


Figure 3a. Semantic network representation of the discussion about HDL by an expert (E01).

The generalist (G03) did not discuss HDL for the client presented in the case scenario. This is especially interesting since the given case scenario presents a female client with low HDL (1 mmol/L) and the target level is greater than 1.29 for women.

The novice (N01) recognizes that the female client's HDL level presented is low (0.9 mmol/L), and that the target is above 1.29 for women. Metabolic syndrome is explicitly mentioned in relation to this symptom as well. Again, no other participating dietitian does this during reasoning. In addition, it is suggested that HDL values be retested. The semantic network illustrating this dietitian's reasoning process can be found in Figure 3b.

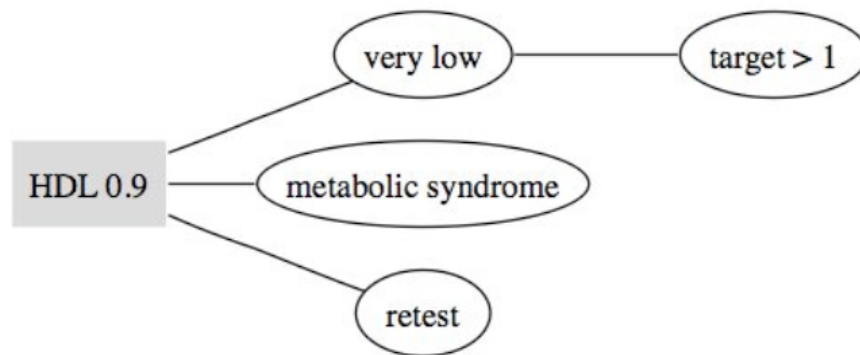


Figure 3b. Semantic network representation of the discussion about HDL by a novice (N01).

Triglycerides

In Figure 4a, a semantic network illustrates the reasoning of an expert (E01) with regards to the triglyceride value of a 39-year-old male client. This expert states again that there is “room to work”, since the client presented has a TG value of 2.3 mmol/L, which is above the recommended target of 1.7 mmol/L. The concept of alcohol is recalled from the case scenario and a reduction of alcohol consumption is suggested, since the client is portrayed as consuming alcohol occasionally. The sugar intake of this client in terms of chocolate, desserts and

doughnuts, sparks the dietitian’s memory of a previous client who drank 2 cans of sprite daily, which equaled to 8-10 spoons of sugar per can. Thus, the dietitian suggests a move away from simple sugar, substituting fruit juice instead of soda. The expert also recommends a reduction in total fat intake (35%), encouraging the consumption of lean meat, low fat desserts, and fish in the client’s diet.

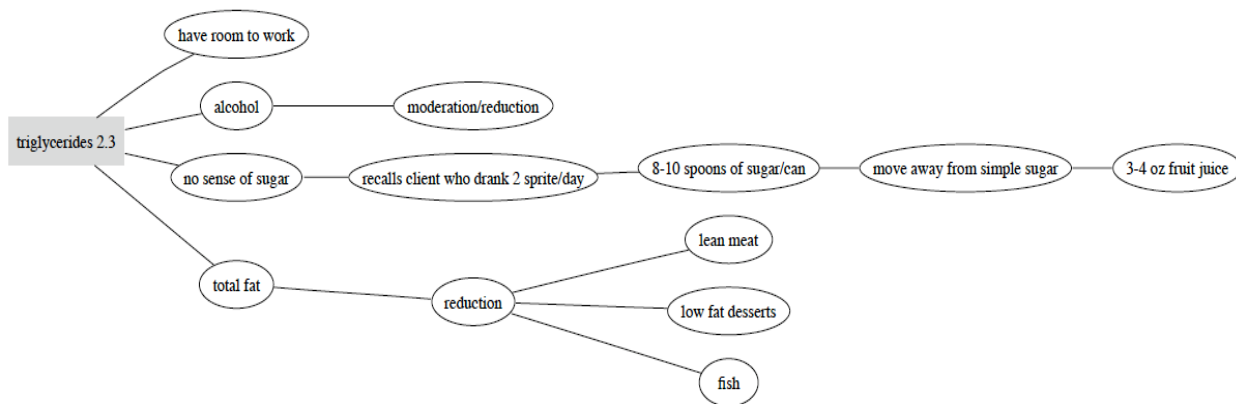


Figure 4a. Semantic network representation of the discussion about triglycerides by an expert (E01).

The generalist (G03) discusses various factors relating to triglyceride values in Figure 8b. First, “menopause” is mentioned as a possible factor influencing TG for this retired 66-year-old female client. Next, the concept of “alcohol” is addressed, since the case scenario describes the client as drinking wine occasionally. Based on this given information, the dietitian suggests a possible reduction in alcohol consumption. A total elimination of alcohol is not recommended if the client enjoys it as a part of their lifestyle. This dietitian suggests vegetables over fruit, in an effort to reduce the client’s sugar intake. Carbohydrates are discussed in relation to fiber, since the case scenario states that the client prefers white bread. Furthermore, Omega-3 fatty acids and monounsaturated fats are discussed. The client’s lipid levels are mentioned, with the notion of balancing fats by including more “fiber” since her intake is relatively low, in addition to

lowering her “saturated fat” intake (15%). This, in turn, will assist in weight reduction for this obese client. “Weight loss” will subsequently affect “cholesterol” values. Lastly, this dietitian discusses the client’s “activity level”, which is low, in relation to “portion sizes”.

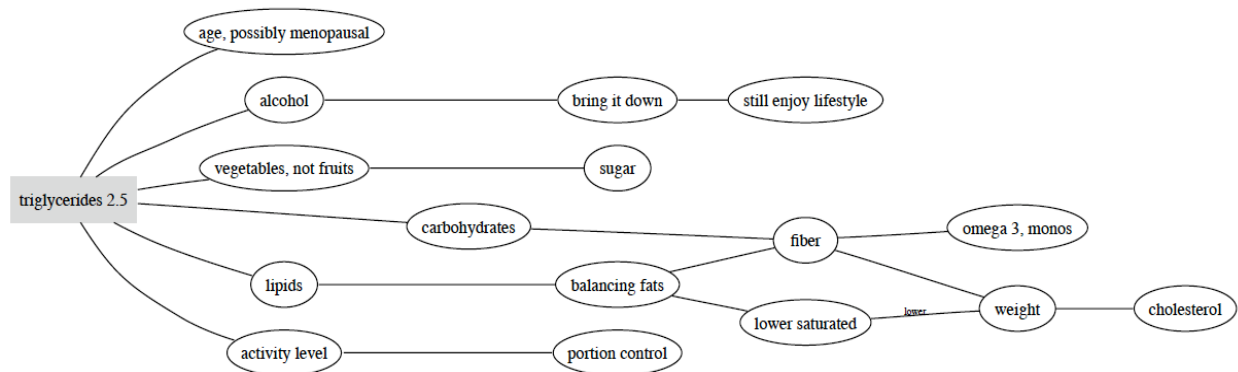


Figure 4b. Semantic network representation of the discussion about triglycerides by a generalist (G03).

The novice (N01) also places emphasis on triglyceride values, by providing a lengthy and detailed discussion about this concept (Figure 4c). The 58-year-old female client’s fasting glucose is given in the case scenario as 6.5 mmol/L, which is considered a criterion for metabolic syndrome. Next, the dietitian recommends that blood sugars be monitored in an effort to lower the glucose and TG values. Moreover, the dietitian uses the given information from the case scenario regarding the client’s occasional alcohol use, and suggests a limit of 2 drinks per week. Also, since the client is portrayed as enjoying sweets, the dietitian recommends that blood sugars could be improved by reducing “sweet beverages”, encouraging the client to consume “3 fruits” instead. This dietitian labels the TG value (2.5 mmol/L) as “high”, aiming for the target goal of 1.7 mmol/L. Thereby; the client’s very high CVD risk would be lowered. According to this novice, CVD risk could also be lowered by the “cessation of smoking”, since the client smokes 15 cigarettes a day. Although the client exercises daily, this novice dietitian recommends

maintaining a “healthy body weight” through increasing her daily “activity”. In addition, the concepts of “fiber”, “monitoring sugar” and “fat” are tied to the lowering of CVD risk. The notion of “metabolic syndrome” is mentioned based on this dietitian’s assessment of blood pressure, HDL and TG values, which is not done by any other dietitian in this study. The “vegetable” and “fruit” content is discussed in relation to triglyceride values, in addition to a question regarding “fatty fish” intake. For this, the dietitian recommends “salmon”. The “type of fat” being consumed by this client is mentioned, since the case scenario depicts the client as someone who is aware of fats in foods.

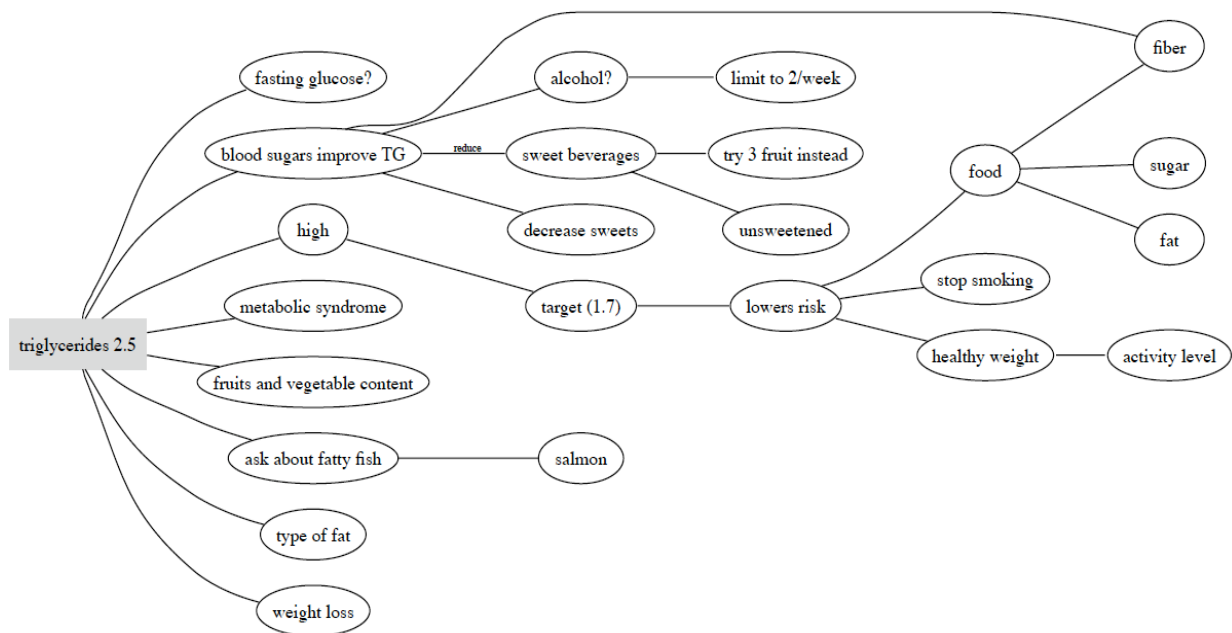


Figure 4c. Semantic network representation of the discussion about triglycerides by a novice (N01).

Lightly Weighted Case Scenarios

Blood Pressure

The blood pressure of a 35 year-old female client was presented to an expert (E02) as not having hypertension; therefore, it was rightfully not discussed in relation to metabolic syndrome.

A generalist (G02) was assigned a case scenario that presented a 66-year-old female client with a high blood pressure of 160/100 mm/Hg, which was “untreated”. The dietitian also questioned the client’s “salt intake” in relation to blood pressure. Furthermore, the dietitian recommends an increase of “fruits” and “vegetables” for this hypothetical client, since her intake ranges from 2-4 servings daily. The semantic network from this dietitian’s reasoning can be found in Figure 5a.

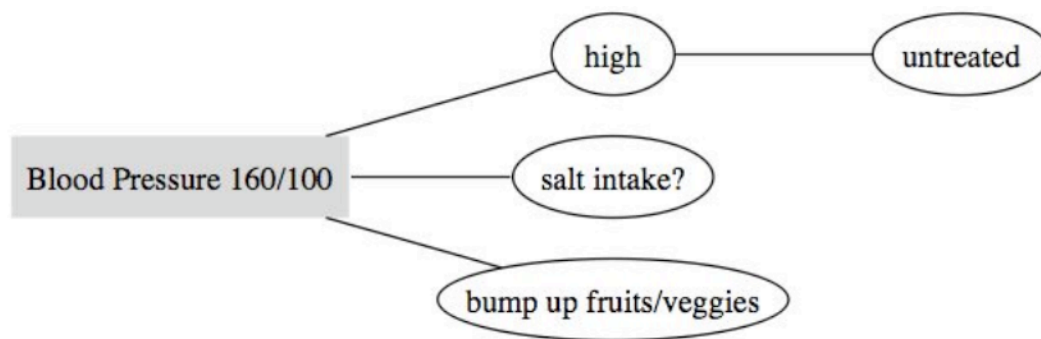


Figure 5a. Semantic network representation of the discussion about blood pressure by a generalist (G02).

A novice (N02) was assigned a scenario that presented a 63-year-old male client with slightly elevated blood pressure of 135/90 mm/Hg. The dietitian simply states that the blood pressure is “high” and recalls from the given scenario that the client is receiving “medication”. The semantic network illustrating this dietitian’s reasoning can be seen in Figure 5b.

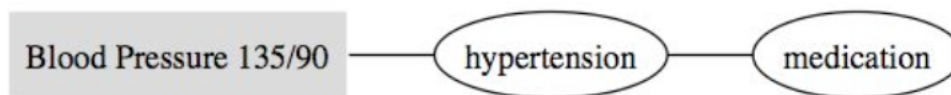


Figure 5b. Semantic network representation for the discussion about blood pressure by a novice (N02).

HDL

HDL values are not discussed in dietitians of the lightly weighted group because the scenarios given to these particular dietitians were designed to include HDL values that are within normal range. Thus, the hypothetical clients in these cases were not characterized as having metabolic syndrome. This is reflected in the reasoning of these dietitians by the lack of emphasis regarding this particular concept.

Triglycerides

According to an expert (E02), the triglyceride value (2.0 mmol/L) of the 35-year-old female client in scenario 4 were labeled as “good”, even though it is considered above the cut off for metabolic syndrome (1.7 mmol/L). It can be seen in Figure 6a that the dietitian recommends that the client increase their total fat from 20% to 25%, by including “olive oil” and “flax seed oil” in her diet.

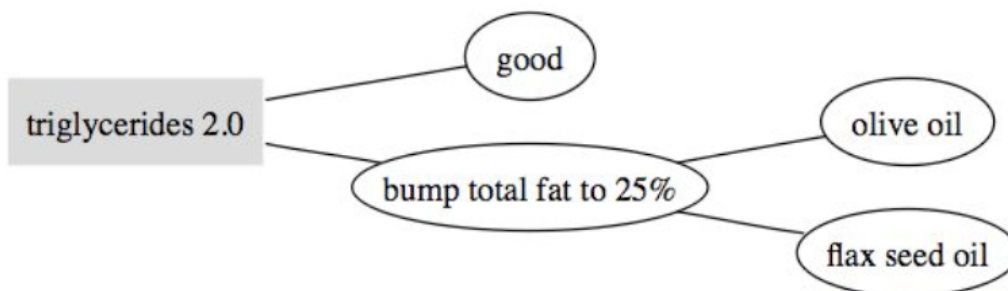


Figure 6a. Semantic network representation of the discussion about triglycerides by an expert (E02).

The generalist (G02) in Figure 6b is “not too concerned” about the 66-year-old female client’s TG values. Although at 1.9 mmol/L, this value is above the recommended target of 1.7 mmol/L. This dietitian would rather see “movement on the total cholesterol values”, since the cholesterol value in the given scenario is 400 mg/day.

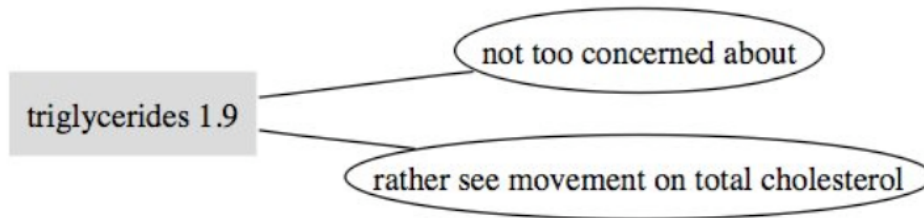


Figure 6b. Semantic network representation of the discussion about triglycerides by a generalist (G02).

The novice (N02) did not discuss the triglyceride value for the 63-year-old male client, because the given value of 1.6 mmol/L was within normal range.

In summary, the results presented above illustrate the reasoning patterns of novice, generalist, and expert dietitians when presented with case scenarios in which metabolic syndrome characteristics were heavily or lightly weighted. Individual concept analyses show that symptoms are discussed differently between dietitians of various levels of expertise, depending on how the symptom was presented in the given scenario.

Discussion

One aim of this study was to characterize concept coverage, to identify trends in the concepts generated and followed through by various levels of expertise. Overall, there appears to be a slight intermediate effect in terms of average concept coverage. Generalists covered the least concepts, as compared to experts and novices; however, further studies should be conducted

to confirm these results. It is possible that these experts cover more relevant concepts than generalists due to experience, and that these novices cover the greatest number of concepts as a result of their inability to filter out irrelevant information. Although in our study, there appear to be trends in numerical values, no clear-cut trends can be identified in terms of concept coverage between levels of expertise. A related study has been submitted for publication, which looks at two particular concepts emphasized during clinical case explanation: dietary fat and blood cholesterol. The results of the aforementioned study suggest that expert descriptions of these concepts are more succinct, and place emphasis on certain relevant subcategories such as LDL cholesterol, while skimming over seemingly less relevant subcategories such as unsaturated fat. Novice descriptions, however, appear to overcompensate and discuss a wider array of concepts, whether relevant or not. As a result, it can be concluded that there are differences in the weight given to particular concepts by novice, generalist and expert dietitians, rather than differences in the overall concepts covered during reasoning.

The analysis of individual protocols in relation to concepts underlying metabolic syndrome depict the reasoning of expert, generalist, and novice dietitians. The characteristics that were heavily weighted in the case scenarios were emphasized and discussed by the participating dietitians in different ways. It is clear by comparing the networks between the dietitians that the generalist reasoning is simplistic, even though blood pressure was heavily weighted and problematic for the hypothetical client. This could be a result of an intermediate effect (Patel, Evans & Groen, 1989; Schmidt, Norman & Boshuizen, 1990; Rikers, Schmidt & Boshuizen, 2000; Groves, O'Rourke & Alexander, 2003; Wimmers, Schmidt, Verkoijen & Van De Wiel, 2005). The novice dietitian's semantic network shows a much more detailed and verbose explanation when discussing blood pressure. This could be explained by the novice

dietitian's inability to filter out irrelevant information, while trying to overcompensate for their inexperience by relating many concepts together. It is possible that the novice dietitian simply did not attain enough experience in dealing with such cases, and was less skilled in formulating schemas for knowledge retrieval and application. Perhaps the most interesting finding is that only one novice, illustrating a concrete relationship between the heavily weighted symptoms and the condition, explicitly mentions the notion of metabolic syndrome. When discussing HDL, the expert dietitian's reasoning creates a succinct network, which appears to summarize the most important factors related to HDL.

The generalist, however, does not discuss HDL at all, even though this characteristic was heavily weighted and problematic in the case scenario. The concept of triglycerides appeared to be the most emphasized by all of the dietitians in focus, regardless of the level of expertise. A comparison of the semantic networks of the novice, generalist and expert reveal similarly structured reasoning patterns. The expert's network shows a particularly interesting finding. When discussing sugar, the dietitian uses case-based reasoning (Schank & Abelson, 1977) to recall a previous client who consumed a significant amount of sugared soda daily. This type of reasoning occurs when knowledge from a previous experience can be used to problem-solve a new case. Case-based reasoning is especially relevant in domains where experience is a crucial element in achieving expertise, and can be found in various other areas of research such as artificial intelligence (Schank & Abelson, 1977), computer software design (Hahn & Chater, 1998), decision-making tool development (He, Erdelez & Wang, 2010), and learning techniques in the health sciences and beyond (Marling, Shubrook & Schwartz, 2009; Bichindaritz & Montani, 2009).

In case scenarios with lightly weighted characteristics of metabolic syndrome, dietitians of all levels of expertise recognized not to place emphasis on those concepts. In other words, when values were within normal range, expert, novice, and generalist alike chose to focus on other problematic factors during reasoning. It is possible that when presented with typical cases, reasoning among dietitians of varying expertise levels generate similar reasoning patterns and decisions.

Limitations and Future Research

The case scenarios created for the study (Brauer, et al., 2007, 2009) were compiled to describe a unique client using a wide variety of standard characteristics typically seen in clients with dyslipidemia, and were strategically designed to simulate real-life experiences with clients. Therefore, the structure and composition of these scenarios constrained the reasoning patterns and processes of the dietitians in the study. Several limitations to the study should be noted. Since this exploratory study concentrated on a small sample of individual dietitians and unique cases, the results obtained here may be unique to these particular individuals. Furthermore, the nature of the study is largely based on interpretations of discourse without face-to-face interaction with the participant. Thus, certain aspects such as body language and empathy could not be measured. Future studies in expert-novice reasoning during dietetic counseling should aim at randomly selecting participants from the dietitian population and investigating the cognitive structures underlying reasoning as well as the application of acquired knowledge. Research in the field of dietetic counseling and reasoning processes of experts and novices will add to existing knowledge, with the goal of developing educational tools to enhance learning in dietetics practice.

APPENDIX C: SAMPLE OF VERBAL PROTOCOLS

VERBAL PROTOCOL 1: E04 - Scenario 7

- I So I am here with practitioner E04 and we are going through scenario number 7. Go ahead. Can you read it out loud and say what you are thinking as you read?
- E04 MN is a thirty eight year old man who went to his family doctor for a check up and then was referred for diet counselling. The physician has placed him at very high risk for cardiovascular disease in the next ten years, ten year risk greater than 30% using the current Canadian Dyslipidemia Guidelines. He has not had any CVD symptoms and is otherwise healthy. He smokes one pack per day of cigarettes. He has a family history of CVD and does not have diabetes. The labs, total cholesterol 7.3, LDL 4.9, HDL 1.5, triglycerides 1.5. So his LDL is quite elevated, we aim for less than 2.5 for high risk and his HDL is good. We would want to talk about the smoking as well and previously recorded anthropometrics BMI 22, okay so the BMI looks really good. Lifestyle MN works in a physically active job as a house painter, in his spare time is active in his workshop and maintaining his house, moderate income, married and wife is supportive, high school education, alcohol occasionally, has come for counselling but has little knowledge or interest in diet and heart health, has not controlled his fat intake in the past. So I would be thinking a stage of a change there, it would be pre-contemplative. And the diet, he eats an average diet consisting of sandwiches, salads, fruits, soups, meat, potatoes and vegetables. He enjoys chocolate desserts and donuts and I would want to find out how often he enjoys those and we always ask people to bring in a three day food intake record and then we ask them how that compares with their usual intake, or something that is quite representative of the usual intake. Dietary intake of fibre is relatively low, prefers white bread and eats about two to four servings of fruits and vegetables each day, so we would want to find out in those fruits and vegetables servings is that juices or is he actually eating fruits and vegetables. So it really helps to have the food intake record I find for at least the three days to go by. He has a high calorie intake which isn't an issue because his BMI is great and he is physically active. The break down 18% protein is fine, 40% carbohydrate, 42% fat, so the percentage of fat seems high and especially given that the saturated fat is 20% of total calories, so we talk about where his fats are.
- I You can say what you would tell the client. You don't have to use the 'you', you can use the term 'he' if you want but just sort of talk at the level of information that you give the client.
- E04 So, when I went through the diet history I would want to find out how they made the sandwiches, what types of fillings were in the sandwiches, what kind of spreads on the bread, and make suggestions for things that they could use in place of that to decrease the saturated fat intake and increase the mono and polyunsaturated. So for example if he used butter on the bread I would suggest either not using butter on the bread or using margarine, mayonnaise that mayonnaise would be quite an acceptable choice for him and he wouldn't have to use light because of his calorie requirements. The types of meats, I would make suggestions for using lean meats like beef, pastrami, ham, sliced turkey and chicken rather than luncheon meat, if that's what he was using or using salmon or tuna that kind of thing, peanut butter would be a good choice. The fruits and vegetable intake

is low, I would see if he was receptive to using the raw vegetables like carrots or taking a V8 in his lunch. The thing that is going through my mind with all of this, is, is his stage of change and really exploring the pros and cons, I think stepping back before really getting into the diet changes is stepping back to see what he is thinking about all of this. What would be the pros and cons of making changes in his diet, what are the barriers to making changes and so we need to address that.

I Can you give some examples of what you might do when you say talk about pros and cons and barriers? How could you address that with this type of individual?

E04 I would ask him, are you concerned about your cholesterol level? I would show him what the target level would be and given that they are at risk, so I would find out if there is some concern there and would they be willing to make some changes and what would be the advantages of lowering your cholesterol to see if you were aware that, that would decrease the risk of heart disease. What would be the down side of having to make some changes? What would prevent you? And maybe we would get into that when I give the more specifics, could you do this, could you change, who is making your sandwiches would they be willing to make these changes? Who does the groceries? Very practical things. Is that what you are looking for?

I Yes.

E04 I probably, seeing as there is a fair bit diet wise to change here, with an initial visit I probably wouldn't address the smoking at this stage. Certainly with my clients depending, that might be something that I might address at a future meeting or give him literature about smoking, I would assume his family physician is also involved in that. Fibre intake, I would talk about the source of fibre, talking about whole grain breads and he prefers the white bread, so it's not a huge issue in terms of his lipid levels, if he would be willing now there is a new white bread that is higher fibre, maybe that would be acceptable that he would be willing to give that a try and then boosting the fruits and vegetables, suggesting really easy ways of packing those into the lunch and maybe that would help with decreasing the desserts and the donuts. So suggesting, take two fruits and some cut up vegetables and then how to make those easy to put into the lunches, talk about how to have those available at home, with the baby carrots that are already prepared. What you could have for dessert that would be acceptable and I might find out what he likes, there are some lower fat items that might be okay.

I Are there any particular counselling tools that come to mind for this type of individual? Any resources?

E04 Well generally if a person is maybe at this stage, the pre-contemplative stage, when I talk about the advantages of lowering cholesterol and the risks of having high cholesterol, I tend to use a model that I have had for years but it still seems to make an impression on clients where I will show them the build-up of cholesterol, it's a model of an artery from the heart showing the build-up of cholesterol and how it can obstruct blood flow and people seem to take notice of that and remember it, so I use that for discussing for the pre

contemplative person. And other tools, I don't know, I would ask if he would want some. He has a high school education, I would ask him if he would like some information to read and in the past he has shown little knowledge or interest in this topic. I do have some pamphlets that I use, there is a variety, the ones from our local health unit on fat. I would be a little bit hesitant to give him these unless he particularly wanted them. I would be more likely to, usually I write down specifics related to their diet, so I would say, when making sandwiches try such and such a bread, try using this margarine and I have the margarine tub that I would show what to look for when buying margarine and I would list the types of meats and fillings for sandwiches, so very specific based on his food intake record, I think that might be best rather than general pamphlets. For most people who sound like they are a little bit more receptive and interested than this man might be, I do use the Becel pamphlet, I do wish that it wasn't put out by a company, I have talked to Health Canada about that and they have chosen not to put their energies into producing a heart health pamphlet because this is a good one and it's meeting dietitians needs apparently. So I will use the Becel or I will use the local ones from a local health unit. I don't think that the Canada's Food Guide would really interest him.

I What kind of follow up might you recommend for this individual?

E04 I definitely follow people, even people that don't show a lot of interest, because I believe that if you talk about the pros and cons it may help to move along the stages of change. And so I would book a follow-up probably in three months time just to then see where he is at and see if he has made any changes. I am able to book bloodwork here at the health centre but in this case I wouldn't order follow-up bloodwork until he was making some changes, so I would wait on that.

I We'll take a pause.

VERBAL PROTOCOL 2: G03 - Scenario 23

I Okay we are continuing with practitioner G03 and now going through scenario 23.

G03 VW is a sixty six year old woman who went to a family doctor for a check up and was referred for diet counselling. When I get individuals at this age, usually fifty plus, what I usually look at is quality of life. They are set in their ways in terms of eating, they are set in their lifestyle, so for you to design an eating plan, go meatless, do this, there might be difficulty so I am usually wary. So what I would like to do is set the pattern, is sort of find out a little bit more about them in terms of lifestyle and eating. Clinical, the physician has placed her at low risk in the next ten years using the current Canadian Dyslipidemia Guidelines. She has not had any CVD symptoms and is otherwise healthy. The physician detected high blood pressure at the last visit and this being assessed, her current blood pressure at 155 over 105. She does not smoke, she has no family history of CVD and does not have diabetes. So fairly healthy, current blood pressure 155 and 105, blood pressure is high. Laboratory data, total cholesterol is 6.8, LDL 4.5, HDL is 1, triglyceride is 2.5, so 6.8, 2.5, risk factor. BMI is 29, height is 165, weight is 79, waist circumference is 97. Sixty six year old, she is menopausal, more inclined to think that it's age, change, loss of estrogen which we do know does cause cholesterol to go up and possibly does affect other lipid parameters just like the triglycerides. So I would like to look further before I make any decision, I would like to look at the lifestyle. VW is a retired laboratory technician living on a small pension. She lives with her adult daughter and keeps a large flower garden. She does not exercise as such, but manages the garden and walks the dog twice daily. She drinks wine occasionally, she has gradually gained weight, especially at menopause. She has come for counselling, she is concerned about her health. She has paid little attention to heart health messages in media and has not controlled her fat intake. Diet, she eats an average diet consisting of salads, sandwiches, fruit, soup, meat, potatoes and vegetables etc. She grows and freezes vegetables for home use. Dietary intake of fibre is relatively low as she prefers white bread and eats about two to four servings of fruits and vegetables each day. She uses butter and not margarine for flavour. Calorie intake is 1400, total fat is 30%, still within the guidelines, saturated fat is 15, polyunsaturated is 8%, mono is 7% and cholesterol is 300. First thing I would start off with is asking her about wine, how often does she drink it, that would be my concern, because then I would like to impress upon her that alcohol has a strong association with triglycerides. If she is having more than one drink a day then I would ask her to bring it down, but not take it out because it is quality of life and I do want her to have some enjoyment with her lifestyle. Activity wise, walks the dog twice daily, she gardens, I think that would be acceptable, that's fine. I would focus on the saturated, again bringing out the book on cholesterol, going through the different types of fat, impressing upon her what the implication that saturated fat has and what foods contain saturated fat, how to lower the saturated fat in her intake. Talk about fibre, now this is very common with the elderly and I find a few with my younger population, any product containing fibre just doesn't taste the same as processed white bread. So I will indicate to them studies about high dietary fibre, in terms of having a strong association of lowering the cholesterol. She did mention that she did lower her weight and also 'did you know

that if you increase your fibre intake you eat less, and if you eat less that is less calories that your body can do without', and that sometimes rings a little bell. 'Really isn't that interesting, but I just don't like the way it tastes.' So you say to them, well you can get fibre in the most interesting ways, and what I do is I have a tool which I will ask them for each meal, breakfast, lunch and dinner, give them a list of all the fibre food that you know you need about 25 to 35 g fibre a day and let's look at the foods that you like and how you can increase the fibre. She says, 'well I love Cheerios and I love white bread'. Okay that's fine, let's look at how we can increase the fibre, you like a tomato sandwich, tomatoes have high fibre so we can add a little bit more tomatoes, you said your cereal is Cheerios, well why don't we add something with more fibre, why don't we add things like kiwi and that's not a bad idea. They will say 'I like a croissant'. I would say to them the croissant is high in saturated fats so we may want to reduce the frequency, trying to impress on them that not all these fats are bad but in terms of balancing them with respect to their lipid level would be more important. Try to tell them why don't we go for more vegetables as opposed to fruits and they are asking why. And the reason why I will say, because fruits and in terms of the sugar and the implication on triglycerides. I mean if you were a very active woman there would be no issue but your activity has come down so you now need to control your portions which will match your metabolism. I would ask her when we are there to tell me on a typical weekday, what do you have for breakfast, lunch and dinner and your snack? So what I am going to go through is make suggestions of how to increase the fibre, then I am going to translate that to let's look at this, let's look at lunch, let's look at the dinner, let's take these fibre high foods, the list I have given you and now let's for each meal have at least 8 to 10 grams of fibre and you are going to keep this and you are going to get at least 25 to 35 grams. Looking at the fat, we are going to talk about, she says she uses butter and margarine, that's fine, there is a low fat butter that we can use out there, in terms of lowering the portion of the concentrated saturated fat in your diet. I might even mention to her that in case you have to lose weight, you know if you use less of butter or margarine in total it helps in terms of weight loss. So what replaces it, you can have for example there could be condiments which are fruit flavour, you can also use vegetables which import natural flavours. She grows and freezes vegetables for home use, that I would encourage, so I would talk about canning, that in the fall and in the winter, what do you think about this, that you can use some peaches or use tomatoes and use them as condiments or as marinates for your meats, not a bad idea. And then I go a little bit further and I say, well this is one way we can increase your fibre, so I would basically do a high fibre sheet with her to get more fibre in. Talk briefly about the different types of fat and leave it at that and ask her, do you want to come back and see me? Being a consulting dietitian, she lives on a small pension, I may ask her, does she have an extended health care plan, if she says, no, then I can give her the option of, well you can come back and see me and I do have senior rates, so she can come back and do that. I would definitely like her to come back and see me in about three weeks, to see how things are progressing. I would probably look at her carbohydrates and say, again going on about the fibre, that, different types of carbohydrates and their role with respect to triglycerides and their role in terms of weight and their role with cholesterol. So I would probably spend some time with that but again it would be the fibre that I would focus on and then talking about the fat but the sessions would be fibre, fibre, fibre. So that way we can definitely play the cholesterol card. She

has paid little attention to heart health messages in the media and has not controlled her fat intake, possibly the reason why she has paid little attention to it in the media is because, well sixty six years old, 'I don't want to make any changes, my quality of life and I am set in my own ways'. So I am not going to pay too much attention to that, I am more going to personalize it to this sixty six year old lady. To me flower garden, walking a dog twice a day, even people with much younger years, they don't even keep that sort of an active lifestyle. So try again, to every single one of my patients that walk in, brownie points first of all to their lifestyle, before I even go on to say this is what you should be doing

I I just wanted to bring you back to one point, you did say that you were going to go through the types of fats, suggestions of lower fat and particularly saturated fat intake, were there any other suggestions that came to mind? You mentioned the butter, but were there some other things given the information that you have, or even just making some assumptions?

G03 Well I probably may want to talk about the omega three fats trying to get her to incorporate that a bit more, and the poly and mono, but with that booklet I would definitely go through talking about the different types of fats and where they should be looking for it in terms of....

I So does that give suggestions, is that a way of giving suggestions for including some types of fats in the diet and how could they include those fats?

G03 Well when we go through the foods and we sort of do the eating plan for the dietary fibre, when she wants to use condiments one of the things that I would probably suggest is like using margarine made from Olive Oil, Olivinia will help her get the mono, using nuts, she probably has the concept that nuts are not good, but nuts in terms of wellness and omega 3 fats will definitely help here. So I will try to impress on her that her saturated fats are way too high and we should try to moderate this. I might discuss the cholesterol but what happens when you start discussing cholesterol, people come with their stereotypes, people come with their concept of cholesterol and I mean dietitians hear this all the time and we are saying, no the cholesterol in the foods has no effect, so unless she asks, what about eggs, but it's more the different types of fats that I would spend time and 300 milligrams I mean she is not widely above and so that is why I would leave it there.

I Okay was there anything else you were thinking of here?

G03 No, this might be a very difficult, a sixty six year old, they are fairly difficult to work with but they would be interesting.

I Okay thank you very much. We have concluded both interviews with practitioner G03.

VERBAL PROTOCOL 3: N02 - Scenario 10

- I I am here with practitioner N02 and I have instructed the practitioner how to read through the case, going through the clinical and laboratory and anthropometric measurements first to assess the individual and then going through the lifestyle and diet information and describing how she would assess and counsel this individual and so we are starting with scenario number 10. Go ahead.
- N02 ST is a sixty three year old man who went to his family doctor for a check up and then was referred for diet counselling. In terms of clinical information the physician placed him at high risk of cardiovascular disease in the next ten years, a ten year risk of twenty to thirty percent using the current Canadian Dyslipidemia Guidelines. He has not had any cardiovascular disease symptoms and is otherwise healthy. He has had hypertension for which he takes medication and his current blood pressure is 135 over 90. He has no family history of cardiovascular disease and does not have diabetes. So the laboratory data indicates that he has a total cholesterol of 7.4 and LDL of 5 and HDL of 1.4 and triglyceride of 1.6 and then in term of anthropometric data his BMI is 24, his height is 183 cm. his weight is 80 kg. and his waist circumference is 91cm. So before I met the patient having this data in hand, obviously he is at a healthy weight. He is sixty three so he is within what is considered a healthy weight for someone his age. The cholesterol values I would compare to the guidelines, the Canadian guidelines, and going from what the doctor provided me with I could assess that what his risk factors are for cardiovascular disease. He has no family history which is positive and there is no information here about whether he is a smoker so that would be information I would need. So assessing his risk factors would give me a sort of a better picture of what his levels for cholesterol and triglycerides should be, what goals to aim for. In terms of lifestyle he works as a short haul truck driver and owns his own business. He is thinking about retirement. He lives in medium sized city and only does yard work, that is his only regular exercise. He has a moderate income. He is married and his wife is supportive. He has a high school education with additional bookkeeping courses to run his business. He uses alcohol occasionally. He has gradually gained weight over his adult years, he was a normal weight as a child. He has come for counselling but has little knowledge about diet and heart health and has not controlled his fat intake in the past. So other lifestyle information that I would want to know, would be again if he is a smoker. How much alcohol he takes? Who does the cooking in the house? How often they eat out? So then in his diet he eats an average diet consisting of sandwiches, salads, fruit, soup, meat, potatoes and vegetables. He enjoys chocolate desserts and donuts. His dietary intake of fibre is relatively low as he prefers white bread and eats about two to four servings of fruit and vegetables each day. So the provided information shows that he is taking in about 2000 calories a day, 15% protein, 43% carbohydrate, and 42% total fat, with 20% saturated fat and 12% polyunsaturated and 10% monounsaturated and 500mg of cholesterol a day. So I think in terms of diet I would actually want to do sort of not a diet recall but go through an average day and talk about where his meals are, whether he snacks, what time of day he eats and then asking him questions about certain target foods, like high fibre foods and foods that are high in saturated fat, like deep fried foods, fast

foods and asking him about his use of polyunsaturated and monounsaturated fats such as non hydrogenated margarine and olive oil, canola oil, so I guess asking about cooking methods. Asking about intake of fish, intake of eggs and then going from there using that information about sort of certain target areas to work on and depending on his responses deciding what specifically to counsel on. But going from the information provided I think probably one counselling appointment initially to go through diet recommendations and then a follow up interview three to four months later with a new set of lab values would be the most useful set up for counselling and in the initial appointment discussing the lab values that initially came in and what they mean to the patient. His HDL is pretty good and his triglycerides are relatively low. So it's his LDL cholesterol which is actually the main problem, so discussing ways to improve LDL cholesterol more specifically, including increasing his intake of fibre and trying to find ways to incorporate fibre into the diet. So just perhaps trying high fibre cereal and suggesting an increase in fruit and vegetable intake. Perhaps talking about what sort of meats he is eating and his intake of eggs and suggesting lower cholesterol alternatives, lower fat alternatives and talking about lower fat cooking methods and discussing eating out if that is something that he and his wife do regularly. If his triglycerides were higher I would perhaps address the alcohol issue but seeing as it's not very high and he is stated to use alcohol occasionally I don't think that is something that I would address. I think just in passing I would encourage exercise but he is at a healthy weight so I wouldn't be addressing weight control with him. In the follow up interview three to four months later, again it would depend on whether there has been a change in his cholesterol values, whether they had come down, and just having him come in, go through what the recommendations were in the first interview and just see whether he had any success in implementing them and if not what was preventing that and perhaps just give him more encouragement and more information if he wishes further information.

- I I know that you don't have a lot of detail about what his food intake is, can you perhaps guess where the problem areas might be or go in different directions with his food intake and indicate what sort of recommendations you might go through.
- N02 Just going on what little information is here, obviously his intake of saturated fat is well above what is recommended and his total fat is 42% where generally we recommend less than 30%. His intake of polyunsaturated and monounsaturated is not that bad, so I think that the area I would look towards the most is perhaps how to take that amount of fat away just from saturated fat. So talking about perhaps problem areas such as desserts, donuts, foods that are high in saturated fat, such as maybe fast foods and perhaps red meat, low fat dairy products, depending on what came out in the diet recall and addressing those areas more specifically.
- I When you say address those areas can you just give examples of how you would address them?
- N02 In speaking with the patient if he indicated that his normal habit would be to go to Tim Horton's every morning and have a large coffee with cream and two donuts, I would perhaps provide alternatives of lower fat snacks in the morning or ask him to perhaps

give me some ideas about ways that he could have a lower fat snack in the morning and just indicate to him that, that may be a problem area. Or if he says that he and his wife eat red meat five days a week, perhaps indicate that there might be alternatives and discuss having vegetarian options or lean meat instead of red meat a couple of days a week.

I Are there any counselling aids that you think could help this individual? Does anything come to mind?

N02 I tend not to use a lot of hand-outs and that kind of thing. I think a general, I mean at our hospital we have sheets on how to lower your cholesterol and just include tips like eating more lean meat, eating lower fat dairy products, increasing your fibre intake, eating more fruits and vegetables and limiting your eggs to three to four a week. So I think just a general handout would be useful. If I was doing a diet recall with him I might be inclined to use food models if it seemed like he was able to describe portion sizes and that type of thing adequately, but in terms of a lot of other handouts I personally don't use them that often because I don't think the patient uses them once they leave. So I think it would be just a matter of discussion and questions and asking him questions to ensure that he is comprehending what I said.

I I will take a pause before we go onto the next scenario.

APPENDIX D: SAMPLE OF PROPOSITIONAL ANALYSIS

PROPOSITIONAL ANALYSIS 1: E04 SC7

1. MN is a thirty eight year old man/
 - 1.1 AGT: MN, ATT: 38 yr old;
 - 1.2 AGT: [1.1], ATT: man;
2. Who went to his family doctor for a check up/
 - 2.1 AGT: [1.1], GO: SRC: doctor;
 - 2.2 ATT: doctor, family;
 - 2.3 RSLT: [2.1], check up;
3. And then was referred for diet counseling/
 - 3.1 REFER: [2.2], counsel;
 - 3.2 ATT: counsel, diet;
 - 3.3 SRC: doctor, [3.1];
 - 3.4 TEM: then, [2.1], [3.1];
4. The physician has placed him at very high risk for CVD in the next 10 years/
 - 4.1 PLACE: physician, AGT: [1.1];
 - 4.2 RSLT: [4.1], risk;
 - 4.3 ATT: risk, very high;
 - 4.4 THM: [4.3], CVD;
 - 4.5 TEM: 10 yrs, next;
5. Ten year risk greater than 30% using the current Canadian Dyslipidemia Guidelines/
 - 5.1 TEM: risk, 10 yr;
 - 5.2 NUM: [4.2], 30%;
 - 5.3 ATT: [5.2], greater than;
 - 5.4 THM: Canadian Dyslipidemia Guidelines;
 - 5.5 ATT: [5.4], current;
6. He has not had any CVD symptoms and is otherwise healthy/
 - 6.1 AGT: [1.1], HAD: symptoms, NEG;
 - 6.2 ATT: symptoms, CVD];
 - 6.3 AGT: [1.1], IS: healthy otherwise;
7. He smokes one pack a day of cigarettes/
 - 7.1 AGT: [1.1], SMOKE: cigarettes;
 - 7.2 NUM: [7.1], 1 pack;
 - 7.3 TEM: [7.1], per day;
8. He has a family history of CVD/
 - 8.1 AGT: [1.1], POSS: history;
 - 8.2 ATT: history, family;
 - 8.3 THM: [8.1], CVD;
9. and does not have diabetes/

- 9.1 AGT: [1.1], HAS: diabetes, NEG;
10. The labs, total cholesterol 7.3, LDL 4.9, HDL 1.5, triglycerides 1.5/
10.1 THM: labs;
10.2 NUM: cholesterol, 7.3;
10.3 ATT: cholesterol, total;
10.4 NUM: LDL, 4.9;
10.5 NUM: HDL, 1.5;
10.6 NUM: triglycerides, 1.5;
11. So his LDL is quite elevated/
11.1 ATT: LDL, elevated;
11.2 ATT: [11.1], quite;
12. We aim for less than 2.5 for high risk/
12.1 AIM: we, NUM: 2.5;
12.2 ATT: [12.1], less than;
12.3 THM: [12.1], high risk;
13. And his HDL is good/
13.1 ATT: HDL, good;
14. We would want to talk about the smoking as well/
14.1 TALK: we, smoking;
14.2 WANT: we, [14.1];
14.3 ATT: [14.1], as well;
15. And previously recorded anthropometrics BMI 22/
15.1 NUM: BMI, 22;
15.2 THM: [15.1], anthropometrics;
15.3 ATT: [15.2], previously recorded;
16. Okay so the BMI looks really good/
16.1 LOOK: BMI, good;
16.2 ATT: [16.1], really;
17. Lifestyle, MN works in a physically active job as a house painter/
17.1 AGT: [1.1], WORK: painter;
17.2 ATT: painter, house;
17.3 ATT: [17.1], physically active;
17.4 THM: [17.1], lifestyle;
18. In his spare time is active in his workshop and maintaining his house/
18.1 AGT: [1.1], ATT: active;
18.2 LOC: [18.1], workshop;

- 18.3 AGT: [1.1], MAINTAIN: house;
18.4 TEM: [18.1], spare time;
19. Moderate income/
19.1 ATT: income, moderate;
20. Married and wife is supportive/
20.1 AGT: [1.1], IS: married;
20.2 ATT: wife, supportive;
21. High school education/
21.1 AGT: [1.1], POSS: education;
21.2 ATT: education, high school;
22. Alcohol occasionally/
22.1 AGT: [1.1], HAS: alcohol;
22.2 TEM: [22.1], occasionally;
23. Has come for counseling /
23.1 AGT: [1.1], COME: counseling;
24. But has little knowledge or interest about diet and heart health /
24.1 AGT: [1.1], HAS: knowledge;
24.2 AGT: [1.1], HAS: interest;
24.3 THM: diet, heart health;
24.4 ATT: [23.2], little;
25. Has not controlled fat intake in the past/
25.1 AGT: [1.1], CONTROL: intake, NEG;
25.2 ATT: intake, fat;
25.3 TEM: [25.1], in past;
26. So I would be thinking a stage of change there/
26.1 THM: stage of change;
26.2 THINK: I, [26.1];
26.3 LOC: [26.2], there;
27. It would be pre-contemplative/
27.1 BE: it, pre-contemplative;
28. And the diet, he eats an average diet consisting of sandwiches, salads, fruits, soups,
meat, potatoes, and vegetables/
28.1 AGT: [1.1], EAT: diet;
28.2 CAT: diet, sandwiches;
28.3 CAT: diet, salads;
28.4 CAT: diet, fruits;

- 28.5 CAT: diet, soups;
 - 28.6 CAT: diet, meat;
 - 28.7 CAT: diet, potatoes;
 - 28.8 CAT: diet, vegetables;
 - 28.9 ATT: diet, average;
29. He enjoys chocolate desserts and donuts/
- 29.1 AGT: [1.1], ENJOY: desserts;
 - 29.2 ATT: desserts, chocolate;
 - 29.3 AGT: [1.1], ENJOY: donuts;
30. And I would want to find out how often he enjoys those/
- 30.1 FIND: I, out;
 - 30.2 AGT: [1.1], ENJOY: those;
 - 30.3 TEM: [30.2], how often;
31. And we always ask people to bring in a 3 day food intake record/
- 31.1 ASK: we, people;
 - 31.2 BRING: [31.1], record;
 - 31.3 ATT: record, food intake;
 - 31.4 NUM: [32.3], 3 day;
 - 31.5 ATT: [31.1], always;
32. And then we ask them how that compares with their usual intake/
- 32.1 ASK: we, how;
 - 32.2 COMPARE: that, intake;
 - 32.3 ATT: intake, usual;
 - 32.4 TEM: [32.1], then;
33. Or something that is quite representative of the usual intake/
- 33.1 EQUIV: something, representative;
 - 33.2 ATT: representative, intake;
 - 33.3 ATT: representative, quite;
34. Dietary intake of fiber is relatively low/
- 34.1 ATT: intake, low;
 - 34.2 ATT: intake, fiber;
 - 34.3 ATT: low, relatively;
35. Prefers white bread/
- 35.1 AGT: [1.1], PREFER: bread;
 - 35.2 ATT: bread, white;
36. And eats about 2-4 servings of fruits and vegetables each day/
- 36.1 AGT: [1.1], EAT: servings;
 - 36.2 NUM: servings, 2-4;

- 36.3 THM: [36.1], fruits & vegetables;
 36.4 TEM: [36.1], each day;
37. So we would want to find out in those fruits and vegetable servings is that juices/
 37.1 FIND: we, out;
 37.2 THM: fruits & veg servings;
 37.3 IS: [37.2], juices;
38. Or is he actually eating fruits and vegetables/
 38.1 AGT: [1.1], EAT: fruits & vegetables;
 38.2 ATT: [38.1], actually;
39. So it really helps to have the food intake record I find/
 39.1 HAVE: helps, record;
 39.2 ATT: record, food intake;
 39.3 FIND: I, [39.1];
40. For atleast the three days to go by/
 40.1 GO: days, by;
 40.2 NUM: days, 3;
41. He has high calorie intake/
 41.1 AGT: [1.1], HAS: intake;
 41.2 ATT: intake, calorie;
 41.3 ATT: intake, high;
42. Which isn't an issue because his BMI is great/
 42.1 IS: [41.1], issue, NEG;
 42.2 ATT: BMI, great;
43. And he is physically active/
 43.1 AGT: [1.1], IS: active;;
 43.2 ATT: active, physically;
44. The break down 18% protein is fine/
 44.1 NUM: protein, 18%;
 44.2 EQUIV: [44.1], break down,
 44.3 ATT: [44.2], fine;
45. 40% carbohydrate, 42% fat, so the percentage of fat seems high/
 45.1 NUM: carbohydrate, 40%;
 45.2 NUM: fat, 42%;
 45.3 ATT: fat, high;
 45.4 EQUIV: fat, percentage;
46. and especially given that the saturated fat is 20% of total calories/

- 46.1 NUM: fat, 20%;
- 46.2 ATT: fat, saturated;
- 46.3 THM: [46.1], total calories
- 46.4 GIVEN: especially, [46.3];

- 47. so we talk about where his fats are/
 - 47.1 TALK: we, fats;
 - 47.2 LOC: fats, where;

- 48. So when I went through the diet history/
 - 48.1 GO: I, through history;
 - 48.2 ATT: history, diet;
 - 48.3 TEM: when, [48.1];

- 49. I would want to find out how they made the sandwiches/
 - 49.1 MADE: they, sandwiches;
 - 49.2 FIND: I, how [49.1];

- 50. What types of fillings were in the sandwiches/
 - 50.1 THM: types of fillings;
 - 50.2 LOC: [50.1], in sandwiches

- 51. What kinds of spreads on the bread/
 - 51.1 THM: kinds of spreads;
 - 51.2 LOC: [51.1], on bread;

- 52. and make suggestions for things that they could use in place of that/
 - 52.1 SUGGEST: I, things;
 - 52.2 USE: they, in place;

- 53. to decrease the saturated fat intake/
 - 53.1 DECREASE: to, intake;
 - 53.2 ATT: intake, fat;
 - 53.3 ATT: fat, saturated;

- 54. and increase the mono and polyunsaturated/
 - 54.1 INCREASE: to, mono;
 - 54.2 INCREASE: to, polyunsaturated;

- 55. So, for example if he used butter on the bread/
 - 55.1 AGT: [1.1], USE: butter;
 - 55.2 LOC: [55.1], bread;

- 56. I would suggest either not using butter on the bread or using margarine, mayonnaise/
 - 56.1 AGT: [1.1], USE: butter, NEG;
 - 56.2 SUGGEST: I, [56.1];

56.3 AGT: [1.1], USE: margarine;
56.4 AGT: [1.1], USE: mayonnaise;

57. That mayonnaise would be quite an acceptable choice for him/

57.1 BE: mayonnaise, choice;
57.2 ATT: choice, acceptable;
57.3 ATT: acceptable, quite;

58. And he wouldn't have to use light because of his calorie requirements/

58.1 AGT: [1.1], USE: light, NEG;
58.2 THM: caloric requirements;

59. The types of meats, I would make suggestions for using lean meats like beef, pastrami,
ham, sliced turkey and chicken/

59.1 AGT: [1.1], USE: meats;
59.2 ATT: meats, lean;
59.4 SUGGEST: I, [59.1];
59.5 CAT: meat, beef;
59.6 CAT: meat, pastrami;
59.7 CAT: meat, ham;
59.8 CAT: meat, sliced turkey;
59.9 CAT: meat, chicken;

60. rather than luncheon meat, if that's what he was using/

60.1 AGT: [1.1], USE: meat;
60.2 ATT: meat, luncheon;
60.3 USE: if, [60.2];

61. or using salmon or tuna that kind of thing/

61.1 AGT: [1.1], USE: salmon;
61.2 AGT: [1.1], USE: tuna;

62. peanut butter would be a good choice/

62.1 BE: peanut butter, choice;
62.2 ATT: choice, good;

63. the fruits and vegetables intake is low/

63.1 IS: intake, low;
63.2 THM: intake, fruits & vegetables;

64. I would see if he was receptive to using raw vegetables carrots/

64.1 AGT: [1.1], WAS: receptive;
64.2 AGT: [1.1], USE:vegetables;
64.3 ATT: vegetables, raw;
64.4 EQUIV: [64.3], carrots;
64.5 SEE: I, [64.1];

65. or taking a V8 in his lunch/
 65.1 AGT: [1.1], TAKE: V8;
 65.2 LOC: [65.1], lunch;
66. The thing that is going through my mind with all of this is his stage of change/
 66.1 GO: thing, LOC: through mind;
 66.2 THM: stage of change;
67. and really exploring the pros and cons/
 67.1 EXPLORE: really, pros & cons;
68. I think stepping back before really getting into the diet changes/
 68.1 GET: really, LOC: changes;
 68.2 ATT: changes, diet;
 68.3 STEP: to, LOC: back;
 68.4 THINK: I, [68.3];
 68.5 TEM: before, [68.3], [68.1];
69. is stepping back to see what he is thinking about all of this/
 69.1 AGT: [1.1], THINK: about this;
 69.2 STEP: to, LOC: backl
 69.3 SEE: to, [69.1];
70. What would be the pros and cons of making changes in his diet/
 70.1 BE: what, pros & cons;
 70.2 MAKE: to, changes;
 70.3 LOC: [70.2], diet;
71. what are the barriers to making changes/
 71.1 ARE: what, barriers;
 71.2 THM: [71.1], make changes;
72. and so we need to address that/
 72.1 ADDRESS: we, that;
 72.2 NEED: we, [72.1];
73. I would ask him, are you concerned about your cholesterol level/
 73.1 AGT: [1.1], CONCERN: level;
 73.2 ATT: level, cholesterol;
 73.3 ASK: I, AGT: [1.1];
74. I would show him what the target level would be/
 74.1 SHOW: I, AGT: [1.1];
 74.2 WOULD: level, be;
 74.3 ATT: level, target;

75. and given that they are at risk/
75.1 ARE: they, at risk;
75.2 GIVEN: that, [75.1];
76. so I would find out if there is some concern there/
76.1 FIND: I, out;
76.2 IS: there, concern;
76.3 LOC: [76.2], there;
76.4 ATT: concern, some;
77. and would they be willing to make some changes/
77.1 BE: they, willing;
77.2 MAKE: they, changes;
77.3 ATT: changes, some;
78. what would prevent you?/
78.1 PREVENT: what, you/
79. and maybe we would get into that when I give the more specifics/
79.1 GIVE: I, specifics;
79.2 ATT: specifics, more;
79.3 GET: we, LOC: into that;
79.4 TEM: [79.3], when;
80. Could you do this, could you change/
80.1 DO: you, this;
80.2 CHANGE: could, you;
81. Who is making your sandwiches/
81.1 MAKE: who, sandwiches;
82. Would they be willing to make these changes/
82.1 MAKE: they, Changes;
82.2 BE: they, willing;
82.3 ATT: changes, these;
83. Who does the groceries/
83.1 DOES: who, groceries;
84. Very practical things/
84.1 ATT: things, practical;
85. Is that what you are looking for/
85.1 LOOK: you, for;
85.2 IS: that, what [85.1];

86. I probably, seeing as there is a fair bit diet wise to change here/
86.1 CHANGE: diet, LOC: here;
86.2 IS: there, [86.1];
86.3 ATT: change, fair bit;
87. with an initial visit, I probably wouldn't address the smoking at this stage/
87.1 ATT: visit, initial;
87.2 ADDRESS: I, smoking, NEG;
87.3 ATT: [87.2], probably;
87.4 ATT: [87.2], this stage;
88. Certainly with my clients depending/
88.1 WITH: certainly, clients;
89. that might be something that I might address at a future meeting/
89.1 ADDRESS: I, something;
89.2 TEM: [89.1], future meeting;
89.3 BE: that, [89.1];
89.4 ATT: [89.1], might;
90. or give him literature about smoking/
90.1 GIVE: I, literature;
90.2 THM: literature, smoking;
91. I would assume his family physician is also involved in that/
91.1 IS: physician, involved;
91.2 ASSUME: I, [91.1];
91.3 ATT: physician, family;
92. Fiber intake, I would talk about the source of fiber/
92.1 THM: fiber intake;
92.2 TALK: I, [92.1];
92.3 ATT: fiber, source;
93. talking about whole grain breads/
93.1 TALK: I, breads;
93.2 ATT: breads, whole grain;
94. he prefers the white bread/
94.1 AGT: [1.1], PREFER: bread;
94.2 ATT: bread, white;
95. so its not a huge issue in terms of his lipid levels/
95.1 IS: it, issue, NEG;
95.2 ATT: issue, huge;

- 95.3 THM: issue, lipid levels;
96. if he would be willing now there is a new white bread that is higher fiber/
 96.1 IS: there, bread;
 96.2 ATT: bread, white;
 96.3 THM: [96.2], fiber;
 96.4 ATT: fiber, higher;
 96.5 [AGT: 1.1], BE: willing;
 96.6 TEM: [96.1], now;
97. maybe that would be acceptable that he would be willing to give that a try/
 97.1 BE: that, acceptable;
 97.2 AGT: [1.1], BE: willing;
 97.3 AGT: [1.1], TRY: that;
98. and then boosting the fruits and vegetables/
 98.1 BOOST: to, fruits & veg;
 98.2 TEM: [98.1], then;
99. suggesting really easy ways of packing those into the lunch/
 99.1 SUGGEST: I, ways;
 99.2 ATT: ways, easy;
 99.3 AGT: [1.1], PACK: those;
 99.4 LOC: [99.3], in lunch;
100. and maybe that would help with decreasing the desserts and the donuts/
 100.1 DECREASE: help, desserts;
 100.2 DECREASE: help, donuts;
 100.3 ATT: [100.1, 100.2], maybe;
101. So suggesting, take two fruits and some cut up vegetables/
 101.1 AGT: [1.1], TAKE: fruits;
 101.2 NUM: fruits, 2;
 101.3 ATT: vegetables, cut up;
 101.4 AMT: [101.3], some;
 101.5 SUGGEST: I, [101.1];
102. and then how to make those easy to put into the lunches/
 102.1 MAKE: to, easy;
 102.2 PUT: to, LOC: into lunches;
 102.3 TEM: [102.1], then;
103. talk about how to have those available at home/
 103.1 HAVE: to, available;
 103.2 LOC: [103.1], home;
 103.3 TALK: to, about [103.1];

104. with the baby carrots that are already prepared/
104.1 ARE: carrots, prepared;
104.2 ATT: carrots, baby;
104.3 ATT: prepared, already;
105. What you could have for dessert that would be acceptable/
105.1 AGT: [1.1], HAVE: dessert;
105.2 BE: that, acceptable;
106. and I might find out what he likes/
106.1 FIND: I, out;
106.2 LIKE: what, AGT: [1.1];
106.3 ATT: [106.1], might;
107. there are some lower fat items that might be okay/
107.1 ARE: there, items;
107.2 ATT: items, lower fat;
107.3 ATT: [107.2], some;
107.4 BE: that, okay;
107.5 ATT: [107.4], might;
108. well, generally if a person is maybe at this stage/
108.1 IS: person, LOC: at this stage;
108.2 ATT: [108.1], generally;
108.3 ATT: [108.2], maybe;
109. the pre-contemplative stage/
109.1 ATT: stage, pre-contemplative;
110. when I talk about the advantages of lowering cholesterol/
110.1 AGT: [1.1], LOWER: cholesterol;
110.2 TALK: I, advantages;
111. and the risks of having high cholesterol/
111.1 [AGT: 1.1], HAVE: risks;
111.2 THM: risks, cholesterol;
111.3 ATT: cholesterol, high;
112. I tend to use a model that I have had for years/
112.1 USE: I, model;
112.2 HAD: I, TEM: years;
113. but it still seems to make an impression on the clients/
113.1 MAKE: it, impression;
113.2 LOC: [113.1], clients;

114. where I will show them the build-up of cholesterol/
114.1 SHOW: I, them;
114.2 THM: cholesterol, build-up;
115. it's a model of an artery from the heart showing the build-up of cholesterol/
115.1 IS: it, model;
115.2 ATT: model, heart;
115.3 THM: [115.1], artery;
115.4 SHOW: it, cholesterol;
115.5 ATT: cholesterol, build-up;
116. and how it can obstruct blood flow/
116.1 OBSTRUCT: it, flow;
116.2 ATT: flow, blood;
117. and people seem to take notice of that and remember it/
117.1 TAKE: people, notice;
117.2 REMEMBER: people, that;
118. so I use that for discussing for the pre-contemplative person/
118.1 USE: I, that;
118.2 DISCUSS: I, person;
118.3 ATT: person, pre-contemplative;
119. And other tools, I don't know, I would ask if he would want some/
119.1 AGT: [1.1], WANT: tools;
119.2 ATT: tools, some;
119.3 ASK: I, [119.1];
120. He has a high school education/
120.1 AGT: [1.1], POSS: education;
120.2 ATT: education, high school;
121. I would ask him if he would like some information to read/
121.1 [AGT: 1.1], LIKE: information;
121.2 AMT: information, some;
121.3 ASK: I, [121.1];
121.3 READ: to, [121.1];
122. and in the past he has shown little knowledge or interest in this topic/
122.1 AGT: [1.1], SHOW: knowledge;
122.2 ATT: knowledge, little;
122.3 AGT: [1.1], SHOW: interest;
122.4 TEM: in the past;
122.5 THM: [122.1], topic;

123. I do have some pamphlets that I use/
123.1 HAVE: I, pamphlets;
123.2 USE: I, [123.1];
124. there is a variety/
124.1 IS: there, variety/
125. the ones from our local health unit on fat/
125.1 LOC: health unit, local;
125.2 THM: [125.1], fat;
126. I would be a little bit hesitant to give him these/
126.1 BE: I, hesitant;
126.2 GIVE: to, these;
126.3 ATT: [126.1], little bit;
127. unless he particularly wanted them/
127.1 AGT: [1.1], WANT: them;
127.2 ATT: [127.1], particularly;
128. I would be more likely, usually I write down specifics related to their diet/
128.1 BE: I, likely;
128.2 WRITE: I, specifics;
128.3 THM: [128.2], related to diet;
128.4 ATT: [128.2], usually;
129. so I would say, when making sandwiches try such and such bread/
129.1 MAKE: when, sandwiches;
129.2 AGT: [1.1], TRY: bread;
129.3 SAY: I, [129.1];
130. try using this margarine/
130.1 USE: try, margarine;
131. and I have the margarine tub/
131.1 HAVE: I, tub;
131.2 ATT: tub, margarine;
132. that I would show what to look for when buying margarine/
132.1 LOOK: to, for;
132.2 SHOW: I, what [132.1];
132.3 BUY: when, margarine;
133. and I would list the types of meats and fillings for sandwiches/
133.1 LIST: I, types;

- 133.2 THM: meats, fillings;
 133.3 ATT: meats, types;
 133.4 ATT: fillings, sandwiches;
134. so very specific based on his food intake record/
 134.1 ATT: specific, very;
 134.2 BASE: it, on record;
 134.3 ATT: record, food intake;
135. I think that might be best rather than general pamphlets/
 135.1 BE: that, best;
 135.2 ATT: [135.1], might;
 135.3 ATT: pamphlets, general;
136. for most people who sound like they are a little bit more receptive and interested
 than this man/
 136.1 ARE: people, receptive;
 136.2 ATT: receptive, little more;
 136.3 ARE: people, interested;
 136.4 SOUND: people, like;
 136.5 THM: [136.3], than this man;
137. I do use the Becel pamphlet/
 137.1 USE: I, pamphlet;
 137.2 ATT: pamphlet, Becel;
138. I do wish that it wasn't put out by a company/
 138.1 PUT: it, out, NEG;
 138.2 SRC: [138.1], company;
 138.3 WISH: I, [138.1];
139. I have talked to Health Canada about that/
 139.1 TALK: I, Health Canada;
 139.2 THM: about that;
140. and they have chosen not to put their energies into producing a heart health
 pamphlet because this is a good one/
 140.1 PUT: they, enegeries, NEG;
 140.2 LOC: [140.1], pamphlet;
 140.3 ATT: pamphlet, heart health;
 140.4 CHOSE: they, [140.1];
 140.5 IS: this, one;
 140.6 ATT: [140.5], good;
141. and its meeting dietitian's needs apparently/
 141.1 MEET: it, needs;

- 141.2 SRC: [141.1], dietitian's;
142. So, I will use the Becel/
142.1 USE: I, Becel;
143. or I will use the local ones from a local health unit/
143.1 USE: I, local ones;
143.2 SRC: [143.1], health unit;
143.3 ATT: health unit, local;
144. I don't think that the Canada's Food Guide would really interest him/
144.1 THM: Canada's Food Guide;
144.2 INTEREST: [144.1], AGT: [1.1];
144.3 THINK: I, [144.2], NEG;
145. I definitely follow people/
145.1 FOLLOW: I, people;
145.2 ATT: [145.1], definitely;
146. even people that don't show a lot of interest/
146.1 SHOW: people, interest, NEG;
146.2 AMT: interest, a lot;
147. because I believe that if you talk about the pros and the cons it may help to move
along the stage of change/
147.1 MOVE: it, change;
147.2 ATT: change, stages;
147.3 THM: [147.1], pros & cons;
147.4 TALK: I, [147.3];
147.5 BELIEVE: I, [147.1];
148. and so I would book a follow-up probably in three months time/
148.1 BOOK: I, follow-up;
148.2 ATT: [148.1], probably;
148.3 TEM: [148.1], 3 months;
149. just to then see where he is at/
149.1 IS: where, AGT: [1.1];
149.2 SEE: to, [149.1];
150. and see if he has made any changes/
150.1 AGT: [1.1], MADE: changes;
150.2 ATT: changes, any;
150.3 SEE: I, [150.1];
151. I am able to book blood work here at the health center/

151.1 BOOK: I, blood work;
151.2 LOC: [151.1], health center;

152. but in this case I wouldn't order follow-up blood work until he was making some changes/

152.1 ORDER: I, blood work, NEG;
152.2 AGT: [1.1], MAKE: changes;
152.3 ATT: blood work, follow-up;
152.4 THM: in this case;

153. so I would wait on that/

153.1 WAIT: I, on that;

PROPOSITIONAL ANALYSIS 2: G03 SC23

1. VW is a sixty six year old woman/
 - 1.1 AGT: VW, ATT: 66 yr old;
 - 1.2 AGT: [1.1], ATT: woman;
2. who went to a family doctor for a check-up /
 - 2.1 AGT: [1.1]; GO: LOC: doctor;
 - 2.2 ATT: doctor, family;
 - 2.3 RSLT: [2.1], check-up;
3. and was referred for diet counselling /
 - 3.1 REFER: doctor, AGT: [1.1];
 - 3.2 COUNSEL: doctor; ATT: diet;
4. When I get individuals at this age, usually fifty plus, what I usually look at is quality of life /
 - 4.1 GET: when, individuals;
 - 4.2 THM: this age; NUM: 50 plus;
 - 4.3 LOOK: I, at quality of life;
 - 4.4 ATT: look, usually;
5. They are set in their ways in terms of eating /
 - 5.1 ARE: they, set; LOC: in their ways;
 - 5.2 THM: eating;
6. they are set in their lifestyle /
 - 6.1 ARE: they, set;
 - 6.2 THM: lifestyle;
7. So for you to design an eating plan, go meatless, do this, there might be difficulty /
 - 7.1 DESIGN: you, plan;
 - 7.2 ATT: plan, eating;
 - 7.3 GO: meatless; DO: this;
 - 7.4 BE: there, difficulty; ATT: might;
8. so I am usually wary /
 - 8.1 AM: I, wary;
 - 8.2 ATT: wary, usually;
9. So what I would like to do is set the pattern /
 - 9.1 LIKE: would, to [9.2];
 - 9.2 SET: I, pattern;
10. is sort of find out a little bit more about them in terms of lifestyle and eating /

- 10.1 FIND: I, out;
 - 10.2 THM: about them;
 - 10.3 THM: lifestyle, eating;
 - 10.4 ATT: [10.1], a little bit more;
11. Clinical, the physician has placed her at low risk in the next ten years using the current Canadian Dylipidemia guidelines /
- 11.1 THM: clinical;
 - 11.2 PLACE: physician, AGT: [1.1];
 - 11.3 RSLT: [11.2], risk;
 - 11.4 ATT: risk, low;
 - 11.5 TEM: 10 yrs, next;
 - 11.6 HM: Canadian Dyslipidemia Guidelines;
 - 11.7 ATT: [11.6], current;
12. She has not had any CVD symptoms /
- 12.1 AGT: [1.1], HAD: symptoms, NEG;
 - 12.2 ATT: Symptoms, CVD;
13. and is otherwise healthy /
- 13.1 AGT: [1.1], IS:healthy otherwise;
14. The physician detected high blood pressure at the last visit /
- 14.1 DETECT: physician, blood pressure;
 - 14.2 TEM: last visit;
 - 14.3 ATT: blood pressure, high;
15. and this being assessed /
- 15.1 BE: this, assessed;
16. her current blood pressure at 155 over 105 /
- 16.1 AGT: [1.1]; ATT: NUM: BP, 155 over 105;
 - 16.2 ATT: blood pressure, current;
17. She does not smoke /
- 17.1 AGT: [1.1], DOES: smoke, NEG;
18. she has no family history of CVD /
- 18.1 AGT: [1.1], HAS: history, NEG;
 - 18.2 ATT: history, family;
 - 18.3 THM: CVD;
19. and does not have diabetes /
- 19.1 AGT: [1.1], HAVE: diabetes, NEG;
20. So fairly healthy /

- 20.1 AGT: [1.1], IS: healthy;
 - 20.2 ATT: healthy, fairly;
- 21. current blood pressure 155 over 105 /
 - 21.1 IS: blood pressure; NUM: 155 over 105;
 - 21.2 ATT: current;
- 22. blood pressure is high /
 - 22.1 ATT: Blood pressure, high;
- 23. Laboratory data, total cholesterol is 6.8, LDL 4.5, HDL is 1, triglyceride is 2.5 /
 - 23.1 THM: laboratory data
 - 23.2 NUM: Cholesterol 6.8; ATT: cholesterol, total;
 - 23.3 NUM: LDL, 4.5
 - 23.4 NUM: HDL, 1;
 - 23.5 NUM: triglyceride, 2.5;
- 24. So 6.8, 2.5, risk factor /
 - 24.1 THM: risk factor
 - 24.2 NUM: 6.8
 - 24.3 NUM: 2.5
- 25. BMI is 29, height is 165, weight is 79, waist circumference is 99 /
 - 25.1 ATT: NUM: BMI, 29;
 - 25.2 ATT: NUM: height, 165;
 - 25.3 ATT: NUM: weight, 79;
 - 25.4 ATT: NUM: waist circumference, 99;
- 26. Sixty six year old, she is menopausal /
 - 26.1 ATT: NUM: 66 year old;
 - 26.2 AGT: [1.1], ATT: menopausal;
- 27. more inclined to think that its age, change, loss of estrogen /
 - 27.1 THINK: to, [27.2], [27.3];
 - 27.2 COND: age, menopausal;
 - 27.3 COND: estrogen, menopausal;
 - 27.4 COND: change, menopausal;
 - 27.5 INCLINED: more, [27.1];
- 28. which we do know does cause cholesterol to go up /
 - 28.1 CAUSE: does, [28.2];
 - 28.2 RSLT: cholesterol, go up;
 - 28.3 DO: we, know;
- 29. and possibly does affect other lipid parameters just like the triglycerides /
 - 29.1 AFFECT: does, parameters;

- 29.2 ATT: affect, possibly;
 29.3 ATT: parameters, other lipid;
 29.4 CAT: triglycerides, cholesterol;
30. So I would like to look further before I make a decision /
 30.1 LOOK: to, further;
 30.2 LIKE: I, [30.1];
 30.3 MAKE: before, decision;
31. I would like to look at the lifestyle /
 31.1 LOOK: to, lifestyle;
 31.2 LIKE: I, [31.1];
32. VW is a retired laboratory technician living on a small pension /
 32.1 AGT: [1.1], IS: retired;
 32.2 AGT: [1.1], IS: technician; ATT: laboratory;
 32.3 AGT: [1.1], LIVE: on pension; ATT: small;
33. She lives with her adult daughter /
 33.1 AGT: [1.1], LIVE: with daughter;
 33.2 ATT: daughter, adult;
34. and keeps a large flower garden /
 34.1 AGT: [1.1], KEEP: garden;
 34.2 ATT: garden, flower;
 34.3 ATT: [34.2], large;
35. She does not exercise as such /
 35.1 AGT: [1.1], DOES: exercise, NEG;
36. but manages the garden and walks the dog twice daily /
 36.1 AGT: [1.1], MANAGE: garden;
 36.2 AGT: [1.1], WALK: dog;
 36.3 TEM: twice daily;
37. She drinks wine occasionally /
 37.1 DRINK: [1.1], wine
 37.2 ATT: [37.1], occasionally;
38. She has gradually gained weight especially at menopause /
 38.1 AGT: [1.1], GAIN: weight;
 38.2 ATT: [38.1], gradually;
 38.3 ATT: [38.1], at menopause;
 38.4 ATT: [38.3], especially;
39. She has come for counselling /

- 39.1 AGT: [1.1], COME: counselling;
40. She is concerned about her health /
 40.1 AGT: [1.1], IS: concerned;
 40.2 THM: her health;
41. She has paid little attention to heart health messages in media /
 41.1 AGT: [1.1], PAID: attention; ATT: little;
 41.2 THM: messages; LOC: media;
 41.3 ATT: [41.2], heart health;
42. and has not controlled her fat intake /
 42.1 AGT: [1.1], HAS: controlled, NEG;
 42.2 THM: [42.1], intake;
 42.3 ATT: [42.2], fat;
43. Diet she eats an average diet consisting of salads, sandwiches, fruit, soup, meat, potatoes, and vegetables, etc. /
 43.1 AGT: [1.1], EAT: diet; ATT: diet, average;
 43.2 CONSIST: diet, salads;
 43.3 CONSIST: diet, sandwiches;
 43.4 CONSIST: diet, fruit;
 43.5 CONSIST: diet, soup;
 43.6 CONSIST: diet, meat;
 43.7 CONSIST: diet, potatoes;
 43.8 CONSIST: diet, vegetables;
44. She grows and freezes vegetables for home use /
 44.1 AGT: [1.1], GROW: vegetables;
 44.2 AGT: [1.1], FREEZE: vegetables;
 44.3 AGT: [1.1], USE: [44.1], [44.2]; LOC: home;
45. Dietary intake of fibre is relatively low as she prefers white bread /
 45.1 IS: intake, low; CAT: diet, fibre; ATT: fibre, dietary;
 45.2 ATT: low, relatively;
 45.3 AGT: [1.1], PREFER: bread; ATT: bread, white;
46. and eats about two to four servings of fruits and vegetables each day /
 46.1 AGT: [1.1] EAT: servings; NUM: two to four;
 46.2 EAT: fruits, vegetables, diet;
 46.3 TEM: [46.1], each day;
47. She uses butter and not margarine for flavour /
 47.1 AGT: [1.1], CAT: butter; NEG: margarine;
 47.2 FOR: [47.1], flavour;

48. Calorie intake is 1400 /
48.1 IS: intake; NUM: 1400;
48.2 ATT: intake, calorie;
49. total fat is 30%, still within the guidelines /
49.1 AGT: [1.1], ATT: fat; NUM: 30%;
49.2 ATT: fat, total;
49.3 IS: [49.1], withint guidelines; ATT: still;
50. saturated fat is 25% /
50.1 AGT: [1.1], ATT: fat; NUM: 15%;
50.2 ATT: fat, saturated;
51. polyunsaturated is 8% /
51.1 AGT: [1.1], ATT: polyunsaturated; NUM: 8%;
52. monounsaturated is 7% /
52.1 AGT: [1.1], ATT: monounsaturated; NUM: 7%;
53. and cholesterol is 300 /
53.1 AGT: [1.1], ATT: cholesterol; NUM: 300;
54. First thing I would start off with is asking her about wine /
54.1 ASK: I, AGT: [1.1];
54.2 CAT: wine, diet;
54.3 WOULD: I, start [54.1];
54.4 ATT: [54.3], first thing;
55. how often does she drink it /
55.1 AGT: [1.1], DRINK: it;
55.2 THM: how, [55.1];
56. that would be my concern /
56.1 BE: that, concern;
56.2 ATT: concern, my;
57. because then I would like to impress upon her that alcohol has a strong association with triglycerides /
57.1 IMPRESS: I, upon her;
57.2 THM: [57.3];
57.3 HAS: alcohol, association; ATT: strong;
57.4 WITH: [57.3], triglycerides;
58. If she is having more than one drink a day then I would ask her to bring it down /
58.1 AGT: [1.1], HAVE: drink; AMT: more than one per day;
58.2 ASK: I, AGT: [1.1], to [58.3];

- 58.3 AGT: [1.1], BRING: it down;
58.4 IF: [58.1], then [58.2];
59. but not take it out because it is quality of life /
59.1 AGT: [1.1], TAKE: out, NEG;
59.2 IS: it, quality of life;
60. and I do want to her to have some enjoyment with her lifestyle /
60.1 WANT: I, [60.2];
60.2 AGT: [1.1], HAVE: enjoyment; ATT: same;
60.3 WITH: lifestyle, [1.1];
61. Activity wise, walks the dog twice daily, she gardens /
61.1 AGT: [1.1], ATT: active;
61.2 AGT: [1.1], WALK:dog; TEM: twice daily;
61.3 AGT: [1.1], GARDEN;
62. I think that would be acceptable, thats fine /
62.1 COND: that, acceptable;
62.2, IS: that, fine;
62.3 THINK: I, that [62.1];
63. I would focus on the saturated /
63.1 FOCUS: I, saturated;
64. again bringing out the book on cholesterol /
64.1 BRING: out, book;
64.2 ATT: book; THM: cholesterol;
64.3 ATT: bring, again;
65. going through the different types of fat /
65.1 GO: I, through;
65.2 THM: fat; ATT: fat, different types;
66. impressing upon her what the implication that saturated fat has /
66.1 HAS: fat, implication;
66.2 ATT: fat, saturated;
66.3 IMPRESS: I, upon AGT: [1.1];
66.4 WHAT, [66.1];
67. and what foods contain saturated fat /
67.1 CONTAIN: foods, fat;
67.2 ATT: fat , saturated;
67.3 WHAT: [67.1];
68. how to lower the saturated fat in her intake /

- 68.1 COND: fat; LOC: intake;
68.2 ATT: fat, saturated;
69. Talk about fibre, now this is very common with the elderly /
69.1 TALK: fibre;
69.2 IS: this, common; ATT: common, very;
69.3 WITH: [69.2], elderly;
69.4 TEM: [69.2], now;
70. and I find a few with my younger population /
70.1 FIND: I; AMT: a few;
70.2 WITH: [70.1], population;
70.3 ATT: population, younger;
71. any product containing fibre just doesn't taste the same as processed white bread /
71.1 CONTAIN: product, fibre;
71.2 TASTE: [71.1], the same, NEG;
71.3 THM: white, bread;
71.4 ATT: [71.3], processed;
72. So I will indicate to them studies about high dietary fibre /
72.1 INDICATE: I, to them;
72.2 THM: studies, fibre;
72.3 ATT: fibre, high, dietary;
73. in terms of having a strong association of lowering the cholesterol /
73.1 HAVE: association; ATT: strong;
73.2 COND: cholesterol;
74. She did mention that she did lower her weight /
74.1 AGT: [1.1], LOWER: weight;
74.2 AGT: [1.1], MENTION: [74.1];
75. did you know that if you increase your fibre intake you eat less /
75.1 INCREASE: you, intake;
75.2 ATT: intake, fibre;
75.3 EAT: you, less;
75.4 YOU: did, you know;
75.5 IF: [75.1], then, [75.3]
76. and if you eat less that is less calories that your body can do without /
76.1 EAT: you, less;
76.2 IS: that, calories; AMT: less;
76.3 DO: body, without;
76.4 If: [76.1], then [76.2];

77. and that sometimes rings a little bell /
77.1 RING: that, bell; ATT: little;
77.2 ATT: ring, sometimes;
78. Really isn't that interesting /
78.1 IS: that, interesting;
78.2 ATT: [78.1], really;
79. but I just don't like the way it tastes /
79.1 LIKE: I, taste, NEG;
80. So you say to them, well you can get fibre in the most interesting ways /
80.1 SAY: you, to them;
80.2 GET: you, fibre;
80.3 THM: most interesting way;
81. and what I do is I have a tool /
81.1 HAVE: I, tool;
82. which I will ask them for each meal, breakfast, lunch and dinner /
82.1 ASK: I, for meal;
82.2 ATT: meal, breakfast;
82.3 ATT: meal, lunch;
82.4 ATT: meal, dinner;
83. give them a list of all the fibre food /
83.1 THM: list, fibre;
83.2 ATT: [83.1], all;
84. that you know you need about 25 to 35 gm fibre a day /
84.1 NEED: you; NUM: 25 to 35 gm a day;
84.2 KNOW: you, [84.1];
84.3 THM: fibre;
85. and lets look at the foods that you like /
85.1 LOOK: lets, foods;
85.2 ATT: foods, like;
86. and how you can increase the fibre /
86.1 COND: increase, fibre;
86.2 CAN: how, [86.1];
87. She says, "well, I love cheerios and I love white bread" /
87.1 AGT: [1.1], LOVE: cheerios;
87.2 AGT: [1.1], LOVE: bread;
87.3 ATT: bread, white;

88. Okay, that's fine, lets look at how we can increase the fibre /
88.1 IS: that, fine;
88.2 INCREASE: we, fibre;
88.3 LOOK: lets, at [88.2];
89. you like a tomato sandwich /
89.1 LIKE: you, sandwich;
89.2 ATT: sandwich, tomato;
90. tomatoes have high fibre so we can add a little bit more tomatoes /
90.1 HAVE: tomatoes, fibre; ATT: high;
90.2 ADD: we, tomatoes; AMT: more;
91. you said your cereal is Cheerios /
91.1 ADD: we, something;
91.2 SAID: you, [91.1];
92. well why don't we add something with more fibre /
92.1 ADD: we, something;
92.2 THM: more fibre;
93. why don't we add things like kiwi /
93.1 ADD: we, things;
93.2 ATT: things, kiwi;
94. and that's not a bad idea /
94.1 IS: that, idea; ATT: bad, NEG;
95. They will say 'I like a croissant' /
95.1 LIKE: I, croissant;
95.2 SAY: they, [95.1];
96. I would say to them the croissant is high in saturated fats /
96.1 IS: croissant, high; THM: saturated fat;
96.2 SAY: I, to them [96.1];
97. So we may want to reduce the frequency /
97.1 REDUCE: we, frequency;
97.2 WANT: may, [97.1];
98. trying to impress on them that nota ll of these fats are bad /
98.1 ARE: fats, bad, NEG;
98.2 IMPRESS: try, on them [98.1];
99. but in terms of balancing them with respect to their lipid level would be more important /

- 99.1 BE: would, important;
 99.2 THM: lipid level;
 99.3 BALANCE: them, with [99.2];
100. Try to tell them why don't we go for more vegetables as opposed to fruits and they are asking why /
 100.1 GO: we, for vegetables;
 100.2 GO: we, for fruits, NEG;
 100.3 TELL: we, them [100.1];
 100.4 ASK: they, why;
101. And the reason why I will say because fruits and in terms of the sugar and the implication on triglycerides /
 101.1 WILL: I, say;
 101.2 RSLT: fruits, sugar;
 101.3 COND: triglycerides;
102. I mean if you were a very active woman there would be issue /
 102.1 BE: there, issue, NEG;
 102.2 WERE: you, woman; ATT: very active;
 102.3 IF: [102.2], then [102.1];
103. but your activity has come down /
 103.1 COME: activity, down;
104. so you now need to control your portions which will match your metabolism /
 104.1 CONTROL: you, portions;
 104.2 MATCH: to, metabolism;
 104.3 TEM: now;
105. I would ask her when we are there to tell me on a typical weekday /
 105.1 ASK: I, [105.2];
 105.2 AGT: [1.1], TELL: me;
 105.3 TEM: on weekday; ATT: typical;
106. what do you have for breakfast, lunch and dinner and your snack /
 106.1 AGT: [1.1]; HAVE: breakfast;
 106.2 AGT: [1.1]; HAVE: lunch;
 106.3 AGT: [1.1]; HAVE: dinner;
 106.4 AGT: [1.1]; HAVE: snack;
107. So what I am going to go through is make suggestions on how to increase the fibre /
 107.1 MAKE: I, suggestions;
 107.2 INCREASE: how, fibre;
 107.3 GO: I, through [107.1];

108. then I am going to translate that into lets look at this /
108.1 TRANSLATE: I, to [108.2];
108.2 LOOK: lets, at this;
108.3 AM: I, going to [108.1];
109. let's look at lunch /
109.1 LOOK: lets, lunch;
110. let's look at the dinner /
110.1 LOOK: lets, dinner;
111. let's take these high fibre foods, the list I have given you /
111.1 TAKE: lets, foods;
111.2 ATT: foods, high fibre;
111.3 GIVE: I, list;
112. and now let's for each meal have at least 8 to 10 grams of fibre /
112.1 HAVE: lets, fibre; TEM: at each meal;
112.2 ATT: fibre; NUM: 8 to 10 grams;
113. and you are going to keep this [list] /
113.1 KEEP: you, list;
114. and you are going to get at least 25 to 35 grams /
114.1 GET: you; NUM: 25 to 35 grams;
114.2 ATT: [114.1], at least;
115. Looking at the fat, we are going to talk about /
115.1 Look: we, fat;
115.2 ARE: we, talking about;
116. She say she uses butter and margarine /
116.1 AGT: [1.1], USE: butter and margarine;
116.2 AGT: [1.1], SAY: [116.1];
117. that's fine, there is a low fat butter that we can use out there /
117.1 IS: that, fine;
117.2 THM: there, butter; ATT: low fat;
117.3 CAN: we, use; LOC: out there;
118. in terms of lowering the portion of the concentrated saturated fat in your diet /
118.1 LOWER: portion, fat;
118.2 ATT: fat, saturated, concentrated;
118.3 LOC: in your diet;
119. I might even mention to her that in case you have to lose weight /

- 119.1 MENTION: I, to AGT: [1.1];
 119.2 LOSE: you, weight;
120. you know if you use less butter or margarine in total it helps in terms of weight loss
 /
 120.1 COND: Less butter, margarine;
 120.2 COND: help, weight loss;
121. So what replaces it you can have for example there could be condiments which are
 fruit flavour /
 121.1 REPLACE: what, it;
 121.2 HAVE: you, example;
 121.3 BE: there, condiments;
 121.4 ARE: condiments, flavour;
 121.5 ATT: flavour, fruit;
122. You can also use vegetables which import natural flavours /
 122.1 USE: you, vegetables;
 122.2 IMPORT: vegetables, flavours;
 122.3 ATT: flavours, natural;
123. She grows and freezes vegetables for home use /
 123.1 AGT: [1.1], GROW: vegetables;
 123.2 AGT: [1.1], FREEZE: vegetables;
 123.3 THM: home use;
124. that I would encourage /
 124.1 ENCOURAGE: I, that;
125. So I would talk about canning, that in the fall and in the winter /
 125.1 TALK: I, about [125.2];
 125.2 THM: canning;
 125.3 TEM: fall, winter;
126. What do you think about this, that you can use some peaches or use tomatoes /
 126.1 THINK: what, about this;
 126.2 USE: you, peaches; ATT: some;
 126.3 USE: you, tomatoes;
127. and use them as condiments or as marinates for your meats, not a bad idea /
 127.1 USE: them, condiments;
 127.2 USE: them, marinates;
 127.3 FOR: meats;
 127.4 IS: idea, bad, NEG;

128. and then I go a little bit further and I say, well this is one way we can increase your fibre /

128.1 GO: I, further;

128.2 ATT: further, little bit;

128.3 INCREASE: we, fibre;

128.4 IS: this, way; ATT: way; NUM: one;

128.5 SAY: I, [128.4], [128.3];

129. so I would basically do a high fibre sheet with her to get more fibre in /

129.1 DO: I, sheet; ATT: sheet, high fibre;

129.2 ATT: do, with her;

129.3 GET: to, fibre; LOC: in; ATT: fibre, more;

129.4 ATT: [129.1], basically;

130. Talk briefly about the different types of fat /

130.1 TALK: about, fat;

130.2 ATT: talk, briefly;

130.3 ATT: fat, different, types;

131. and leave it at that /

131.1 LEAVE: it, at that;

132. and ask her, do you want to come back and see me? /

132.1 ASK: I, AGT: [1.1];

132.2 COME: you, back;

132.3 SEE: to, me?

133. Being a consulting dietitian, she lives on a small pension /

133.1 THM: consulting dietitian;

133.2 AGT: [1.1], LIVE: on pension;

133.3 ATT: pension, small;

134. I may ask her, does she have an extended health care plan? /

134.1 ASK: I, AGT: [1.1]; ATT: may;

134.2 AGT: [1.1], HAVE: plan?

134.3 AGT: [1.1], DOES: [134.2];

134.4 ATT: plan, extended health care;

135. if she says no, then I can give her the option of /

135.1 AGT: [1.1], SAY: no;

135.2 GIVE: I, option;

135.3 IF: [135.1], then [135.2];

136. well you can come back and see me /

136.1 COME: you, back;

136.2 SEE: you, me;

137. and I do have senior rates /
137.1 HAVE: I, rates;
137.2 ATT: rates, senior;
138. so she can come back see me about three weeks /
138.1 COME: she, back;
138.2 AGT: [1.1], SEE: me;
138.3 TEM: [138.2], three weeks;
139. to see how things are progressing /
139.1 SEE: to, how;
139.2 ARE: things, progressing;
140. I would probably look at her carbohydrates /
140.1 AGT: [1.1], ATT: carbohydrates;
140.2 ATT: probably;
141. and say, again going on about the fibre /
141.1 SAY: I, again;
141.2 GO: I, on;
141.3 THM: fibre;
142. that different types of carbohydrates and their role with respect to triglycerides /
142.1 THM: carbohydrates;
142.2 ATT: [142.1], role;
142.3 THM: triglycerides;
143. and their role in terms of weight, and their role with cholesterol /
143.1 THM: weight;
143.2 COND: [143.1], carbohydrates;
143.3 THM: cholesterol;
143.4 COND: [143.3], carbohydrates;
144. So I would probably spend some time with that /
144.1 SPEND: I, time;
144.2 WITH: [144.1], that;
144.3 ATT: [144.1], probably;
145. but again it would be the fibre that I would focus on /
145.1 BE: it, focus;
145.2 ATT: focus, fibre;
145.3 ATT: [144.1], probably;
146. and then talking about the fat /
146.1 TALK: then, about [146.2];
146.2 THM: fat;

147. but the sessions would be fibre, fibre, fibre /
 147.1 BE: sessions, fibre;
148. So that way we can definitely play the cholesterol card /
 148.1 PLAY: we, card;
 148.2 ATT: card, cholesterol;
 148.3 ATT: play, definitely;
149. She has paid little attention to heart health messages in the media /
 149.1 AGT: [1.1], PAY: attention;
 149.2 THM: heart health messages;
 149.3 LOC: [149.2], in media;
 149.4 ATT: [149.1], little;
150. and has not controlled her fat intake /
 150.1 AGT: [1.1], CONTROL: intake, NEG;
 150.2 ATT: intake, fat;
151. possibly the reason why she has paid little attention to it, well 66 years old /
 151.1 PAY: [1.1], attention;
 151.2 ATT: attention, little;
 151.3 IS: reason [151.1], [151.4];
 151.4 AGT: [1.1], IS: 66 year old;
152. I don't want to make changes, my quality of life /
 152.1 MAKE: I, changes;
 152.2 WANT: I, [152.1], NEG;
 152.3 THM: quality of life;
153. and I am set in my own ways /
 153.1 AM: I, set; LOC: my own ways;
154. So I am not going to pay too much attention to that /
 154.1 PAY: I, attention, NEG;
 154.2 ATT: [154.1], too much;
155. I am more going to personalize it to this 66 year old lady /
 155.1 PERSONALIZE: I, it;
 155.2 GO: I, [155.1]; ATT: more;
 155.3 ATT: to, [155.4];
 155.4 ATT: lady, 66 year old;
156. To me flower garden, walking dog twice a day /
 156.1 THM: flower garden;
 156.2 AGT: [1.1], WALK: dog;

- 156.3 TEM: twice a day;
157. even people with much younger years, they don't even keep that sort of an active lifestyle /
157.1 WITH: people, years; ATT: younger;
157.2 KEEP: they, lifestyle, NEG;
157.3 ATT: lifestyle, active;
158. So try again, to every single one of my patients that walk in /
158.1 TRY: so, again;
158.2 WALK: patients, in;
158.3 ATT: patients, every single one;
159. brownie points first of all to their lifestyle /
159.1 THM: brownie points;
159.2 LOC: [159.1], their lifestyle;
160. before I even go on to say this is what you should be doing /
160.1 BE: you, doing;
160.2 SAY: I, [160.1];
160.3 ATT: [160.2], before;
161. Well I probably may want to talk about the omega three fats /
161.1 TALK: I, fats;
161.2 ATT: fats, omega three;
161.3 WANT: I, [161.1];
162. trying to get her to incorporate that a bit more /
162.1 AGT: [1.1], INCORPORATE: that;
162.2 ATT: [162.1], bit more;
162.3 GET: try, [162.1];
163. and the poly and mono/
163.1 THM: poly;
163.2 THM: mono;
164. but with that booklet I would definitely go through talking about the different types of fats /
164.1 TALK: I, about [164.2];
164.2 THM: fats; ATT: different types;
164.3 WITH: booklet;
164.4 GO: I, through [164.1];
165. and where they should be looking for it in terms of /
165.1 BE: where, they, looking;

- 165.2 FOR: [165.1], if;
166. Well, when we go through the foods /
166.1 GO: we, through foods;
167. and we sort of do the eating plan for the dietary fibre /
167.1 DO: we, plan;
167.2 ATT: plan, eating;
167.3 THM: dietary fibre;
168. when she wants to use condiments /
168.1 AGT: [1.1], WANT: [168.2];
168.2 USE: to, condiments;
169. one of the things that I would probably suggest is like using margarine made from
olive oil /
169.1 COND: I, [169.2];
169.2 USE: to, [169.4];
169.3 THM: margarine
169.4 ATT: suggest, probably;
170. Olivinia will help her get the mono /
170.1 HELP: Olivinia, [170.2];
170.2 GET: to, mono;
171. using nuts, she probably has the concept that nuts are not good /
171.1 THM: nuts;
171.2 AGT: [1.1], HAS: concept [171.3];
171.3 ARE: nuts, good, NEG;
172. but nuts in terms of wellness /
172.1 THM: nuts;
172.2 THM: wellness;
173. and omega-3 fats will definitely help here /
173.1 HELP: fats, here;
173.2 ATT: fats, omega-3;
173.3 ATT: help, definitely;
174. So I will try to impress on her that her saturated fats are way too high /
174.1 ARE: fats, high;
174.2 ATT: fats, saturated;
174.3 IMPRESS: to; LOC: on her;
174.4 TRY: I, [174.3];
175. and we should try to moderate this /

- 175.1 MODERATE: to, this;
175.2 TRY: we, [175.1];
176. I might discuss the cholesterol /
176.1 DISCUSS: I, cholesterol;
177. but what happens what you start discussing cholesterol, people come with their
stereotypes /
177.1 SMART: you, discussing [177.2];
177.2 THM: cholesterol;
177.3 HAPPEN: what, [177.1]
177.4 COME: people, with stereotypes;
178. people come with their concept of cholesterol /
178.1 COME: people, with [178.2];
178.2 THM: concept of cholesterol;
179. and I mean dietitians hear this all the time /
179.1 HEAR: dietitians, this;
179.2 TEM: all the time;
180. and we are saying, no the cholesterol in the foods has no effect /
180.1 HAS: cholesterol, effect, NEG;
180.2 LOC: cholesterol, in foods;
180.3 ARE: we, saying [180.1];
181. so unless she asks, what about eggs /
181.1 AGT: [1.1], ASK: about eggs;
181.2 UNLESS: [181.2];
182. but its more the different types of fats that I would spend time /
182.1 IS: it, fats;
182.2 ATT: [182.1], more;
182.3 ATT: fats, different types;
182.4 SPEND: I, time;
183. and 300 mg, I mean she is not widely above /
183.1 NUM: 300 mg;
183.2 AGT: [1.1], IS: above, NEG;
183.3 ATT: above, widely;
184. and so that is why I would leave it there /
184.1 LEAVE: I, it; LOC: there;
184.2 IS: that, why, [184.1];
185. No, this might be very different, a 66 year old /

185.1 BE: this, difficult; ATT: very;
185.2 AGT: [1.1]; ATT: NUM: 66 year old;

186. they are family difficult to work with /
186.1 ARE: they, difficult; ATT: family;
186.2 WORK: to, with;

187. but they would be interesting /
187.1 BE: they, interesting;

PROPOSITIONAL ANALYSIS 3: N02 SC10

1. ST is a sixty-three year old man who went to his family doctor for a check up/
 - 1.1 AGT: ST, ATT: 63 year old
 - 1.2 AGT: [1.1], ATT: man;
 - 1.3 AGT: [1.1], GO: LOC: doctor;
 - 1.4 ATT: doctor, family;
 - 1.5 RSLT: [1.3], check up;
2. and then was referred for diet counseling/
 - 2.1 AGT: [1.1], REFER: [2.2];
 - 2.2 COUNSEL: [2.1], diet;
 - 2.3 SRC: doctor, [2.1];
 - 2.4 TEM: [1.3], then [2.1];
3. In terms of clinical information the physician placed him at high risk of CVD in the next 10 years/
 - 3.1 PLACE: doctor, AGT: [1.1];
 - 3.2 RSLT: [3.1], risk;
 - 3.3 ATT: risk, high;
 - 3.4 THM: [3.3], CVD;
 - 3.5 TEM: 10 years, next;
4. a 10 year risk of 20-30% using the Canadian Dyslipidemia Guidelines/
 - 4.1 TEM: risk, 10 year;
 - 4.2 NUM: [3.2], 20-30%;
 - 4.3 THM: [4.1], Canadian Dyslipidemia Guidelines;
5. He has not had any CVD symptoms and is otherwise healthy/
 - 5.1 AGT: [1.1], HAD: symptoms NEG;
 - 5.2 ATT: symptoms, CVD;
 - 5.3 AGT: [1.1], IS: healthy otherwise;
6. He has had hypertension for which he takes medication/
 - 6.1 AGT: [1.1], HAS: hypertension;
 - 6.2 AGT: [1.1], TAKE: medication;
7. and his current blood pressure is 135 over 90/
 - 7.1 ATT: blood pressure, NUM: 135 over 90;
 - 7.2 TEM: [7.1], current;
 - 7.3 EQUIV: [7.1], [6.1];
8. He has no family history of CVD and does not have diabetes/
 - 8.1 AGT: [1.1], HAS: history NEG;
 - 8.2 ATT: history, family;

- 8.3 THM: [8.1], CVD;
 - 8.4 AGT: [1.1], ATT: diabetes NEG;
9. So the laboratory data indicates that he has a total cholesterol of 7.4 and LDL of 5 and HDL of 1.4 and triglyceride of 1.6/
 - 9.1 INDICATE: lab data, total;
 - 9.2 AGT: [1.1], ATT: cholesterol NUM: 7.4;
 - 9.3 AGT: [1.1], ATT: LDL NUM: 5;
 - 9.4 AGT: [1.1], ATT: HDL NUM: 1.4;
 - 9.5 AGT: [1.1], ATT: triglycerides NUM: 1.6;
 10. and then in terms of anthropometric data his BMI is 24, his height is 183 cm/
 - 10.1 ATT: data, anthropometric;
 - 10.2 NUM: BMI, 24;
 - 10.3 NUM: height, 183 cm;
 11. his weight is 80 kg and his waist circumference is 91 cm/
 - 11.1 AGT: [1.1], ATT: weight NUM: 80 kg;
 - 11.2 AGT: [1.1], ATT: waist circumference, NUM: 91 cm;
 12. So before I met him the patient having his data in hand, obviously he is at a healthy weight/
 - 12.1 MET: I, patient;
 - 12.2 TEM: [12.1], before;
 - 12.3 HAVE: I, data LOC: in hand;
 - 12.4 AGT: [1.1], COND: healthy weight;
 13. He is 63, so he is within what is considered a healthy weight for someone his age/
 - 13.1 AGT: [1.1], ATT: 63;
 - 13.2 AGT: [1.1], IS: healthy weight;
 - 13.3 THM: [13.2], someone;
 14. The cholesterol values I would compare to the guidelines, the Canadian Guidelines/
 - 14.1 COMPARE: values, to guidelines;
 - 14.2 ATT: values, cholesterol;
 - 14.3 ATT: guidelines, Canadian;
 15. and going from what the doctor provided me with I could assess that what his risk factor are for CVD/
 - 15.1 PROVIDE: doctor, information;
 - 15.2 ASSESS: I, risk factors;
 - 15.3 THM: [15.2], CVD;
 16. He has no family history, which is positive/
 - 16.1 AGT: [1.1], HAS: history NEG;
 - 16.2 ATT: history, family;

- 16.3 ATT: [16.1], positive;
17. and there is no information here about whether he is a smoker/
 17.1 IS: there, information NEG;
 17.2 AGT: [1.1], ATT: smoker;
 17.3 WHETHER: [1.1], [17.2];
 17.4 LOC: [17.1], here;
18. So that would be information I would need/
 18.1 BE: that, information;
 18.2 WOULD: I, need;
19. So assessing his risk factors would give me a sort of better picture of what his levels for cholesterol and triglycerides should be, what goes to aim for/
 19.1 ASSESS: I, factors;
 19.2 ATT: factors, risk;
 19.3 GIVE: [19.1], picture;
 19.4 THM: [19.3], cholesterol;
 19.5 THM: [19.3], triglycerides;
 19.6 AIM: goals, for;
20. In terms of lifestyle, he works as a short haul truck driver/
 20.1 AGT: [1.1], WORK: driver;
 20.2 THM: [20.1], lifestyle;
 20.3 ATT: driver, short haul truck;
21. and owns his own business/
 21.1 AGT: [1.1], OWN: business;
22. he is thinking about retirement/
 22.1 AGT: [1.1], THINK: retirement;
23. He lives in a medium sized city, and only does yard work/
 23.1 [1.1], LIVE: city;
 23.2 ATT: city, medium;
 23.3 [1.1], DO: work;
 23.4 ATT: work, yard;
24. that is his only regular exercise/
 24.1 ATT: [23.3], exercise;
 24.2 ATT: exercise, regular;
25. He has a moderate income/
 25.1 AGT: [1.1], POSS: income;
 25.2 ATT: income, moderate;

26. He is married and his wife is supportive/
 26.1 AGT: [1.1], IS: married;
 26.2 IS: wife, supportive;
27. He has a highschool education with additional bookkeeping courses to run his business/
 27.1 AGT: [1.1], POSS: education;
 27.2 ATT: education, highschool;
 27.3 AGT: [1.1], RUN: business;
 27.4 THM: [27.3], courses;
 27.5 ATT: courses, bookkeeping;
 27.6 ATT: [27.5], additional;
28. He uses alcohol occasionally/
 28.1 AGT: [1.1], CAT: alcohol;
 28.2 TEM: [28.1], occasionally;
29. He has gradually gained weight over his adult years/
 29.1 AGT: [1.1], GAIN: weight;
 29.2 TEM: [29.1], gradually;
 29.3 THM: [29.1], adult years;
30. he was a normal weight as a child/
 30.1 ATT: weight, normal;
 30.2 AGT: [1.1], WAS: [30.1];
 30.3 TEM: [30.1], child;
31. He has come for counseling but has little knowledge about diet and heart health/
 31.1 AGT: [1.1], COME: counseling;
 31.2 AGT: [1.1], KNOW: diet;
 31.3 AGT: [1.1], KNOW: heart health;
 31.4 ATT: know, little;
32. and he has not controlled his fat intake in the past/
 32.1 AGT: [1.1], CONTROL: intake NEG;
 32.2 ATT: intake, fat;
 32.3 TEM: [32.1], past;
33. So other lifestyle information that I would want to know, would be again if he is a smoker/
 33.1 THM: information;
 33.2 ATT: [33.1], lifestyle;
 33.3 WANT: I, to know;
 33.4 AGT: [1.1], IS: smoker;
 33.5 IF: [33.4];
34. How much alcohol he takes?/

- 34.1 AGT: [1.1], TAKE: alcohol;
 - 34.2 THM: [34.1], how much;
35. Who does the cooking in the house?/
- 35.1 COOK: who, LOC: house;
36. How often they eat out?/
- 36.1 EAT: they, out;
 - 36.2 THM: [36.1], how often;
37. So then in his diet he eats an average diet consisting of sandwiches, salads, fruit, soup, meat, potato and vegetables/
- 37.1 AGT: [1.1], ATT: diet;
 - 37.2 ATT: diet, average;
 - 37.3 CAT: diet, sandwiches;
 - 37.4 CAT: diet, salads;
 - 37.5 CAT: diet, soup;
 - 37.6 CAT: diet, fruit;
 - 37.7 CAT: diet, meat;
 - 37.8 CAT: diet, potato;
 - 37.9 CAT: diet, vegetables;
38. He enjoys chocolate desserts and donuts/
- 38.1 CAT: diet, desserts;
 - 38.2 ATT: desserts, chocolate;
 - 38.3 EQUIV: desserts, donuts;
39. His dietary intake of fiber is relatively low as he prefers white bread/
- 39.1 IS: fiber, low;
 - 39.2 ATT: fiber, dietary;
 - 39.3 ATT: low, relatively;
 - 39.4 AGT: [1.1], PREFER: bread;
 - 39.5 ATT: bread, white;
40. and eats about two to four servings of fruit and vegetables each day/
- 40.1 CAT: diet, fruits & vegetables;
 - 40.2 AGT: [1.1], EAT: [40.1];
 - 40.3 THM: [40.1], servings;
 - 40.4 NUM: [40.3], 2-4;
 - 40.5 TEM: [40.2], each day;
41. So the provided information shows that he is taking in about 2000 calories a day/
- 41.1 SHOW: information, calories;
 - 41.2 ATT: information, provided;
 - 41.3 AGT: [1.1], TAKE: calories;
 - 41.4 NUM: [41.3], 2000;

- 41.5 TEM: [41.4], a day;
- 42. 15% protein, 43% carbohydrate, 42% total fat/
 - 42.1 NUM: 15%, protein,
 - 42.2 NUM: 43%, carbohydrates;
 - 42.3 NUM: 42%, fat;
 - 42.4 ATT: fat, total;
- 43. with 20% saturated fat, 12% polyunsaturated and 10% monounsaturated, and 500 mg of cholesterol a day/
 - 43.1 NUM: saturated fat, 20%;
 - 43.2 NUM: polyunsaturated, 12%;
 - 43.3 NUM: monounsaturated, 10%;
 - 43.4 NUM: 500 mg, cholesterol;
 - 43.5 TEM: [43.1-43.4], a day;
- 44. So I think in terms of diet, I would actually want to do sort of not a diet recall, but go through an average day/
 - 44.1 RSLT: want, recall;
 - 44.2 ATT: recall, diet;
 - 44.3 GO: I, through;
 - 44.4 ATT: day, average;
- 45. and talk about where his meals are, whether he snacks, what time of day he eats/
 - 45.1 TALK: I, about meals;
 - 45.2 AGT: [1.1], DOES: snacks;
 - 45.3 WHETHER: [45.2];
 - 45.4 AGT: [1.1], EAT: when;
- 46. and then asking him questions about certain target foods, like high fiber foods/
 - 46.1 ASK: I, AGT: [1.1];
 - 46.2 THM: target foods;
 - 46.3 ATT: [46.2], high fiber;
- 47. and foods that are high in saturated fat, like deep fried foods, fast foods/
 - 47.1 ARE: foods, fat;
 - 47.2 ATT: fat, saturated;
 - 47.3 THM: deep fried, fast foods;
 - 47.4 EQUIV: [47.2], [47.3];
- 48. and asking him about his use of polyunsaturated and monounsaturated fats such as hydrogenated margarine and olive oil, canola oil/
 - 48.1 ASK: I, AGT: [1.1];
 - 48.2 AGT: [1.1], USE: fats;
 - 48.3 ATT: fats, polyunsaturated & monounsaturated;
 - 48.4 CAT: diet, hydrogenated margarine;

- 48.5 CAT: diet, olive oil;
 - 48.6 CAT: diet, canola oil;
49. So I guess asking about cooking methods/
- 49.1 THM: methods;
 - 49.2 ATT: [49.1], cooking;
50. Asking about intake of fish, intake of eggs/
- 50.1 ASK: I, intake;
 - 50.2 ATT: intake, fish;
 - 50.3 ATT: intake, eggs;
51. and then going from there using that information about sort of certain target areas to work on/
- 51.1 GO: to, from there;
 - 51.2 USE: to, information;
 - 51.3 THM: target areas;
 - 51.4 WORK: to, on;
 - 51.5 TEM: [51.1], then;
52. and depending on his responses deciding what specifically to counsel on/
- 52.1 AGT: [1.1], RESPOND::;
 - 52.2 COUNSEL: to, AGT: [1.1];
 - 52.3 DEPEND: [52.2], [52.1];
 - 52.4 DECIDE: to, [52.2];
 - 52.5 ATT: counsel, specifically;
53. but going from the information provided, I think probably one counseling appointment initially to go through diet recommendations/
- 53.1 GO: to, from information;
 - 53.2 ATT: information, provided;
 - 53.3 SUGGEST: I, appointment;
 - 53.4 NUM: [53.3], one;
 - 53.5 ATT: appointment, counseling;
 - 53.6 TEM: [53.3], initially;
 - 53.7 THM: [53.3], recommendations;
 - 53.8 ATT: recommendations, diet;
54. and then a follow-up interview three to four months later with a new set of lab values, would be the most useful set-up for counseling/
- 54.1 DO: I, interview;
 - 54.2 ATT: interview, follow-up;
 - 54.3 TEM: [54.1], 3-4 months later;
 - 54.4 THM: interview, new values;
 - 54.5 IS: [54.1], useful;
 - 54.6 THM: interview, counseling;

55. and in the initial appointment discussing the lab values that initially came in and what they mean to the patient/
 55.1 DISCUSS: we, values;
 55.2 ATT: values, lab;
 55.3 TEM: initial appointment;
 55.4 CAME: values, in;
 55.5 TEM: [55.4], initially;
 55.6 MEAN: values, AGT: [1.1];
56. His HDL is pretty good and his triglycerides are relatively low/
 56.1 COND: HDL, good;
 56.2 COND: triglycerides, low;
 56.3 ATT: good, pretty;
 56.4 ATT: low, relatively;
57. So its his LDL cholesterol which is actually the main problem/
 57.1 EQUIV: cholesterol, problem;
 57.2 ATT: problem, main;
 57.3 ATT: cholesterol, LDL;
58. so discussing ways to improve LDL cholesterol more specifically/
 58.1 DISCUSS: I, cholesterol;
 58.2 ATT: cholesterol, LDL;
 58.3 ATT: [58.1], more specifically;
 58.4 COND: [58.1], improve cholesterol;
59. including increasing his intake of fiber and trying to find ways to incorporate fiber into the diet/
 59.1 AGT: [1.1], INCREASE: intake;
 59.2 ATT: intake, fiber;
 59.3 AGT: [1.1], INCORPORATE: [59.2];
 59.4 THM: [59.3], LOC: diet;
 59.5 RSLT: [59.1], improve [59.2];
60. So just perhaps trying high fiber cereal and suggesting an increase in fruit and vegetable intake/
 60.1 AGT: [1.1] COND: try, cereal;
 60.2 AGT: [1.1], INCREASE: [60.6];
 60.3 AGT: [1.1], INCREASE: [60.5];
 60.4 SUGGEST: I, [60.3];
 60.5 EQUIV: fruit, fiber source;
 60.6 EQUIV: vegetables, fiber source;
61. Perhaps talking about what sort of meats he is eating and his intake of eggs/

- 61.1 AGT: [1.1], EAT: meats;
 - 61.2 AGT: [1.1], INTAKE: eggs;
 - 61.3 TALK: I, [61.1-61.2];
62. and suggesting lower cholesterol alternatives, lower fat alternatives/
- 62.1 SUGGEST: I, alternatives;
 - 62.2 ATT: alternatives, lower fat;
 - 62.3 ATT: alternatives, lower cholesterol;
63. and talking about lower fat cooking methods/
- 63.1 COND: discuss, [63.3];
 - 63.2 ATT: methods, cooking;
 - 63.3 ATT: [63.2], lower fat;
64. and discussing eating out if that is something he and his wife do regularly/
- 64.1 DISCUSS: I, eating out;
 - 64.2 AGT: [1.1], WHETHER: eat out;
 - 64.3 TEMP: [64.2], regularly;
 - 64.4 THM: [64.2], with wife;
65. If his triglycerides were higher I would perhaps address the alcohol issue/
- 65.1 WERE: triglycerides, higher; IF: [65.1];
 - 65.2 ADDRESS: would, issue;
 - 65.3 ATT: issue, alcohol;
66. but seeing as its not very high, and he is stated to use alcohol occasionally, I don't think that is something I would address/
- 66.1 ARE: triglycerides, high, NEG;
 - 66.2 AGT: [1.1], USE: alcohol;
 - 66.3 TEM: [66.2], occasionally;
 - 66.4 COND: address, [66.1] NEG;
67. I think just in passing I would encourage exercise/
- 67.1 COND: encourage, exercise;
 - 67.2 THM: [67.1], in passing;
68. but he is at a healthy weight, so I wouldn't be addressing weight control with him/
- 68.1 AGT: [1.1], IS: healthy weight;
 - 68.2 ADDRESS: I, control NEG;
 - 68.3 ATT: control, weight;
 - 68.4 THM: [68.2], with him;
69. In the follow-up interview 3-4 months later, again it would depend on whether there has been a change in his cholesterol values/
- 69.1 TEM: interview, 3-4 months later;
 - 69.2 ATT: interview, follow-up;

- 69.3 CHANGE: value, whether;
 - 69.4 DEPEND: [69.2], [69.3];
 - 69.5 ATT: values, cholesterol;
70. whether they had come down/
- 70.1 COME: values, down;
 - 70.2 WHETHER: [70.1];
71. and just having him come in, go through, what the recommendations were in the first interview/
- 71.1 AGT: [1.1], COME: in;
 - 71.2 GO: we, through;
 - 71.3 THM: [71.1], recommendations;
 - 71.4 TEM: first interview;
72. and just see whether he had any success in implementing them/
- 72.1 AGT: [1.1], HAD: success;
 - 72.2 WHETHER: [72.1];
 - 72.3 THM: [72.1], implementing recommendations;
73. and if not, what was preventing that/
- 73.1 PREVENT: what, that;
 - 73.2 THM: [73.1], no success;
74. and perhaps just give him more encouragement and more information if he wishes further information/
- 74.1 ENCOURAGE: I, AGT: [1.1];
 - 74.2 GIVE: I, information;
 - 74.3 AGT: [1.1], WISH: [74.2];
75. Just going on what little information is here, obviously his intake of saturated fat is well above what is recommended/
- 75.1 IS: information, LOC: here;
 - 75.2 ATT: information, little;
 - 75.3 AGT: [1.1], INTAKE: fat;
 - 75.4 ATT: fat, saturated;
 - 75.5 THM: [75.3], above recommended;
76. and his total fat is 42%, where generally we recommend less than 30%/
- 76.1 NUM: fat, 42%;
 - 76.2 ATT: fat, total;
 - 76.3 RECOMMEND: we, NUM: 30%;
 - 76.4 ATT: [76.3], less than;
 - 76.5 ATT: [76.3], generally;
77. his intake of polyunsaturated and monounsaturated is not that bad/

- 77.1 AGT: [1.1], INTAKE: fat;
 - 77.2 ATT: fat, polyunsaturated and monounsaturated;
 - 77.3 ATT: [77.1], bad, NEG;
78. So I think that the area I would look towards the most is perhaps how to take that amount of fat away just from saturated fat/
- 78.1 LOOK: I, area;
 - 78.2 TAKE: how, fat LOC: away;
 - 78.3 SRC: [78.2], saturated fat;
 - 78.4 ATT: [78.1], most;
79. So talking about perhaps problem areas such as desserts, donuts/
- 79.1 TALK: I, areas;
 - 79.2 ATT: areas, problem;
 - 79.3 EQUIV: [79.2], desserts, donuts;
80. foods that are high in saturated fat, such as maybe fast foods and perhaps red meat, low fat dairy products/
- 80.1 ARE: foods, fat;
 - 80.2 ATT: fat, saturated;
 - 80.3 EQUIV: [80.2], fast foods;
 - 80.4 EQUIV: [80.2], red meat;
 - 80.5 EQUIV: [80.2], low fat dairy products;
81. depending on what came out in the diet recall and addressing those areas more specifically/
- 81.1 CAME: what, out;
 - 81.2 THM: [81.1], diet recall;
 - 81.3 ADDRESS: I, areas;
 - 81.4 ATT: [81.3], specifically;
 - 81.5 DEPEND: [81.3], [81.1];
 - 81.6 TEM: [81.1], 3-4 months later;
82. In speaking with the patient, if he indicates that his normal habit would be to go to Tim Horton's every morning/
- 82.1 SPEAK: I, with AGT: [1.1];
 - 82.2 AGT: [1.1], INDICATE: habit;
 - 82.3 ATT: habit, normal;
 - 82.4 AGT: [1.1], GO: LOC: tim horton's;
 - 82.5 TEM: [82.4], every morning;
 - 82.6 IF: [82.2];
83. and have a large coffee with cream and two donuts/
- 83.1 AGT: [1.1], HAVE: coffee;
 - 83.2 ATT: coffee, with cream;
 - 83.3 NUM: donuts, 2;

- 83.4 ATT: coffee, large;
84. I would perhaps provide alternatives of lower fat snacks in the morning/
84.1 PROVIDE: I, alternatives;
84.2 ATT: alternatives, lower fat;
84.3 TEM: [84.1], in morning;
85. or ask him to perhaps give me some ideas about ways that he could have a lower fat snack in the morning/
85.1 ASK: I, AGT: [1.1];
85.2 AGT: [1.1], GIVE: ideas;
85.3 AGT: [1.1], HAVE: snack;
85.4 ATT: snack, lower fat;
85.5 TEM: [85.3], in morning;
86. and just indicate to him that may be a problem area/
86.1 INDICATE: I, to AGT: [1.1];
86.2 BE: that, area;
86.3 ATT: area, problem;
87. of if he says that he and his wife eat red meat five days a week/
87.1 CAT: eat, meat;
87.2 ATT: meat, red;
87.3 TEM: [87.1], 5 days a week;
87.4 AGT: [1.1], SAY: [87.1, 87.4];
88. perhaps indicate that there might be alternatives/
88.1 RSLT: indicate, alternatives;
89. and discuss having vegetarian options, or lean meat instead of red meat, a couple of days a week/
89.1 DISCUSS: we, options;
89.2 ATT: options, vegetarian;
89.3 THM: lean meat vs. red meat;
89.4 TEM: couple days a week;
90. I tend not to use a lot of handouts and that kind of thing/
90.1 USE: I, handouts NEG;
90.2 ATT: handouts, a lot;
91. I think a general, I mean at our hospital we have sheets on how to lower your cholesterol/
91.1 COND: have, sheets;
91.2 LOC: at our hospital;
91.3 THM: [91.1], lower cholesterol;
92. and just include tips like eating more lean meat, eating lower fat dairy products/
92.1 INCLUDE: sheets, tips;

- 92.2 THM: [92.1], more lean meat;
 - 92.3 THM: lower fat dairy products;
93. increasing your fiber intake, eating more fruits and vegetables, and limiting your eggs to 3-4 times a week/
- 93.1 INCREASE: to, intake;
 - 93.2 ATT: intake, fiber;
 - 93.3 THM: eggs, limit;
 - 93.4 AGT: [1.1], EAT: fruits & veg;
 - 93.5 TEM: [93.3], 3-4 times a week;
94. So I think a general handout would be useful/
- 94.1 IS: handout, useful;
 - 94.2 ATT: handout, general;
95. If I was doing a diet recall with him, I might be inclined to use food models/
- 95.1 DO: I, recall;
 - 95.2 ATT: recall, diet;
 - 95.3 BE: I, inclined;
 - 95.4 USE: to, models;
 - 95.5 ATT: models, food;
 - 95.6 COND: if [95.1], then [95.5];
96. if it seemed like he was able to describe portion sizes and that type of thing adequately/
- 96.1 AGT: [1.1], WAS: able;
 - 96.2 AGT: [1.1], DESCRIBE: sizes;
 - 96.3 ATT: sizes, portion;
 - 96.4 ATT: [96.2], adequately;
 - 96.5 COND: if [96.2], then [95.4];
97. but in terms of a lot of other handouts, I personally don't use them that often/
- 97.1 USE: I, handouts NEG;
 - 97.2 TEM: [97.1], often;
98. because I don't think the patient uses them once they leave/
- 98.1 USE: patient, handout NEG;
 - 98.2 TEM: [98.1], once they leave;
99. So I think it would just be a matter of discussion and questions/
- 99.1 BE: it, matter;
 - 99.2 ATT: matter, discussion;
 - 99.3 ATT: matter, questions;
100. and asking him to ensure that he is comprehending what I said/
- 100.1 ASK: I, AGT: [1.1];
 - 100.2 ENSURE: I, comprehension;

APPENDIX E: SAMPLE CASE SCENARIO

Scenario 12

WY is a 58-year-old woman who went to her family doctor for a checkup and then was referred for diet counseling.

Clinical

The physician has placed her at high risk of CVD in the next 10 years (10 year risk 20-30%) using the current Canadian dyslipidemia guidelines. She has not had any CVD symptoms and is otherwise healthy. She has had hypertension for which she takes medication. Her current blood pressure is 135/90. She smokes 10 cigarettes per day. She has a positive family history of CVD and does not have diabetes.

Laboratory Data on Lipid Levels

Total cholesterol (mmol/L)	7.5
LDL cholesterol (mmol/L)	5.0
HDL cholesterol (mmol/L)	1.5
Triglycerides (mmol/L)	2.0

Previously recorded Anthropometric measurements

BMI	24
Height (cm)	173
Weight (kg)	72
Waist Circumference (cm)	91

Lifestyle

WY works in an insurance office but works out in a gym 4-5 times per week and is a member of the company longboat crew, participating in races around Canada. She considers herself to be healthy and was shocked when told she had a cholesterol problem. WY lives alone in a downtown apartment in a large city and has a good support system. She has a moderate income and graduated from a community college program and has taken numerous courses to stay current in her field. She uses alcohol occasionally. She has come for counseling and is knowledgeable about diet and heart health and has controlled her fat intake in the past. She smokes to help curb her appetite.

Diet

WY eats little meat and emphasizes carbohydrates, legumes, fruits and vegetables. Her fat intake is quite low. She is not officially vegetarian however. She eats a wide variety of foods and actively experiments trying new foods and cuisines. Her fibre intake is relatively high as well. WY takes a multi-vitamin.

Estimated Daily Intake

Calories (kcal)	1400
Protein (%)	20
CHO (%)	60
Total fat (%)	20
Saturated fat (% of total calories)	8
Polyunsaturated fat (% of total calories)	6
Monounsaturated fat (% of total calories)	6
Cholesterol (mg/day)	300

**APPENDIX F: SAMPLE OF GRAPHVIZ SEMANTIC NETWORK
REPRESENTATIONS**

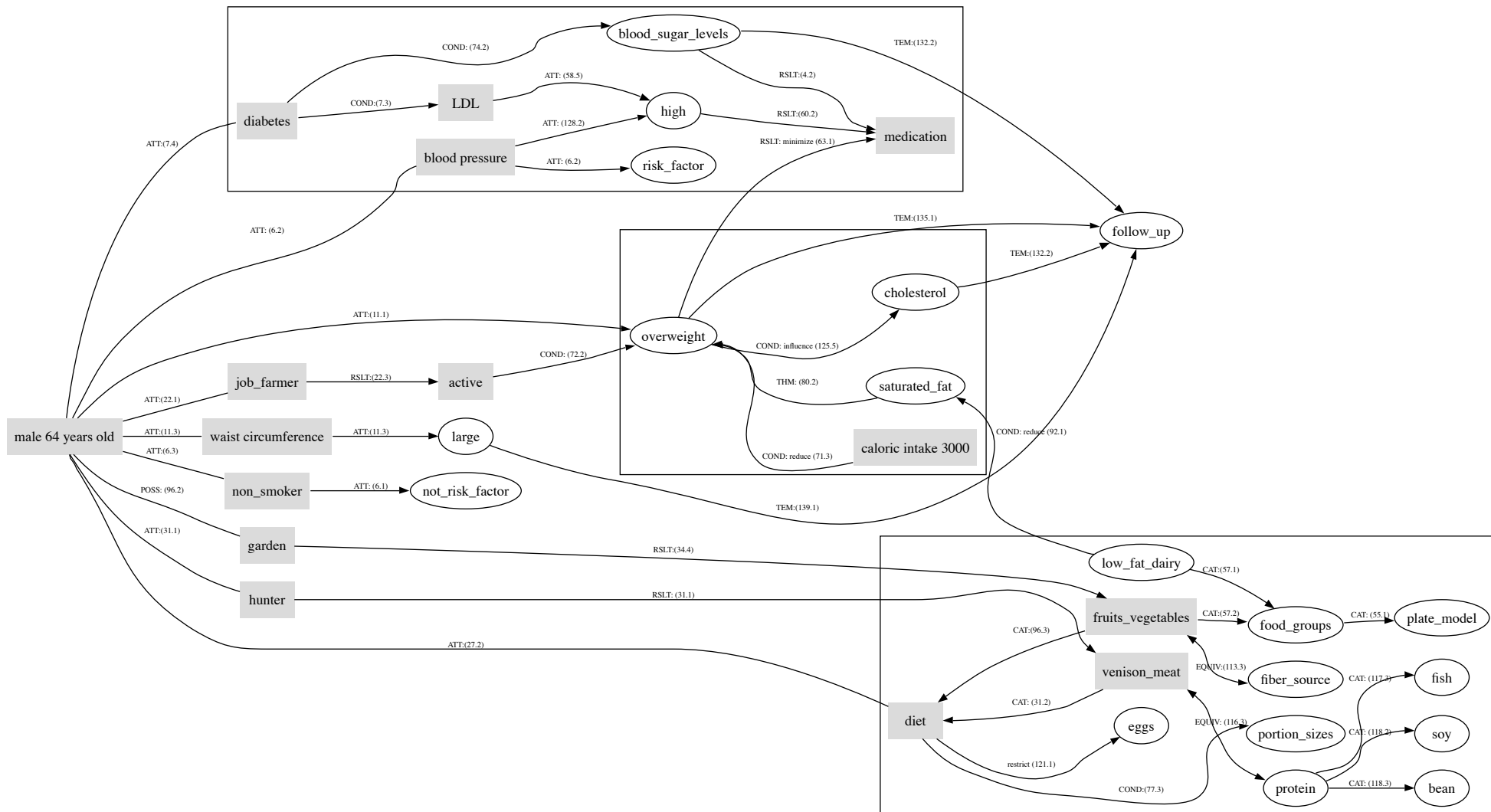


Figure 6. Semantic Network 1: representation of reasoning by Expert 3 for case scenario 2. Ovals indicate inferences made, grayed boxes indicate recalls. Arrowhead direction indicates directionality, where forward thoughts going from given cue to hypothesis, and backward thoughts going from hypothesis to confirm given cue. Double ended arrows refer to ideas that are equivalent, having no direction.

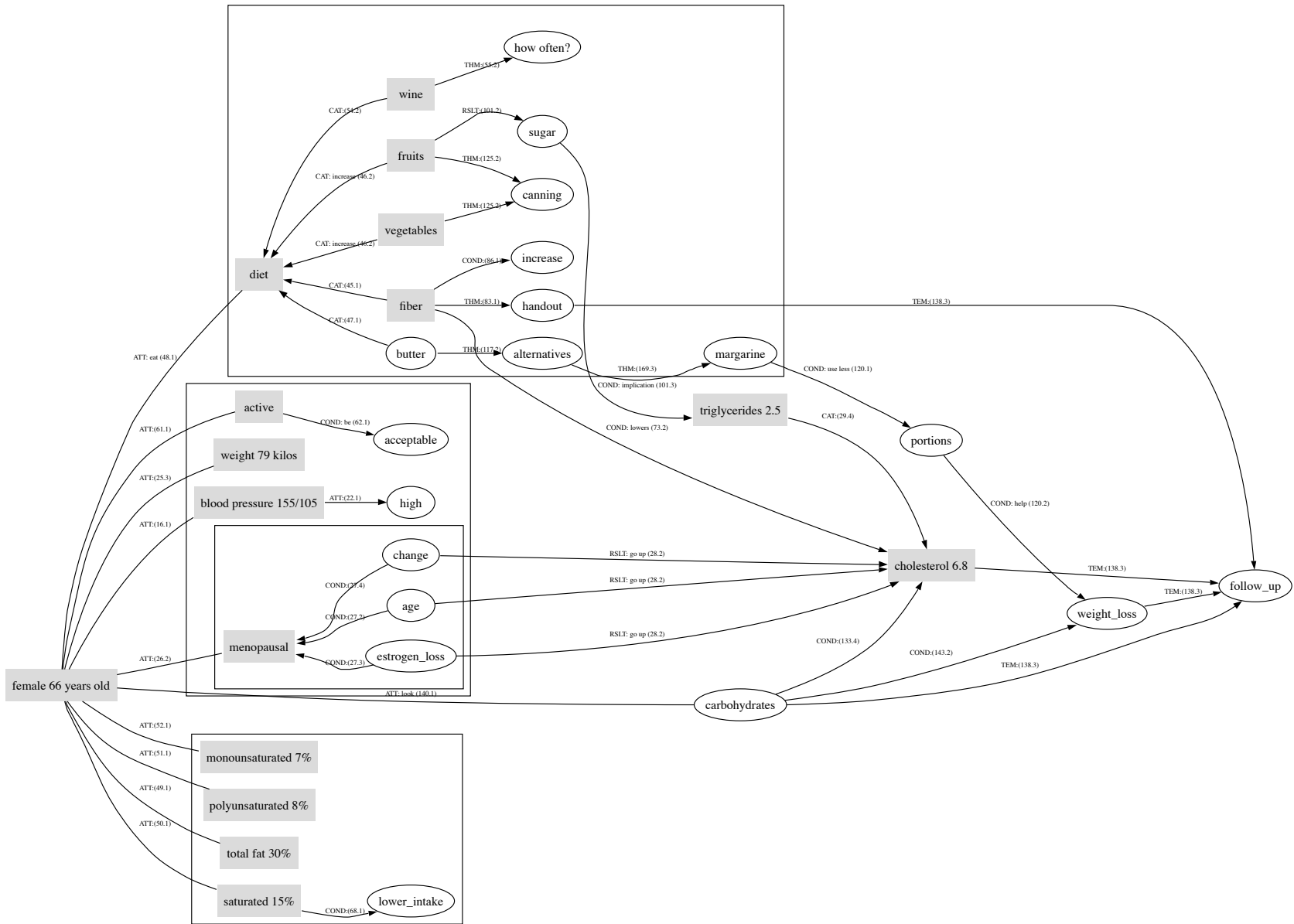


Figure 7. Semantic Network 2: representation of reasoning by Generalist 3 for case scenario 23. Ovals indicate inferences made, grayed boxes indicate recalls. Arrowhead direction indicates directionality, where forward thoughts going from given cue to hypothesis, and backward thoughts going from hypothesis to confirm given cue. Double ended arrows refer to ideas that are equivalent, having no direction.

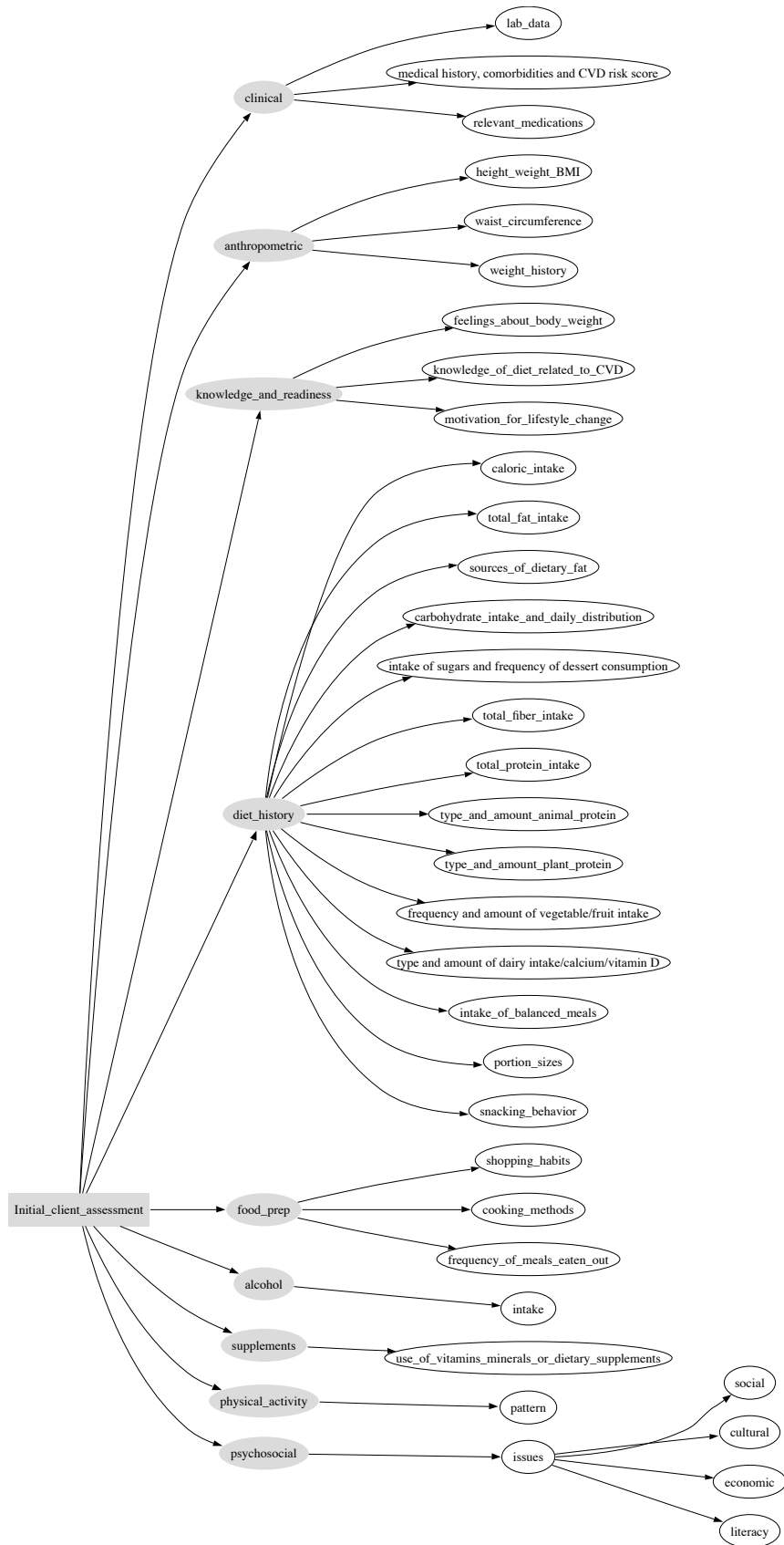


Figure 9. Semantic Network : Initial Consultation Reference Model based on Brauer, et al, 2007.



Figure 10. Semantic Network: Recommendations and Follow-up Reference Model, based on Brauer, et al, 2007.