Exploring Rural Family Physicians' Learning from a Web-based Continuing Medical Education Program on Alzheimer's Disease: A Pilot Study

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Abstract

Physicians' online learning has been gaining attention in the continuing medical education (CME) literature. This descriptive multiple case study investigated rural family physicians's (RFPs) learning about early Alzheimer's disease (AD) from an online continuing medical education (OCME) program. To overcome common criticisms of lecture-based OCME programs, a problem-based collaborative approach was implemented. Eight RFPs, working in pairs and plenaries, completed the AD Program which lasted 9 months. A family physician with expertise in AD moderated the online discussions; an educator coordinated logistics and took the dual role of designer and researcher.

The effectiveness of the program in supporting participants' learning about Alzheimer's disease and transfer to practice was evaluated at various levels: participation, satisfaction, learning, competence and performance. Data analysis included within- and cross-case analyses. Member checks, data triangulation, long-term observation and thick description were used to verify the quality of the study.

Regarding learning, objective measures demonstrated a significant increase in declarative AD knowledge and improved problem solving of clinical cases focused on AD treatment. Self-reported measures provided evidence that the AD Program had an impact on the RFPs' reports of their clinical practice. Regarding the effectiveness of the Program, participants were uniformly satisfied, and would recommend it to their peers and to accreditation bodies mainly for its innovative design, interactivity and convenience of access. They said the most effective features were the educator's scaffolding, opportunities to practice, and collaborative plenary discussions. The least effective features were an unfriendly platform (i.e., WebCT), paired activities and, limited facilitation during online discussions. Variables that may have influenced learning and reports of transfer to practice were: (a) levels of computer literacy and ease with technology; (b) program platform; (c) readiness for self-directed learning; (d) readiness to learn and change; (e) level of expertise in AD practice; (f) level of engagement and (g) an open, safe learning environment with effective scaffolding.

This study demonstrates that online learning is a viable option for continuing medical education. Program design and evaluation should be theory driven; the framework developed for this study provides some initial steps in this direction.

Résumé

L'apprentissage en ligne des médecins capte de plus en plus l'attention dans la littérature en formation médicale continue. Cette étude descriptive de cas examine l'apprentissage du début de la maladie d'Alzheimer par les médecins de famille ruraux, à partir d'un programme en ligne de la formation médicale continue. Cette investigation englobe également l'analyse des huit cas, i.e. les huit participants. Afin de surmonter les critiques courantes sur l'enseignement magistral des programmes en ligne de la formation médicale continue, une approche par résolution de problèmes utilisant la collaboration fut mise en pratique. Huit médecins de famille ruraux, travaillant en paires et en plénière, ont complété en neuf mois le programme portant sur la maladie d'Alzheimer. Un médecin de famille, expert en maladie d'Alzheimer, a agi comme modérateur des discussions en ligne; une enseignante a coordonné la logistique et a assumé le double rôle de concepteur et de chercheur.

L'efficacité du programme à soutenir l'apprentissage des participants concernant la maladie d'Alzheimer et le transfert à la pratique ont été évaluée à plusieurs niveaux : participation, satisfaction, apprentissage, compétence et performance. Des analyses de cas interne et transversal furent effectuées sur les données. La vérification par les participants, la triangulation des données, les observations à long terme, et les descriptions substantielles furent incluses afin d'assurer la qualité de l'étude.

Quant à l'apprentissage, des mesures objectives ont démontré une augmentation significative des connaissances déclaratives et une amélioration dans la résolution de problèmes en cas cliniques centrés sur le traitement de la maladie d'Alzheimer. Des mesures fournies par les participants eux-mêmes ont démontré que le programme axé sur la maladie d' Alzheimer avait un impact sur les rapports de pratique clinique fournis par les médecins de famille ruraux. Concernant l'efficacité du programme, les participants ont été uniformément satisfaits, et ils le recommanderaient à leurs pairs et à toute institution accréditée, surtout pour son design innovateur, et son caractère interactif et facilement accessible. Les participants ont dit que les stratégies de soutien logistique et émotionnel de

l'enseignante, les occasions de pratiquer, et les discussions faites en collaboration avaient été les caractéristiques les plus efficaces. Les caractéristiques du programme les moins efficaces furent un logiciel difficile a utiliser (i.e., WebCT), des activités à deux et une assistance limitée du modérateur.

Les variables qui ont pu influencer l'apprentissage et les rapports de transfert à la pratique furent : (a) les niveaux de connaissances de l'ordinateur et aisance a manipuler la technologie; (b) le type de logiciel; (c) la préparation à l'apprentissage autodirigé; (d) la préparation à l'apprentissage et au changement; (e) le niveau d'expertise dans la pratique clinique; (f) niveau d'engagement et (g) un environnement d'apprentissage sécuritaire et ouvert offrant un soutien efficace.

Cette étude démontre que l'apprentissage en ligne est une option viable pour la formation médicale continue. La conception et l'évaluation de programmes devraient êtres guidés par la théorie; l'encadrement développé dans cette étude procure quelques premiers pas dans cette direction.

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CHAPTER ONE: INTRODUCTION

Due to new challenges emerging from simultaneous trends in the health care systems of both Canada and the United States, physicians are increasingly under pressure to keep up with the explosion in medical knowledge and information technology. Limited available resources to fulfill the expanding needs of an aging population, greater demands for accountability and transparency to achieve and maintain health care quality, and higher expectations of inter-professional collaboration between education and practice, are but a few of these challenges (Beaupré et al. 1998; Davis, E., 2006).

Family physicians (FP) play a significant role as 'gatekeepers' of the Canadian health system. Consequently, their broad knowledge base must be constantly updated so as to improve their clinical skills, all of which help them to stream patients in a more timely fashion towards appropriate specialists' care and community resources.

This study targeted Canadian rural family physicians (RFPs) who perceive themselves as different from their urban counterparts because of the specific demands of their rural practice (Curran, Hatcher & Kirby, 2000a). Due to a shortage of locum coverage and the difficulty in accessing information from remote locations, RFPs cannot easily attend traditional 'live' (or face-to-face) continuing medical education (CME) programs (Sullivan & Buske, 1998). On the other hand, online CME (OCME) has the advantage of offering RFPs convenient and flexible access from the comfort of their home or office as a means of keeping them informed on matters relating to their profession, and assisting them to maintain their professional license.

As anticipated by Bourdeau & Bates (1997), Web-based instruction (WBI) has revolutionized distance education. Physicians in the United States have increasingly embraced OCME. Fordis and colleagues (2005) report that "between 1998 and 2003, OCME surpassed 700% growth compared to a 38% growth in total CME activities" (p.1044). In 2003, at least 73% of physicians in the US participated in CME programs delivered through the Web (ACCME, 2003). Two National

Physicians Surveys in Canada also reported the trend that Canadian physicians have been increasingly accessing continuing medical education through Web-tools (Anderson, P., 2008; Lacasse & Fremont, 2006).

Despite its growth and potential for improving the effectiveness of online continuing medical education, Web-based instruction is not a panacea. It could impact learning and practice depending on how the medium is used (Sugrue, 2000). The Web has the technical ability to support any type of instruction (Ahmad, 2000; Ahmad & Lajoie, 2001; Owston, 1997; Sugrue 2000). However, for a Web-based learning environment to be effective in general, and specifically in the CME context, it should be driven by theories of learning and instruction to support the kind of learning desired.

In North America, the revolution that has shaken CME since the late 90s covers three aspects: the design, the delivery and evaluation of educational interventions. Since then, the quality of the CME design and its impact on physicians' learning and clinical practice have been under the scrutiny of accreditation bodies; i.e., Accreditation Council for Continuing Medical Education (ACCME) and professional orders (Dion, 2007; Goulet, 2007). The CME literature indicates that traditional CME (live, formal and passive) has been highly criticized due to its limited or nonexistent impact in transforming physicians' clinical practice. The formal live CME format has usually been didactic, episodic, isolated from patients' care, and lacking any consideration of the participants' learning styles (Caseeber, Centor & Kristofco, 2003; Davis, Thomson-O'Brien, Freemantle, Wolf, Mazmanian & Taylor-Vaisey, 1999; Fordis et al. 2005; Mazmanian & Davis, 2002). With regard to the medium used to deliver CME, it is worth noting that the emerging online format can also be criticized for some of the same reasons. Most of the online programs from the late 90s to 2006 presented content as plain text without fully exploiting the unique collaborative and interactive features of the Web (Luconi, Marlow, & Cochrane, 2000; Sklar, 2000). However, proof of OCME effectiveness to promote learning and change in professional practice requires more research. It is the paucity of studies assessing OCME effectiveness beyond the level of satisfaction (Moore, 2003a) that has inspired the present study.

1.1 Purpose and Significance of the Study

The purpose of this study was to explore rural family physicians' learning in an online continuing medical education (OCME) Program that was designed, based on theories of learning and instruction. To investigate this phenomenon, physicians' learning as well as their perception of the program's impact on their clinical Alzheimer's disease (AD) practice were evaluated to determine the effectiveness of the educational intervention. The underlying question in this study was how to design and deliver effective OCME that will support physicians in updating and confirming their knowledge, and applying it to their clinical practice in accordance with CME standards.

The significance of this study is that it is a breakthrough in the emerging area of OCME which, at the time it was carried out, was still in its infancy. Driven by theories of learning and instruction, this study provides a framework for developing and delivering OCME to rural and geographically-remote physicians. As such, OCME provides an opportunity to enhance practice-based lifelong learning by addressing their professional needs, and offers on-going just-in-time support for their AD practice, (Gill, Mcreelis, Debruin, & D'Eon, 2000; Zollo, Kienzle, Henshaw, Crist, & Wakefield, 1999).

The key characteristics of the present study are: (a) its framework driven by theories of learning and instruction, (b) its multiple instructional longitudinal strategies to support online learning, (c) its evaluation of the educational intervention's effectiveness with evidence of participants' learning and reported transfer to their clinical practice, and (d) its in-depth descriptions of the participants' experiences.

CME providers, medical instructors, medical students, family physicians and AD patients and their caregivers can benefit directly or indirectly from the outcomes of this study. (A Glossary is presented in Appendix A).

1.2 Summary

This chapter covered two sections. The statement of the problem provided an overview of the challenges and demands faced by the medical profession and, in particular, by rural family physicians who have specific needs arising from the particularities of their medical practice. The purpose of the study focused on testing the effectiveness of a theory-driven OCME in supporting RFPs learning and reported impact on their clinical AD practice.

The next chapter presents a review of the literature that represents the backbone of this study.

CHAPTER TWO: LITERATURE REVIEW

The literature review chapter covers five sections that informed the design, delivery and evaluation of the educational intervention. Firstly, the context of the study describes the participants' characteristics, continuing medical education (CME), and accreditation criteria for CME programs. Secondly, major theories are discussed in relation to physicians' learning and clinical practice. Thirdly, instructional models, methods for practice-based learning (PBL) and collaborative learning are reviewed. Fourthly, Web-based instruction (WBI) and online CME (OCME) that informed the delivery of the educational intervention are discussed. Finally, the research questions that guided this study are presented.

2.1 Context of the Study

2.1.1 Rural Family Physicians

This study targets rural family physicians (RFPs). The terms family physician, general practitioner, and rural generalist are used interchangeably. In Canada, rural generalists represent approximately 16% of the total number of family physicians (FPs). In Quebec, the number of rural generalists decreased by 11% between 1994 to 2000, which is about half the rate of the Canadian national decrease in the number of rural generalists (20. 5%) (SRPC, 2000).

The lack of a validated standard definition of a *rural community* (SRPC, 2000) poses methodological challenges for researchers, policy-makers and practitioners. Statistics Canada defined a rural community as having a population of less than 10,000 (Easterbrook et al. 1999). Rural towns represent 22.2% of the population or roughly 6.4 million people who are served by only 10.1% of the total number of physicians (2000, Canadian Medical Association). In Quebec (Sullivan & Buske 1998), following the definition of rural practice as one providing care to communities of under 10,000 people, the rural population represents 22.4% of the total population. Quebec is served by a total of 7,579 FPs of which 17.5% are rural generalists. A general practitioner (GP) serves 887 urban patients whereas a rural generalist serves a considerably larger population (1,202 patients) (Sullivan and Buske, 1998).While RFPs have traditionally been males, both genders have been equally represented in rural family medicine since 1994 (CMA, 2000). The consensus in the Canadian literature (Adams et al. 2003; CMA, 2000; Rourke,1999; Rourke, Newbery & Topps, 2000) indicates that rural medical practice is characterized by: (a) a high level of on-call responsibilities (Martin, 2000; Sibbald, 2000) and workload (Slade & Busing, 2002); (b) a shortage of RFPs and locum coverage due to the problems of recruitment, training and retention in rural areas; (c) lack of specialized services; and (d) distant secondary and tertiary referral centres (CMA, 2000; Rourke & Rourke, 1995) which impose higher transportation costs for patients (Moores, Woodhead-Lyons, & Wilson 1998; SRPC, 1997). As a result, RFPs require specialized training (SRPC, 1997) through continuing medical education (CME) which is presented next.

2.1.2 Continuing Medical Education

Physicians in the US and Canada are required to follow CME accredited programs for certification purposes, maintenance of a professional license, and the necessity to keep abreast of rapidly expanding medical information (Peterson, 1999; Carriere & Harvey, 2001). The Conseil de l'Éducation Médicale Continue du Québec (CMECQ, 2003) has defined CME as:

> Any action designed for or performed by a physician for the purpose of acquiring, maintaining or upgrading knowledge, skills, or attitudes to improve the quality of the health care that the physician dispenses to patients. CME may be an individual or group action, based on a need or interest, being a part of the learning process (p. 5)

The goals of CME include: "the development of skills necessary for lifelong learning, the exercise of clinical reasoning, an understanding of the decision-making process, and specific content acquisition" (Abrahamson et al. 1999, p. 1290).

Since the late 90s, CME in North America has been in a state of transition and has experienced pressure to systematically change its approach to better fulfill the evolving professional needs of physicians, and to increase the quality of the health system services in the 21st century (Nahrwold, 2005; Regnier, Murray, Kopelow, Lane & Alden, 2005; Spivey, 2005). A combination of factors has triggered this crisis, including the reorganization of the health system, the broadening of medical knowledge and technological innovations, and the fact that traditional live CME has not been effective in significantly changing clinical practice (Davis, Thomson-O'Brien, Freemantle, Wolf, Mazmanian & Taylor-Vaisey, 1999; Mazmanian & Davis, 2002). Consequently, more effective CME models, and new parameters to evaluate CME programs are needed. In fact, the main criteria used in the 80s to assess a CME program consisted primarily of content relevance, a lecturer's teaching skills and the level of comfort of the setting. However, the focus shifted in the 90s to instructional models which evaluated the impact of CME's outcomes in physicians' learning and potential changes in their clinical practice, in the health status of their patients and overall population of patients (Moore, 2003a). The challenge has been to replace the traditional teacher-centered instructional format of lectures and memorization of information with more innovative, effective and efficient learner-centered CME formats framed by instructional methods (e.g. self-directed learning, Brookfield, 1984; and practice-based learning) that might enhance transfer of knowledge to clinical practice (Abrahamson et al. 1999; Fox & Bennett, 1998; Mazmanian & Davis, 2002; Moore & Pennington, 2003; Regnier et al. 2005). Despite these guideline recommendations given over the past decade, more research is needed to demonstrate that the CME reform advocating "the shift toward competency-based assessment and assuring maintenance of physician competence" (Johnson, Austin, & Thompson 2005, p.186) will in fact improve health care outcomes (Nahrwold, 2005) by developing the still "unrealized potential of CME" as a facilitator for change (Regnier et al. 2005).

Studies focusing on the rural family physicians' habits in participating in CME, and more specifically in Quebec and Ontario, are scarce. National surveys carried out in Canada in the late 90s (CME, 2000; Sullivan & Buske, 1998) showed that urban and rural physicians spend approximately 3 hrs in CME per week. A study in Newfoundland and Labrador (Curran, Hatcher, & Kirby, 2000) revealed differences between urban and rural FPs' CME learning needs. RFPs preferred less formal accredited CME programs, attended fewer events sponsored by pharmaceutical companies, and spent more time in informal, self-directed study.

The Scott Report (SRPC, 1997) and other studies in rural areas of Southern Ontario (Young, Chart, Franseen, Tipping, Morris, & Davis, 1998) and Nova Scotia (Langille, Sargeant & Allen, 1998) indicate that RFPs' perceived barriers in attending accredited live CME programs were: dissatisfaction with costs, prohibitive distances, inconvenience of travel, conflicts with local professionals' responsibilities due to low locum coverage, and the limited number of CME programs specifically addressing the RFPs' needs. Consequently, RFPs are seen as an ideal audience for an OCME program that addresses their educational and professional needs and that breaks their professional isolation with peers and academic institutions (Gill, Mcreelis, Debruin, & D'Eon 2000; Wooton, 1998).

2.1.2.1 Continuing Medical Education Accreditation

Since its formation in 1954 the College of Family Physicians of Canada (CFPC) has required its members to provide proof of participation in Continuing Professional Development (CPD) following the Maintenance of Proficiency program (MAINPRO). This program aims to support family physicians' maintenance of high standards of care throughout their careers, and to provide a means of maintaining their license. The guiding educational principles of the MAINPRO are: (a) physicians should plan their own self-directed and practice-based lifelong learning; and (b) effective learning should include the critical questioning of clinical practice, reflecting on the impact of new information on practice, and keeping updated with accurate information (Dion, 2007). Since July 2007, re-validation has become mandatory across Canada for family physicians and specialists. Members of CFPC must obtain a total of 250 credits every 5 years. At least 125 of these must be from accredited CME (MAINPRO-M1 and/or MAINPRO-C credits), while the other half can be obtained from non-accredited CME programs (MAINPRO-M2).

The AD Program referred to in this study was accredited from 2003 to 2004 by the CFPC and by the Quebec Union of Family Physicians (Fédération Médecins

Omnipraticiens du Québec, FMOQ). The CFPC accredits CME programs following two types of categories: MAINPRO-1 and MAINPRO-C. Participants in the AD Program received 12 MAINPRO-C credits (1 credit per hour ratio) because it was estimated that 12 hours would be required to complete it. At the time of this study, online CME was in its early stages of development. From 2000 to 2003, the CFPC accredited a total of 159 MAINPRO-C programs from across Canada, of which only 13 (8%) were delivered on the Internet (CFPC, 2008). This AD Program, the only MAINPRO-C one accredited in the Province of Quebec at that time, was accredited with the second highest number of credits of the 13 MAINPRO-C programs offered on the Internet (12 credits).

At the time of the present study, to be eligible for MAINPRO-C accreditation, a program or activity had to comply with the following criteria: (a) a member of the CFPC participates in the design, (b) a needs assessment of the actual participants determines the content, (c) physicians participate in small groups discussions, and (d) after the program, a self-reported reflective activity assesses the impact the program has had on the participants' subsequent clinical practice. A variety of activities are eligible for MAINPRO-C credits, such as courses and workshops (live or online), practice audits and quality assurance programs (Dion, 2007). The FMOQ Category 2 is the equivalent of the MAINPRO-C category (of CFPC). From the outset, the FMOQ and the CFPC closely monitored that the required accreditation criteria were implemented to guide the design and delivery of the AD Program. The learning and instructional theories reviewed in this chapter basically inform why these criteria are important and how to best design them to support learning.

Another accreditation criterion is that the content of a CME program should be free of commercial bias. In North America, commercial support for pharmacy education (Smith, Cervero & Valentine, 2006) and for CME (CEMCQ, 2003) is a widespread phenomenon and an on-going cause of concern (Davis, 2004; Cornish & Leist, 2006). The majority of financial support for CME comes from pharmaceutical companies and other industrial entities (Van Harrison, 2003). In the US, "total commercial support more than tripled between 1998 and 2003 from $

302 million to $ 971" (Steinbrook, 2005, p.534). The potential conflict of interest between the improvement of health professionals' education and commercial promotion by industry could limit the quality of CME programs and their impact on the participants' learning experiences and, ultimately, on their clinical practice. Between 1998 and 2004, new standards were put in place in the US and Canada to control the level of commercial support to CME providers (Beaupré et al. 1998; Davis, 2004; Marlow, 2004). If industry finds that supporting CME is of no further value, the medical profession will in the future have to assume its costs (Steinbrook, 2005).

Overall, the context of the study revealed the specific training that RFPs need and the relevant role that CME could play in supporting their learning and transferring of acquired knowledge to their clinical practice. According to CME standards, self-directed and practice-based learning enhances high-order thinking skills and life-long learning. The accreditation of the educational intervention by two institutions (CFPC and FMOQ) ensured its credibility, relevance, and validity vis-à-vis the RFPs' AD practice.

2.2. Learning Theories

This section focuses on the theories that informed the design of the study. Included are: (1) a description of major learning theories, namely cognitive constructivism and socio-constructivism; (2) models and theories more specifically focused on physicians' learning and change in the context of CME, namely, the Four-Stage theory of physician's learning (Slotnick, 2001), and clinical reasoning models (Barrows & Feltovich, 1987).

2.2.1 Cognitive Constructivism

Constructivism is a complex concept in that it encompasses a variety of educational perspectives and theories (Candy, 1991; Jonassen, 1991; Phillips, 1995). The constructivist aspects of this study stems from cognitive and social constructivism (Cobb, P., 1994). Cognitive constructivism is mostly oriented towards the understanding of individual knowledge construction and includes three theories: information-processing (Anderson, J. R., 1983), radical constructivism (von Glasersfeld, 1988), and cognitive schema theory (Derry, 1996). Learning is an "active, constructive, cumulative and goal-oriented process" (Shuell, 1988, p. 277). The assumption is that meaningful learning requires the *active* construction and restructuring of prior knowledge that occurs through multiple opportunities. *Constructive* implies that new information should be elaborated and related to prior information. C*umulative* assumes that new learning builds upon the learner's prior knowledge that will, in turn, determine the quality and amount of learning. In other words, prior knowledge could facilitate or limit learning depending on the existence of misconceptions. *Goal-oriented* means that learning, viewed as an intentional process with realistic expectations, facilitates the reaching of learning outcomes. The teacher's role is to guide students' thinking towards a higher level of understanding (Shuell, 1988). Drawing from Dewey (1938), Piaget (1977), and von Glasersfeld (1989) another constructivist implication is that "cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned" (Savery & Duffy, 1995, p. 31). The goal of the learner and his/her previous experience essentially determine how the learner constructs understanding. Viewed from a constructivist perspective, the goal of teaching is to facilitate learning. Learning from instruction implies that the learner is engaged through psychological functions that could be initiated by either the learner or the instructional agent (e.g. teacher, computer, and book). These functions include expectations, attention, encoding, comparison, hypothesis generation, repetition, feedback, evaluation, monitoring and the combination of integration and synthesis of information (Shuell, 1988). The Barrows' clinical reasoning model includes most of these psychological functions and is presented later on.

2.2.2 Social Constructivism

The interdependence of social and individual processes for the co-construction of knowledge is the core of social constructivism (Palincsar, 1998). Viewed from the cognitive constructivist perspective, peers can stimulate thinking and raise questions, but they play a more central role in social constructivism where learning is defined as the "collaborative construction of socially defined knowledge and values which occurs through socially constructed opportunities" (Shuell, 1996, p. 744) where the student actively co-constructs with others and the self. Additionally, the teacher "co-constructs different interpretations of knowledge and listens to socially constructed conceptions" (Shuell, 1996, p. 744). Social constructivism is grounded in three assumptions: (a) knowledge is a social product created by a community of learners; (b) knowledge evolves through negotiation; and (c) historical and cultural factors influence knowledge construction (Prawat & Floden, 1994). Social constructivism (Palincsar, 1998) is rooted in the sociocognitive conflict theory of Piaget (1985) and the sociocultural theory (Vygotsky, 1978).

The sociocognitive theory of Piaget and colleagues argues that learning is triggered by social interaction because the individual faces disequilibrium or cognitive conflict between his understanding and that of the group. This disequilibrium motivates the learner to go beyond his current state (Piaget, 1985).

The sociocultural theory assumes that higher mental functions (verbal thought, logical memory and selective attention) are created through activity and are the product of sociohistorical development. Therefore, "the traditionalist formula from thought to action is reversed from action to thought" (Kozulin, 1990, p. 114). Social interaction in the educational setting mediates the development of higher mental functions through the use of tools and semiotics. As a result, language and discourse play a central role in the co-construction of knowledge (Cazden, 1986; Palincsar, 1998) within a socially mediated activity such as in the *Zone of Proximal development (ZPD)* where the individual's problem solving task is restructured with the help of an adult or competent peer(s). The interesting aspect of the ZPD is that it connects the individual and the social environment within a holistic view of instruction (Moll, 1990). Knowledge construction does not occur in a vacuum but is situated in social, cultural and historical contexts. The social influence on individual cognition can be analyzed at three levels of participation: (a) in pairs; (b) in a community of practice (e.g., colleagues) and (c) in other social circles included in the whole society and its culture (Dillenbourg, 1999). Learning is then viewed as: "a social dialogical process in which the communities of practitioners socially negotiate the meaning of phenomena" (Jonassen, Davidson, Collins, Campbell, & Haag, 1995, p.8). From an anthropological perspective, Lave and Wenger (1991) define a community of practice as:

> A set of relations among persons, activity and world, over time and in relation with other tangential and overlapping communities of practice. A community or practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretive support necessary for making sense of its heritage. Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning. This social structure of this practice, its power relations and its conditions for legitimacy define possibilities for learning (i.e. for legitimate peripheral participation (p. 98).

Participation in communities of practice is grounded in situated cognition and has implications for adult education in general (Bonk & Kim, 1998) and for professional education in particular (Palincsar, 1998; Parboosingh, 2002). In reaction to information processing theories, situated cognition is based on the assumption that what is learned is influenced by the situation or context in which it is learned. Context implies participation in a social context. In other words, the situative perspective implies that participants interact not only with other individuals but also with materials in communities of practice. Greeno (1989) summarizes the key points of situated cognition as follows:

> Thinking is situated in physical and social contexts. Cognition including thinking, knowing, and learning, can be considered in relation involving an agent in a situation, rather than as an activity in an individual mind (Greeno, 1989, p. 135)

The key assumption of situated cognition is that knowledge is contextualized in action. However, participation is not limited to face-to-face interactions with others.

> Instead, all individual actions are viewed as elements or aspects of an encompassing system of social practices and individuals are viewed as participating in social practices even when they act in physical isolation from others (Cobb & Bowers, 1999, p.5).

Cognitive apprenticeship (Collins, Brown, & Newman, 1989), anchored instruction (Cognition and Technology Group at Vanderbilt, 1990, 1996) and practice-based learning (PBL) (Barrows, 1985) are instructional models rooted in situated cognition where learning is situated or contextualized in authentic activities in order to facilitate the development of thinking skills and content knowledge (Williams, 1992). In solving ill-structured problems such as clinical cases, Barrows (1994) and Jonassen (1997) highlighted the importance of social construction of knowledge through visiting and revisiting problems from different viewpoints when solving complex clinical cases and exchanging information with peers having divergent opinions. In the present study, the educational intervention was designed following an adaptation of the PBL method which will be later explained. The AD Program provided social interaction through a variety of collaborative activities for problem solving clinical cases.

In summary, cognitive processes that underlie physicians' problem-solving, decision-making, clinical reasoning and transferring to practice are framed by cognitive constructivist (Schmidt, 1993) and socio-constructivist learning theories. Constructivist theory which is focused on how physicians learn in the context of problem solving is presented next.

2.2.2.1 Four-Stage Theory of Physicians Learning

Based in social constructivism, the Four-Stage Theory (FST) is a specific theory about how physicians learn (Slotnick & Shershneva, 2002). This theory has been empirically validated in the fields of CME and of veterinary continuing education (Moore, 2003b) and is built upon a variety of sources which are explained next.

The FST borrows from adult education literature three interrelated constructs: the learner, the learning process and the context. The complexity of the learning process derives from the fact that it is influenced by a holistic view of the learner (cognitive, social, affective and physical aspects), and the context as stipulated by situated cognition.

Following Maslow' theory of self-actualization, the FST is based on the assumption that physicians are motivated to learn and change when they perceive a need. Medical education is a lifelong process which provides medical students and practitioners with the opportunity to develop their professional identity by satisfying their Maslowian psychosocial needs for security, affiliation and self-esteem (Slotnick, 2001).

The FST is focused on learning which has been demonstrated to be a relevant force to influence change of physicians' practice. The Learning and Change model showed that physicians learn and change due to personal, social, and professional forces (Fox, Mazmanian, & Putnam, 1989). The drive to achieve competent performance in patient care is highly influenced by the pressure of: (a) meeting high personal and professional standards, (b) adopting innovations, and (c) searching for alternatives ways to improve their practice. The drive for competence was considered to be the prevalent professional force which leads to learning (Putnam & Campbell, 1989).

The FST qualifies as socio-constructivist because "learning occurs as individuals reflect on their experiences both individually and with others to construct meaning in ways consistent with being members of a community of practice" (Parboosingh, 2002, p.198). FST is also situated in that learning occurs in the workplace where interaction with peers and mentors provides "the best environment for learning that enhances professional practice and professional judgment" (Parboosingh, 2002, p.230). The community of practice (COP) (Lave & Wenger, 1991) is composed of colleagues who share common goals in the caring of patients. Membership in a COP is contingent upon the physician's ability to contribute to the COP's evidence-based knowledge, and to the maintenance of high standards for learning and practice (Parboosingh, 2002; Schön, 1988). A COP offers its members a safe environment in which to "exchange evidence-based knowledge, tacit knowledge and practical wisdom derived from practice experience" (Parboosingh, 2002, p.231). This interactive environment also assists physicians in the learning of new procedures and competences. This kind of collaborative and reflective learning shapes a physician's professional identity and is perceived as being "…a natural and fun thing to do" (Parboosingh, 2002, p. 231). Learning from medical practice is accentuated when solving real-life and complex problems that emerge in the caring of patients (Slotnick, 2001; Parboosingh, 2002). Experiential learning through problem solving is the natural way that physicians learn. Physicians' learning is driven by the desire to actively participate in the construction of meaning and in the solving of practical problems. Consequently, learning is defined as "the process of deriving insights from reflection on experience, insights that may be useful in solving problems in the future" (Slotnick & Shershneva, 2002, p. 199). The dissatisfaction felt by physicians with respect to their clinical practice can often be traced to the divergence between what they know and what they perceive they should know (Moore & Pennington, 2003).

The FST is based on the assumption that learning occurs in stages defined as "periods of time of variable length which are qualitatively different from one another in terms of the tasks doctors perform. The stages also have clear demarcations and they occur in an invariant order" (Slotnick & Shershneva, 2002, p. 198). The notion of a staged learning process has been drawn from two sources: (a) Dewey's definition of the thinking process when solving a problem (Dewey, 1991), and (b) existing staged theories and models all focused on physicians' learning and changing clinical practice (Geertsma, Parker, & Whitbourne, 1982; Fox and Bennett, 1998). A staged theory "describes a social or behavioral process in terms of the collection of activities that an individual must pass through in order to successfully complete the process" (Moore, 2007, p. 3). In spite of the fact that staged theories have been commonly used in the educational literature to describe the process of learning, they run the risk of oversimplifying this process. Learning is embedded in the social context and is not a static process but one that is extremely dynamic "…with many interactions among and within the stages" (Moore, 2007, p. 3). FST has built on and expanded previous staged learning theories (Geertsma et al. 1982) by introducing the following changes: (a) adding a Scanning stage at the beginning of the cycle, (b) specifying that stages of learning will vary depending on the precipitating problem (specific or general), and (c) providing criteria describing whether learning should continue to the next stage or should terminate. The FST includes four stages as follows:

Stage 0, *Scanning*: physicians examine their environment both for problems that might precipitate learning and for ideas that may be useful to them in the future. Scanning implies exploration without immediate need. Reflection is focused on the relation between a problem and practice. Physicians are alert to potential problems, with the stage ending when one is detected. This stage applies only when a physician is learning a new area. When learning means updating knowledge and skills, the cycle starts at stage 1.

Stage 1, *Evaluation:* physicians critically assess the relevance of the problem, the possibility of reaching a solution with the resources available, and its potential for changing clinical practice in a desirable way. The physician will move to the next stage only if this critical assessment is positive; otherwise, the learning activity is terminated.

Stage 2, *Learning*: physicians acquire knowledge and skills required to address the precipitating problem. When solving a specific problem reflection usually is clinical and immediate. When solving a general problem, reflection is deliberative. However, at this stage, physicians do not apply the acquired skills and knowledge. Consequently, the important issue is to know when they have learned enough to facilitate a confident application of their new knowledge and skills.

Stage 3, Gaining experience: this stage begins with the application of newly-acquired skills and knowledge. It includes the initial concerns expressed over the new abilities and ends when physicians feel comfortable with their use. Physicians also learn when best to apply those skills and how to differentiate between the types of problems to which they are applicable (Slotnick & Shershneva, 2002). At this stage, gaining experience implies: (a) applying what has been learned (skills and knowledge) in a variety of contexts and (b) accessing resources (e.g. medical literature) to verify how others have transferred these skills and knowledge to their clinical practice (Slotnick, 2000). During a post-mortem focused on the solution of a specific or a general problem, reflection is deliberative and does not necessarily occur on the site of the action (Slotnick, 1999).

The uniqueness of each learning stage is reflected in: (a) its goal, (b) the discrepancy solved during the stage (between what the physician knows and what he should know to reach the goal), (c) available resources, (d) the required criteria for completion and, (e) the level of thinking generated (Slotnick, 1999). Criteria of accessibility, applicability and familiarity are used to select resources to learn and solve the precipitating problem. With regard to criteria for completion of each stage, physicians adopt practical approaches. For example, a gynaecologist who was close to retirement decided not to learn a new therapy due to lack of time required to gain experience in such therapy during the few years left in his professional career (Slotnick, 1999). Physicians use clear and logic learning heuristics in order to decide if they are ready to terminate stage 2; that is, if they have learned enough before moving on to the next stage. Learning heuristics to put an end to a learning episode include these general principles: (a) having reached a plan of what to do next, (b) having found consistency of information from a variety of sources, (c) having increased understanding of the problem to solve, and (d) having confirmed the solution of the problem at hand with the solution adopted by peers.

A key construct in the FST is the *learning episode* which is defined as a period of time that includes "the stages that doctors move through in going from the problems that precipitate learning to the outcomes of that learning" (Slotnick, 1999, p.1106). A physician engages in a learning episode and selects learning activities for solving a specific or general problem (Slotnick, 2000). Depending on the nature of the precipitating problem, the form of learning and learning outcomes vary. A semistructured form of learning is adopted to solve specific problems precipitated by a patient. This type of ad hoc learning implies incremental learning through adjustments between prior knowledge and required knowledge to solve the problem. Physicians usually learn from resources available at their office (e.g. journals) and peer-consultation.

On the other hand, it takes longer for a physician to solve general problems, such as the updating of bodies of knowledge and skills that could lead to a change in their professional behaviour. This type of learning is qualified as formal and results into the redirecting a physician's perspective "…about the potential utility and application of what he has learned, as so is accompanied by 'moderately to strong positive feelings'" (Slotnick, 1999, p. 1107). Problem solving of general problems requires a more deliberate process, and additional effort is required to regularly access resources such as attending a CME program or hospital rounds, and/or taking courses offered by colleges or specialty societies (Slotnick & Shershneva, 2002).

A learning episode does not necessarily progress through the four stages. For example, a physician at the Evaluation stage could decide to terminate the learning episode because he realizes that he does not have access to the needed resources to solve the precipitating problem. Another reason for terminating a learning episode is arriving at the conclusion that enough knowledge has been acquired to solve the precipitating problem. If a physician is able to justify his decision to terminate a learning episode, then "the decision qualifies as early termination and not as a learning failure" (Slotnick & Shershneva, 2002, p. 200).

Besides self-directed learning focusing on the individual, physicians also learn from their peers and colleagues at work as well as from their professional organizations (Fox, Mazmaniam & Putnam, 1989). Organizational learning is a source of interaction that supports self-directed learning within the culture of health care where "each setting from primary to tertiary referral units represents a unique organization with a personality shaped by beliefs, norms, and ways of thinking, learning and adjusting behaviour to changes in the environment" (Fox & Bennett, 1998 p. 470). Consequently, organizational learning can also influence physicians' learning and bring about change by defining standards of behavior appropriate to the medical culture, and by providing a systematic review of clinical practice (Fox & Bennett, 1998). Clinical guidelines provide the standards for physicians' performance and competence. However, the implementation of clinical guidelines into physicians' clinical practice is limited by a variety of barriers (Cabana, Rand, Powe, Wu, Wilson, & Abboud, 1999). A recent comprehensive literature review (Cochrane, Olson, Murray, Dupuis, Tooman & Hayes, 2007) reveals that the barriers classified under the categories of behaviour (i.e., external barriers and environmental factors) and attitudes (i.e., characteristics of the professional groups and self-efficacy) are more important than the lack of familiarity with and awareness of guidelines.

In the present study, RFPs were required to complete collaborative activities based on the assumption that physicians' learning is enhanced when participating in a community of practice (Parboosingh, 2002; Slotnick & Shershneva, 2002). The learning stages were used as a basis for longitudinally assessing the participants' perceived learning stage and documenting potential changes during the educational intervention.

Problem solving is commonly used by physicians in their practice-based learning (Slotnick, 1999) and is presented next.

2.2.3 Problem Solving

Problem solving covers a broad area of research that has been carried out in different domains and grounded in a variety of traditions including constructivism, social constructivism and situated cognition (Gredler, 1997). Problem solving "engages higher-order skills and is believed to be among the most authentic, relevant and important skills that learners can develop" (Jonassen, 1997, p.86).

Jonassen (1997) presents a comprehensive definition of problem solving as an activity that includes cognitive, metacognitive and affective components derived from *domain* knowledge (i.e., concepts, rules and principles), *structural* knowledge (i.e., scripts, mental models) and knowledge *about self* (e.g. articulating prior knowledge). Problem solving also requires motivation (e.g. persisting in tasks) and two types of skills: *ampliative* (e.g. constructing, applying arguments/analogies); and metacognitive (e.g. planning and assessing progress) (Jonassen, 1997). This definition is applicable for solving a range of problems from well-structured to ill-structured. Models to support instruction for solving well-structured problems have been framed by information processing theories of learning. Well-structured problems are usually encountered in textbooks in order to apply specific concepts, rules and principles and possess correct, convergent answers. On the other hand constructivist and situated approaches to learning have framed ID models for solving ill-structured problems which are usually situated in everyday practice in fields such as medicine, law, politics and sociology. The complexity in solving ill-defined problems stems from the ill-defined nature of a problem, namely:

1. One or more of its elements are unknown or not known with any degree of confidence.
2. There are many solutions, solution paths, or no solution; that is, no consensual agreement on the appropriate solution.
3. Multiple criteria are needed to evaluate solutions.
4. There are no explicit means for determining appropriate action.
5. Learners are required to make judgments about the problem and defend them (Jonassen, 1997, p.68-69).

Problem space representation is the most important step in problem solving and implies reflecting on prior knowledge as well as identifying the contextual factors. Due to the dialectic nature of ill-defined problems, the learner constructs multiple problem spaces and generates alternative solutions. Finally, the learner constructs a mental model to support evidence-based decisions (Jonassen, 1997). Problem solving ill-structured problems is a context and domain-dependent activity requiring the learner to think about the problem as an authentic situation. For example, cases solved in medical schools should be similar to clinical cases encountered in clinical practice.

Problem solving is commonly used by physicians in their practice-based learning (Slotnick, 1999). In the medical literature, Barrows & Feltovich (1987) describe the challenge physicians face in solving medical ill-structured problems due to the scarcity of available information for defining the problem. The nature of the problem unfolds over time, and there is no single, right way to get that information. As new information is obtained, the problem changes, and decisions must be made in the absence of definitive knowledge. There may never be certainty about having made the right decision. Physicians solve clinical cases through clinical reasoning and this process is taught in medical education (Barrows & Feltovich, 1987). Clinical reasoning models are presented as follows.

2.2.3.1 Clinical Reasoning Models

The clinical reasoning process (CRP) is a problem-solving approach specific to the medical context and has been defined in a myriad of ways depending on the discipline, scope of professional practice, and the research method used to investigate it (Ladyshewsky, 2000). In the medical literature, Barrows & Feltovich (1987) define CRP as "a problem-solving process designed to adapt to the need to obtain more information to resolve an initially ambiguous diagnostic situation and the need to work with a progressive unfolding of information over time" (p.88).

Most of the research on CRP has been carried out in the medical field through the use of three theoretical models of clinical reasoning (Higgs & Jones, 1995): (a) hypothetico-deductive (H-D) reasoning, (b) pattern recognition, and (c) the prototype (Bordage and Zacks, 1984).

The H-D model originated in the seminal work of Elstein, Shulman and Sprafka (1979) and represented reasoning in four stages: (a) cue acquisition, (b) hypothesis generation, (c) cue interpretation, and (d) hypothesis evaluation. This model played an important role in guiding research on clinical reasoning, but was criticized for representing the CRP as a linear process (Bordage & Lemieux 1986). Barrows and colleagues later expanded on Elstein's model (Ladyshewsky, 2000). This H-D model will now be described in some depth as it was substantially drawn upon in the design of this study.

In contrast to Elstein's, the CRP model of Barrows and colleagues represents clinical reasoning and the solving of ill-structured problems as a dynamic, cyclic, and reiterative process (Barrows & Pickell, 1991). They define the CRP in six stages as: (a) *hypothesis generation*, (b) *inquiry strategy*, (c) *data analysis*, (d) *problem synthesis*, and (e) *diagnostic* and (f) *treatment decision-making*. These stages of the CRP guided the design of the case-based activities contained in the AD Program of the present study, and are now explained in greater detail.

Early on in the process, the physician generates an initial concept or representation of the patient's problem by analyzing information from a variety of sources (e.g. medical records) (Barrows & Pickell, 1991). Then, through a creative brainstorming process, physicians *generate multiple hypotheses* based on the representation of the problem. A hypothesis is "a fixed constellation of facts or ideas from the clinician's memory; when a hypothesis proves to be incorrect or too vague it will be replaced by another hypothesis" (Barrows & Pickell, 1991, p.58). A hypothesis should be viewed as "a net that will capture all the important data coming from the patient during inquiry or evaluation" (Barrows & Pickell, 1991, p. 65). The design of an *inquiry strategy* is defined as "a deductive, linear process… requiring the picking of discriminating questions, examinations or tests to rank a hypothesis…" (Barrows & Pickell 1991, p.79). The working hypothesis guides the inquiry strategy in its search for information and cues to solve the ill-structured problem. Due to the nature of the problem, there is no right way to obtain additional information to solve the patient's problem (Barrows, 1994). The *data analysis* stage includes analyzing new information and contrasting it against the working hypothesis in order to develop *the problem synthesis* (Barrows & Pickell, 1991). This on-going analysis produces a mental representation or "illness script" where accumulated facts "…are organized by the physician in a cause and effect relationship that suggests the chain of events that led to the patient's problem" (Barrows, 1994, p.16). Feltovich and Barrows (1984) were the first to introduce the concept of script in the medical literature. Scripts describe the structure of medical knowledge and assist physicians in performing tasks efficiently during a clinical situation. During hypothesis-testing, reasoning with an illness script is hypothetic-deductive (Charlin, Tardif, & Boshuizen, 2000). Scripts of experienced physicians are more elaborate than those of medical students and less experienced physicians (Charlin et al. 2000). When a physician consults one of his peers on a complex clinical case, the illness script serves as the vehicle to exchange information and organize communication (Barrows, 1994).

CRP is not a linear process, but rather an iterative inquiry cycle triggered by a variety of factors such as unsuspected findings leading to new hypotheses, or by the need to narrow down the initial hypothesis that was too broad to initiate any treatment (Barrows, 1994). At one point in the decision-making process, the physician selects the hypothesis that best matches the information gathered and arrives at a *diagnosis* described as "…one of the greatest professional challenges in medicine" (Barrows & Pickell, 1991, p. ix), and one which explains the patient's problem based on the available evidence. The final step in the process is the *treatment decision* focusing on alleviating the patient's symptoms or minimizing potential complications. This decision is influenced by several factors such as a cost/benefit analysis, as well as the patient's needs and value system. A management plan is directly related to a treatment plan. It involves selecting the required tests and monitoring the treatment progress (Barrows & Pickell, 1991).

In summary, problem solving ill-structured problems by using the clinical reasoning process characterizes the way physicians learn in medical education and continuing medical education (Barrows & Pickell, 1991). During a learning episode, physicians are driven by self-directed learning which is presented next.

2.2.4 Self-Directed Learning

Physicians are required to be self-directed learners during their professional life in order to keep updated and improve their clinical practice. Practice-based self-directed learning opens the door to life-long learning and CME (Barrows, 1994). There are different approaches to self-directed learning (Brookfield, 1984; Caffarella & O'Donnell, 1987) in the adult education literature. From the perspective of the humanist approach, Knowles (1975) defines self-directed learning (SDL) as:

> A process in which individuals take the initiative with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes… (p. 24).

This definition of SDL has been frequently used in the field of medical education (Barrows, 1985) and CME (Abrahamson et al. 1999; Fox, Mazmanian & Putnam, 1989; Mann & Gelula, 2003; McLaran, Snell, & Franco, 1998) and is embedded in the Four-Stage Theory (Slotnick & Shershneva, 2002. Barrows (1994) expands this definition of SDL in the medical and CME context as:

> The ability to continue learning throughout their entire professional lives in order to meet the often unique and changing needs of patients and the problems they present, the changing problems and demands of the health care system and to keep contemporary in medical knowledge and practice (p. 29)

Physicians are expected to acquire the SDL ability during medical school and apply it as a *reflex habit* during their professional lives in order to keep updated and improve their clinical practice. This ability entails the following eight skills: self-monitoring, self-assessment, defining learning needs, determining the appropriate learning resource, using the resource effectively, evaluating the accuracy and value of the information in the resource, recording or filing the information for future reference, and applying what has been learned to the present patient problem and future problems (Barrows, 1994; Koschman, Myers, Feltovich & Barrows, 1994). Each of these skills is described below.

Self-monitoring means constantly monitoring a physician's performance in clinical practice. It is defined as: "the ability to continuously reflect on your own thinking and progress, to reflect upon and review your thoughts and decisions during a patient encounter" (Barrows & Pickell, 1991, p. 208). Self-monitoring assesses the progress and accuracy of the clinical reasoning. In other words, it implies questioning oneself about the accuracy of each step and the level of confidence with which each decision that was taken regarding the diagnosis, treatment and management of the patient. For example, were the history, physical examination and laboratory tests appropriate?

Self-assessment is broadly defined as "The involvement of students in identifying standards and/or criteria to apply to their work and making judgments about the extent to which they have met these criteria and standards" (Boud, 1995, p. 12). However, self-assessment is more than self-grading or self-testing. Applied to the medical field, self-assessment is the skill to "determine if their (physicians) performance is appropriate for their level of training and experience and for the type of patient problems they are encountering" (Barrows, 1994, p. 30). Self-assessment implies evaluating the accuracy of their performance and being aware of strengths and weaknesses in a physician's performance. For example, should I refer this patient to a specialist because the diagnosis of his condition requires more knowledge and skills that I presently have?

The CME literature (Slotnick, 1999; Fox & Miner, 1999) indicates that critical reflection for self-assessing a physician's practice is not an easy natural process and there is doubt about the physician's capacity for effective self-assessment (Eva & Regehr, 2005). Self-assessment is considered as a necessary skill to develop life-long learning and effective learning. Effective learning implies being proactive in modifying one's learning to achieve specific goals. Self-assessment is influenced by the views and perspectives of teachers, peers, and other external sources (Boud, 1995; Eva & Regehr, 2005).

Defining learning needs is directly related to the self-assessment of the physician's strengths and weaknesses. Once a physician has identified her learning needs, she reflects on what types of skills and information are required to fulfill those needs.

Determining the appropriate learning resource implies judging the appropriateness of a specific resource to fulfill a learning need. Resources range from books, journal articles, online databases, videotapes, friends, peers, consultants and CME courses.

Using the resource effectively. This entails information seeking skills to maximize the effective use of available resources.

Evaluating the accuracy and value of the information in the resource. Assessing the accuracy and reliability of a resource implies critical thinking skills to analyze and compare information and opinions.

Recording or filing the information for future reference. This skill to manage the abundance and variety of resources available to physicians is becoming increasingly important.

Applying what has been learned to the present patient problem and future problems. This skill implies transferring what has been learned to the solution of the present and future problems (Barrows, 1994). In the context of CME or continuing professional education programs, participants are encouraged to reflect on the impact of what has been learned on their clinical practice or work setting (Moon, 2004; Lowe, Rappolt, Jaglal & MacDonald, 2007).

SDL is a complex phenomenon to investigate because it is influenced by several factors within and outside the learner. Internal factors include: the learner's view of the learning task and of himself as learner, the learner's mastery of subject matter, and the ability to reflect on learning and experience. Environmental factors include access to colleagues and communities of learners as resources for self-directed learning (Mann & Gelula, 2003).

There are only a few tools to measure SDL, one of which is the 55-items scale called the Self-directed Readiness Scale (SDRS) which was developed and standardized by Guglielmino and Guglielmino (1994). This tool has been widely used, and measures readiness for self-directed learning (Appendix B).

Self-directed readiness items are grouped into four main topics as follows: learning preferences (e.g. preference for learning independently or in group), attitudes to learn (e.g. openness and love of learning), learning skills (e.g. identifying learning needs, planning, and self-assessment), and leadership. These features are similar to Barrows' definition of SDL.

One of the limitations of the Self-directed Readiness Scale is that it is a self-reported measure whose design was based on adult learners who were not physicians. As a self-reported instrument, its validity is limited because it is based on the individual's subjective interpretation of SDL readiness rather than on objective measures (Mann & Gelula, 2003). In the present study, participants completed the SDRL, and a variety of activities that supported self-directed learning.

This section explored general and specific learning theories that are relevant to physicians' learning in the CME context, and that informed the design of the educational intervention in order to support RFPs' learning.

2.3 Instructional Models

The aim of instruction is to promote learning (Anderson & Burns, 1989). This section reviews instructional design models, methods and strategies that underlie the design of the educational intervention to support online learning. Particularly relevant to this study are: instructional design (ID) for ill-defined problems, instruction for practice-based learning (PBL), and instruction for collaborative learning and effective change in clinical practice.

2.3.1 Instructional Design

Instructional Design is a systematic process which includes: needs assessment analysis, design, production, evaluation and revision. All of these steps have been included "in virtually all ID models created in the 60s, 70s and 80s" (Gustafson & Branch, 1997, p.68). The basic ID assumptions are: (a) the desired outcome can be defined; (b) the learning gap is caused by a lack of knowledge and skill; (c) instruction is a valid approach to address the learning situation; (d) some principles of instruction are applicable to different types of learners and content areas; (e) evaluation of learning and instruction is twofold: formative and summative; (f) all components of ID should be congruent; and (g) effective instruction facilitates the learners' acquisition of identified knowledge and skills (Gustafson & Branch, 1997; Smith & Ragan, 1999).

Problem solving is typical of physicians' learning; the next section presents Jonassen's ID model (1997) for problem solving in ill-structured domains, such as in medicine.

2.3.1.1 Instructional Design Model for Ill-Structured Domains

Jonassen's (1997) ID model is grounded in socio-constructivism and situated cognition that consider problem solving as a context and domain-dependent activity. This ID model links learning theories with instructional theories (Anderson & Burns, 1989; Shuell, 1993). Table 2.1 synthesizes Jonassen's seven-step ID model and shows how the designer's actions serve as prompts for learners to move through the problem-solving cycle.

Table 2.1

Adaptation of Jonassen's ID Model

Designer	Learner
Articulate the problem domain	
Introduce problem constraints	
Locate, select and develop cases	
Construct cases to present to learners	Articulate goal(s)/Verify problem
	Relate problem's goals to domain
	Clarify alternative perspectives
	Generate problem solutions
Provide knowledge resources	Gather evidence support/reject position
Support argument construction	Construct arguments
Assess problem solutions	Implement and monitor solution
	Adapt solution

Note. From Instructional design models for well-structured and ill-structured problem-solving learning outcomes by Jonassen, D. H, 1997, *Educational Technology Research and Development, 45*(1) p. 87. Adapted with permission of the author.

Jonassen's (1997) ID model reflects the situated cognition perspective because initially the designer needs to contextualize the problem to create an authentic task environment (as in the real world). To accomplish these steps, the designer needs to work closely with subject-matter experts and experienced practitioners. Understanding the context of the problem involves taking into account contextual constraints to build authentic cases to present to the learners.

To support knowledge-based construction when problem solving ill-defined cases, Jonassen (1997) suggests providing information needed to solve the case as well as requiring learners to seek additional information and articulate their decisions in a group. The purpose is to provide learners with opportunities to explore alternative opinions and perspectives on the problem by using cognitive flexibility. Constructing arguments and counter-arguments and articulating personal beliefs in a group or with oneself facilitate the learners' refinement of the problem representation and decision as to the appropriate course of action to be taken

(Jonassen, 1997). Argumentation is an important component of problem-solving. Research on transfer of knowledge to practice indicates that the best evidence of domain- knowledge acquisition is based on a well supported argument (Resnick, 1987). However, the task of engaging learners in argumentation is not easy. Consequently, the designer should provide an argument template or checklist to scaffold argumentation (Jonassen, 1997). The AD Program provided Paired and Plenary activities with an environment where participants could articulate their arguments to support problem solving of clinical cases.

The last step in the problem-solving cycle is the assessment of the problem solutions. However, solutions to ill-defined problems are divergent and therefore difficult to assess. Both the process and product of problem solving should be assessed, including the viability of the solution and the type of supporting argument. Designers need to provide structure to prompt learners to use metacognitive strategies such as epistemic monitoring. The key aspect of implementing solutions to ill-structured problems is the fact that problem solving is a reiterative and cyclical process where learners need to re-adjust the solution depending on the available resources and other contextual constraints (Jonassen, 1997). Compared to medical students, practitioners have the advantage of discussing clinical cases solutions based on their clinical practice.

Jonassen's ID model has been relevant in the design of the educational intervention used in this study because of its applicability to the design, development and delivery of interactive environments in distance education (Bourdeau & Bates, 1997), and its compatibility with the Practice-based learning method which is presented next.

2.3.2 Instruction for Practice-Based Learning

Practice-based learning (PBL) is a collaborative, case-based, student-centered instructional method that has been described as "the best exemplar of a constructivist learning environment" (Savery and Duffy, 1995 p. 31) and one which pioneered a paradigm shift in instructional technology (Koschmann, 1996; Koschmann et al. 1994). It originated in the 50s and 60s in Canada during preclinical medical training at McMaster University (Neufeld and Barrows, 1974), and was later adopted by other disciplines (Gijbels, Dochy, Van den Bossche & Segers, 2005).

Practice-based learning evolved from the problem-based learning method used extensively in medical education and elsewhere (e.g. Barrows, 1994; Brookfield, 1986 & 1995; Fox & Bennet, 1998; Greenwood, 1993; Schön, 1987). After 25 years of existence, "problem-based" was changed to "practice-based". The main reason for this change was that "practice" is a more comprehensive and accurate term. Practice includes not only solving the clinical cases of individual patients but also broader health problems related to the community and to larger groups in society. Consequently, the practice-based learning method (PBLM) expanded the original problem-based objectives by adding to them the development of effective patient education, communication and interpersonal skills and the development of internal motivation for life-long learning (Barrows, 1994). In the context of the present study, practice-based learning is more in tune with continuing medical education which requires the on-going process of updating, confirming and expanding knowledge and skills so as to improve the quality of health care and to maintain physicians' professional license (Moore & Pennington, 2003). Furthermore, at the time of this study, some features of the PBLM (i.e., case-based instruction in small groups) were included in the accreditation criteria of the MAINPRO-C category of the College of Family Physicians of Canada.

The PBLM has been influenced by American functionalism/pragmatism as exemplified by Dewey's independent discovery learning and the role of problems as a starting point for learning in the context of real-life situations (Dewey, 1991; Gijbels et al. 2005; Schmidt, 1993). The cognitive psychology revolution lead by Jean Piaget (1954) and Jerome Bruner (1959) also influenced the PBLM.

The PBLM objectives are, in order of importance: (a) to develop effective clinical reasoning, self-directed learning, and team skills; (b) to develop life-long learning, and (c) "to acquire a rich body of deeply understood knowledge from a variety of disciplines, structured in ways that will facilitate recall and the application to the problem solving of clinical cases" (Barrows 1998, p. 630). These objectives are achieved through five stages of learning: problem-formulation, self-directed learning, problem re-examination, abstraction (articulation), and reflection (Koschmann et al. 1994). Notably, these steps are very similar to the problem-solving process used in Jonassen's ID model (1997).

Scaffolding (Wood, Bruner, & Ross, 1976) during problem solving provides "some kind of assistance so that students can accomplish a task that they would not be able to carry out without help" (Williams, 2003. p. 371). Scaffolding is distributed among group members because they support each other in solving the case. It can also be provided by a tutor who prompts learners' thinking with a non-directive approach. The success of PBLM is greatly influenced by the role of the tutor who facilitates learning by guiding and questioning instead of providing students with right or wrong answers, as is the case with the traditional Socratic teacher-centered method (Frederiksen, 1999; Houlden, Collier, Frid, John, & Pross, 2001). A well-trained tutor should ideally, also be an expert in the domain in question. Consequently, individual learning is enriched by collaboration in group. Isolated rural family physicians can benefit from all of the above mentioned advantages of peer-consultation via OCME.

Influenced by situated cognition, the PBLM anchors instruction in the interactive discussion of authentic clinical cases similar to those encountered in real-life. Consequently, in order to mimic the first encounter with a patient, the case is intentionally presented in an incomplete form and additional information is readily available when needed. The complexity of cases should be sequenced to support the changing needs of the learner at different stages of his/her learning process (Williams, 1993). As social interaction is a central feature of the PBLM, authentic clinical problems are presented to small groups (5-7 students) at the beginning of the learning sequence before any preparation or study has occurred. This learning sequence guided the design of the modular instruction of the educational intervention in the present study.

Active participation in the discussion of a case in the context of a small group should enhance students' active engagement. Active engagement is demonstrated by the asking of questions, providing information, offering constructive feedback to other members of the group, and reflecting on a learner's problem- solving process. In the PBLM, metacognitive strategies are directly taught to students to support self-monitoring and self-assessment. For example, the tutor prompts the learner to self-question the appropriateness of the problem-solving process (Williams, 1993).

Assessment "emphasizes problem solving, clinical reasoning and self-directed learning, not just the acquisition of facts" (Williams, 1993, p.412). Assessment includes the use of simulated patients, self-assessment measures and evaluation of the group work. The assessment criteria used in criterion-referenced peer- and self-assessment measures in the PBLM are: knowledge and understanding, clarity and accuracy of explanation, type of individual research skills used, critical analysis, and the ability to synthesize information to assess student learning. With regard to team interaction, assessment criteria are: communication skills, contribution to work group, attitude toward group learning, and cooperation (Aldred & Aldred, 1998). Grades can foster competition, whereas the pass-fail approach can enhance collaboration in small groups (Barrows, 1994).

Globally, the PBLM has been extensively used in higher education across subjects and disciplines (Gijbels et al. 2005). PBL curricula effectiveness has been usually compared with traditional curriculum where lectures are the predominant method of instruction. Its positive effects have been recorded in situations involving problem solving (Hmelo, 1998) and understanding principles linked to concepts (Gijbels et al. 2005), but inconclusive with regard to the acquisition of knowledge (Albanese & Mitchell, 1993, Colliver, 2000; Distlehorst & Robbs, 1998; Smits, Verbeek & de Buisonje, 2002; Vernon & Blake, 1993).

Despite the fact that the PBLM was originally conceived to support preclinical medical training, it can be also used to design CME and continuing professional development (CPD) for physicians. Extensive CME research showed the PBLM's effectiveness in changing and sustaining physicians' clinical practice for several months without further reinforcement (Zeitz, 2000). However, despite its advantages, the PBLM's potential has not been fully exploited and integrated into CME and CPD for physicians (Casebeer, Centor & Kristofco, 2003; Zeitz, 2000). For example, the PBLM has not yet replaced the large group lecture format predominantly used in the US (Zeitz, 2000).

Computer-based instruction has been advocated by various scholars (Koschmann et al. 1994; Lillehaug & Lajoie, 1998; Williams, 1992) to support the PBLM which continues to be considered as the most promising pedagogical approach for distance education (DE) (Bernard, Rojo de Rubalcava, & St Pierre, 2000; Bernard et al. 2004; Larreamendy-Joerns & Leinhardt, 2006). In fact, the PBLM is one of the predictors for effective DE as it fosters "…interactivity among learners, with the material leading to learner engagement, deep processing and understanding" (Bernard et al. 2004, p. 413). However, online social interaction and a robust educational model such as the PBLM cannot guarantee online learning and community building (Larreamendy-Joerns & Leinhardt, 2006).

This study adapted the PBLM to an online CME learning environment in order to address the gap identified in the literature review in the fields of live and online CME. This theory-driven instructional method presented relevant features for supporting learners' engagement during online learning such as case-based discussions in small group, and opportunities for self-monitoring and self-assessment. Collaborative learning is at the core of the PBLM and the instruction required to support collaborative learning is presented next.

2.3.3 Instruction for Collaborative Learning

Collaborative learning is a complex construct that groups various educational strategies and one that has been described by a profusion of terms (Dillenbourg, 1999). Broadly defined, collaborative learning "is a *situation* in which *two or more* people *learn* or attempt to learn something *together*" (Dillenbourg, 1999, p.2). Rooted in constructivist and socio-constructivist principles (Bruffee, 1999, Koschmann, 1996), collaborative learning is defined as "a learning and instructional approach typified by self-directed groups working together on a common learning task. The approach relies upon the mutual engagement of learners to jointly clarify their reasoning process and construct common meaning primarily through dialogical discourse" (Rose, 2002 p. 18). In collaborative learning, Teasley and Roschelle (1993) emphasized the importance of maintaining a shared problem space; Schrage (1990) highlighted the complementary interaction of group members; and Slavin (1990) pointed out the benefits of a higher level of understanding in group that probably could not have been reached individually.

In the PBLM, collaborative learning in groups takes advantage of peer support, the exchange of accumulated knowledge, the sharing of struggles encountered by others in their attempts to understand, and argumentation which facilitates the transfer of new information to solve a clinical case (Koschmann et al. 1994). Physicians often recognize their knowledge gaps during the work-up of the case (Barrows, 1994) and new information is acquired through self-directed learning (Gijbels et al. 2005). Empirical evidence shows that case-based discussion in teams provided the opportunity for interactive processes, and PBL discourse supported the *bystanders*' learning by providing them with exposure to how *active* members applied biomedical and clinical knowledge in solving a diagnostic problem (Frederiksen, 1999; Glenn, Koschmann & Conlee, 1999).

Collaborative forms of instruction require independence and interdependence among members of the group in online discussions. Independence implies that a truly collaborative group works independently from the instructor and takes advantage of the group's resources. Participants interact among themselves, take advantage of peer-consultation, and bring additional resources to group discussions (Ingram & Hathorn, 2004).

Interdependence implies that individual and group outcomes are interrelated because one cannot be achieved without the other. Positive interdependence promotes learning and the sharing of knowledge to accomplish the group's shared goal (Ingram & Hathorn, 2004). In this study, participants were required to actively participate in collaborative activities (Paired and Plenary).

The degree and type of division of labour are what distinguish cooperation from collaboration. Cooperation entails a fixed division of tasks that are assembled into a final product (Dillenbourg, 1999). Collaboration implies working together with flexible roles which might change during the collaborative work phase (Panitz, 2001). However, the facilitator's guiding role and the student's active role in knowledge construction are just a few similarities between these instructional methods. Extensive research in traditional classes has demonstrated the academic, social and psychological benefits of collaboration and cooperation (Johnson & Johnson, 1986; Panitz, 2001). Academic benefits include the promotion of critical thinking skills, clarification of ideas through debate and discussion, development of higher-order thinking skills, students' active involvement in the learning process, and improved classroom results. Social benefits include a support system for students, team building and leadership. Psychological benefits include the increase of students' self esteem and the development of positive attitudes towards teachers (Panitz, 2001). Research in the late 80s and 90s demonstrated "impressive student gains in knowledge and skill acquisition from collaborative learning environments" (Shute & Psotka, 1994, p. 584) in both the classroom context (Brown & Palincsar, 1989; Scardamelia, Bereiter, McLean, Swallow & Woodruff, 1989) as well as computer-based learning environments (Katz & Lesgold, 1993; Papert, 1980).

Despite the increasing number of distance education courses (Hardwick, 2000) and guidelines to create a community in virtual classrooms (Bonk, Wisher, & Lee, 2004; Kochtanek & Hein, 2000), the literature review revealed that team composition tends to be a neglected topic. Team composition was relevant to this study because the educational intervention included a variety of collaborative team activities (Pairs).

The limited literature on group composition suggests using of the criteria of random selection (Nicolay, 2002) or heterogeneous performance. Heterogeneous grouping is encouraged to enable students with different performance levels to work together to achieve common goals (Rovai, 2000). However, it is only low achievers who usually benefit from this type of grouping (Webb, Nemer & Zunigai, 2002). The literature review revealed that most studies focus primarily on live classrooms and K-12 students, neither of which is easily transferable to the virtual classroom composed of professional practitioners (McInnerney & Roberts, 2004). Finally, the criteria of heterogeneity of AD knowledge and the unfamiliarity between members were used to match physicians into pairs for solving clinical cases.

2.3.4 Instruction for Enhancing Change of Clinical Practice

The emphasis of CME since the 90s has been on facilitating change in clinical practice (Fox & Bennett, 1998). Investigating physicians' learning can explain changes in practice (Moore & Pennington, 2003; Parboosingh, 2002; Putnam & Campbell, 1989; Slotnick & Shershneva, 2002). However, there is no one best method of CME intervention to ensure change and competence in clinical practice (Grol, 2002, Mazmanian, 2002). Consensus in the literature points to the need for combined and multifaceted CME interventions to ensure effective change in physicians' performance and competence (Davis, D. A., Thomson, Oxman, & Haynes, 1995; Davis, D. A. et al. 1999). Slotnick and Shershneva (2002) argue that a learning theory is capable of explaining the variation in physicians' clinical practice because:

> learning is central to the development of new knowledge and skills directed toward changing physicians' clinical behaviors…(learning) theories identify concepts and principles important to teaching and learning and so should explain why some interventions reduce unwanted variability and others do not (p.197)

Practicality, participation and multiple-demands are the suggested principles to guide instruction in alignment with the way physicians learn (Slotnick & Shershneva, 2002). Practicality means that practicing physicians seek to solve problems they recognize having. Participation requires that physicians wish to be involved in their own learning. As the hectic and busy life of physicians is influenced by multiple-demands, instruction must be time-efficient by offering content that is relevant, and structuring the learning episode to facilitate the transfer of what was learned to solve the precipitating problem (i.e., specific or general) (Slotnick & Shershneva, 2002).

Six elements of effective change from the medical literature have been summarized by Grol (2001; 2002) and supported by Slotnick and Shershneva (2002). These principles suggest that instruction to facilitate change in professional practice should take into account the context of learning and a physician's background. Consequently, the learning outcomes of the same educational intervention will vary depending on the context of a participant's clinical practice. Needs assessment's findings that focus on a participant's perceived needs should be compared with other measures (such as chart audits) to identify possible unperceived learning needs. As it takes time to solve general problems, and in order to facilitate change in clinical practice, instruction should provide support in a sustained but varied ways (e.g. training, rewards, and feedback). Effective change will also be enhanced by comprehensive plans that take into account both the physician's individual plan to implement change as well as potential barriers in the organizational environment (e.g. policies and procedures) that could limit its implementation and/or effectiveness (Grol, 2002; Slotnick & Shershneva, 2002).

Learning is central to enhance practice-based learning and improvement (PBLI) of clinical practice. Physicians are expected to engage in PBLI. However, this requires changes in the medical culture which needs:

> Leadership by physicians engaged in forging new systems and systemic approach to patient care that involves partnerships with numerous people and organizations inside and outside the practice setting (Moore & Pennington, 2003, p.S74)

Instruction to facilitate PBLI includes: (a) easy access to data about practice performance, (b) short relevant educational experiences that must be convenient and accessible in the practice setting, (c) a system of patient-specific reminders, (d) opportunities to discuss practice performance and what has been learned from that discussion with colleagues, and (e) a seamless integration of PBLI with the work of practice (Moore & Pennington, 2003).

Instruction to enhance change in clinical practice encourages physicians to complete the Commitment to Change (CTC) tool to support the transfer of what was learned into clinical practice (Fox et al. 2003; Lowe et al. 2007; Wakefield et al. 2003; White, Grzybowski, & Broudo, 2004). After a CME event, the physician reflects on its content and lists three changes that he/she will try to implement in his/her clinical practice. After a couple of months, the physician completes a log to evaluate the extent to which those anticipated changes have been implemented, and also reflects on those factors that either triggered or limited change. However, as Mazmanian, Ratcliff, Johnson, Davis, & Kantrowitz's (1998) empirical study showed, information about potential barriers to change did not facilitate a physician's change in clinical practice. In order to increase the validity of data gathered with self-assessment tools (such as CTC), results should be triangulated with other sources, such as audit charts to validate potential changes in clinical practice (Mann & Gelula, 2003)

In this study, participants were required to complete the CTC. Furthermore, physicians discussed the content of the educational intervention during collaborative activities. Although organizational learning can play a relevant role in facilitating the integration of learning to improve clinical practice (Grol, 2002), it was not covered because it was not within the scope of this study.

In summary, instructional design (ID) for solving ill-structured problems, instruction to enhance practice-based learning (PBL), collaborative learning, and change in professional practice have all been reviewed because they contributed to the design of the educational intervention aimed at supporting online learning. The delivery of the educational intervention is presented next.

2.4 Delivery of the Online Educational Interventions

A key aspect in the design of the educational intervention is the selection and integration of the technological delivery. This is based on the assumption that technology is more than hardware and can play a significant role as an intellectual partner in supporting meaningful practice-based learning (Jonassen, 1995). This section starts with a review of the literature on Web-based instruction (WBI) in the fields of higher education, distance education and corporate training with particular attention to online discussions. The rationale is to see how what has been done in other fields can be applied to the design of a Web-based learning environment to enhance rural physicians' learning. Consequently, the second section focuses on online continuing medical education (OCME) whose attributes might be particularly useful to support practice-based learning by isolated rural family physicians. The computer literacy level of urban and rural family physicians and their access to technology are presented last.

2.4.1 Web-Based Instruction

Web-based instruction (WBI) has emerged from three fields: distance education (DE), computer-assisted-education, and Internet technologies (Bourdeau & Bates, 1997; Horton, 2000). Khan (1997) defines WBI as:

> …a hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported. A WBI learning environment should include many resources, support collaboration, implement Web-based activities as part of the learning framework, and support both novices and experts (p. 6).

WBI is an innovative way to deliver instruction and just-in-time training in the workplace. Just-in-time training implies "a high level of individualization and self-direction in the training and education processes, so that each individual may learn just what he or she needs at the time when he or she needs it" (Romiszowski, 1997, p. 28). Grounded in adult education, Horton (2000) presents the profile of the ideal learner for WBI that includes the following characteristics:

1. Learns independently and views learning positively;
2. Is self-disciplined, manages time well, and enjoys working alone;
3. Expresses himself/herself clearly in writing;
4. Has good basic computer skills and values the role of technology in business and learning;
5. Needs to acquire new knowledge now but cannot easily attend traditional training;
6. Laughs at small technical glitches and revels in solving problems;
7. Has a definite goal such as certification, a degree, or the ability to perform a specific task;
8. Is moderately experienced in a field and already understands the basic concepts of that field (p. 18).

This definition of the ideal learner for WBI has a few attributes similar to the profile of the self-directed learner (Guglielmino & Guglielmino, 1994; Mann & Gelula, 2003), a subject which was already discussed earlier in this chapter. Both profiles have learning independently and determining learning needs and goals in common. However, Horton's definition does not include the ability of working with others which is one of the most interesting features of WBI that may enhance computer-based learning (Githens, 2006).

The role media plays in supporting learning could be inferred from what Jonassen and Reeves (1996) refer to as *Learning From* and *Learning With* computers (Salomon, Perkins, & Globerson, 1991). Each of these models is grounded in opposite views of learning. The Learning From model is rooted in the behaviourist perspective whereby the learner passively absorbs information transmitted from the medium, such as basics facts that are memorized and tested as required learning. Teachers are in charge of managing the content delivered through the Internet (Hill, Reeves, Grant, Han & Wang, 2005). On the other hand, the Learning With model is grounded in the constructivist perspectives (Piaget, 1954; von Glasersfeld, 1993; Harel & Papert, 1991; Kafai & Resnick, 1996) that support learners' activeness in knowledge construction which is influenced by learners' skills and experiences as well as by curriculum design. For example, Brown (2000) describes digital learners as *bricoleurs* who actively construct knowledge during discovery-based learning on the Web where:

> Learning becomes situated in action; it becomes as much social as cognitive, it is concrete rather than abstract, and it becomes intertwined with judgement and exploration. As such, the Web becomes not only an informational and social resource but a *learning medium* where understandings are socially constructed and shared. In that medium, learning becomes a part of the action and knowledge creation. (p.14)

Bricoleurs actively construct knowledge in the Learning With model which is congruent with the ideal learner's profile and the constructivist and socio-constructivist theoretical framework of this study which assumes that participants use technology as a cognitive tool. This metaphor describes the computer as an intellectual partner that can support a variety of cognitive tasks (Lajoie, 1993). However, for the Web to be considered as a cognitive tool the learning environment should offer authentic activities and integrate instructional and metacognitive strategies (Hill & Hannafin, 1997; Sugrue, 2000) to support the learning process. For example, collaboration is a suggested instructional strategy (Pea, 1985; 1993). However, collaboration cannot be taken for granted because it might be limited by a learner's frustration with the reluctance of other members to share information, and the delay in posting messages or completing a task (Hara & Kling, 2000; Hill et al. 2005; Kanuka, 2001). The Web-based learning environment should integrate features that regulate the users' perceived orientation which is defined as the "awareness of location within a system, as well as awareness of the strategies and activities needed. The ability to recognize location, or gain 'bearings' in a system, influences success in open systems" (Hill & Hannafin, 2000, p.39). Low levels of disorientation could be considered as a challenge for the learner whereas high levels of disorientation have a negative effect on the learner (Marchionini, 1995). As the Web offers numerous opportunities for exploration which might lead to disorientation, instructional strategies that limit cognitive load during the learner's exploration phase should balance "a mix of guidance and freedom that each learner needs and can handle" (Sugrue, 2000, p. 158).

The DE field has changed dramatically since 1995 and has gained a relevant place in mainstream education (Gunawardena & McIsaac, 2004; Larreamendy-Joerns & Leinhardt, 2006) because "… nothing before has captured the imagination and interest of educators simultaneously around the globe more than the World Wide Web" (Owston (1997, p. 27). Universities are redefining their roles by offering Web-based flexible learning environments to fulfill the need to educate and train *knowledge-age* workers (Duffy & Kirkley, 2004). Research on e-learning in the corporate sector shows "a positive relationship between increased interpersonal interaction and success in computer-based learning" (Githens 2006, p. 21). However, WBI's exponential growth has been mostly driven by technological innovation and commercialization, thus creating some disappointment in academic and corporate circles as high expectations on the effectiveness of online learning were not fulfilled (Gunawardena & McIsaac, 2004; Oblinger, 2001; Rentroia-Bonito & Jorge, 2004). This is not new to the history of instructional technology (IT) where high expectations generated by innovative media (e.g. early computer-assisted instruction) that were supposed to be the catalyst for educational reform were never fulfilled (Horton, 2000; Owston, 1997). In distance education one of the reasons for this failure has been the prevalence of the business model which undermines the pedagogical quality of distance education programs. Larreamendy-Joerns and Leinhardt (2006) argue that:

> Quality is undermined when business becomes the prevailing model of distance programs…Business models may dissociate, in the name of efficiency, course conception and development from their pedagogical enactment. And in doing so compromise the desirable integrality of the scholarship of teaching (p. 583).

Consequently, WBI is not a panacea and certain conditions must be met before fully exploiting its potential for improving the accessibility and quality of online learning at a reasonable cost (Luconi et al. 2000; Owston, 1997; Weston, Gandell, & McAlpine, 1999). One of these conditions is that WBI be driven by learning and instructional theories and learner-centered principles (Bonk & Cummings, 1998; Reeves & Reeves, 1997). These early suggestions have been implemented by some universities where traditional didactic models of instruction have been gradually replaced by theory-driven constructivist learner-centered models that emphasize problem-solving, inquiry, critical thinking and community building (Bransford, Vye, Bateman, Brophy & Roselli, 2004; Duffy & Kirkley, 2004; Gunawardena, 2004; Kirkley, 2004; Lopez-Islas, 2004; Wisher, 2004). However, more research is required to examine and explain the complexity of online learning beyond the traditional systems of distance education (Kanuka, 2001; Stacey 2005; Wisher, 2004).

In order to fully exploit the potential of WBI to support online learning, empirical research in the academic and corporate sectors should: (a) develop multi-level theoretical frameworks to holistically capture the learning process through learner-context relationships and evaluate both process and performance; (b) prioritize technical stability over the development of highly sophisticated technology which could end up being unstable; (c) address the needs of all online users, including lurkers and novice users; (d) develop a personal, caring relationship with students to balance the lack of non-verbal communication and limit other negative effects of transactional distance; (e) teach teamwork skills; (f) calculate return on investment (ROI); and (g) carefully balance structured and open discussions in democratic environments (Ahmad, 2000; Ahmad & Lajoie, 2001;

Duffy & Kirkley, 2004; Githens, 2006; Powers & Guan, 2000; Rentroia-Bonito & Jorge 2004). An instructional strategy that may support online learning is asynchronous online discussion which is presented next.

2.4.1.1 Asynchronous Networked Discussions

Computer-supported-Collaborative Learning (CSCL) is the emerging research paradigm focused on WBI. This paradigm investigates online collaborative or *networked* learning based on socio-cognitive and socio-cultural theories focusing on the social context of learning and discourse used to negotiate knowledge construction (Bonk & Cunningham, 1998; Derry, Gance, Gance, & Schlager, 2000; Goodyear, Banks, Hodgson, McConnel, 2004; Koschmann, 1996).

The educational intervention implemented in the present study provided opportunities for online discussion by using the WBI's feature of asynchronous group interaction through text-based messages. Asynchronous communication provides the learner with some control through a delayed time of response and process of information, as well as the possibility to discuss more in depth because the "wait-time" encourages opportunities for reflection as demonstrated in face-to face classrooms (Berliner, 1987). In asynchronous environments, messages are organized into thematic threads so as to provide a structure and promote certain coherence in online communication. Furthermore, "text-based chats and discussion forums are automatically archived which allow those participants called *lurkers* and *nonconversants* to actually participate as 'readers' of the conversation without having posted any messages" (Mazur, 2004, p.1094).

In Web-based instruction, effective online discussions facilitate learning. This phenomenon has been reported in the fields of higher education (Anderson, T., 2004; Duffy & Kirkley, 2004), professional education (Chung 2005; Moss, 2002), and industry (Githens, 2006). Opportunities for online learning (Brandon & Hollingshead, 1999; Chung, 2005) are increased through enabling reflection on prior knowledge, the development of higher-order thinking skills, exposure to multiple perspectives, and the discussion and asking of questions (Ingram & Hathorn, 2004; Lajoie et al. 2006; Moss 2002). However, as with other features of

WBI, the design of online learning environments that support effective online discussions is a challenge. The type and quality of online interaction is influenced by a variety of factors; namely, the task type (collaborative or cooperative) (Paulus, 2004), available technology, group size, facilitation, incentive, and individual accountability (Hill, Wiley, Miller-Nelson, & Han, 2004; Ingram and Hathorn, 2004).

Research focusing on networked learning has identified the following pitfalls: (a) reporting students' reactions and experiences instead of measuring learning outcomes; (b) reporting the frequency of messages exchanged instead of taking into account contextual factors and the quality of interaction (Salmon, 2002); (c) assuming that social interaction takes place because it is technologically feasible; (d) minimizing the complexity of the facilitation of online discussions (Larreamendy-Joerns & Leinhardt, 2006; (e) focusing the design of the learning environment exclusively on the cognitive processes and neglecting the learner's socio-emotional processes (Kreijins, Kirschner & Jochems, 2003); (f) not keeping a balance between the social, cognitive, and teaching presences (Hill et al. 2005; Garrison & Anderson, 2003; Anderson,T., 2004); and (g) assuming that the preferred way to learn is through social interaction without taking into account other formats, such as that of the solitary and highly autonomous learner who prefers working alone (Hopper, 2003; Ragoonaden & Bordeleau, 2000).

Research has demonstrated that WBI's effectiveness to support online discussion is also limited by contextual factors, such as the time lag associated with the sharing of information; users' individual differences (ethnicity and gender) (Hill et al. 2004); and the students' limited computer literacy level which causes frustration and dissatisfaction (Hill et al. 2004; Lajoie, Garcia, Berdugo, Marquez, Espindola, & Nakamura, 2006).

Overall, consensus in the literature points to the complexity of designing and implementing effective constructivist online learning environments (Ahmad, 2000; Dillenbourg, 1999; Gunawardena, 2004; De Laat & Lally, 2004; Duffy & Kirkley, 2004). A combination of complementary frameworks (social-constructivist and socio-cultural views of learning) along with a multi-method approach is suggested as a way of better understanding this complexity (Larreamendy-Joerns & Leinhardt, 2006). However, more research is needed to fully exploit the unique contributions of WBI to distance education (Gunawardena, 2004) in various disciplines and fields, one of which is continuing medical education. In light of this, the next section focuses on online continuing medical education and the RFP's computer literacy levels and access to technology (as reflected in the literature reviewed at the time of the design of the present study).

2.4.1.2 Online Continuing Medical Education

As media plays a significant role in supporting learner-centered environments (Jonassen, 1995), this section focuses on lessons learned from research on continuing medical education delivered through the Web.

Various media have been used to deliver CME programs in the US and Canada over the past 80 years (Carriere & Harvey, 2001; Whitten, Ford, Davis, Speicher, & Collins, 1998). More recently, delivery through video-conferencing shows that teaching and learning are enhanced by interactive instructional methods and by the training of facilitators and participants in computer literacy and communication skills (Bitterman, Schappert, & Schaefer, 2000; Curran, Hoekman, Gulliver, Landells, & Hatcher, 2000b; Langille et al. 1998; Whitten et al. 1998; Young, et al. 1998).

Online continuing medical education (OCME) includes a variety of accredited and non-accredited programs delivered through the Web. OCME offers a variety of formats requiring different levels of interactivity. Interactive OCME programs have the potential to offer unique practical advantages to learners and instructors. For example, they can provide efficient and flexible ways for a busy and isolated physician to obtain credits, participate in discussion forums and receive prompt feedback, and access expert advice and hypertext resources (Chan, Leclair, & Kaczorowski, 1999; Jonassen et al. 1997; Peterson, 1999; Peterson, Galvin, Dayton & D'Alessandro, 1999). Furthermore, instructors and CME designers can readily change and re-use modular instructional materials, and track a learner's access to and navigation within the program.

As initially predicted (Fox & Miner, 1999; Luconi et al. 2000; Sklar, 2000) and despite the fact that the preferred format is still live CME in the US and Canada (Sklar, 2006), OCME participation has grown exponentially from 3.75% of total (181,922) *physician-participants* in 2000 to 18% of total (1,358,335) *physician-participants* in 2005 (Sklar, 2006). From 2000 to 2006 the number of sites increased from 97 to 300; activities increased from 1874 to 15,744 and credits/hours augmented from 3064 to 26,287. Since 2000, OCME fees have remained stable (70/80% of fees remained between $5 to $15 per credit/hour) and 40% of sites addressed family and internal medicine. In 2006, 59% of sites offered free instruction, with the most important sources of support coming from commercial sites (51%) and university/medical schools (33%) (Sklar, 2006).

It is worth noting, that although the seven OCME formats offered in 2000 increased to 15 in 2006, the dominant formats (*text with graphics, text-only, slide-audio lecture,* and *case-based interactive*) remained stable (Sklar, 2000, 2006) while the least popular were the new formats (i.e., *correspondence, game, podcast, and point of care learning* with each one representing 1% of total OCME). The case-based interactive format (e.g. The Interactive Patient) represents approximately 20% of total OCME and has been well accepted (Sklar, 2006). This is due to its self-paced approach, prompt feedback from academic or technical experts, usefulness, and easy, convenient access to relevant updated content at a relatively low cost (Hayes & Lehmann, 1996). Nonetheless, despite the increased level of technological sophistication and the emergence of collaborative interactive OCME formats (e.g. Correspondence), physicians still continue to predominantly prefer the individual, text-based and slide/audio lecture format (Sklar, 2006; Wutoh, Boren, & Balas 2004). The predominance of these text-based non-interactive formats might be explained by the fact that designers tend to replicate and learners prefer an instructional method that they are most familiar with without taking advantage of other features of Web-based instruction (Kanuka, 2001). This trend in online learning indicates a gap between practice and educational theory (i.e., cognitive and socio-constructivist) that suggests the use of student-centered, collaborative PBL models (Duffy & Kirkely, 2004b; Larreamendy-Joerns &

Leinhardt, 2006; MacIntosh-Murray, Perrier, & Davis, D. A., 2006; Stacey, 2005). More research is needed to better understand this phenomenon and identify the factors that influence effective online learning (Cobb, S. C., 2004; Wutoh et al. 2004).

At the time of this study, research on OCME was in its early stages. Hence, this literature review examines a few prescriptive and efficacy studies and media-comparison studies that reflect the evolution of online continuing medical education from the late 90s to the early years of 2000.

Prescriptive studies on OCME benefited from the lessons learned from live CME research. In reaction to ineffective didactic live CME in changing knowledge and clinical practice, research indicated that educational interventions should integrate practice-enabling or reinforcing strategies and offer sequential activities and a high level of interaction among participants (Davis, Thomson, Oxman & Haynes, 1992). Convenience, relevance, individualization, and independent and systematic learning were the components of the CRISIS model's criteria for ensuring effective OCME (Harden, 2005). The emphasis of prescriptive studies has been on effective "just-in-time" practice-based learning CME models that foster reflection on physicians' practice gaps, the identification of best resources appropriate to their learning needs, ways to facilitate the acquisition and retention of knowledge, and the transfer of learning into clinical practice (Abramson et al. 1999; Allington, Bailey, Dix & Glatzer, 2000; Barnes, 1998).

The majority of the early efficacy studies were centered on assessing the feasibility of case-based multimedia interactive OCME programs. However, the limitation of these studies was that they only evaluated participants' satisfaction (e.g. Hayes & Lehman, 1996; Horn et al. 1997; Peterson et al. 1999).

Media-comparison studies on the e-learning of the health professions assessed the effectiveness of Internet-based CME compared to other media (e.g. print) in changing knowledge, performance and health care outcomes. A literature review (Wutoh et al. 2004) of 16 randomized controlled trials (RCTs) shows that Internet-based CME is as effective as traditional formats in imparting knowledge to health professionals (in the areas of medicine, nursing, dentistry, pharmacy, and allied professions). However, only 3 out of 16 RCTs were effective in changing clinical practice (Curran, Hoekman, Gulliver, Landells, & Hatcher, 2000c; Kemper et al. 2002; Marshall, Brett, Stewart & Ostbye, 1999). One possible explanation for this reported ineffectiveness in changing clinical practice was that online CME programs replicated the same deficiencies of traditional didactic formats of CME (Wutoh et al. 2004). Furthermore, change in clinical practice is influenced by a myriad of variables, one of which is organizational learning, a suggested topic for future research (Stewart et al. 2005). A randomized controlled trial (RCT) compared the instructional efficacy of the OCME with a live workshop (Fordis et al. 2005) and showed that the former produces sustained gains in knowledge and behaviour changes that are comparable or superior to those of the latter format.

An effective online instructional model to support knowledge gains and change in clinical practice includes interactive case-based instruction in small groups with asynchronous moderated discussions. Sustainability of knowledge gains and change in practice ranged from 1-12 months. Relevant factors that support effective online instructional models are convenience of location (FP's setting), case-based instruction, small group interaction, peer-support, self-direction in selecting content, and effective facilitation by a trained family physician (e.g. Casebeer et al. 2004; Curran et al. 2000c; Marshall et al. 1999; Sargeant et al. 2004; Short, Surprenant, & Harris, 2006; Stewart et al. 2005).

2.4.1.3 Asynchronous Networked Discussions in CME

Asynchronous online discussions via computer-mediated-conference (CMC) have the potential of creating a community of practice via participants' interaction, collaboration and knowledge building as well as the fostering of higher-order thinking skills (e.g. critical reflection). However, as demonstrated by the history of instructional technology and by the computer-supported-collaborative learning paradigm (Goodyear et al. 2004; Salmon, 2002), CMC benefits cannot be taken for granted and low participation is a recurrent phenomenon in OCME (Curran, Kirby, Parsons & Lockyer, 2003; Sargeant, Purdy, Allen, Nadkarni, Watton & O'Brien, 2001). One possible explanation is that online interpersonal interaction in Canada is encouraged by CME accreditation criteria, but is not mandatory; hence, clear directives are missing (Sargeant et al. 2004). Nonetheless, more research is needed to identify those key factors that influence the frequency and nature of interpersonal interaction (i.e., instructor-learner and/or learner-learner). In fact, even though research has demonstrated that OCME is as equally effective as live CME in changing physicians' knowledge (Cobb, S. C., 2004; Fordis et al. 2005; Wutoh et al. 2004) and that participants are generally satisfied with online learning, CMC effectiveness in facilitating participants' learning is still inconclusive (Curran et al. 2003; Muilenberg & Berge, 2001; Sargeant et al. 2001).

Exploratory qualitative studies addressing Canadian rural and urban family physicians provide evidence that interpersonal online interaction was influenced by: participants' characteristics, instructional methods and type of facilitation (Curran et al. 2003; Sargeant et al. 2004). Participants' characteristics included social comfort, perceived educational value of interactions, levels of computer literacy and responsibility to engage in active participation and concerns with confidentiality in posting opinions in a virtual public space (Curran et al. 2003; Curran, Lockyer, Kirby, Sargeant, Fleet, & Wright, 2005; Sargeant et al. 2004; Sklar, 2006). Instructional methods cover teacher-centered or learner-centered methods. A teacher-centered method fosters learner-facilitator interaction instead of learner-learner interaction (Sargeant et al. 2001; Curran et al. 2000c).

Consensus in the literature points to the influential role played by the facilitator in practice-based learning in both live (Barrows, 1988) and OCME. As demonstrated by a seminal empirical study, off-line and online facilitation is required to ensure support for online learning of Canadian RFPs. Off-line facilitation for ensuring logistics and participation required double the amount of resources anticipated (Sargeant et al. 2001).

Online facilitation specifically requires the training of the content facilitator. This should include not only pedagogical knowledge in order to increase participants' understanding of the content to be learned, but also additional skills for fostering peer-to-peer interaction and reflection, as well as the ability to create an open and friendly online environment (Sargeant et al. 2004).

Notwithstanding the increased level of technological sophistication and the potential benefits of collaborative instructional methods, the trend in OCME has been towards the predominance of individualized text-based non-interactive instruction. This tendency is not surprising because physicians and CME providers alike tend to replicate the instructional method they are most familiar with, that is, the traditional lecture format which is easier and cheaper to design and implement.

In spite of the exponential growth of OCME, participation by physicians is still limited by: (a) participants' low computer literacy level and comfort in navigating on the Internet, (b) lack of user-friendly registration procedures, (c) concerns with the disclosure of private information in a public virtual space; (d) lack of information about where and how to access OCME; and (e) a preference for attending live CME which is considered as sufficient for staying updated (Sklar, 2006).

The identified knowledge gaps in the design, delivery and evaluation of OCME indicates the need to design customized theory-driven educational interventions that complement self-reported measures with objective measures and effective reinforcement strategies. Furthermore, there is a scarcity of randomized controlled trials and time-series designs (Casebeer et al. 2004; Cobb, S. C., 2004; Wutoh et al. 2004) to systematically evaluate the effectiveness of the educational intervention in supporting the acquisition and retention of knowledge, as well as assessing changes in physicians' performance and patients' outcomes.

The main limitations of available literature reviews focusing on OCME are the relatively reduced sample of studies covered, the heterogeneity of health professions, and the wide range of sample sizes which reduces the possibility of generalizing (Cobb, S. C., 2004; Sklar, 2000, 2006; Wutoh et al. 2004). Furthermore, and as other researchers in the field have noted, a systematic review of the literature in WBI, and specifically in OCME (Curran et al. 2005), is considered to be difficult to carry out due to the rapidity with which the media and delivery systems change, and online learning evolves. Hence, studies performed at different times are difficult to compare, and the level of generalization is low. The present study was designed and implemented in the late 90s and early 2000s when

OCME was in its early stages, and only a few prescriptive and efficacy studies addressing rural family physicians online learning were available.

Overall, it appears that OCME rooted in Web-based instruction can support the type of learning that RFPs need. However, what is its feasibility to support learning by novice Web-users with limited computer literacy and access to the Internet? This point is presented next.

2.4.1.4 Rural Family Physicians' Computer Literacy and Access to Technology

Two basic conditions for the success of online learning are that users should be computer literate and feel comfortable with technology (Sargeant et al. 2001; Sargeant et al. 2004). In Canada, rural family physicians (RFPs) slowly and progressively embraced the use of computers (Sullivan & Buske, 1998) and the Internet (CMA 2000). In 2000, the majority of RFPs (81 %) used a computer, compared to only half (52%) in the 1998 survey (Sullivan & Buske, 1998). In 2000, the majority of medical specialists (83%) used the Internet compared to 77 % of surgeon specialists, 77% of rural physicians and 76 % of urban physicians. Between 1998 (Sullivan & Buske, 1998) and 2000 (CMA, 2000) female physicians increased their use of computers from 73% to 83%, whereas male physicians' use only increased from 81% to 84% (CMA, 2000). Younger physicians (34 and under) increased their Internet use from 58% (Sullivan & Buske, 1998) to 85% (CMA, 2000), whereas older physicians (65 and over) increased from 35% (Sullivan & Buske, 1998) to 44% (CMA, 2000). Canadian physicians' most frequently reported uses of the Internet were for: (a) e-mail (46%), (b) access to the World Wide Web (47%), (c) bibliographic database search (45%) and, (d) CME delivered on diskette or CD-ROM (40%) (Sullivan & Buske, 1998). RFPs reported slight differences in the priority of use: first CD-ROM (45%), second e-mail (43%) and third bibliographic database search (40%) (Sullivan & Buske, 1998). In 2000, the priority of use for Canadian physicians remained the same although there was an important increase in the proportion of users. E-mail users increased from 46% to 72 %; access to the WWW increased from 47% to 72 %; and bibliographic database search increased from 45% to 67% (CMA, 2000). RFPs also reported an increase in the use of e-mail (72%), followed by the WWW (71 %), Medline searching (60%) and reading or browsing medical journals online (50%) (CMA, 2000). In Newfoundland, more than two thirds of RFPs used computers less than six hours per week at home or at the office, and used computer software (72%) and e-mail (73%) more than the Internet (60%) (Curran et al. 2000a). These results are similar to those of the Canadian Medical Association (CMA) survey (Burke & Sullivan, 1998). In the United States young physicians and women in particular, have been early adopters of online CME (Harris, Novalis-Marine, Harris, 2003).

In summary, since 1998, Canadian physicians have been increasingly using computers and accessing the Internet for a variety of activities. Attending OCME is an emerging phenomenon. As expected, younger physicians appeared to be more computer literate and more frequent Internet users than older physicians (CMA, 2000). At the time of the design of the present study, RFPs were not among the most computer literate and frequent Internet users within the medical profession. The challenge was to design interactive, engaging OCME programs that would capture the interest of a RFP audience with a relatively low computer literacy level, limited access to the Internet and, more importantly more accustomed to attending traditional lectures in live CME programs and/or passive OCME programs.

2.5 Evaluation of Educational Interventions

Assessing the impact of CME on physicians' learning and behaviour has been driven by concerns over the quality and rising costs of health care in North America and by the limited availability of reliable tools to measure CME effectiveness (Moore, 2003, 2007). Don Moore offers a theory-driven framework to evaluate the effectiveness of CME which is presented next.

2.5.1 The Outcomes-Based Continuing Medical Education Evaluation Framework

The Outcomes-based Continuing Medical Evaluation framework (OBCMEF) draws from two types of sources: (a) decision-making and evaluation models, for example the popular 4-level Kirkpatrick model adapted to the health domain by Dixon (1978), and the Phillips (1997) model used in industry and training; and (b) an emerging theory of how physicians learn and change that assumes that CME can facilitate behavioural change by offering relevant, multiple educational activities that predispose, enable and reinforce change (Davis, D. A. et al. 1992; Fox et al. 1989).

In Moore's framework, a CME activity is designed and evaluated at one or more levels and outcomes. An effective activity is defined as "having accomplished an intended or desired result or outcome" (Moore, 2007, p. 35). There are three types of outcomes: short, medium and long term. In CME, "an outcome would be defined as the result of consequence of a CME event or events" (Moore, 2003, p. 251). The Outcomes-Based Continuing Medical Education Evaluation Framework is presented in Table 2.2.

Table 2.2

The Outcome–Based Continuing Medical Education Evaluation Framework

Levels	Outcomes	Definition of outcomes
1	Participation	The number of physicians who registered and attended.
2	Satisfaction	The degree to which the expectations of the participants about the setting and delivery of the CME activity were met.
3	Knowledge	A short term outcome implies changes in declarative and procedural knowledge of the participants.
4	Competence	A short term outcome implies demonstration of how to do something in the educational setting.
5	Performance	A medium term outcome implies changes in practice performance as the result of the application of what was learned in the work setting.
6	Patient-health	A long term outcome implies changes in the health status of patients due to changes in practice behaviour.
7	Population-health	A long term outcome implies changes in the health status of a population of patients due to changes in practice behaviour.

Note. From: How physicians learn and how to design learning experiences from them: An approach based on an interpretive review of evidence by D. Moore, 2007. In S. Fletcher (Ed.), *Proceedings of the Macy Conference on Continuing Education in the Health Professions*, November 28 – December 1, Southampton, Bermuda, p. 36. Adapted with permission of the author.

Table 2.2 presents the seven levels of evaluation and outcomes of the OBCMEF. The levels of patient-health and population- health were excluded from the present study because they were outside its scope. Initially, Moore's framework covered six levels: participation, satisfaction, learning, performance, patient health status, and population health status (2003). More recently, Moore's framework evolved to seven levels in which the level of Learning was re-named Knowledge and included declarative and procedural knowledge. Competence level was also added and focuses on how the learner can apply the content learned from of a CME activity to the educational setting (Moore, 2007). The Knowledge level corresponds to the Learning stage of Slotnick's Four-Stage theory (1999). The Competence and Performance levels correspond to the Gaining experience stage in Slotnick's Four-Stage theory (1999).

Grant (1999) argues that causality between the educational intervention and the observed effect

> …can be rarely demonstrated…(because) the CPD event is usually not isolated but is influenced by many uncontrolled and controllable variables that impinge on the clinician ability to use newly acquired knowledge and skills to their full potential…expert's clinician clinical practice is a highly complex, integrated and judgemental process. Measuring identifiable parts of that process is often a very partial view of the practical context. Where the integrated behaviour can be described, its measurement is not possible using conventional tools (p. 220).

Grant (1999) concludes that physicians' professional judgement is key for assessing clinical practice and that more research is needed in assessing the outcomes of continuing professional development (CPD).

Despite the fact that Moore's framework has not been systematically evaluated in the CME context (Moore, 2003a), it seems to be a promising tool for collecting information on the impact of a CME event on physicians' behaviour, patients, and health population outcomes.

This chapter reviewed theories of learning and instructional models. The research questions that guided this study, and which are presented next, were derived from the knowledge gaps that were identified in this literature review.

2.6 Research Questions

The central question that guided this study was: How does an online continuing medical education (OCME) environment support the rural family physicians' learning? Three subquestions were derived from the central one and are stated as follows:

1. What is the evidence of the participants' learning about Alzheimer's disease knowledge?
2. How effective is the AD Program in supporting the participants' learning process?
3. What is the evidence of impact of the AD Program on the participants' reports of their clinical AD practice?

2.7 Summary

This chapter reviewed a variety of topics. The context of the study covered RFPs' characteristics and CME and its accreditation criteria. The theoretical framework reviewed general and specific theories in relation to physicians' learning and change in clinical practice. Instructional methods included ID models for solving ill-defined problems, for practice-based learning and collaborative learning. Delivery of the educational intervention reviewed Web-based instruction and trends in online CME (OCME).

Rural family physicians need specific training through CME for the revalidation of their medical license, for the update of their knowledge and skills, and for creating bridges to break their isolation. However, CME has been in a state of transition in its search for effective models for improving physicians' performance and competence, and in facilitating the translation of knowledge into clinical practice. Attendance at live CME has been limited by different barriers which justify an OCME program tailored to the needs of Quebec and Ontario RFPs. Nonetheless, empirical evidence in the academic and corporate sectors confirmed that Web-based instruction (WBI), despite its exponential growth, is not a panacea and that certain conditions should be met in order to fully exploit its benefits as a cognitive tool (Sugrue, 2000; Owston, 1997). Furthermore, the Computer-supported-Collaborative Learning research paradigm pointed out several limitations of WBI research and showed the complexity of designing and implementing effective constructivist online learning environments. Recommendations include the use of complementary frameworks focused on the learner's cognitive and socio-affective processes, and the use of a multi-method approach.

OCME has grown exponentially in the US and Canada since the late 90s, offering a variety of formats with different levels of interactivity. However, individual, text-based, and slide/audio lecture format instead of case-based instruction in small groups with asynchronous moderated discussions, is still the predominant format. More research is needed to explore the contextual factors that can influence productive online discussions, and the employment of appropriate methodology to analyze the nature of online collaboration. The literature review revealed some suggestions in support of online learning and discussions such as providing on-line and off-line facilitation; training the facilitator to create a student-centered learning environment; and engaging the participants' higher-order thinking skills.

In conclusion, the literature review demonstrates that the field of OCME, despite its exponential growth, is in a state of transition; faces gaps between theory and practice; and is in search of more effective ways to support physicians' learning and change their clinical practice. Even though research in OCME has demonstrated its ability to be equally or more effective than live CME in changing physicians' knowledge (Cobb, S. C., 2004; Wutoh et al. 2004), the challenge is to design interactive programs based on current theories of physicians' learning that are aimed at engaging an audience with a relatively low level of computer literacy, and one audience which still prefers to attend traditional live CME programs.

The next chapter is focused on the methodology that guided this study.

CHAPTER THREE: METHOD

The purpose of this study was to explore rural family physicians' (RFPs) learning in online continuing medical education (OCME) as a means of answering the following overall research question: How does an online continuing medical education (OCME) environment support rural family physicians' learning about Alzheimer's disease? The study investigated participants' learning (RQ#1), the effectiveness of the Program in supporting their learning (RQ#2), and the impact of the Program on their reports of clinical AD practice (RQ#3). This chapter includes the following sections: the research approach, the participants, data collection and data analysis.

3.1 Research Approach

A case-study approach was selected for the present study. A case-study is defined as "an exploration of a 'bounded system' or a case (or multiple cases) over time through detailed, in-depth data collection involving multiple sources of information rich in context" (Creswell, 1998, p. 61). This approach was chosen because this study investigates a specific phenomenon (i.e. online learning) within the context in which it occurs. The description of the context is important because it may reveal a variety of relevant explanatory variables of the phenomenon under scrutiny (Yin, 1993).

This case-study is descriptive and collective (Yin, 1993). It is descriptive because it investigates a specific phenomenon in-depth; that is, the process of learning which takes into account the participants' perspectives (Gall, Borg & Gall, 1996; Merriam, 1988). Yin (1993) argues that a *descriptive* theory guides the design and implementation of a descriptive case study. Descriptive theory does not explain cause-effect relationships. Rather it defines the scope and boundaries of the description as well as the criteria to select the kind of information to be included in the description. The case is described through vignettes and thick description so that readers will be able to derive *naturalistic generalizations* which…

> …develop within a person as a product of experience. They derive from the tacit knowledge of how things are and why they are, how people feel about

> them, and how these things are likely to be later or in other places with which this person is familiar… (Stake, 1978, p.6).

Naturalistic generalizations refer to understandings that are private and that are embedded in the reader's experience. The case of the present study also qualified as *multiple or collective* (Stake, 1995; Yin, 1993) because it included 8 mini-cases. Each family physician's learning represented a mini-case embedded in the collective case (Gall et al. 1996); that is, bounded by time (i.e., 9- month AD Program) and by place (i.e., Web-based learning environment).

3.2 Participants

This descriptive and collective case study included 3 types of participants: the investigator, the learner, and the facilitator. The investigator assumed the roles of researcher, designer and educator. The learners were 8 rural family physicians (RFPs) who attended the AD Program. The facilitator was a family physician with expertise in the therapeutic area of dementia. In the present study, the learners and facilitator were identified with codenames so as to ensure confidentiality and anonymity. Each type of participant is described in this section.

3.2.1 Investigator Roles

The investigator in the present study took on three roles (i.e., researcher, designer and educator) that are described in this section.

Consensus in the qualitative research literature (Bogdan & Biklen, 1992; Creswell, 1998; Flick, 2002; Merriam, 1988) indicates that the researcher plays a key role as a filter for designing the study and collecting and interpreting data. As "the researcher's self is an integral constructor of the social reality being studied" (Gall et al. 1996, p. 18), clarifying the researcher's bias, perspective, and background is required to ensure the internal validity of the study. This descriptive collective case study was influenced by the researcher's background in social anthropology and educational psychology, her cultural background (Italian female with international experience), her professional experience as an educational consultant in the health care domain, and by her vision of the potential of Web-based instruction (WBI).

In this study, the researcher had to redefine her role, given her past ethnographic research background as a social anthropologist (in Mexico, Spain, and Canada) where she described the culture of the 'informants' (participants) through extensive participant observation and interviews. In the AD Program, the relationship with the informants, type of context, and the fieldwork's boundaries were radically changed. The phenomenon to investigate was embedded in a virtual classroom where written discourse was the most common means of communication. Participants interacted through e-mail and discussed clinical cases in private and public spaces. Computers mediated learning, instruction, and data collection procedures. The *community of practice* (Lave & Wenger, 1994) expanded its horizons beyond the local rural clinical practice to create networking between geographically remote physicians facing similar needs and professional problems. Learning does not occur in a vacuum but is rather viewed as a situated activity. The *community of practice* is defined as the context where newcomers interact with old-timers for the purpose of learning via participation in a socio-cultural practice (Lave & Wenger, 1994).

The investigator took on the role of designer of the AD Program. Moreover, the educational potential of the Web influenced the selection of this medium to deliver the intervention. Having attended several training workshops at McGill University, she designed and implemented the AD Program on WebCT. As a novice WebCT user, the designer felt empathy with the majority of participants who experienced frustration when learning to use a new platform.

The investigator also played the active role of educator, an approach supported by a similar study (Sargeant et al. 2001) that encouraged having more than one person handling the implementation of OCME programs. The higher level of complexity of the present study justified this decision when compared with the Sargeant and colleagues' study (2001). The educator took care of administrative and logistical issues (i.e., accreditation), the participants' compliance with required tasks, and follow-up procedures. The coordination of logistics proved to be very demanding and required multiple tasks before and after the launching of the AD Program. Two years before its launching, the most important tasks were the recruitment of participants, the search for candidates to replace drop-outs, and the continuous communication with participants. During the Implementation phase (May 2003- February 2004), the educator's most relevant tasks were monitoring the participants' compliance, and assisting them with technological support through electronic communication that encompassed a total of 510 e-mail messages. The majority of these messages (378 or 73%) were sent by the educator to the participants, with the remainder being sent by the participants to the educator. The educator patiently applied the appropriate tone to encourage physicians to comply with the required tasks. She anticipated the participants' needs and offered quick and easy solutions to their concerns and problems. She fortunately worked from home which provided her with the opportunity to closely monitor the participants' needs on a daily basis.

The educator faced a challenge similar to that of an orchestra conductor who has to ensure that all the instruments are properly tuned so as to play harmoniously. Half of the participants complied effectively, with the other half encountering some difficulty with the AD Program's requirements being under the constant pressure of their clinical practice. As a result, the educator had to exercise flexibility in accommodating their needs. For example, during the Plenary discussion on AD diagnosis, Luke asked permission to post questions concerning the AD treatment of one of his patients. Despite the fact that the topic of treatment was scheduled for the next few weeks, Luc's requirement was immediately addressed and met.

The educator provided support, close guidance and encouragement. In order to maintain a friendly atmosphere in the virtual classroom, she exchanged messages with typical Italian expressions so as to create a colloquial and friendly tone.

The investigator, who assumed the roles of researcher, designer and educator, took full advantage of a rich and unpredictable experience replete with positive lessons and exercised the flexibility and understanding required for working with motivated but very busy professionals. A key player in online CME programs is the facilitator whose description follows.

3.2.2 Facilitator

The Plenary activities were a central component of the AD Program and were designed following the PBL method. The facilitator's role was to moderate discussions, clarify issues, and answer participants' questions regarding the AD content to be learned. The expected role of the facilitator was to prompt participants' thinking and avoid lecturing (Barrows, 1988).

In selecting a facilitator, the challenge was to prioritize the degree of expertise in three areas: (a) content to teach (dementia), (b) instructional method (PBL), and (c) computer literacy that included familiarity with WebCT. Finally, a female family physician, who was both a university professor as well as a practitioner in a local hospital in the field of dementia, was recruited. She had extensive knowledge of and experience in the field of dementia, and had been trained to deliver the accredited face-to-face CME program for family physicians entitled *Early Alzheimer Disease. Diagnosis, Treatment and Management* (AXDEV, 2000). As a family physician, she shared the same language and background as that of the participants. She was also experienced in the PBL method and was quite comfortable working on the Web. To ensure sufficient familiarity with WebCT, the facilitator attended WebCT training workshops given at McGill University. Notwithstanding, expertise in the content to be taught was the most important criterion used in selecting the facilitator, followed by expertise in both the instructional method and computer literacy.

In the present study, the facilitator's training included meetings with the designer/researcher to clarify her role in the AD Program. Materials included: (a) a summary of the tutorial process in the PBL method which emphasized the prompting of students instead of lecturing, (Barrows, 1988); (b) a table that specified the type, frequency and modality of the facilitator's tasks in the AD Program, and (c) participation in workshops to learn how to use WebCT.

3.2.3 *Learners/Rural Family Physicians*

The rural family physicians (RFPs) who assumed the role of learners were selected through purposeful sampling qualified as *convenience* (Creswell, 2001; Gall et al, 1996; Miles & Huberman, 1994). In fact, the researcher initially recruited RFPs through the McGill rural network following 4 criteria: medium computer literacy level, gender, rural practice and English proficiency. The limited size of the sample (12) was justified by the qualitative nature of the research design as well as the requirements of the PBL method and the accreditation criteria from the College of Family Physicians of Canada.

Yin (1993) argues that "multiple case studies should follow a *replication* not a *sampling* logic. This means that 2 or more cases should be included in the same study precisely because the investigator predicts that similar results (replications) will be found" (p.34). The purpose of a *sampling* logic is to generalize findings to a population because the assumption is that the cases selected by specific criteria represent a larger universe. Surveys or experimental methods usually employ *sampling* logic (Yin, 1993). In multiple case studies, comparing cases offers the potential to record evidence or the absence of replicability. The more replicability, the more robust is the design of the case, and findings are generalized to other similar cases framed by the same theory. The replication logic "…strengthens the precision, the validity and the stability of the finding" (Miles & Huberman, 1994, p. 29). The multiple case-study includes within- and cross-case analyses aiming at finding similar results (i.e., replications).

3.2.3.1 Recruiting Procedure and Dropping Out

The educator met significant challenges in identifying and recruiting a sample of 12 candidates to participate in this study, as well as replacing drop-outs. Of the first sample only four RFPs (Marcela, Marc, Diana, and George) completed the AD Program in its entirety.

A combination of factors slowed down the recruitment process: (a) the type of audience, that is, busy professionals with limited technological skills and equipment; (b) timing; that is, RFP's offices were closed during summer vacations or potential candidates were overworked due to shared locum coverage (temporarily replacing their peers); (c) limited resources, that is, only one person orchestrating the study; and (d) lack of efficient and reliable methods for identifying potential candidates.

Between 2001 and 2003, 8 RFPs dropped out at different stages of the study. Four RFPs (Robert, John, Maria and Mercedes) dropped out before its launching, citing a number of external factors such as moving to a remote location without access to Internet, pregnancy, and a busy professional schedule.

Another 4 RFPs dropped out (Charles, Peter, Paul and Kerry) a year after the launching of the AD Program for the following reasons: (a) busy professional schedule, (b) frustration with technology, (c) impatience, and (d) the time needed to learn WebCT that was considered as unfriendly (Reality Check Tool, Appendix C). Of the participants who dropped out after the launching of the AD Program, Paul was the one who completed the biggest portion, and the one who received the most assistance from the educator. His demographic profile was similar to that of the group who completed the AD Program: aged 54, having medium computer literacy and caring for a medium size AD clientele. Paul, however, had the advantage of accessing the AD Program with a high-speed connection and had some experience in OCME programs. However, his comfort level in those OCME programs was rated as low and his competence level as medium. The educator took special care in encouraging and coaching Paul through electronic mail and phone, when dealing with his frustration and impatience. He finally admitted that he could not "stand his perfectionist side" and added:

> Concerning the program, I am somewhat used (for better or for worse) to programs sent by drug companies that are types of questionnaires; one thing that I noticed between these and the Luconi program is, for computer-innocents like me, I am told when I have actually finished a section, and told exactly where to go next. I hadn't actually realized that I had done section three (or whatever). Again for computer-innocents, I think that a more directive program could be helpful and time-saving. The actual concept of the program is very interesting and I think has a definite future. When my daughter becomes a doctor, she'll be so computer-savvy that all my whiney complaints will be a thing of the past. Thanks for your patience (Paul, 0803).

3.2.3.2 Final Sample

The final sample which completed the AD Program was composed of 8 rural family physicians. All of them signed the consent letter (Appendix D) and completed the Needs Assessment which was instrumental in tailoring the AD Program to their needs. Their participation was compensated with a $500 honorarium in recognition of their effort lasting over 9 months. Two regulatory bodies, the McGill Ethic's Committees at the Faculty of Medicine and the Faculty of Education, approved this study and delivered the Certificate of Ethical Acceptability for research involving human participants (Appendix E). The subject-matter experts (SMEs), the facilitator, and the CME director at FMOQ signed a Confidentiality Disclosure Agreement.

Table 3.1 presents the demographic characteristics of the final sample that completed the AD Program: the date participants joined the AD Program, their age, years of practice, type of practice and setting, geographical location, locum coverage, and size of yearly AD clientele (mild, moderate, severe stages); and the distance from referral centres, specialist services, and high technology health care facilities.

Table 3.1

Demographic Characteristics of the Final Sample

RFPs	*Age*	*L-P*	*T-P*	*Set*	*Pv*	*Lo*	*C size*	*R-200*	*R-400*	*Mild Stage*	*Mod Stage*	*Sev Stage*	*SC*	*MC*	*LC*
Mathew	47-57	> 25	S	Priv	ON	L	< 10,000	X		26-50	11-25	1-10		X	
Marcela	36-46	6-15	G	Priv	QC	L	< 10,000	X		1-10	1-10	0	X		
Mark	25-35	6-15	G	P-H	QC	L	> 10,000	X		1-10	1-10	11-25		X	
Luc	47-57	6-15	G	P-H	QC	L	< 10,000	X		1-10	1-10	0	X		
Ronald	47-57	> 25	S	Priv	ON	L	< 10,000	X		> 100	26-50	26-50			X
Norma	25-35	< 5	G	P-H	ON	L	< 10,000		X	1-10	1-10	1-10	X		
Diana	47-57	> 25	S	Priv	QC	L	< 10,000	X		26-50	11-25	11-25			X
George	47-57	16-25	G	Ho	QC	H	< 10,000	X		1-10	1-10	1-10	X		

Note. RFPs = rural family physicians; L-P= length of practice; T-P = type of practice; G = group practice; S = solo practice; Set = setting; P-H = private and hospital-based practice; Pv = province; ON = Ontario; QC = Quebec; Lo = locum coverage; L = low; H = high; C size = community size; R-200 = < than 200 km from referral centers & special services; R-400 = 400-600 km from referral centers & special services; Mod = moderate AD stage; Sev = severe AD stage; Pts: patients. SC= small clientele (0-40 pts); MC = medium clientele (41-81 pts); LC = large clientele (> 81 pts).

Table 3.1 illustrates the characteristics of the final sample. Five were males and 3 females. Five were aged 47-57. Half of the physicians had practiced family medicine between 5 to 15 years, while the other half had practiced between 16 to 25 years or more. Five RFPs practiced family medicine as a group. The most frequent type of practice setting was a clinic/private office (50%), followed by a combination of clinic/private office and hospital-based practice (25%). The majority of physicians had low locum coverage and served a population of less than 10.000 inhabitants, which coincides with the definition of rural practice. All participants except one worked at less than 200 km from secondary referral centres, specialist services, and high technology health care facilities. Five participants practiced in Quebec and 3 in Ontario.

The participants' AD clientele represented the three stages of the disease (mild, moderate, and severe). Participants cared for more patients at the mild AD stage than at the severe and moderate stages. Consequently, the AD Program's content was focused more on the early stage of AD.

All participants were members of the College of Family Physicians of Canada (CFPC). The second most frequent associations were the FMOQ (Fédération Médecins Omnipraticiens du Québec) and the Society of Rural Physicians of Canada. The fact that the CFPC and the FMOQ accredited the AD Program may have motivated the RFPs to participate.

As shown in Table 3.2, participants completed a standardized instrument that measures the degree of self-directed learning readiness (Guglielmino & Guglielmino, 1994; Appendix B) as well as completing a self-reported measure on preference of type of learning environment (Ahmad, 2000).

Table 3.2

Self-directed Learning Profile and Preferred Learning Environment

Participant	SDLR profile	Preference of learning environment
George	High	Mx
Norma	High	Mx
Marcela	Above average	DL
Ronald	Above average	GS
Luc	Average	Mx
Mathew	Average	Mx
Mark	Average	Mx
Diana	Below average	Mx

Note. SDLR = Self-directed learning readiness; Mx = mixture discovery learning & guided structure; GS = guided structure; DL = discovery learning

Table 3.2 indicates that the majority of participants preferred a learning environment that combined discovery learning with guided structure. Two of the RFPs' profiles were regarded as high, followed by two as above average, and three as average. Only Diana's profile was below average. In the self-directed learning readiness scale (SDLRS) Guglielmino and Guglielmino (1994) define three types of profiles as follows:

1. Adults with *high* SDLRS scores usually prefer to determine their learning needs and plan and implement their own learning. This does not mean that they will never choose to be in a structured learning situation as they may well choose traditional courses or workshops as a part of a learning plan.
2. Adults with *average* SDLRS scores are more likely to be successful in more independent situations, but are not fully comfortable with handling the entire process of identifying their learning needs and planning and implementing the learning.
3. Adults with *below average* SDLRS scores usually prefer very structured learning options, such as lectures and traditional classroom settings.

3.2.3.3 Composition of Pairs

Ultimately, the criteria employed for matching participants into pairs were unfamiliarity (i.e., not knowing each other) and heterogeneity (i.e., having different levels of AD experience). The former criterion was derived from the AD Program's design and was deemed critical as the future target audience of this AD Program (rural family physicians worldwide) would probably not know each other. To implement the first criterion, each RFP received the list of participants and was asked to check off those RFPs he/she did not know. The second criterion of heterogeneity was determined by the size of AD clientele at the time of the study (small = 0-40, medium = 41-81, large = >81). Anticipating that these criteria might not guarantee a successful match for the Paired activities, Plenary activities were added to the design of the AD Program. The rationale was that if for any reason a pair did not work well together, they could take advantage of the Plenary discussions composed of the entire group and coordinated by the facilitator. This format matches the PBL model and the MAINPRO-C accreditation requirement of the College of Family Physicians of Canada.

When the number of pairs was reduced from 6 to 4 (due to participants' dropping out), participants were re-grouped according to the criteria of not knowing each other. However, this criterion could be applied to all pairs except one (i.e., Norma and Ronald) due to the reduced sample size. The 4 pairs who completed the AD Program were: Mathew and Marcela; Mark and Luc; Diana and George; and Norma and Ronald. The first 2 pairs never changed partners, whereas the last 2 did. The dropping out and re-grouping of participants directly influenced the schedule and flow of the Paired case-based discussions. For instance, discussions were somewhat delayed because some participants had to wait for new candidates to post their responses.

The next section presents data collection.

3.3 Data Collection

Data collection includes a variety of sections. The first one focuses on the educational intervention that was designed and implemented in order to collect data. It covers the AD Program's content and structure, its theoretical framework, and measures to assess learning. The second section includes the development and evaluation of the AD Program. The third section covers the delivery of the AD Program. Chronology of data collection procedures is presented last.

3.3.1 The Program: Early Alzheimer's Disease

The educational intervention was entitled Early Alzheimer's Disease Program. Its content was an adaptation of an existing accredited face-to-face CME Program for family physicians called Early Alzheimer Disease: Diagnosis, Treatment and Management (AXDEV, 2000). It was designed and implemented by a CME provider based on a Canadian National Needs Assessment. The researcher sought and received permission from its authors to use this content. The content was then updated, validated by subject matter experts, and extended from 2 to 16 hours of instruction. In other words, the original face-to face AD Program was completely transformed and adapted to the WebCT platform (only approximately 30% of the original content remained unchanged).

Driven by the Needs Assessment's results, the overall learning outcomes of the AD Program were to increase and/or confirm the rural family physicians' knowledge, skill, and confidence in (a) diagnosing the early symptoms of AD, (b) prescribing appropriate and safe treatment for early and moderate stages of AD, and (c) managing the care of patients and their caregivers during the early stages of AD. These broad learning outcomes included a total of 16 more specific ones which were subdivided into the categories of diagnosis (7), treatment (4) and management (5) (Appendix F).

The AD Program was organized into four chronological phases: *Introduction*, *Instructional*, *Practice Opportunities* and *Closure* as shown in Table 3.3

Table 3.3

The AD Program Phases

Phase	Introduction	Instructional	Practice Opportunities	Closure
	Icebreaker & 3 Modules	5 Modules	1 Module	1 Module
	Pre-test	Post-test		1Month-Post test

Each phase of the educational intervention included one to five Modules, for a total of 10 Modules. Each Module included two parts: (a) Logistics, and (b) Content and Activities. For the busy professional, logistics had the advantage of listing the Module's content (the purpose, learning outcomes, brief description of activities, and time to complete) in a succinct manner. Content and Activities varied somewhat depending on the AD Program's phase, and are described next.

3.3.1.1Phase I: Introduction

The Introduction phase of the AD Program lasted approximately 1 month (May-June 2003). It included an Icebreaker and three Modules. The majority of participants had never met face-to-face nor had they completed a CME online. Therefore, it was important to design a virtual Icebreaker to permit socialization before starting the AD Program. For novice WebCT users, this was a good opportunity to practice posting messages on the Discussion Board. A photo of each participant was posted during the Icebreaker to facilitate virtual interaction within the group.

During the Introduction phase, participants were also required to complete three Modules and the Pre-test. Module 1 provided an overview of the AD Program, its requirements and background. Module 2 covered a tutorial on the PBL instructional method. Module 3 offered a tutorial on technology because the majority of participants had never followed a CME course on WebCT. This last tutorial aimed to increase their comfort level, decrease their potential frustrations with the new platform, and thereby facilitate their learning process by limiting cognitive overload.

3.3.1.2 Phase II: Instructional.

The Instructional phase covering five Modules was the most important part of the AD Program. Completion was expected to take14 hours over a 5-month period (June-November 2003).

Modules 4 and 5 focused on diagnosis (Dx) of the early stage of AD. Module 4 provided an opportunity to discuss in Pairs the differential diagnoses of two clinical cases (Mrs. Gerber's and Mr. Singh's) that were previously completed individually in the Pre-test. No prior direct instruction was provided in Module 4 which began with an Icebreaker aimed at enhancing the construction of a joint problem space between the two participants (Teasley & Rochelle, 1993; Jonassen, 1997). This was carried out by discussing the nature of the task and those contextual factors that could influence its completion, as well as the clarification of misunderstandings that could limit a shared conception of the task.

Module 5 presented the key points on AD diagnosis with an optional exercise to review the main concepts, principles and procedures. After having read Module 5, each Pair had the option to either modify or to maintain the initial joint diagnosis for Mrs. Gerber and Mr. Singh. The Plenary focused on reviewing the final differential diagnoses, and discussing issues relating to the RFP's clinical practice.

The focus of Module 6 was on AD treatment (Tx), specifically to select an appropriate treatment (tx) for the early stage of AD. It described different types of therapy and as co-morbid conditions that could complicate the tx of AD, and included a mini-lecture as well as individual and collaborative activities focusing on Mr. Singh's tx which was completed individually in the Pre-test. Each participant could either modify or maintain Mr. Singh's tx plan after reading the mini-lecture. In the Paired activity, participants exchanged views on their tx plans and negotiated a joint treatment plan for Mr. Singh. Confidence in the individual and joint tx plans and the willingness to change the initial individual tx plan were determined on a 5-point Likert scale. In the Plenary, RFPs exchanged views and discussed the main issues encountered in Mr. Singh's case and other tx topics relevant to their AD practice. This Module also offered an optional exercise to review the main concepts, principles and procedures on AD tx.

The focus of Module 7 was on AD management (Mg). Its purpose was to prepare RFPs to appropriately manage patients at the early stage of AD. This Module emphasized the crucial role of caregivers and the importance of optimizing referrals to specialists. A mini-lecture was followed by an optional exercise to review the main concepts, principles and procedures on AD management (mg). Participants reflected individually on their mg approach of Mrs. Robinson's case previously solved in the Pre-test. This Module did not include Paired activities. Instead, RFPs exchanged views in the Plenary on Mrs. Robinson's case, and discussed issues encountered in managing this and other similar cases.

Module 8 was designed to address the specific needs of advanced self-directed learners who might be interested in exploring additional resources. The linear sequence of instruction could be reassuring for novice learners, but constraining for advanced self-directed learners. In order to fulfill these divergent needs, participants were able to explore optional resources embedded as hypertext links in the AD Program, or those grouped in this module (e.g. a list covered national and provincial organizations that provide services and/or research on AD).

At the completion of the Instructional phase, RFPs completed a Post-test and the first section of the Participant Reaction Questionnaire (PRQ-I).

3.3.1.3 Phase III: Opportunities to Practice.

After completion of the Instructional phase, RFPs were encouraged to participate during the following 45 days in the Opportunities to Practice phase. This phase had initially been conceived to last 4 months but was later shortened to 1 month and a half, the main reason being that the AD Program had to comply with the due dates of the accrediting bodies. This Module included the Case-Library and opportunities for non-guided discussions. Participants could review past modules at any time during the AD Program.

3.3.1.4 Phase IV: Closure.

The Closure phase lasted approximately 2 months (December 2003 – February 2004). A month and a half after the completion of the Instructional phase, participants were required to complete: (a) the 1Month-Post test, (b) the Log to assess anticipated and non-anticipated changes in RFPs' AD practice, (c) section II of the Participant Reaction Questionnaire (PRQ-II), and (d) the final Plenary discussion for debriefing and closing the AD Program.

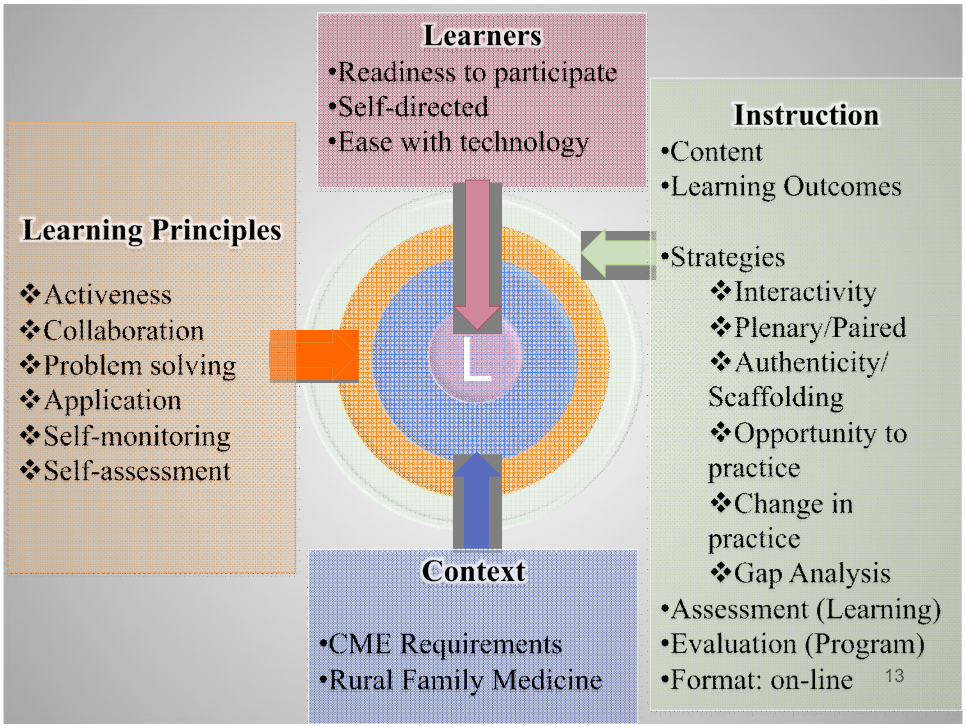
The next section describes the theoretical framework which guided the design, delivery and evaluation the AD Program.

3.3.2 The Integrated Practice-Based Learning Framework

Instructional technology has been criticized for its lack of theories and models that drive the design of learning environments (Collins, 1996, Dijstra, 1997; Jonassen, 1997; Khan, 1997; Koschmann et al. 1994; Price, 1999; Mann, 2004, De Laat & Lally, 2004; Ahmad, 2000). Informed by the above critique, the design and development of this AD Program was guided by a theoretical framework developed by the author of this study and entitled an Integrated Practice-based Learning Framework (IPBLF). The IPBLF principles were driven by broad and specific theories of learning and instruction. Figure 3.1 describes the main components of the IPBLF.

Figure 3.1

The Integrated Practice-Based Learning Framework



As shown in Figure 3.1, the Integrated Practice-based Learning Framework (IPBLF) is composed of learners, the context, learning principles and the instructional process.

Learners were rural family physicians whose demographic profiles were previously described. Readiness to participate, ease with technology and self-direction are characteristics of the ideal learner in a Web-based learning environment. High drop-out rates are usually reported in distance education when the learner's ease with technology is not addressed (Horton, 2000; Vrasidas & McIsaac, 1999). Ease with technology is a basic requirement to enhance learning. Lack of ease with technology increases the cognitive load and limits cognitive resources needed for knowledge acquisition and practice in an online learning environment (Ahmad, 2000). At the Needs Assessment, participants rated their ease with technology and specifically their past experience with OCME programs.

Learning is situated in the context of a Web-based learning environment. The design and implementation of the educational intervention is theory-driven so as to fulfill the requirements and characteristics of rural family practice and CME accreditation.

The instructional approach covers four categories of course design, that is, content, learning outcomes, strategies and assessment (Saroyan & Amundsen, 2004). Instruction is aligned with learning principles which will now be defined, including a description of how the learning principles were addressed in the educational intervention.

Activeness: From a constructivist perspective, active learning implies an active process of constructing meaning. An active learner "is driven by a need to know and is able to identify what needs to be learned in light of the context…" (Koschman et al. 1994, p. 234). Active learning also implies the accommodation and adaptation of prior knowledge and beliefs with new information (Koschman et al. 1994). Activeness was operationalized through interactivity, which is described as:

> Perhaps the most important feature of computer-based instructional systems…that engages the learner in external choices, answering questions and solving problems…this leads to increased motivation and enhanced performance and productivity" (Jih & Reeves, 1992, p.40).

In the AD Program, activeness encompassed several instructional implications such as interactivity which meant offering frequent and varied types of activities as shown in Table 3.4.

Table 3.4

Frequency of AD Program Activities

Activity format	Required	Optional	Total
Individual	16	10	26
Paired	3		3
Plenary	4	6	10
Total	23	16	39

Table 3.4 shows that the AD Program included 39 activities covering three formats: Individual, Paired, and Plenary. The Individual format included 16 required and 10 optional activities. The collaborative activities included three

required Paired activities and ten Plenaries. Four Plenaries were required and six were optional.

Furthermore, activeness implied flexible instruction that takes into account the learners' diverse stages of adaptation and accommodation. Instruction was tailored to the audience's characteristics by offering tutorials for novice Web-users, as well as a glossary and additional online resources on AD.

Collaboration: this is a key principle in practice-based learning and is defined as "a learning and instructional approach typified by self-directed groups working together on a common learning task. The approach relies upon mutual engagement of learners to jointly clarify their reasoning process and construct common meaning primarily through dialogical discourse" (Rose, 2002 p. 18). A variety of collaborative activities (Paired and Plenary) aimed at building a community of practice among participants were included in the educational intervention.

In a private space, case-based Paired activities offered to each team the opportunity to: (a) clarify their thinking by articulating it in writing so as to better justify their dx, tx, and mg procedures; (b) prompt critical thinking by considering his/her partner as a source of information and expertise; and (c) value his/her peer's alternative perspectives and the collaborative aspect of the PBL method with a view to its eventual use.

Moderated by the facilitator, Plenary activities complemented and expanded the goals of Individual and Paired activities. The rationale for this combination was to provide additional benefits to those physicians who could not, for a variety of reasons (e.g. different motivation, working style), work successfully in Paired activities.When discussing common AD issues and when being exposed to other approaches to AD, physicians were able expand and/or confirm their prior knowledge and engage in higher-order thinking (reflection and critical thinking).

Problem solving: This principle is borrowed from practice-based learning (Barrows, 1994); Jonassen's ID model (1997) and the Four-stage learning theory (Slotnick, & Shershneva, 2002). A physician's practice-based learning is usually initiated by dissatisfaction between what he/she knows and what he/she should know in order to solve specific or general problems related to his/her profession. Physicians need to solve ill-structured problems within knowledge domains which require "aggressive inquiry, reasoning and reflection" (Koschman et al. 1994, p. 234). Case-based instruction was the main instructional strategy implemented in individual, Paired and Plenary activities. Individual and Paired activities were designed following the clinical reasoning process (Barrows & Pickell, 1991). An articulation of the problem space and contextual constraints, and the argumentation needed to support decision-making, are relevant cognitive processes activated during problem solving. Articulation is defined as "giving utterance to force a cohesive explanation and interrelating of concepts and relationships" (Koschman et al. 1994, p. 237. Articulation enhances retention and understanding, as well as the ability to take a stand on the learner's knowledge when discussing with peers.

In the present study, during the collaborative problem solving stage, participants articulated their opinions and arguments to support their position, as well as the explanation and interrelation of concepts derived from the learning outcomes of the AD Program. In Paired activities, participants articulated their initial diagnosis, treatment and management of clinical cases and provided supporting arguments. Furthermore, they elaborated on AD concepts during Plenary activities, through a discussion with the facilitator and the group.

Application: this principle entails applying to clinical practice and within the AD Program what was learned and/or confirmed from the educational intervention (Barrows, 1994; Jonassen, 1997; Koschman et al. 1994; Slotnick, 2001). Application was operationalized through a variety of required and optional activities which included: (a) case-based instruction in the tests, (b) the Log where participants identified areas in their clinical practice where they might apply what was learned and/or confirmed from the AD Program and (c) optional opportunities to practice (e.g. Case-Library).

Self-monitoring: this metacognitive skill entails the monitoring of one's thinking (Barrows, 1991) and progress during participation in the educational intervention. During case-based instruction, RFPs monitored their progress by comparing the initial hypothesis with subsequent changes in order to replace or refine the initial hypothesis, and eventually arrive at a diagnostic decision. Participants were also prompted to monitor the implementation of changes into their clinical practice (Schön, 1988). Furthermore, in a self-reported measure (i.e., Barometer), participants monitored the learning stage in which they were situated at each phase of the AD Program.

Self-assessment: this metacognitive ability is an expected characteristic of self-directed learners (Barrows, 1994). It implies evaluating strengths and weaknesses in performance. In the Needs assessment participants identified their knowledge gaps in the area of AD.

Authenticity: this instructional principle draws from *contextualism* in which learning is situated in realistic settings following situated cognition (Brown, Collins, & Duguid, 1989), anchored instruction (Cognition and Technology Group, 1990; 1996), and the PBLM (Barrows, 1994). As learning is "sensitive to perspective, goal and context; instruction should involve authentic activities, settings, and goals" (Koschman et al. 1994, p. 233). Authentic clinical cases were used to assess participants' problem solving skills. These cases presented learners with a scarce amount of information, similar to what patients and caregivers usually give during their initial visit at their FP's office (Barrows, 1998; Savery & Duffy, 1995). Furthermore, participants raised issues drawn from their AD clinical practice for discussion in collaborative activities.

Scaffolding: this supportive instructional strategy draws from the cognitive apprenticeship model (Collins, Brown, & Newman, 1989) and implies providing assistance for as long as it is needed. Following the PBLM the facilitator's role was to scaffold participants' clinical reasoning process during Plenary discussions by prompting their thinking instead of lecturing to them. The educator's role was also to provide assistance and emotional support in a variety of fields such as technology, administrative issues, and logistics. The Introduction phase offered a tutorial on technological support.

Direct instruction: in each module, content was usually delivered as a screen-sized (i.e., one paragraph or two) hyperlinked text with key points displayed in the form of Power-Point slides. The rationale was to present content in layers of depth so as to allow participants the opportunity to explore hot links at their leisure, as well as to deliver information in chunks thereby to facilitating reading on a screen.

Online: driven by Web-based instruction, the educational intervention was delivered online in order to offer convenient and flexible access to CME to isolated and busy professionals. Asynchronous communication was selected to facilitate participation and completion of the AD Program.

3.3.3 Assessment of Rural Family Physicians' Learning

In the IPBLF, assessment was multiple, longitudinal, criterion-referenced and focused on the product as well as on the process of learning. Despite the fact that RFPs' participation in CME is usually not scored, multiple assessments were aligned to answer the research questions (RQs). This section describes the measures used for data collection for each of the three research questions (RQs) that guided this study.

3.3.3.1 Research Question #1

Research question 1 focused on the evidence of RFP's learning which corresponds to the levels of knowledge and competence (Moore, 2007). In alignment with the AD Program's learning outcomes, three types of measure gathered data for answering RQ#1: objective measures, self-reported measures and Plenary discussions.

Objective measures included a Pre-test (Appendix G), Post-test (Appendix H) and 1Month-Post test (Appendix I) which assessed: (a) the participants' mastery of knowledge and skills related to the dx, tx, and mg of early AD; and (b) potential change over time in the acquisition and retention of knowledge. Table 3.5 lists the objective measures that provided evidence of changes in participants' learning.

Table 3.5

Objective Measures (RQ#1)

Measure	Section A (MCQ) Frequency of items	Section B (OEQ) Frequency of items	Grand total
Pre-test (section A)	22		
Pre-test (section B)			
1 case Dx Gerber		7	
1 case Dx Singh		6	
1 case Tx Singh		10	
1 case Mg Singh		1	
1 case Mg Robinson		7	
Subtotal		31	
Post-test (section A)	22		
Post-test (section B)			
Mrs Jones Dx		13	
Mrs Jones Tx		10	
Mrs Jones Mg		7	
Subtotal		30	
1M-Post-test (section A)	22		
1M- Post-test (section B)			
Mr Roper Dx		13	
Mr Roper Tx		10	
Mr Roper Mg		6	
Subtotal		29	
Total	66	90	156

Note. 1M-Post test = 1Month-Post test; MCQ = multiple-choice questions; OEQ = open-ended questions; Dx = diagnosis; Tx = treatment; Mg = management

Table 3.5 indicates that the data set from the Pre, Post, and 1Month-Post tests totalled 156 questions. Each test was composed of Section A (MCQs) and Section B (OEQs). Section A (Appendix G) comprised 22 identical questions (16 multiple-choice, 5 matching and 1 true/false) to assess the three levels of learning in Bloom's taxonomy (Knowledge, Comprehension, Application) (Anderson, L. W. et al. 2001) that correspond to the Unistructural, and Multistructural levels in the SOLO (Structure of the Observed Learning Outcomes) taxonomy (Biggs & Collins, 1982). Knowledge was assessed through recognition and association with background knowledge.

The MCQ tests were designed according to educational psychology guidelines (Ory & Ryan, 1993; Mehrens & Lehman, 1975). In order to ensure their content validity, a table of specifications aligned the content of the test to the learning outcomes and strategies used in the AD Program (Appendix J).

Critical and independent reviewing helps to increase the validity of a test (Ory & Ryan, 1993). Consequently, the designer sought the advice of five subject matter experts. Two were professors at the Faculty of Medicine, and three were family physicians in the community. Their feedback focused on the tests' construction, clarity of language, level of difficulty, and relevance for the target audience.

The use of the MCQ questionnaire presented advantages and disadvantages. The main advantage was that it was quickly administered and automatically scored by WebCT, which suited the participants' hectic schedules. The main disadvantage is that it usually assesses the acquisition of basic knowledge which, in turn, leads to "memorization and the subsequent regurgitation of isolated facts" (Cunningham, 1998, p. 89). Aware of this limitation, the designer complemented Section A of each test with Section B.

Section B covered five cases with a total of 90 OEQs that better reflected what physicians normally encounter in their medical practice. The aim of case-based questions was to activate the participant's higher-order thinking skills that correspond to Analysis, Synthesis and Evaluation in Bloom's taxonomy (1956) and to Relational and Extended Abstract Thinking in the SOLO taxonomy (Biggs & Collis, 1982). The five cases were of similar difficulty and aligned with the learning outcomes of the AD Program. The Pre-test covered three short cases focused on AD dx (Mrs. Gerber and Mr. Singh), on tx (Mr. Singh), and on mg (Mrs. Robinson) (Appendix G). These cases were later discussed in Paired and Plenary activities. The Post-test included Mrs. Jones's case (Appendix H) while the 1Month-Post test covered Mr. Roper's (Appendix I). Both cases included three comprehensive visits so as to cover the same topics (dx, tx, and mg) as those found in the Pre-test cases. Mrs. Jones's and Mr. Roper's cases were not discussed collaboratively because they were used to assess individual construction of knowledge after the Instructional phase.

Frequency of use of concepts during Plenary activities was the second type of measure used to collect data to answer RQ#1. Participants were required to actively participate in the Plenary to discuss the AD Program's clinical cases and real cases from their clinical practice, as well as other pertinent issues. This was an opportunity to apply and reinforce the use of concepts presented in the modules.

The third type of measure for collecting data for answering RQ#1 was self-reported measure.The Participant Reaction Questionnaire (PRQ-I) (Appendix K) covered questions on confirmation of knowledge. Data set included responses to three Likert-scale and three open-ended questions. In the first type of question participants evaluated the extent to which the AD Program content had confirmed the RFP's AD practice. In the second type of question, participants listed specific concepts and procedures which were confirmed by the AD Program.

In the Reflective Individual activity participants reflected on two topics: (a) rating their willingness to reconsider their initial plans for the dx, tx, and mg of clinical cases that they had individually solved at the Pre-test (this topic was driven by self-monitoring); and (b) specifying what they had learned from Paired and Plenary activities, a topic driven by self-assessment.

Opportunity to practice covered optional activities which were not scored, but provided opportunities to receive feedback and review and reinforce AD content in preparation for the tests. Table 3.6 lists a variety of optional activities that were aligned with RQ#1.

Table 3.6.

Optional Opportunities to Practice Activities (RQ#1)

Measures	MCQ	OEQ	Total
1. Quiz Dx	8		
2. Quiz Tx	8		
3. Quiz Mg	4		
Review past modules			
Web resources			
Case library			
Case 1		1	
Case 2		2	
Case 3		1	
Case 4		2	
Total	20	6	26

Note. Dx = diagnosis; Tx = treatment; Mg = management; MCQ = multiple-choice questions; OEQ = open-ended questions.

Table 3.6 indicates that the Optional Practice activities included three MCQ quizzes (on AD dx, tx, and mg) and a Case-library with four short cases totalling 26 questions. Multiple-choice questions represent the most frequent format (77%). Participants could also review past modules at their leisure. The AD Program also offered optional Web resources that were embedded in the hypertext or listed in Module 8.

3.3.3.2 Research Question #2

Research question 2 focused on the effectiveness of the AD Program in supporting participants' learning which corresponds with the levels of participation and satisfaction (Moore, 2007). Three types of measures were used to collect data to answer RQ#2, namely: self-reported measures, participation in Paired and Plenary activities, and Transcripts of Plenary activities.

Five self-reported measures evaluated the extent to which the AD Program's design supported the RFPs' learning process, namely, both sections of the Participant Reaction Questionnaire (PRQ I in Appendix K & PRQ II in Appendix L), Check-out quizzes, the Technological support quiz (Appendix M) and the Closure Plenary. The data set for each participant covered 81 questions including three formats: Likert-scale, MCQ and OEQ. The most frequently used format was the Likert-scale question.

In the Participant Reaction Questionnaire (PRQ-I) participants reflected on the effectiveness of Paired activities for supporting their learning process as shown in Table 3.7.

Table 3.7

Participant Reaction Questionnaire Focused on Paired Activities (RQ#2)

Type of questions	LSQ	OEQ	Total
Listing Paired activities strengths & weaknesses		2	
Providing suggestions to improve Paired activities		1	
Evaluating effectiveness/usefulness of working in pairs	2		
Rating comfort levels in working in pairs	7		
AD dx, tx, mg		3	
Total	9	6	15

Note. LSQ= Likert-scale questions; OEQ = open-ended questions; dx = diagnosis; tx = treatment; mg = management.

Table 3.7 indicates that each participant answered 15 questions with two types of format (Likert-scale and open-ended questions). The Likert-scale format was more frequently represented (60%).

In the PRQ-I, participants also rated their comfort level in Paired activities in a variety of situations such as: (a) discussing their own ideas, (b) providing and receiving constructive feedback, (c) dealing with disagreement, and (d) demonstrating attentiveness to the opinion of one's partner.

In Plenaries, participants discussed cases and issues relating to AD dx, tx and mg. Table 3.8 illustrates the measures which focused on evaluating the effectiveness of Plenary activities in supporting the participants' learning process.

Table 3.8

Measures Focused on Plenary Activities (RQ#2)

Measures	LSQ	OEQ	Total
NEEDS ASSESSMENT			
Comfort/ability levels in working in a small group	7		
Participant Reaction Questionnaire (I)			

Comfort/ability levels in working in a small group	6		
Gain support from peers, facilitator & educator	3		
Democratic climate	1		
Level of interest	1		
Support for RFP's learning process	3		
Suggestions to improve Plenary		1	
Effectiveness of facilitator's functions	6		
TRANSCRIPTS PLENARIES			
Diagnosis (Plenary #1)		1	
Treatment (Plenary #2)		1	
Management (Plenary #3)		1	
Total	20	4	24

Note. LSQ = Likert-scale questions; OEQ = open-ended questions.

Table 3.8 lists three types of measures aligned with RQ#2: (a) Needs Assessment, (b) Participant Reaction questionnaire (PRQ-I), and (c) Transcripts of three Plenaries focusing on AD dx, tx, and mg. Likert-scale was the most frequent format (83 %) for questions relating to Plenary activities.

As learning does not occur in a vacuum but is influenced by its context, participants were prompted to assess their comfort and ability levels for working in small groups. In the NA and the PRQ-I, the comfort level included situations such as: (a) discussing one's own ideas, (b) providing and receiving constructive feedback, and (c) dealing with disagreement. The ability level covers the skill of demonstrating attentiveness to the opinion of peers. In the PRQ-I, participants also rated the effectiveness of the Plenaries in supporting their learning process (e.g. the provision of a democratic climate and the exchange of constructive feedback). Furthermore, participants rated the facilitator's competency in six areas (e.g. providing feedback and guidance; prompting RFPs to reflect and elaborate on their prior knowledge instead of providing them with quick answers).

In the PRQ (I & II) participants also evaluated the effectiveness of a variety of the AD Program's features to support their learning (e.g. the Overall Design, the Educator's scaffolding, Opportunities to Practice).

The condition for navigating from one Module to another was the completion of a brief quiz called the Check-out. The AD Program covered a total of nine Check-out quizzes posted at the end of each module or test. This individual activity was required but not scored. Driven by the self-monitoring principle, this quiz reminded participants to monitor their progress by verifying if all required activities had been completed before moving on to the next module. Secondly, the Check-out quiz encouraged RFPs to rate the effectiveness of a specific activity to support their learning process. Lastly, it regulated the linear sequence of the AD Program, and met the RFPs' needs for pace and timing of access**.** Due to the length of the AD Program (9 months), the progressive collection of feedback on the instructional process proved to be more effective than any attempt to collect it all at the end of the AD Program.

As the majority of RFPs had never participated in an OCME program, they were required to take a quiz meant to evaluate the effectiveness of the available Technological support (Appendix M).

In the Closure Plenary, participants described their experience in the AD Program and provided feedback on ways to improve the effectiveness of this educational intervention to support their learning.

Transcripts of Plenary activities constituted the measure used to gather evidence on participants' collaboration during the moderated discussions. Each Plenary started with an open-ended question posted by the educator or by one of the participants. The data set included 40 double-spaced pages of Transcripts. The longest Plenary (#1) included 19 pages and focused mainly on AD diagnosis. The shortest Plenary (#2) focused on AD treatment and included 8 pages. The Plenary (#3) focusing on AD management covered 13 pages. The data set of the coded discussions included 200 on-task-scenario statements used to gather evidence of collaboration.

3.3.3.3 Research Question #3

Research question 3 focused on the evidence of impact of the AD Program on RFP's reports of their AD clinical practice. This corresponds with the assessment of participants' performance (Moore, 2007). Four self-reported measures focusing on knowledge transfer to the participants' AD practice were aligned with RQ#3, as shown in Table 3.9.

Table 3.9

Measures Focused on Impact on Participants' AD Practice (RQ#3)

Measures	LSQ	MCQ	OEQ	Total
Barometer		12		
Reflective Individual activities			3	
Post-test			1	
Log	3	8	11	
Total	3	20	15	38

Note. RFPs = rural family physicians; AD: Alzheimer's disease; LSQ= Likert-scale questions; MCQ = multiple-choice questions; OEQ = Open-ended questions

Table 3.9 lists the following self-reported measures: the Barometer, Reflective Individual activities, the Post-test, and the Log. The data set for each participant covered 38 responses. The MCQ was the most frequently used format (53%).

Participants were required to complete the Barometer 4 times: at the Needs Assessment, Pre-test (Appendix G), Post-test, and at the 1Month-Post test. The Barometer monitored the RFPs' readiness to learn and readiness to change their AD practice. The Barometer is a self-monitoring (not standardized) tool rooted on an adaptation of the Four-Stage theory (Slotnick & Shershneva, 2002). When reflecting on their current clinical practice in AD dx, tx, and mg, physicians select one stage that best describes their learning process. The five stages range from satisfaction to dissatisfaction with clinical practice, each one having a different level of influence on learning and change (Table 3.10).

Table 3.10

The Barometer

Statement	Stage
The way I diagnose AD is acceptable to me	Confirmation of knowledge/skills
I need to examine how I diagnose AD to verify its appropriateness	Scanning (for a potential problem)
I am dissatisfied with the way I diagnose AD	Evaluating
I might change some aspects of my diagnostic practices for AD	Learning

I plan to change the way I diagnose	Application to practice and gaining experience

At the first stage (Confirmation), physicians are satisfied with the way they practice. Attending a CME event is used to confirm their knowledge and skills in diagnosing AD patients. At the Scanning stage, physicians detect a potential problem in their practice. At the Evaluation stage, physicians report dissatisfaction with their current practice and look for a solution. This dissatisfaction and anxiety caused by a gap between what they know and what they should know leads to the following stage which focuses on learning skills and knowledge required to address the precipitating problem. Finally, physicians learn skills and acquire the knowledge necessary to fill the gap identified in previous stages, and plan to apply what has been learned to change their clinical practice.

Reflective Individual activities are self-report measures driven by self-assessment, whereby participants reflected on the transfer to their AD practice of what they had learned or confirmed through the AD Program. Participants also described the implications of what they had learned/confirmed for their rural practice.

In the Post-test, participants reflected on the extent to which they anticipated transferring what they had learned to their clinical practice, and as such were required to list three anticipated changes in their AD practice. They also completed a Log for self-monitoring their AD practice a month after the Post-test. The Log operationalized and adapted the self-reported tool called Commitment to Change (Curry & Purkis, 1986; Lockyer, Fidler, Ward, Basson, Elliott, Toews, 2001; Lockyer et al. 2005; Purkis, 1982; Wakefield et al. 2003; White et al. 2004). In one section of the Log, participants evaluated the extent to which the anticipated (listed in the Post-test) and non-anticipated changes had been implemented into their AD practice. Furthermore, they reflected on the enablers and barriers to those anticipated and non-anticipated changes in the dx, tx, and mg of early AD. The Log included 12 multiple choice and 11 open-ended questions (Appendix N). This individual self-monitoring activity was required but not scored.

Participants asked and answered open-ended questions during Plenary discussions. These collaborative activities provided them with the opportunity to discuss the content of the AD Program as a means of solving some practical issues relating to their AD practice. The data set, as previously described, included 40 double-spaced pages of Transcripts. The coded discussions included 200 on-task-scenario statements used to gather evidence on the impact of the AD Program in the participants' reports of their clinical practice.

3.3.4 *Development and Evaluation of the AD Program*

The previous sections presented the AD Program's content and structure at the Implementation phase. This section describes the phases of the development of the AD Program (Needs Assessment) and its formative and summative evaluations.

3.3.4.1 Needs Assessment

Following instructional design principles, a Needs Assessment (NA) questionnaire with two sections was used to gather information on the target audience. This type of information was crucial for tailoring the AD Program to the participants' needs and technological infrastructure.

The first section of the NA focused on the participants' background knowledge on AD. It was paper-based and delivered by fax to the physician's office and returned either by fax or regular mail. It included two self-reported measures: the Gap Analysis and the Barometer (Appendix O). In the Gap Analysis, participants rated a number of items exploring gaps between their perceived current and desired ability for diagnosing (dx), treating (tx) and managing (mg) AD. Results indicated that 90% of participants in AD tx selected discrimination of tx for early AD and the awareness of drug-drug interaction as their highest gaps. In AD dx, 80% of participants selected the identification of the mild AD stage, the differentiation of AD from Vascular Dementia, and the implementation of history taking as their highest gaps. In AD mg, 70% of participants selected the use of instruments to monitor tx's response as their highest gap.

In the Barometer (Appendix O), participants were asked to select that one statement out of the six which best described their readiness to learn and change their current AD practice. Results indicated that across areas of care of early Alzheimer Disease (dx, tx, mg), the majority of physicians (80%) were motivated to participate in the AD Program either because they wished to *examine* the appropriateness of their practice (43%), or *might want* to change the way they practiced (37%). The selection of the learning outcomes and content of the educational intervention were tailored to participants' needs as expressed in the Barometer and Needs Assessment. These results were also used as baseline to compare subsequent potential changes in RFPs' learning, and were triangulated with other measures.

When participants were asked to name their preferred CME format to learn about AD, the majority selected one that combined access to updated literature, and the discussion of best practices and clinical cases with colleagues. Consequently, the AD Program offered opportunities for collaborative activities and case-based instruction. Case-based instruction is also a prerequisite to deliver MAINPRO-C online programs accredited by the College of Family Physicians of Canada.

The second section of the Needs Assessment focused on the participants' computer literacy, access to available technology, experience with OCME, and problem-solving ability in small groups (Appendix P). The 36 MCQs questionnaire was delivered by WebCT and piloted for content validity with 2 family physicians and 3 educators. Half of the participants anticipated accessing the AD Program on weekdays and the other half on weekends. The majority of physicians anticipated participating from home, using a conventional modem (56.6Kb/sec). This limited desktop computing power alerted the researcher who designed mostly text-based modules without multimedia features as a way of facilitating the AD Program's accessibility. Due to the RFPs' hectic work schedule, asynchronous instead of synchronous access to the AD Program was offered.

Participants rated their frequency of use, comfort level, and competency in using seven Internet features. The most frequently used features were e- mail (3.5), bibliographic databases search (3.13) and reading/browsing medical journals online (2.88). Participants' comfort (3.63) and competency (3.38) levels in the use of e-mail were rated as medium. Half of the RFPs occasionally searched bibliographic databases. Within this group, half rated their comfort and competency levels as low, and the other half as high. Five participants read or browsed online medical journals from sometimes to very often, with medium to very high levels of comfort and competency. Half of the participants never used multimedia, whereas the other half used it sporadically with low to medium levels of comfort and competency. These results matched the minimum computer literacy profile required for participating in the AD Program. The educator communicated by fax or by telephone with those participants who did not answer e-mails promptly.

It was important to note that the majority of participants had never completed an OCME program, engaged in peer-driven online collaborative tasks and forum discussions, or had used WebCT. In the Needs assessment, participants anticipated that their comfort and competency levels would range from low to medium. Consequently, the AD Program included a tutorial to support novice WebCT users. Only half of the participants had participated in CME case-based problem solving in small groups, and rated their comfort level as medium-high in the following problem-solving skills in group: (a) presenting a hypothesis, (b) discussing, (c) speaking up when uncertain or confused, (d) dealing with disagreement, (e) providing constructive feedback, (f) receiving constructive feedback, and (g) being attentive to the discussion. These results indicated that only half of the RFPs had some experience in small group work; hence, a tutorial on the PBL method, as well as collaborative activities and quizzes aimed at prompting them to reflect on their group work process, were offered.

The NA prompted RFPs to rate the importance of five factors (technology, convenience, content, peer-interaction and credits) that influenced them to participate in the AD Program. Results indicate that participants were attracted mainly by the novelty of the technology, convenience of access and type of content. Interestingly, the opportunity to gain credits was the least influential incentive to participate in the AD Program. Furthermore, despite the fact that sharing best practices with colleagues was one of the preferred CME formats, peer interaction was rated as one of the least influential incentives to participate in the AD Program. Nonetheless, the designer included Paired and Plenary activities to encourage collaboration so as to facilitate learning and networking between isolated participants.

Overall, the NA's results indicated the participants' willingness to improve their abilities in the dx, tx and mg of early AD. These findings are in agreement with the results of a previous Canadian Needs Assessment (AXDEV, 2000) which addressed the urban and rural family physicians' learning gaps in the field of early Alzheimer's disease.

The characteristics of the audience (i.e., type of technological infrastructure and computer literacy background) had a direct impact on the design and development of the AD Program. Despite the fact that WebCT is a multimedia platform, the designer did not fully exploit its audio-visual features due to the participants' limited desktop computing power (i.e., slow Internet connections); their medium level of computer literacy; and the time constraints which prevented them from learning more sophisticated technological features.

3.3.4.2 Formative Evaluation

The AD Program's formative evaluation (described in this section) underwent a complete revision before being implemented. Due to the evolving nature of the fields of medicine, technology, and accreditation, consultation with subject matter experts (SMEs) in these fields was essential, thereby providing the designer with medical background information, and information on the changing nature of medical knowledge and accreditation requirements. Two family physicians with expertise in AD reviewed, updated, expanded and validated the CME workshop Early Alzheimer Disease: Diagnosis, Treatment and Management (AXDEV, 2000). The objective measures (Pre-test, Post-test and 1Month-Post test) were reviewed by an internist and a family physician. The McGill WebCT experts provided logistical support and feedback on the design and delivery of the AD Program.

Three evaluators (two primary care physicians and an educational psychologist) completed the Beta-test and provided extensive feedback. Evaluators unanimously acknowledged and appreciated the innovative and highly interactive nature of the AD Program's design. Automatic feedback to MCQ questionnaires and the format used to display content were also appreciated.

Recommendations focused on improving the navigation on WebCT and guidance for novice Web-users (Bonk, Cummings, Hara, Fischler & Lee, 2000), and on enlarging the AD Program's content to counterbalance the preponderance of reflective activities focused on the learning process.

The design and implementation of the educational intervention was also influenced by the existence of scarce and unpredictable resources which limited the customizing of WebCT to better support the constructivist theoretical framework focusing on the product and process of learning.

3.3.4.3 Summative Evaluation

Upon completing the AD Program the participants provided feedback on its effectiveness in supporting their learning. The summative evaluation of the AD Program followed the Outcomes–based CME Evaluation Framework (OBCME) (Moore, 2007) at the levels of participation and satisfaction.

The facilitator's feedback also contributed to the AD Program's summative evaluation. She rated all nine features as high (Appendix Q), and qualified this educational intervention as relevant for family practice, credible, non-biased, well organized and timed, interactive, consistent with its stated objectives, and recommendable to other RFPs. The strongest features of the AD Program were: (a) its organization, (b) well documented content, (c) level of interaction between the group and facilitator, and (d) opportunity to break the isolation of RFP's practicing in remote areas. The facilitator suggested delivering the AD Program with a more user-friendly platform, and finding additional mechanisms to shorten the participants' delay in the completion of requirements. However, she also argued that the RFPs' busy work schedule made the last point difficult to implement.

3.3.5 Delivery of the Alzheimer Disease Program

The present study took place in a virtual classroom hosted by the McGill University Website. This Institution offered free training and technological support for the designer, facilitator, and RFPs. Access and participation were secured and protected by private codes. The basic hardware and software required for participation were a computer with Internet access, a modem (56K or higher) or cable, and a Web Browser (Explorer 4 and up, or Netscape 6).

The AD Program was built and delivered through the platform WebCT. At the time of the study, WebCT was publicized by its manufacturer as one of the most popular and widely used Web-based course management systems in higher education (www.Webct.com) offering a variety of features for online teaching and learning.

Data were collected through seven WebCT features that are described as follows.

Course Content: The course content was organized into ten modules accessible by clicking on a specific icon in the Homepage. A menu of the module appeared by clicking on the icon. Research has shown that the format in which the content to be learned is organized and presented directly influences the levels of processing subject matter (i.e., surface versus deep approaches to learning) (Kanuka, 2001; Ramsden, 1992). The AD Program used the hypertext-based learning environment (Nelson, 1980) which Jonassen (1996) defines as:

> …among the most effective types of computer-based instruction… Hypertext is a nonlinear or dynamic text which allows the user immediate access to any piece of text or information in the knowledge base (p. 55).

The hypertext's links were carefully selected in the interactive learning environment of the AD Program, and sequenced in order to enhance exploration, but at the same time limit cognitive overload and prevent random traveling in cyberspace (Jonassen, 1988; Kanuka, 2001; Marchionini, 1995). Course content was also presented in chunks as a means of facilitating learning (Gobet et al. 2001)

Discussion Board: Discussions were organized by topic in private or public spaces. Each Pair and the educator interacted in a private space, whereas the group as a whole discussed in a public space (i.e., Plenary) which is a central component in fostering collaboration and a community of practice.

Quizzes: The designer aligned the availability, duration and the questions' format (multiple choice, short answer, and paragraph) of the quizzes and tests to the AD Program's learning outcomes. In order to document the participants' process of learning, quizzes were included across the AD Program to encourage reflection and practice. Furthermore, Check-out quizzes ensured the selective release of a module.

In other words, and in order to ensure the sequence of the AD Program, participants could only access the next module after submitting a Check-out quiz at the completion of the previous module.

Feedback: WebCT automatically provided feedback and records of descriptive statistics on the scored MCQ quizzes only. Therefore, an ad hoc scoring system for case-based open-ended questions was created and validated outside WebCT.

E-mail: WebCT electronic-mail capability was confined to the sending and receiving of only those messages relating to the AD Program. To improve the efficiency of this feature, and to avoid logging onto the AD Program to check for new messages, WebCT e-mail messages were automatically forwarded to the participant's e-mail box outside of the AD Program.

Calendar: On the Homepage, all participants could access the Calendar which posted relevant information about logistics to help them comply with the AD Program's requirements, e.g. reminders about due dates, tips to facilitate navigation. The designer encouraged participants to frequently check the Calendar to keep updated.

Help button: this is a contextually sensitive feature that provided support for the participants' navigation.

Tracking: WebCT automatically offers two types of tracking used by the researcher, nanely, *Page* and *Student* which were useful features to the educator for monitoring RFPs' participation. *Page tracking showed* the number of times students visited the Content Module pages and posted messages on the Discussion Board. *Student tracking* showed a history of the timing and location of a user's navigation, and provided the total number of hits when accessing the AD Program's modules. Each record computed the number of hits by date and time, as well as when the AD Program was first and last accessed. Only the tracking of student postings on the Discussion Board was used to collect data in the present study.

The designer adapted the AD Program's content to the WebCT platform and selected seven WebCT features to ensure effective communication, collaboration and learning in a virtual classroom. The next section describes the chronology and the factors that influenced data collection.

3.3.6 Chronology of the Doctoral Research Project

This section describes the chronology of the doctoral research project. All phases were implemented on WebCT except: (a) section A of the Needs Assessment and the consent letter which were delivered by fax, and (b) the Beta-test which was implemented face-to-face. Table 3.11 indicates the chronology of the doctoral research project which covers two parts: a) the design of the educational intervention and b) the implementation of the educational intervention.

Table 3.11

Chronology of the Doctoral Research Project: Design and Implementation of the Educational Intervention

Procedures/phases	*Started*	*Completed*
Needs Assessment	June 2001	Nov 2001
Design (1)		
Design 1st draft AD Program	March 2002	July 2002
Formative Evaluation		
Consultation SMEs	June 2002	Jan 2004
Beta-test	July 2002	Aug 2002
Design (2)		
Design 2nd draft AD Program	Aug 2002	May 2003
Implementation	May 2003	Feb 2004
Introduction phase	May 2003	June 2003
Instructional phase	June 2003	Nov 2003
Practice Opportunities phase	Nov 2003	Dec 2003
Closure phase	Dec 2003	Feb 2004
Facilitator's feedback	Feb 2004	Feb 2004

Note. AD: Alzheimer's disease; SME: subject matter experts.

The doctoral research project lasted 2.5 years (from June 2001 to February 2004). Data were collected during the implementation phase which covered 9 months (from May 2003 to February 2004) as shown in Table 3.1.1.

3.3.7 Factors Influencing Data Collection

In this study, data collection was influenced by the following factors as presented by order of importance: (a) the type of audience, (b) the time lag between the development and the launching of the AD Program, and (c) the technological glitches.

Data collection was influenced by the participants' busy and unpredictable professional schedules that resulted in low compliance and a high dropout rate (67%) which caused three changes: (a) shortening of the curriculum, (b) abolishing penalties for delayed compliance, and (c) increasing the educator's scaffolding.

Almost two years elapsed (June 2001 – May 2003) between the Needs Assessment and the launching of the AD Program. This resulted in a reduced sample of participants due to dropping out and the difficulties encountered in recruiting new candidates.

The addressing of technological WebCT glitches influenced the timing and rhythm of data collection. Access to WebCT was on occasion interrupted during the development and implementation phases which resulted in a time extension to complete required activities and the necessary adjustment in logistics. Fortunately, data were not lost but were re-organized in different locations.

3.4 Data Analysis

The type of data analysis was derived from the research approach, research design, and methodology. Reports on case studies usually describe the context and the case (Creswell, 1998, Merriam, 1988). In this study, the context was the PBL learning environment. The boundary of the case was the duration of the educational intervention.

The definition of a unit of analysis was crucial for setting the boundaries of the case (Yin 1993), the type of research questions, and the results (Merriam, 1988; Patton, 1980). The unit of analysis is "an aspect of the phenomenon that can be sampled with each member of the sample being studied as a separate case (Gall, Borg & Gall, 1996, p. 546). In this study, the unit of analysis was the learning process and product of each rural family physician. The participants' experiences and reflections during the AD Program were embedded in the physician's routine of rural practice. However, their roles in their rural practice and life in general—as a spouse, parent, teacher, and citizen—were outside the boundaries of this case study (Gall et al. 1996).

In this collective case, data analysis included two complementary phases: the within- and the cross-case analyses (Miles & Huberman, 1994). The within-case analysis involves constructing a short story for each participant (who is considered as a mini-case) to document participation and the learning process and product. The cross-case analysis involves the comparison of the participants' stories to document whether clusters sharing a certain pattern or configuration could emerge. Table 3.12

shows the type of data, analysis method and software package used to answer each research question.

Table 3.12

Data Analysis for Each Type of Data

Research question	Type of data	Data analysis	Package
1. Evidence of learning	MCQs (Section A of three tests)	Descriptive statistics (t tests)	WebCT SPSS
	Narrative: Cases (Section B of three tests)	Content analysis	Manually
	Open-ended questions (Confirmation of AD knowledge)	Thematic analysis	Manually
	Narrative: Transcripts (Plenaries 1,2 and 3)	Content analysis (Use of concepts)	Manually
2. Effectiveness of the AD Program to support learning	MCQs and LSQs (PRQ I & II, Check-out quizzes)	Descriptive statistics	Excel & SPSS
	OEQs	Thematic analysis	Manually
	Narrative: Transcripts (Plenaries 1,2 and 3)	Content analysis (Collaboration)	Manually
3. Impact of the AD Program on reports of clinical AD practice	Narrative: OEQs (Log)	Thematic analysis	Manually
	LSQs on level of implementation of change to clinical AD practice	Descriptive statistics	Excel & SPSS

Note. OEQ = open-ended questions; MCQ = multiple-choice questions; LSQs = Likert-scale questions.

In this study, the majority of data were gathered and electronically stored through WebCT. Narrative data were derived from three sources: (a) problem solving five cases in the Pre-test, Post-test and 1Month Post- test (total of 68 open-ended questions); (b) Plenary Transcripts (40 pages); and (c) Self-reported measures such as, the Log. Responses to the five cases were analyzed through an ad hoc scoring system. Plenary Transcripts were analyzed manually by the researcher because the nature and size of the narrative data did not justify the use of computer-assisted qualitative data analysis software (Lee & Esterhuizen, 2000).

Responses to open-ended questions in self-reported measures were analyzed through thematic analysis (Strauss & Corbin, 1994).

Table 3.13 summarizes the different weight of measures in the participants' final score.

Table 3.13

Measures Weight in the Final Score

RQ	Measure	Type of assessment	Weight
1	• Pre-test	MCQs + 3 cases	5 %
	• Post-test	MCQs + 1 case	30 %
	• 1Month-Post test	MCQs + 1 case	30 %
2	• 3 Plenaries	OEQs	20 %
	• 4 Paired activ		
2	• PRQ (I & II)	MCQs + LSQs	10%
3	• Log	OEQs	5%
Total			100%

Note. RQs = research questions; MCQs = multiple-choice questions; OEQs = open-ended questions; PRQ = Participant Reaction Questionnaire; LSQs = Likert-scale questions; Activ = activities

In Table 3.13, the Pre-test's weight was 5% because it was used in the Introduction phase as baseline to compare with the Post-test (completed at the end of the Instructional Phase) and 1Month-Post test (completed at the end of the Closure phase). The measurement of participants' learning and collaboration over a 9-month period constituted the main objective of this study. Therefore, the Post-test and the 1Month-Post test, as well as collaborative activities (Plenary and Paired activities), were weighted higher than other measures.

The data set covers responses to multiple choice questions (MCQ), open-ended questions (OEQ), and Likert-scale questions (LSQ). In the tests, answering

MCQs and problem solving clinical cases were scored separately due to the different type of knowledge each assessed. However, as shown in Table 3.13, MCQs and problem solving were combined for the final global score. The FMOQ's standard for passing a CME program is by correctly answering 60% of the test questions, the same standard that was applied to the AD Program.

The next section presents the scoring systems, and coding schemes used to analyse data for answering research questions 1 and 2.

3.4.1 Research Question #1: Evidence of Learning

This section presents data analysis systems to provide evidence of learning (RQ#1). Learning is defined as the construction of declarative and procedural knowledge on the diagnosis, treatment and management of AD, as well as the confirmation of prior knowledge. The systems for scoring the Pre-test, Post-test and 1Month-Post test (multiple-choice questions and open-ended questions), as well as the coding schemes for analyzing the Plenary Transcripts, are presented next.

3.4.1.1 Scoring System for Multiple-Choice Questions in the Tests

Using descriptive statistics, WebCT automatically scored Section A of the Pre-test, Post-test and 1Month-Post test (22 MCQs). A correct response to each question was given one point. After the test was submitted, feedback was provided to the participant by the system (WebCT), along with the correct answer.

A parametric inferential statistic test (t test for paired samples) was preferred to a non-parametric one (e.g. Wilcoxon or Friedman) due to its greater power to detect change between the Pre-test scores and subsequent tests' scores. Despite the small sample (N = 8), t test is a robust test with regard to the assumption that AD knowledge is normally distributed in the population of physicians.

3.4.1.2 Scoring System for Clinical Cases in the Tests

A valid and reliable scoring system was created to measure the knowledge that participants acquired, confirmed, retained and applied when solving clinical cases. In the assessment literature (Mehrens & Lehmann, 1978; Oosterhof, 1994), cases are reagarded as being similar to essays. Compared to MCQs, the essay's advantages are that: (a) they measure more than one skill, (b) reduce blind guessing, and (c) better represent reasoning and understanding compared to the selecting of an item from a MCQ checklist.

On the other hand, the essay has some disadvantages when compared to a MCQ questionnaire. The scoring of essay tests is more time-consuming than the scoring of MCQ questionnaires. Furthermore, by providing broad open-ended answers, essay items do not offer an adequate sampling of the content. Consequently, numerous open-ended questions were included as a means of counterbalancing this drawback (Oosterhof, 1994) and strengthening the content validity of this study.

Scoring essays is less reliable due to its subjective component reflected in the reader's individual differences, difficulty in reading the responses, and in evaluating expected achievement levels (Oosterhof, 1994). In the present study, and in order to increase the objectivity of the scoring system, two subject matter experts, who were family physicians with expertise in geriatrics, provided model answers for the five clinical cases included in the Pre, Post, and 1Month-Post tests. For each question, a model response was generated by the subject-matter experts. The model response covered a number of required components called items which contained key concepts or phrases. However, the subject-matter experts who created the cases did not weight the items' importance within the model responses. Therefore, and in order to facilitate the scoring of the participants' responses, four judges (two neurologists and two geriatricians) ranked the importance of each item on a 5-point Likert scale (1 most important, 5 least important). In only a few instances was consensus reached amongst the judges on the importance of an item within a model response. Therefore, the mean of the judges' ratings of importance was calculated. This mean was then converted into points following the rule that the lower the mean the higher the weight of importance of such item in the model response (i.e., mean of 1 indicated the highest relevance and, hence, was transformed into 5 scoring points). Table 3.14 illustrates the rule on how to convert the weight of relevance of an item into scoring points.

Table 3.14

Converting the Relevance of Items into Scoring Points

Means of item relevance	Value of item in scoring points
1	5
2	4
3	3
4	2
5	1

Note: Mean of the item's relevance is calculated from the judges' ratings for each item in a model response.

Finally, each model response had a score which represented the sum of the points given to all of its items (e.g. 14 total points) as shown in Appendix R which illustrates the procedure for scoring Marcela's and Diana's responses to question 1 on Mrs Gerber's case. Responses from participants totalled 1600 statements across five cases. Following a procedure similar to thematic analysis, these statements were grouped under a specific item of the model response. The scoring procedure was validated by a clinician and general agreement (80%) was reached between the clinician and the researcher.

In order to provide evidence to support research question 1, Transcripts from three Plenary activities were used for content analysis that is presented next.

3.4.1.3 Content Analysis

Content analysis is a generic term that includes a variety of procedures for analysing textual material; in this case, the transcripts of online discussions which were automatically stored in WebCT. Content analysis involves "comparing, contrasting, and categorizing a set of data" (Hara, Bonk, & Angeli, 2000, p.6) following a priori or aposteriori guiding principles.

In the present study, a multi-level framework was used to capture the complexity and multi-dimensional nature of interaction in networked environments

(De Laat & Lally, 2004; Hara et al. 2000). The same Transcripts were coded at three levels: (a) Use of concepts (RQ#1), (b) Collaboration and (c) Emerging patterns of collaboration (RQ#2). A codebook was compiled for each level (Appendices T,U,V).

In this multi-level framework, the same thematic unit of analysis was used to facilitate the integration of the three levels. This unit was a statement, a main idea expressed in one or more sentences (Ingram & Hathorn, 2004). This is equivalent to *chunks* (Miles & Huberman, 1994) and to *units of data* (Bogdan & Biklen, 1992). The thematic unit of analysis has been often used in the literature on online discussions (Henri, 1992; Newman, Webb, & Cochrane, 1995; Rourke, Anderson, Garrison, & Archer, 1999). Transcripts of online discussions contained messages that were segmented into statements. This subdivision was necessary because a message could reply to one or many messages, and refer to more than one topic that may or may not be related (Ingram & Hathorn, 2004).

In this study, triangulation of sources was implemented to increase the validity and reliability of the multi-level content analysis framework (De Laat & Lally, 2004; Hara et al. 2000). For example, in the Participant Reaction Questionnaire participants were asked to specify the main concepts and /or procedures that were confirmed by the AD Program for each of the three categories (i.e., dx, tx, and mg). These results were triangulated with the content analysis of the Transcripts for Use of Concepts during Plenary activities.

The procedure to determine reliability of the multi-level coding scheme (inter/intra rater reliability) is described later in this chapter.

3.4.1.3.1 Coding Scheme for Use of Concepts. Research question #1 focuses on evidence of RFPs' learning from the AD Program. The Transcripts of Plenary activities were coded for Use of Concepts to gather evidence of learning as manifested in the elaboration of concepts included in the learning outcomes of the AD Program (Pressley & McCormick, 1995).

The coding procedure for Use of Concepts included several steps. First, a list of concepts derived from the 16 specific learning outcomes of the AD Program was compiled and subdivided into the categories of Diagnosis (dx), Treatment (tx) and Management (mg) (Appendix F). The category of Diagnosis included 39 concepts/themes covered in the AD Program and which were divided into 8 subcategories. The category of Treatment included 14 concepts/themes covered in the AD Program and divided into 6 subcategories. The category of Management included 14 concepts/themes covered in the AD Program and divided into 3 subcategories (Appendix S). A codebook was compiled for each category where each concept was defined and assigned a descriptive code which included the main topic (e.g. Dx) and, at times a subtopic (e.g. H for Patient History, see Appendix T for examples).

Secondly, messages from the Plenary Transcripts were segmented into thematic units, called statements. Each statement was coded following the list of concepts derived from the 16 specific learning outcomes of the AD Program. Once coded, concepts were grouped by subcategory and counted.

Finally, the coding scheme results were validated through Check coding (Miles & Huberman, 1994) which is described at the end of this chapter.

The next section presents the context of Plenary activities which is then followed by a description of the coding scheme used to analyze the Transcripts of Plenary activities and to determine whether collaboration occurred.

3.4.2 Research Question #2: Effectiveness of the AD Program in Supporting Learning

The AD Program offered a variety of activities to support learning and collaboration (RQ#2). In Plenary activities the moderated group discussed clinical cases and other issues relating to their AD practice. Group collaboration is influenced by the task type, available technology, group size, facilitation, incentive, and individual accountability (Ingram & Hathorn, 2004; Paulus, 2005). Table 3.15 describes the context of the Plenary activities in the AD Program.

Table 3.15

Context of Plenary Activities

Context	Description
Type of task	Collaborative discussion of on-task topics in order to apply the

	AD Program's concepts and procedures to the problem solving of cases and issues derived from clinical practice.
Technology	Web-based asynchronous, threaded forum on WebCT.
Group size	10 participants (8 RFPs, 1 facilitator and 1 educator); heterogeneous group having different levels of AD expertise.
Facilitation	A family physician expert in AD moderated the discussions on AD. The educator was in charge of logistics.
Incentive	Participation in Plenary and Paired activities was weighted 20% in the final score. RFPs received an honorarium and credits for participating in the AD Program. The facilitator received an honorarium for moderating the discussion.
Individual accountability	Frequency of on-task messages posted on the Discussion Board. A final tangible product created by the group was not required

Note. RFPs = rural family physicians; AD = Alzheimer's disease

3.4.2.1 Coding Scheme for Collaboration

In order to analyze the extent to which collaboration occurred during Plenary activities, online discourse was analyzed by adapting Ingram and Hathorn's (2004) collaborative framework which offered the following advantages: (a) it was developed specifically for analyzing online collaboration, (b) it clearly explained the coding scheme procedure and the construct of collaboration, and (c) it employed a thematic unit of analysis which is a recurrent format for analyzing transcripts of online discussions (De Wever, Schellens, Valcke, & Van Keer, 2005).

Collaboration is operationalized through three indicators: *independence, interdependence,* and *synthesis* (Ingram & Hathorn, 2004). The attribute of independence implies that a truly collaborative group works independently from the instructor and takes advantage of the group's resources. Interdependence implies that the individual's and group's outcomes are interrelated because one cannot be achieved without the other. Positive interdependence promotes learning and sharing of knowledge to accomplish the group's shared goal. Table 3.16 shows a summary of Ingram and Hathorn's (2004) coding framework

Table 3.16

Ingram & Hathorn's Coding Framework

Indicator of Collaboration	Category & Requirements
Interdependence	Equal Participation Interaction • Connectivity • Quality of interaction
Independence from the instructor	Participation Interaction
Synthesis	Final group project

Note. From Methods for analyzing collaboration in online communications by Ingram A. L. & Hathorn, L. G. (2004). In. T. S. Roberts (Ed.), *Online collaborative learning: Theory and practice* p. 226. Hershey, PA: Information Science. Reprinted by permission of the publisher.

Table 3.16 indicates that interdependence requires equal participation and interaction. Participation is measured by the frequency of messages sent and received by each member of the group. Interaction is measured through the *connectivity* and *quality* of interaction. Connectivity of messages occurs "…when group members refer explicitly or implicitly to prior messages in a discussion, while staying on topic" (Ingram & Hathorn, 2004, p. 218). The *quality* of interaction is assessed through the level of agreement with previous messages and the contribution to the discussion with additional information.

Synthesis is the third indicator of collaboration and refers to "the creation of something new as a result of discussion" (Ingram & Hathorn, 2004, p.225) because collaboration is more than an exchange of views and information. Synthesis is operationalized through the production of a final tangible group product.

This study adapted and expanded Ingram and Hathorn's (2004) framework as shown in Table 3.17

Table 3.17

Adaptation of Ingram & Hathorn's Coding Framework

Indicator of Collaboration	Category
Interdependence	1. Participation (frequency counts of statements) 2. Interaction • Connectivity • Quality of interaction 3. Emerging patterns of collaboration
Independence	Participation Interaction

In this study, collaboration was operationalized through two indicators (i.e., interdependence and independence). The third indicator (i.e., synthesis) was excluded because participants were busy professionals who would not be able to create a tangible final product. Furthermore equal participation was not required. As quality of interaction was a category too broad to describe the type of topics discussed, an inferential level of coding (i.e., emerging patterns of collaboration) was added by the researcher.

3.4.2.1.1 Procedure for Coding Collaboration. The procedure for coding Plenary Transcripts included a variety of steps. As participation is the basis for potential collaboration, it was measured by the frequency of messages sent and received during the three Plenary activities.

Using a thematic unit of analysis, messages were segmented into statements which were then classified into two broad categories: *off-task* and *on-task*. Off-task statements focused on the creation of a community of learners and facilitated group dynamics by starting a discussion or arriving at a conclusion (Ingram & Hathorn, 2004). Only on-task statements were coded, as follows (a) *social group management* (positive and negative comments from all members of the group), or (b) *direct discussions on the scenario* (i.e., on Alzheimer's disease).

These on-task statements were coded in terms of: (a) connectivity, (b) quality of interaction, and (c) emergent patterns of collaboration.

Connectivity to previous messages included four types of statements: *independent statement*, *direct response*, *direct comment*, and *indirect comment* (Ingram & Hathorn, 2004) (Appendix U).

Quality of interaction was coded as: (a) *simple agreement*, (b) *adding information* (Ingram & Hathorn, 2004), or (c) *references* (Appendix U).

To code emergent patterns of collaboration, the researcher followed an inductive process of coding aimed at letting the body of data speak for itself. In other words, instead of analyzing the data from the researcher's pre-established conceptions about the phenomenon under study, she attempted to capture the participants' perspectives as reflected in the nature of their discussion (Leitao, 2001). Eight categories emerged from this inferential analysis. Each statement was assigned a specific code (two codes maximum) within these eight categories: *agreement, disagreement, link to practice, illustrating a new idea with an example, knowledge assessment, identified barriers to transfer to practice, predicting, and questioning (*Appendix V). The initial list of codes was subsequently revised several times by the researcher, and later validated by two judges through Check coding which is presented at the end of this chapter.

3.4.3 Methods to Verify the Quality of the Study

Methods to verify the quality and credibility of the study included: data triangulation, member checks, narrative based on thick description, clarification of the researcher's biases, long-term observation, and peer review or debriefing (Creswell, 1998; Merriam, 1988; Stake, 1995). Data triangulation ensured internal validity of the study; that is, "verifying if the study results match reality, or capture what is actually there" (Merriam, 1988, p.167). At different times during the AD Program, data on the participants' learning process through multiple sources were collected and then triangulated (Creswell, 1998). The researcher (in her role of educator) monitored the physicians' interaction and participation in the virtual classroom through long-term observation, and gathered data over a two year period. Through narrative based on thick description integrating multiple sources, each physician was considered as a mini-case, thereby permitting the reader to derive naturalistic generalizations (Stake, 1978) as well as to select aspects that could be transferred to a similar case study (Creswell, 1998).

Member checks is considered "as the most critical technique for establishing credibility" (Lincoln and Guba, 1985 p. 314) because it validates the researcher's reconstruction of the participants' perspectives.

In this study, RFPs were sent stories whereby the researcher summarized and interpreted their experience in the AD Program. Participants were then asked to reflect on them, with particular attention to the following five questions:

1. Describe briefly your reaction when you read your story.
2. Rate the accuracy of the researcher's interpretation of your experience in the AD Program (5 point-Likert scale)
3. Rate the level of bias of the researcher's interpretation of your experience in the AD Program (5 point-Likert scale)
4. Rate the clarity of language in this story (5 point Likert scale)
5. Rate your understanding of the information presented in this story (5 point Likert-scale).

All participants completed the Member checks, and agreed that the researcher's interpretation of their learning experience in the AD Program was very accurate, non-biased and clearly presented. One of the participants stated:

> I thought it was a very accurate summary of the experience as a whole. I felt it very accurately reflected my thinking and the process throughout the course. 'Got inside my head quite well' was my first reaction (Mark, Member checks).

Additional comments from Member checks are presented in the Discussion chapter.

3.4.3.1 Check-Coding

In the present study, check-coding was used to increase the accuracy and reliability of the content analyses of the Transcripts of the three Plenaries activities. Two check-coding procedures were used to increase the reliability of the coding system. In the first check-coding procedure, called *intercoder*, the Transcripts coded by the researcher were compared with those independently coded by two judges. In the second check-coding, called *intracoder*, the researcher coded and re-coded the same data a few days apart (Miles & Huberman, 1994).

The multi-level coding system included the Use of concepts, Collaboration (i.e., Connectivity and Quality of interaction), and Emerging Patterns of Collaboration.

With regard to the level of Use of Concepts, the intercoder reliability coefficient was 88% and the intracoder reliability coefficient was 86%.

With regard to the level of Collaboration, two counts were necessary to reach intercoder reliability coefficient of 86% for Connectivity and 93% for Quality of Interaction. The intracoder reliability coefficient for the level of Collaboration was 93% for Connectivity and 92% for Quality of Interaction.

Finally, with regard to the level of Emerging Patterns of Collaboration, the intercoder reliability coefficient was 92% and the intracoder reliability coefficient 87%.

3.5 Summary

This chapter described the research design, the participants, and procedures for data collection and data analysis.

The descriptive collective case study was coordinated by the researcher who played the dual role of educator and designer. The facilitator, who was a family physician with expertise in AD, moderated the discussions. Eight rural family physicians from the provinces of Quebec and Ontario completed the AD Program. Laborious recruiting procedures and a relatively high drop-out level (67%) were caused by a variety of factors.

The small size of the sample adhered to the research design principles and requirements of the PBL instructional method and accreditation criteria. Participants were expected to collaborate in plenary and paired activities. Composition of pairs was driven by the criteria of unfamiliarity and heterogeneity.

The setting of this study was an online learning environment hosted by the McGill University server. The design and implementation of the educational intervention was tailored to characteristics of the audience and the features of WebCT. Needs assessment results reported that RFPs were motivated to participate mostly by the novelty of technology and a flexible, asynchronous, and convenient access from their homes. However, the majority of participants were novice Web-users who had never taken an OCME program and who had limited desktop computing power. Consequently, the designer selected a text-based format without multimedia features, combined with close scaffolding and a tutorial on technology to ensure accessibility and limit dropping out.

Before its implementation, the AD Program was thoroughly reviewed at the formative evaluation phase by an inter-disciplinary group of subject-matter experts. At the summative evaluation phase, the AD Program's effectiveness in supporting learning was assessed at the levels of participation, satisfaction, knowledge, competence and performance (Moore, 2007). The facilitator's feedback also contributed to the summative evaluation of the educational intervention.

The design and implementation of the AD Program were driven by the Integrated-Practice-based-Learning Framework. Adhering to Instructional Design principles, the content, strategies, and assessment of the educational intervention were aligned to its learning outcomes and audience's characteristics.

The modular content of the AD Program was organized into four phases, namely, Introduction, Instructional, Practice Opportunities and Closure. Instructional strategies included: direct instruction, problem solving, collaboration, self-monitoring, practice opportunities and scaffolding. Assessment was longitudinal, authentic, multiple, criterion-referenced and targeted both the product and process of learning. Objective measures included three tests (Pre, Post, and 1Month-Post). A variety of self-reported measures assessed the effectiveness of the AD Program design, and its impact on facilitating learning and change in clinical practice.

Data analysis was driven by the research design and included two complementary phases: the within- and cross-case analyses. The data set included MCQ questionnaires which were analyzed by descriptive statistics, and narrative (i.e., clinical cases and Plenary Transcripts) which was analyzed by content analysis. In order to assess the participants' level of collaboration, Plenary Transcripts were analyzed by a multi-level coding scheme.

The credibility and quality of the present study was supported by a variety of methods, namely, member checks, data triangulation, thick description of participants' experience, clarification of the researcher's biases, and check coding.

The next chapter presents the results of this study.

CHAPTER FOUR: RESULTS

The purpose of this study was to explore rural family physicians' (RFPs) learning in online continuing medical education (OCME) as a means for answering the following overall research question: How does an online Alzheimer's disease (AD) Program support rural family physicians' learning about Alzheimer's disease? The study investigated participants' learning (RQ#1), the effectiveness of the AD Program in supporting their learning (RQ#2), and the impact of the Program on their reports of clinical AD practice (RQ#3). This chapter includes the results of the study which are presented in two sections: the within-case analysis and the cross-case analysis.

4.1 Within-Case Analysis

The within-case analysis describes in detail the experience of each of the 8 participants (each considered as a mini-case). Each mini-case covered the following aspects: (a) demographic characteristics, (b) computer literacy and technical infrastructure, (c) unique traits of the participant, (d) triangulation of sources to support the three research questions, and (e) a summary. Due to space limitations, the description of each mini-case is focused mostly on documenting the participant's highest reported gap which was knowledge about AD treatment. This gap applied to the whole group except for Ronald. Comfort level in small group work and frequency of practice activities are reported based on the assumption that they could influence the participants' learning process. The sequence of the eight mini-cases is driven by the level of team work effectiveness during Paired activities. Effectiveness of Paired activities to support participants' learning was rated by self-reported measures. The team that was perceived as the most effective was that of George and Diana which is the first to be presented, followed by Mark and Luc, Norma and Ronald, and finally, Marcela and Mathew.

4.1.1 George

George is an experienced rural family physician (25 years of rural practice, 52 years of age). His practice is hospital-based and in group (i.e., working in a team) with high locum coverage. It is located less than 200 km from secondary referral centers, specialist services, and between 400 to 600 km from high technology health care facilities. He is affiliated with the College of Family Physicians of Canada (CFPC), the Society of Rural Physicians of Canada (SRPC), and has been actively involved in the organization of rural CME. At the time of this study, the size of his AD clientele was fairly small at each of the three stages (1-10 patients in the mild, moderate, and severe stages).

George's self-directed learning profile and computer literacy level were high. He preferred an environment with opportunities for a mixture of guided and discovery learning. George was motivated to participate in the AD Program by the novelty of the technology, convenient access and type of content. Despite being a novice WebCT user, George tried the innovative CME online format which he described as requiring time and effort and even frustration due to delayed postings from other RFPs on the Discussion Board.

George was the most engaged and active participant in the AD Program as illustrated by his story. The AD Program supported George's construction and confirmation of his AD knowledge (RQ#1). Objective measures showed that George was already knowledgeable about AD practice at the Pre-test on which he scored the highest in the group and his mean (86) was above the group mean (74). Across the MCQs sections of the three tests (Pre-Post and 1Month-Post), George's progress was reflected by an increase in scores (Pre-test, 86; Post-test, 93 and 1Month-Post-test, 100). In case-based instruction, there was only evidence of an increase in scores in AD treatment (tx) (Pre-test, 30; Post-test, 57; 1Month-Post test, 67).

George reported that a substantial part of the AD Program confirmed his AD practice. The AD Program offered current and stimulating information to fulfill his need for updating and confirming his AD practice and sharing relevant issues with his peers. George was the most active participant who contributed the most to the discussion by using 26% of all diagnostic concepts, 20% of all therapeutic concepts and 21% of all managerial concepts used by the group across Plenaries.

Regarding the extent to which the AD Program's features contributed to his learning (RQ#2), George reported that overall they were very effective in supporting his learning (mean 3.87 of 20 features rated on a 5-point Likert-scale, Appendix W). The most highly effective features were the educator's performance, the Pre and Post-tests, the Modules on diagnosis and treatment, Paired activities, and the practice quiz on treatment. In fact, he took advantage of most practice opportunities (7out of 9) to reinforce and confirm his knowledge, and prepare for the tests. Some of the medium effective features were the facilitator's performance, WebCT, the Log, and the Plenary. The least effective feature was the Technological support.

Paired and Plenary activities were designed to provide opportunities for collaboration. In the Paired activities, George showed great flexibility when his partner Paul unexpectedly dropped out and was replaced by Diana. George was the only participant who rated as very effective the problem-solving experience in Pairs because he benefited from peer consultation which he realized is an undervalued resource available for rural practice. George and Diana became the most effective pair in the group.

In the three Plenary discussions, George was the most outspoken, critical, and active participant (27% of total on-task statements of 8 RFPs). He demonstrated critical thinking by identifying barriers to practice (36% of his statements), making links between the AD Program's content and his clinical practice (15% of his statements) and asking relevant questioning (13% of his statements). Although diagnosis was not an area he perceived as a gap in his knowledge, George raised the controversial issue regarding the use of CT scans for screening early AD, and initiated a stimulating debate where all RFPs actively participated. Here George linked the use of CT scans to Mr. Singh's case. Then, he built an argument by challenging the applicability of the Canadian Consensus Guidelines (1999) to the rural community setting. He articulated his position by reflecting on his prior knowledge and contrasted his current practice with that of his peers. In his words:

> I've been doing this for 23 years and I'm still not as good as I'd like to be. Alzheimer's disease is a terrible diagnosis to give anyone…I am aware that the 'Canadian Recommendation' have been validated for use in tertiary hospitals, but have they ever been evaluated in community settings, specially when access to a neurologist or Alzheimer's specialist is not easy? Personally, I do a CT scan on everyone whom I suspect has early Alzheimer's disease (George, PL1, 553).

George's activeness and engagement were also demonstrated by his initiative in bringing to the group discussion relevant literature related to the AD Program, as well as promptly answering the educator's question on the main issues encountered in monitoring the disease's progression and treatment response in patients similar to Mr. Singh.

Throughout the AD Program, George reflected on the possibility of changing his therapeutic AD practice, which was his highest perceived gap (as reported by the Gap Analysis, Icebreaker and Barometer). He initiated the group's discussion about CI medications by describing the content of an article on the safety and efficacy of CI for AD treatment. Then, George articulated his position by describing the barriers encountered in his current clinical practice, providing practical examples and openly expressing his feelings of frustration and impatience when reflecting on his therapeutic practice:

> I tend to be impatient. You do have to give each medication a good 6-month trial…It's easy to get impatient and change medications or stop them due to side effects, the family demanding you do 'something', etc… (George, PL 1 – 560).

When asked what he learned from this Plenary discussion on AD treatment, George stated: "Different groups (of physicians) work differently. Learn one drug well and use it. Ask a colleague for a second opinion, this is an undervalued resource" (Activity 22).

According to George's reports, the AD Program combined with additional AD resources outside the AD Program might have had some impact (RQ#3) on his AD practice (e.g. accessing Web resources and caring for his AD patients).

In the Log, George reported that the majority of anticipated changes in AD treatment and management have been partially or fully implemented. For example, in providing more treatment to caregivers, George reported that the enabler for this change was one of his AD patients

> …who appeared to be getting increasingly jealous and a bit paranoid. This has triggered a family crisis and they are demanding institutionalization, not a quick option. I need to pay more attention to caregivers…

This change was only partially implemented due to limited resources (e.g. social workers). George also implemented one change in AD management which he had not previously anticipated, that is, a more systematic monitoring and follow-up of complex patients, or in his own words:

> I am actually making more detailed notes on these patients. I realize that it is more important to record details like daily levels of functioning so that there is a written record to compare it within 6-12 months, to see if there has been deterioration or if the patient is stable (Log 1, Q21).

This non-anticipated change was triggered by George's participation in the AD Program as evidenced by his comment: "Taking this course has shown me that I can and must do a better job in caring for these difficult patients" (Log).

In summary, despite being a WebCT novice and struggling at the beginning to get used to the new platform, George actively participated in the AD Program which confirmed and expanded his knowledge of AD. In the Plenaries, he was the leader of the group and posted the highest number of on-task messages that demonstrated his higher-order thinking. He worked effectively in Paired activities with his partner Diana, and together became the best team in the group. He consistently rated the AD Program's features as very supportive for his learning process because of: "its updated and comprehensive content, convenient access, and peers' and expert's support" (George, PL 4). Finally, the AD Program, combined with external additional Web resources and practice gained through caring for his AD patients might have had some impact on his AD practice as illustrated by his feedback and the implementation of anticipated and non-anticipated changes in those areas that were initially perceived as knowledge gaps.

The story of George's partner, Diana is presented next.

4.1.2 Diana

Diana is an experienced RFP (47-57 years age bracket) practicing in a rural community of less than 10,000 inhabitants in the Eastern Townships, Quebec. For the past 25 years, she has practiced in a clinic/private office where locum coverage is low. Her office is located less than 200 km from a secondary referral center, specialist services, and high technology health care facilities. Diana is affiliated with the CFPC. At the time of the study, the size of her AD clientele was fairly large. She cared for between 26-50 patients at the mild stage; 11-25 at the moderate stage; and 11-25 at the severe stage. Diana's self-directed learning profile is below average in that she usually prefers very structured learning options such as lectures and traditional classroom settings (Guglielmino & Guglielmino, 1994). In a self-reported measure, she reported her preference for an environment offering opportunities for a mixture of both guided and discovery learning. Diana rated her interest in AD as the most important motivating factor to participate in the AD Program. Convenience of access, peer interaction, novelty of technology, and the opportunity to receive Mainpro-C credits from the CFPC were equally rated as somewhat important.

Despite being a novice Web-user, lacking experience in CME online, and preferring very structured learning environments, Diana agreed to participate in this innovative AD Program. She quickly learned the new platform (WebCT), and her participation was supported by an effective follow-up by the educator. Showing patience, humour and motivation, Diana gained familiarity and comfort with the new technology and considered this technological challenge as fun.

One of Diana's distinctive traits was that despite being one of the most experienced AD participants in the group, she scored the lowest. Furthermore, although she was one of the least computer literate of the group, she managed to successfully transform this gap into a success story. Her own words "where there's a will there's a way" best summarize her experience.

As documented by the objective measures, there is some evidence of Diana's learning (RQ#1). Despite having one of the largest AD clientele (approximately 100 AD patients per year), Diana consistently scored under the group mean in all objective measures. Her final global score (82.55) was the lowest of the group (group mean was 85.87). She showed an increase in scores in the MCQ section (Pre-test, 62; Post-test, 86; and 1Month-Post test, 100), but did not increase in overall scores on cases (Pre-test, 52; to Post-test, 58; and 1Month-Post-test, 54). However, in AD treatment, which was her largest perceived knowledge gap, Diana increased her scores (Pre-test, 29; Post-test, 56; a score she maintained at the 1Month-Post test, 55).

In Plenary 2, which focused on treatment, Diana contributed to the discussion with 11% of total therapeutic concepts used by the group. At the end of the AD Program, she stated that a substantial part of the AD Program confirmed her treatment practice: "Helpful review of the main facts accepted in the treatment of AD, the different medications, and profiles and what to follow-up and expect" (PRQ 1-3-4). She also contributed to the Plenary discussions with 8% of total managerial and 2% of total diagnostic concepts used by her peers.

Regarding the extent to which the AD Program contributed to her learning (RQ#2), Diana rated as medium the overall effectiveness of the design features of the Program (her mean for 20 features was 2.93 on a 5-point Likert scale, Appendix W). For her, the highest effective features were: the educator's performance, Module 5 on diagnosis and Module 7 on management, and two optional practice activities (i.e., quiz on treatment and review of modules). In fact, Diana was among the top 3 participants in terms of the extent of frequency of practice (9 times) by engaging in optional activities in the AD Program as a means of reinforcing her knowledge and preparing for the Post and 1 Month-Post tests.

For Diana, the medium effective features were WebCT, Module 4 on diagnosis and Module 6 on treatment. The least effective features were the facilitator's performance, the Plenary, the Pre- and Post tests, and Modules-1-3.

When Diana was recruited by the researcher over the phone, she questioned the need to include small group discussions in the AD Program, preferring to work alone. Despite anticipating low comfort and competency levels in working in a group, Diana adapted to unexpected changes in the re-grouping of pairs with patience and flexibility. She actively collaborated with her new partner (George) which resulted in their becoming the most effective team working in pairs. Diana rated as effective her experience in Paired activities. She rated as high her ability to be attentive to her partner's opinions as well as her comfort level in the following situations: (a) discussing her ideas, (b) speaking up when she was puzzled or uncertain, (c) receiving constructive feedback from her partner, and (d) dealing with disagreement. She rated as medium her comfort level for providing constructive feedback to her partner. In Module 4 focused on AD diagnosis, where participants were required to discuss two cases in pairs (cases which they had previously completed individually in the Pre-test), Diana rated her case-based discussions with her partner as somewhat useful and the overall Module 4 as effective in supporting her learning process. According to Diana, a weakness of discussing cases in pairs was "the slow pace that made you lose interest over time" (PRQ-I). She suggested two changes that would have improved her Paired team work: "Keeping a faster pace so that discussions would be livelier and interesting, and creating more stability in the initial pairing up!" (PRQ-I). She further stated that one of the strengths of problem solving in pairs was that it permitted them to "revise and confirm our different but both acceptable approaches" (PRQ-I-Q18). When asked what she learned from the Paired work that she may not have acquired from working alone, she answered:

> Everybody is uncertain about the right approach, since there are many possibilities (realization as the working years accumulate)" (Diana, PRQ-I). She also learned "Patience! A step by step approach with some interference due to differing schedules and unease with computer skills… (Activity 16)

Plenaries were rated as one of her least effective features to support her learning which could explain her low participation in the three Plenaries (8% of total statements from 8 RFPs). Diana's limited participation in Plenary discussions focused mainly on her agreeing with peers and elaborating on that agreement (47% of her statements), as well as by linking the discussion to her clinical practice (27% of her statements).

Diana rated different factors (her ability to work in group, the organization of the Plenary, and the effectiveness of the facilitator and the educator) that might have influenced her learning process (PRQ-I). Overall, her rating of the Plenaries' effectiveness to support her learning was the lowest in the group (mean of 2 on a 5 point-Likert scale). In looking at Diana's ability and comfort levels for working in groups, she rated as high her comfort level in dealing with disagreement, and as medium her ability to be attentive to her peers' opinions and her comfort level in discussing her ideas and receiving constructive feedback from her peers. Diana rated as low her comfort level in providing constructive feedback to her peers. She rated Plenary discussions as somewhat democratic and interesting. The organization of the Plenary helped Diana somewhat in gaining support from her peers and the facilitator. On the other hand, it was very helpful in gaining support from the educator. In the Plenaries, she considered the most helpful aspect for her learning process to be the realization that: "Everybody struggled the same way" (PRQ-I). The least helpful point was that: "It took too long to coordinate everybody's work" (PRQ-I), and suggested the following idea to improve Plenary discussions: "Have a smaller group and follow a more efficient pace" (PRQ-I). Diana gave the following example of what she had learned from the group that she may not have learned from working alone:

> AD is prevalent everywhere and everybody tries to deal as well as they can with dx, tx, and follow-up in our present day and age where Internet makes everyone an expert and novelties in medicine abound! (Diana, PRQ-I)

With regard to the impact of the AD Program on her clinical practice (RQ#3), Diana stated, at the beginning of the AD Program, that she *might change* the way she diagnosed, treated and managed her AD patients. Later, at the Post and 1Month-Post tests, she stated that she was *planning to change* her AD practice (Barometer). Diana described the impact of the AD Program on her AD practice (RQ#3) as: "Following a more systematic approach and follow-up; less shyness about prescribing CI (medication)" (Activity 22). Her increased confidence and competency in prescribing CI medication support her identified gap in treatment at the Needs assessment. In her own words: " I am more at ease in prescribing CIs and monitoring their efficacy and side effects and I feel more ready than before to treat" (Activity 22). She also reported that another anticipated change (i.e., using the Reisberg scale) was partially implemented in her AD practice.

When asked what her first reaction had been when reading the story that described her experience in the AD Program (Member checks), Diana answered: "We are on display...How poorly I fared!" The researcher asked her to expand on her thinking and she added:

> It is an analysis of the doctor, not of an AD (not yet at least!) patient...A lot of below average remarks: self-directed learning profile, lower scores...This might reflect in part a reticence I still have in prescribing drugs that can be helpful to a certain degree (often modest at most), to a population already very medicated , adding the risk of side effects and interactions, and cost , and paperwork...Pressures from pharmaceutical companies is omnipresent through publicity, studies, medical faculties financed by them...As stated before, general practice is a fine balance between art and science; the well being of the patient must be our ultimate guide. My practice has changed over the last few years, as I do not cover the long term facility where most of the AD patients were.

Diana's reaction in Member Checks will be discussed in the last chapter. In summary, despite scoring the lowest in the group, the AD Program somewhat supported Diana's learning and transfer to practice. The AD Program offered her the opportunity to become aware of and to reflect on her knowledge gaps, particularly on AD treatment. She confirmed and increased her understanding of AD so that she could implement some changes in her clinical practice regarding early CI treatment, management, and diagnosis of AD. Despite being a novice WebCT user with the lowest level of computer literacy in the group, she succeeded in completing the AD Program, and described her experience as:

> Where there's a will, there's a way…this AD Program has been a fun way to learn; the challenge of slowly mastering computer skills, feeling comfortable enough to exchange over the net specific medical situations and realizing that medicine is still a combination of art and science with multiple sound approaches… (Diana, PL 4).

Norma's and Ronald's team is presented next.

4.1.3 Norma

Norma was the youngest RFP of the group (25-35 years age bracket) with a fairly small AD clientele in each of the three stages (i.e., 1-10 at the mild, moderate, and severe stages). She has practiced for the past 5 years in a community of less than 10,000 inhabitants in Ontario in a clinic/private office, as well as at the local hospital where locum coverage is low. Her practice is located 401 – 600 km from a secondary referral center, specialist services, and high technology health care facilities. She was affiliated with the CFPC and the SRPC.

Her self-directed learning profile was high, in that she usually preferred to determine her learning needs and plan and implement her own learning (Guglielmino & Guglielmino, 1994). In a self-reported measure, Norma stated that an environment with opportunities for a mixture of guided and discovery learning was her preference that best matched her learning style. She rated additional Web resources as highly effective in supporting her learning process.

Norma introduced herself to the group during the Icebreaker session as follows:

> Hi, I am a locum physician, working in various small towns in BC and Ontario. I am interested in the various dementiae and their diagnosis/management. I think there will be an epidemic in about 10 years as the average age of the population increases (and the 'baby boomers' become the 'geezer glut' – borrowed phrase from an internist). I look forward to learning online.

Convenience of access, peer interaction, novelty of technology, interest in AD, and the opportunity to receive Mainpro-C credits from the CFPC motivated Norma to participate in the AD Program. In spite of her constant travelling due to her role as locum coverage physician, she managed to participate quite actively in the AD Program. She was highly motivated, extremely responsible, and always informed the educator in advance as to when she could not comply with required assignments due to her trips. Despite being part of a generation of physicians who grew up with computers, and having a medium computer literacy level and high self-directed profile, she needed an adaptation period to familiarize herself with the new Web-based learning environment, and realized that she was not as effective as expected in a virtual environment without access to printed materials.

Norma's distinctive characteristic was that despite being the least experienced RFP in AD, combined with her need to be constantly travelling, she successfully completed the AD Program and scored the highest in the final global score.

As documented by the objective measures, there is evidence of Norma's learning (RQ#1). She increased her scores in the MCQ section (Pre-test, 71; Post-test and 1Month-Post test, 100). Her mean (90) was slightly above the group mean (88). Despite the fact that she did not show the same progress in case-based instruction, Norma consistently scored above the group mean (a mean of 79as compared to group mean of 72). In the final global score she also scored the highest in the group (her mean of 89 was above the group mean of 86). Her progress was supported by self-reported measures where she qualified the AD Program as relevant and stated that a substantial part of the AD Program confirmed her AD practice. During Plenary discussions she used 4% of total diagnostic concepts and 13% of managerial concepts used by the group.

Norma also reported that a substantial part of the AD Program confirmed her AD practice such as the following concepts and procedures in treatment practice: "Rx with CI's (prescribing CI medication), watch for depression, physical symptoms to monitor for, and contraindications to rx" (PRQ-I).

Regarding the extent to which the AD Program contributed to her learning (RQ#2), Norma rated as high the overall effectiveness of the AD Program's features (for 20 features, a mean of 3.6 in a 5-point Likert scale, Appendix W). She rated more than half of the Program's features as highly effective, with the highest being the educator followed by the Plenary, additional Web resources, and two optional practice activities (the Case-Library and treatment quiz). Norma took advantage of the optional practice opportunities 7 times for reinforcing her knowledge and preparing for tests.

She rated the facilitator, Module 4 on diagnosis, the Log and the Pre and 1Month-Post tests as medium effective features. The least effective features were WebCT navigation, the Post-test and Paired activities.

During her past CME, Norma participated in small groups on case-based problem-solving and rated her comfort level as high for the following activities: (a) presenting and discussing her hypothesis to solve the case, (b) speaking up when confused or uncertain, (c) providing and receiving constructive feedback from peers, and (d) listening actively to other group members. She rated her comfort level for dealing with disagreement as low. In reflecting back on her experience in Paired activities, she rated as medium her ability to be attentive to her partner's opinions and as medium her comfort level in the following situations: (a) discussing her ideas, (b) receiving and providing constructive feedback, and (c) dealing with disagreement. She rated her comfort level for speaking up when confused or uncertain as high (PRQ-I). However, due to logistical problems (limited coordination, time lags between postings, re-composition of team players, and already knowing her new partner, Ronald), Paired discussions were less supportive of her learning process than were Plenary discussions.

In Plenary 1 on diagnosis, Norma posted two messages. In the first message, she agreed with Marcela's dilemma on the accuracy of tools for screening patients suspected of AD. She also asked the facilitator a question on management of vascular dementia (one of her identified gaps). Since the facilitator did not answer her question, Norma suggested that the facilitator's availability should be increased. In the second message, she participated briefly in the controversial issue on the use of CT scans for AD screening. From Paired and Plenary activities she reported to have learned about the Canadian Consensus Guidelines and timelines to reassess patients. Despite the fact that AD treatment was her largest perceived gap, Norma did not post any message in Plenary 2. However, from this discussion she learned the titration of CI, and the fact that there was "not real evidence showing that one CI was more effective than others" (Activity 22).

In Plenary 3 on AD management, Norma posted one message. She paraphrased and agreed with her peers' approaches for managing crisis situations with the caregiver, and elaborated on the discussion by adding new information on the limited infrastructure of the Canadian Health System to provide effective care. Norma predicted that the number of AD patients would increase due to demographic changes and, as a result, crisis intervention with caregivers would become very common (PL 3). She stated that she learned from the group on the need for a more comprehensive approach to AD and the availability of community resources for patient and caregiver.

Norma's participation in Plenaries was relatively low (9% of total posted on-task statements from 8 RFPs). Half of her statements focused on agreeing with her peers and elaborating on her agreement. In fact, Norma usually paraphrased or agreed with her peers' criticism with regard to the application of AD guidelines and the limitations of the Canadian Health System. This might be related to her low comfort level in dealing with disagreement and/or her limited experience in AD. However, as bystander, Norma benefited from Plenary discussions by sharing and contrasting her clinical approach to multiple perspectives, and considered as the most helpful aspect of the Plenary discussions: "hearing other doctors' thoughts on management; hearing that other docs find problems in the same situations; hearing their approaches to crisis management" (Norma, PRQ-I). She offered the following example of what she had learned from the group that she may not have learned from working alone: "Different doctors' approaches to management and support of caregivers" (Norma, PRQ-I).

Norma rated the Plenary discussions as very democratic and interesting and very supportive of her learning process (PRQ-I). However, she pointed out that more involvement from the facilitator would have been a plus (PRQ-I).

According to Norma's reports, the AD Program, combined with literature on AD accessed outside of the AD Program, had some impact on facilitating the transfer of knowledge to her clinical practice (RQ#3). Two of the three anticipated changes were implemented in her practice. The first partially implemented change was in addressing advanced directives (Log). The main barriers to full implementation were: (a) Norma's forgetfulness in implementing advanced directives (10% of the time), and (b) her lack of awareness of the need for advanced directives from the part of the caregivers and patients. The second change was the use of the 'wandering person registry' that was not implemented because Norma's AD patients were kept at the hospital waiting to go to a nursing home and hence, did not need to be listed in such registry. The last change (compiling a list of Web resources for the patients' relatives) was fully implemented. This change indicated her high rating of the additional Web resources as an effective feature of the AD Program.

Norma's progress in the AD Program was also documented by a change before and after the AD Program, ranging from initial dissatisfaction to satisfaction with her clinical AD practice (Barometer). Norma was interested in continuing to network with her peers who participated in the AD Program. The most important reasons given were: (a) to exchange current information on AD, (b) share information on community services for AD patients and their caregivers, and (c) discuss professional issues relating to her rural practice (PRQ-II). In describing her experience in the AD Program, Norma stated that:

> I have enjoyed the course, Francesca. I have learned that my approach is similar to that of other rural physicians, which is reassuring. Lots of limitations when one is practicing out of the big smoke, but I think we all know that. In terms of what I learned of my actual 'learning' – well, I am not as efficient as I thought. Sometimes a week or two would go by without me realizing it! I also realized that having a book or paper in front of me so that I can refer back to certain parts is something I am very used to. The Internet courses are a bit more cumbersome, as one is not just flipping pages (although I guess in a virtual sense we are)… (Norma – PL 4).

In summary, as a high self-directed learner with a medium computer literacy level, Norma needed time to familiarize herself with the new platform and to learn without printed materials. The AD Program supported Norma's learning as evidenced by her progress that placed her first in the group. She rated as high the effectiveness of the AD Program to support her learning and transfer to practice. In spite of some logistical drawbacks, she collaborated in Paired activities. In Plenaries, she benefited from being exposed to multiple perspectives on pertinent issues, and was willing to collaborate further with the same group. The AD Program combined with external AD literature accessed outside this course, had some impact on her AD Practice as evidenced by self-reported measures on changes in her AD practice. Norma's partner in Paired activities was Ronald whose story is presented next.

4.1.4 Ronald

Ronald is an experienced rural family physician (47-57 years age bracket) practicing in a rural community of less than 10,000 inhabitants in Ontario. He has been practicing for more than 25 years in individual practice in a clinic/private office where locum coverage is low. For specific types of neuroimaging investigations (CAT, MRI), his practice is located less than 200 km from secondary referral centers, specialist services, and high technology health care facilities. For other types of investigations (e.g. cardiology, neurology, thoracic) this distance is 200 – 400 km. Ronald is a member of the board of the CFPC and is affiliated with the SRPC as well as other professional organisations (Geriatrics-Ontario and Long Term Care Physicians).

Ronald equally rated as very important the following factors that influenced his motivation to participate in the Program: convenience of access, novelty of technology, and interest in AD. He rated as important the opportunity to interact with peers and to receive Mainpro-C credits from the CFPC.

Ronald's self-directed learning profile was above average, in that he preferred to personally determine his learning needs and then plan and implement his learning. This type of profile does not mean that he would never choose to be in a structured learning situation (Guglielmino & Guglielmino, 1994). In fact, in a self-reported measure, Ronald stated his preference for an environment with guided structure where he is told what and how to learn.

Despite having participated in a couple of online CME programs, he anticipated that his levels of comfort and competency in the AD Program would be low due to his limited computer literacy level and access to the Web. In fact, Ronald needed a close and effective follow-up by the educator to familiarize himself with WebCT. This support, combined with his sense of humour, helped him endure frustration as a novice Web-user and successfully complete the AD

Program. His increased comfort and familiarity with the novel technology was successfully transferred later to other similar OCME programs.

Ronald's distinctive trait was that he was the most experienced RFP in the group with the largest clientele of AD patients (more than 100 patients at the mild stage; and between 26-50 patients at the moderate and severe stages respectively). He was the last to join the AD Program, as a replacement for Kerry who had dropped out. In the AD Program, he was the one who practiced the most (12 times) by completing all the opportunities to practice. Despite these positive traits, he was surprised to learn at the end of the Program that he had not done as well as his peers, and believed that he should have done better. Perhaps his story might help to better explain this outcome.

Ronald's lack of familiarity with WebCT somewhat limited the AD Program's effectiveness to support his learning (RQ#1). There is some evidence of Ronald's learning as documented by the objective measures. In the MCQ section, Ronald's progress was reflected by his increase in scores (Pre-test, 73; Post-test, 96 and 1M-post test, 96). His mean of the three tests was the same as that of the group (88). In the case-based instruction section, Ronald scored 54 at the Pre-test, 57 at the Post-test and 65 at the 1Month-Post test. His mean (59) was below the group mean (64). Across Plenary discussions Ronald used 16% of all therapeutic concepts, 8% of all diagnostic concepts and 7% of all managerial concepts used by the group.

Ronald's most important perceived gap was in the area of AD management, more specifically in the following: (a) involving a reliable caregiver, (b) using instruments to monitor treatment response, and (c) providing appropriate support and resources to the AD patient and caregiver(s). The content of the Program was relevant for Ronald's practice. At the Closure, he stated that a substantial part of the Program confirmed the way he managed his AD patients. Specifically, the main concepts and procedures that were confirmed by the AD Program were: "Looking after the caregiver as well as the patient. Talk with the caregiver about the natural history of AD, and power of attorney, wandering persons, etc" (PRQ-I- Q5-6).

Regarding the extent to which the AD Program contributed to his learning (RQ#2), Ronald rated as medium the overall effectiveness of the AD Program's features to support his learning (for 20 features, a mean of 3.13 on a 5-point Likert scale, Appendix W). He rated the most highly effective features to be: (a) the Post and 1Month-Post tests, (b) Module 5 focused on diagnosis, (c) the Plenary, and (d) two practice activities (review of modules and quiz on treatment).

Ronald rated a variety of features as moderately effective, such as the Module on treatment, the educator's performance, and additional Web resources. The least effective features were navigation on WebCT, Module 4, and Paired activities.

Regarding collaborative activities, Ronald rated as positive his past CME experiences in case-based problem solving in small groups. However, he reported that a variety of factors limited the effectiveness of Paired activities: (a) the lack of familiarity with WebCT, (b) the time lag between postings, (c) the lack of discrepancy with his partner (Norma) when discussing three clinical cases, and (d) having been the last to join the AD Program. Reflecting on his experience in Paired activities, he stated:

> We were both on the same track and agreed with each other. It might have been different if we had disagreed. Getting used to WebCT and learning my way around it took time and detracted from the issue at hand. Need a user-friendly platform. We need to be doing the same thing at the same time. Didn't work when one was ahead of the other (PRQ-I- Q15).

Ronald preferred Plenaries to Paired activities where he ranked second in active participation in the discussions (13% of total statements from 8 RFPs). Though AD diagnosis was not his main perceived gap in knowledge, Ronald learned from Plenary 1 something that he would not have learned from working alone; that is, the "General approach to CAT scans" (PRQ-I- Q35). He elaborated on the discussion and linked it to his own patients who were mostly "diabetic and hypertensive smokers" (Ronald, PL 1, 550). In Plenary 2 focused on AD treatment, Ronald agreed that a comprehensive visit of the AD patient is very time-consuming and described how he handled this matter in his own practice.

Ronald preferred Plenary to Paired discussions. Across Plenaries, Ronald's statements focused on linking the content of the discussion to his practice (30% of his statements), elaborating on agreed ideas (22% of his statements) and reflecting on his knowledge gaps or stating what he had learned from the AD Program (17% of his statements). For example, the AD Program made him aware of how to differentiate between types of dementia patients. In his words: "The course has made me more aware of Lewy Body, and Frontal Lobe whereas before I would have lumped them all as Alzheimers" (PL 21- 570). In Plenary 3 focused on management, Ronald agreed with Diana and George on the need for respite care for the caregiver, and provided an example of the type of community services available in his rural community (Ronald PL 3 – 599).

According to Ronald's reports, the AD Program, combined with additional external resources (peer-consultation and caring for a large AD clientele), might have had some impact on his AD practice (RQ#3). Ronald partially implemented all anticipated changes in AD management which was his highest perceived gap. These changes included spending more time educating AD patients and their caregivers. In fact, Ronald's initial dissatisfaction with his highest perceived gap in AD management was recorded by the Barometer where he consistently stated that he *might change* his management practice. Finally, at the Closure, he considered as *acceptable* the way he managed AD.

Ronald was satisfied with his participation in this AD Program and was interested in continuing to network and share with this group of colleagues the complexity of caring for AD patients. At the Closure, Ronald described his experience in the AD Program as follows:

> As an older GP (egad), getting used to the WebCT has taken a bit of effort. Having grown up in a paper system, it is a bit difficult getting used to this Internet. It also ties up the one phone line in the house, and we can't get high-speed Internet in rural areas, where we still have party lines, and can only sometimes get CBE ratio 1 (AM broadcasting). Also, being a busy GP, it takes time to do this but it was fun, a learning experience, for the process as well as the content. I feel much more comfortable doing this Alzheimer thing now. So thank you Francesca for the great program. What am I going to do on these cold winter evenings now that I am not on the Internet? (Ronald PL 4 – 667)

In summary, as a novice Web-user and an above average self-directed learner with a preference for structured learning environments, Ronald's case presents challenging contrasts. His low scores in objective measures did not match his perception of having learned from the AD Program. In fact, Ronald rated as quite high the effectiveness of the AD Program to support his learning process, and perceived as positive his experience in the AD Program. Furthermore, he successfully implemented all anticipated changes in his clinical practice.

Mark and Luc's team is presented next.

4.1.5 Mark

Mark is a young RFP (25-35 years age bracket) who has been practicing for the past 6-15 years in a community of more than 10,000 inhabitants in the Eastern Townships, Quebec. His group-practice is clinic- as well as hospital-based, concentrating on long-term care with low locum coverage. His practice is located less than 200 km from secondary referral centers, specialist services, and high technology health care facilities. Mark is affiliated with the CFPC. At the time of the study, the size of his AD clientele was fairly small (i.e., 1-10 patients at the mild, moderate and severe stages).

Mark's self-directed learning profile was average, in that he was more likely to be successful in independent situations, but not fully comfortable with handling the entire process of identifying his learning needs and planning and implementing learning (Guglielmino & Guglielmino, 1994). In the Needs Assessment, Mark described his learning style as a mixture of discovery learning and guided structure and was motivated to participate in the AD Program for its convenience of access, peer interaction, and accreditation purposes.

Mark's distinctive characteristic was being the most computer literate of the group, and having the best technological infrastructure. Furthermore, in the Needs Assessment, he was the only RFP who rated the way he diagnosed, treated and managed AD as *acceptable* (Barometer) which was reflected in his scoring the highest in the Pre-test and the limited perceived gaps in his AD practice (Gap Analysis). However, at the completion of the AD Program, he stated that he *might* *change* some aspects of his AD practice which could indicate that the AD Program confirmed his clinical practice and whose new content led him to review his current clinical practice and consider the possibility of changing it.

As documented by the objective measures, there was some evidence of Mark's learning (RQ#1). He showed a score increase in the MCQ section (Pre-test, 88; Post-test, 91) only to see it decrease at the 1Month-Post test (85). In the case-based instruction section, Mark scored the highest in the Pre-test (77) , but decreased at the Post-test (73) and at the 1Month-Post test (74). His mean (76) was above the group's mean (64).

His most important self-reported gap was in AD treatment, specifically in being aware of the interaction effects of drugs, and recognizing the side-effects of cholinesterase inhibitors (CI). Objective measures provided evidence of Mark's progress in the construction of knowledge in the category of AD treatment. In the MCQ section, he increased from the Pre-test (78) to Post-test (89) to the 1Month-Post test (100). His mean (89) was above the group mean (84). In case-based instruction, Mark only showed an increase in the AD treatment section, going from a score of 35 at the Pre-test to 68 at the Post-test, and maintaining a similar score (67) at the 1Month-Post test. His mean (57) was above the group mean (52). Furthermore, he reported that a substantial part of the AD Program confirmed his treatment practice, specifically the "choices of medication and doses, contraindications to therapy, assessing compliance, and the monitoring of therapy" (PRQ-I, Q3-4).

Regarding the extent to which the AD Program contributed to his learning (RQ#2), Mark rated its overall effectiveness as the lowest in the group (for 20 features, a mean of 2.55 on a 5-point Likert scale, Appendix W). The Plenary was rated as highly effective. The educator's performance, Modules on treatment and management, Post- and 1Month-Post tests, two practice activities (review of modules and quiz on AD treatment), and the facilitator's performance were rated as medium effective. The least effective features were navigating on WebCT and Paired activities.

Occasionally, Mark took advantage of optional practice opportunities for reviewing basic concepts and principles related to AD practice. He consistently scored above the group mean in the tests but was among those who practiced the least (4 times).

Despite lacking experience in problem solving clinical cases in CME small groups, Mark anticipated very high comfort and competency levels. However, his experience in Paired problem solving was not very effective for his learning process, and he rated as low his comfort level in a variety of Paired activities. When reflecting on the weaknesses of problem solving in pairs, Mark stated: "Time constraints, long pauses, lack of interest because of lack of interaction" (PRQ-I). For the format and the timing of the Paired activities, he suggested some changes:

> More flexibility on time, a better test system that facilitates answering questions, locating where we are, and measuring our progress. Ability to do online 'CHAT'. More flexibility in answering questions. No time to answer one at a time and wait for a response. Too much repetition in questions, answers (PRQ-I).

Despite these limitations of working in pairs, Mark identified one of the strengths of collaborative problem solving as: "The ability to look at things from another perspective" (PRQ-I). Furthermore, he acknowledged having learned some things that he probably would not have learned from working alone, for example, "to consider a wider diagnosis and look for an alcohol history more carefully" (PRQ-I).

Mark preferred Plenary to Paired discussions. However, his participation in Plenaries was low. He posted 10% of total statements, mostly on AD diagnosis and management. During Plenary activities, he used 10% of all diagnostic concepts and 12% of all mg concepts used by the group. Across Plenaries, Mark's statements were mostly focused on agreeing and elaborating on his agreement (22% of his statements), illustrating an idea with an example (22% of his statements), and linking the discussion to his clinical practice (17% of his statements). For example, in Plenary 1 Mark participated in the controversial issue of requesting a CT scan on patients suspected of dementia and stated:

> I'd like Dr W's opinion (the facilitator) in this matter as it is a major issue for me. I'd appreciate knowing what all of you are doing in actual practice in this matter (w.r.t. the CT in particular) (PL 1).

He then challenged the applicability of the AD guidelines and articulated his position by arguing that: "…I also feel, given the small cost of the CT scan in relation to what just one year of medication will cost, that it should be considered as 'basic investigation' (Mark, PL 1). When he reflected on what he had learned from this discussion on CT scans, he answered: "… I found it interesting to see many had the same questions and concerns (e.g. CT scan)" (Activity 16) Specifically, the most helpful aspect of Plenary discussions was the possibility to "…learn from the experience of others in other settings, problems they encounter practically, and opinions about CT scans which is a point of contention for me" (Mark, PRQ-I). Furthermore, Mark learned from the group something that he may not have learned from working alone, saying that "others have areas of uncertainty as well, particularly with reference to the CT scan" (Mark, PRQ-I). Even though Mark did not post any message on the topic of treatment (in Plenary 2), which was his highest identified gap, he learned that "people are actually using agents other than Aricept…" (Activity 22).

According to Mark's reports the AD Program, combined with additional external resources (i.e., peer-consultation), had some impact on his clinical practice (RQ#3). After Plenary 1 on diagnosis, he reported that he would reconsider his opinion on the use of CT scans following the facilitator's experience and the discussed US guidelines, as well as broadening his differential diagnosis "before deciding upon one of the two most common causes of dementia" (Activity 16).

In the Log, Mark partially implemented anticipated changes by: (a) creating and using a comprehensive Dementia checklist to improve patients' visits and follow-up; (b) involving the clinic nurse to better organize in advance the objectives of each visit; and (c) starting CI therapy as early as possible, which was one of the AD Program's learning outcomes.

At the Closure, and after reflecting on his experience in the AD Program, Mark concluded that he would recommend this AD Program to his peers because:

> … it has been a new way of approaching CME. Mainpro-C has not been an easy process for the CCFP (Canadian College Family Physicians) to adopt, but this is a good example of how it differs from traditional 'passive' CME (PL 4).

In summary, as a highly computer-literate and average self-directed learner, the AD Program confirmed and expanded Mark's knowledge on AD by raising his awareness on some knowledge gaps that he had not foreseen in the Needs Assessment, and he changed his practice accordingly.

Even if Mark consistently rated the overall design to support his learning process as somewhat effective (RQ#2), he consistently scored high across tests. Regarding the opportunities to engage in collaboration, Mark anticipated medium to high levels of competency and comfort in working in small groups. However, his experience in Paired activities did not support his learning process due to a combination of factors: (a) format and pacing of the discussion, (b) lack of a more user-friendly platform, and (c) his hectic schedule. On the other hand, he benefited from Plenary activities which better suited his self-directed learning profile (average), in that they offered a less structured and more independent learning environment. Despite his relatively low level participation, Mark engaged in higher-order thinking and received feedback from his peers and the facilitator regarding relevant issues in his practice. The sharing of experiences and exposure to multiple perspectives on the same issue were considered an asset. The AD Program, combined with other external resources, impacted somewhat his clinical practice (RQ#3) because he was able to partially implement three anticipated changes as well as a non-anticipated change in the caring of AD patients. Mark's partner in Paired activities was Luc whose story is presented next.

4.1.6 Luc

Luc is a RFP in the 47-57 years age bracket, and practicing in a community of less than 10,000 inhabitants in rural Quebec. He has practiced in group for the past 11 years and works in a clinic/private office as well as in hospital-based, long-term care and home care with low locum coverage. His practice is located less than 200 km from a secondary referral center, specialist services, and high technology health care facilities. Luc is affiliated with the CFPC. At the time of this study, the size of his AD clientele was quite small, with 1 to 10 patients concentrated in the mild and moderate stages.

Luc's self-directed learning profile was average and he preferred an environment that offered a mixture of discovery learning and guided structure. A variety of factors influenced his motivation to participate in the AD Program, the most important being the novelty of technology, followed by his interest in AD. The opportunity to interact with peers and the convenience of access were rated as somewhat important. Receiving Mainpro-C credits from the CFPC was rated as not at all important. Despite being a novice Web-user with unreliable and slow hardware, Luc benefited from this experience and progressed towards an increased level of comfort and ease with WebCT.

Being outspoken, reflective, critical and articulate were Luc's distinctive traits. Despite being a novice Web-user and having anticipated low comfort and competency levels in small group online interaction, Luc actively participated in the AD Program. He was the RFP who asked the most questions directly relating to his clinical practice. Although he criticized the facilitator's moderating style, he greatly benefited from her feedback on issues relating to his AD practice.

Objective measures provided some evidence of Luc's learning (RQ#1). In the MCQs section, Luc's progress was reflected by an increase in his scores (Pre-test, 79; Post-test, 96; 1Month- Post test, 100). His mean (92) was above the group mean (88). On the other hand, in the case-based instruction section, Luc scored 61 in the Pre-test, 67 in the Post-test, and 59 in the 1Month-Post test. His mean (62) was below the group mean (64).

Luc's largest perceived knowledge gap was in AD treatment, specifically in recognizing the side-effects of cholinesterase inhibitors (CI), and in monitoring and modifying treatment appropriately. Objective measures provided evidence of Luc's learning in the category of AD treatment. In the MCQ section, he scored the highest and showed an increase in scores (Pre-test, 85; Post-test, 100; and 1Month-Post test, 100). His mean (95) was above the group mean (84). In the case-based instruction section on treatment, Luc also increased his scores (Pre-test, 27; Post-test, 64), but decreased to 59 in the 1Month-Post test. His mean (50) was slightly below the group mean (52).

The AD Program's content was relevant to Luc's practice. In fact, at the end of the Instructional phase, he stated that a substantial part of the AD Program confirmed the way he treated his AD patients: "Same medications but much more at ease with therapeutic expectations, contraindications, possible drug interactions, and time to improve."(PRQ-I). Luc participated in Plenary activities (posting 12% of total on-task statements coming from the group) where he discussed 16% of total therapeutic concepts, 11% of total managerial concepts and 4% of total diagnostic concepts. He was ranked as the third most active participant in the group.

Regarding the extent to which the AD Program contributed to his learning (RQ#2), Luc rated as medium the overall effectiveness of the AD Program's features (for 20 features, a mean of 3 on a 5-point Likert scale, Appendix W). The most effective features for Luc were the educator's performance, the Module on management, the Post and 1Month-Post tests, and the two optional practice activities (review of modules and quiz on treatment). After Ronald, he was the RFP who practiced the second most (11 times). Luc also stated that his preferred feature of the AD Program was its didactic component. The medium effective features were navigation on WebCT, the Plenary, and Modules on diagnosis and treatment. The least effective features were the facilitator's performance, Module 4, Paired activities, and the Log.

Paired and Plenary activities provided an opportunity for him to collaborate. Although Luc had some positive past experiences with small CME groups, the Paired activities' effectiveness was limited by: (a) his busy work schedule, (b) unreliable hardware, (c) limited computer literacy, and (d) the type of clinical case to be discussed. Despite these limiting factors, problem solving in pairs provided him with the opportunity for "exchanging views on cases" (PRQ-I), even if the context represented an "artificial situation with pre-selected pairs with no real clinical imperative to communicate" (PRQ-I). Luc learned from these activities something he probably would not have learned from working alone: "The fact that he (Mark) would have ordered a scan irrespective of the Consensus Guidelines in almost all cases of suspected dementia confirms a tendency that I share" (PRQ-I). Adopting "an expanded differential diagnosis" (PRQ-I) was something that Mark learned from Luc.

As with most of his peers, Luc preferred Plenary to Paired discussions. He openly criticized the moderating style of the facilitator (some lecturing and not keeping the discussion on track), and rated her performance as the lowest in the group (1.7). Despite this limitation, Plenaries provided an effective environment to ask questions relating to his AD patients, to share with his peers similar approaches to AD, and critically reflect on the application of the Consensus Guidelines in the context of rural practice. Luc engaged in critical thinking as documented by most of his statements linking the discussion to his clinical practice (32% of his statements), asking questions (18% of his statements), and identifying barriers to clinical practice (12% of his statements).

According to Luc's reports the AD Program, combined with additional literature consulted outside the AD Program, might have had some impact on his AD practice (RQ#3). Transfer of AD knowledge to his clinical practice was documented by a variety of self-reported measures. His anticipated changes in AD practice, namely, establishing treatment as early as possible and being more attentive to caregiver's needs were partially implemented (Log). Both changes matched the two most important learning outcomes of the AD Program. Luc also implemented a non-anticipated change by showing a higher level of interest in community resources for AD patients. In describing his learning experience in the AD Program at the Closure, Luc concluded:

> The benefits have been multifold: increased knowledge and assurance in dealing with demented patients and their families, a heightened appreciation

> of the restricted applicability of Consensus statements in light of particular practice constraints/realities of rural physicians, a much improved sense of ease using Web-based materials and overall a sense of satisfaction in having invested the time in your project. I think the AD Program has also fostered a nascent sense of community among the physicians who participated, and this could be exploited in further joint ventures. One of the most attractive features to me was the ready accessibility to a whole body of detailed and structured material that was insightfully presented and clinically pertinent. I would be interested in pursuing this experience on other topics with those colleagues who feel likewise. Thank you Francesca for your dogged good-natured persistence in (gently) hounding me to complete the course and bravo for a job well done! (Luc, PL 4).

Overall the AD Program supported Luc's learning process, particularly in the area of AD treatment which was his highest perceived gap. He greatly benefited from learning to use a new technology, and successfully completed the AD Program. During Plenary activities, Luc was the participant who asked the most questions relating to his AD practice and promptly received feedback from the facilitator. Paired activities also offered opportunities for collaboration, and Luc expressed interest in continuing to network with this group of physicians.

The last team comprising Marcela and Mathew is presented next.

4.1.7 Marcela

Marcela is a female (36-46 years age bracket) RFP practicing in a community of approximately 10,000 inhabitants in Quebec. She has been practicing in group for the past 10 years in a clinic where locum coverage is low. The clinic is located less than 200 km from a secondary referral center and specialists services with high technology health care facilities. Marcela was affiliated with three medical associations (CFPC, FMOQ, and CMDQ). At the time of the study, the size of her AD clientele was fairly small (1-10 patients in mild and moderate AD stages).

Marcela's self-directed learning profile was above average, in that she preferred to determine her learning needs, as well as plan and implement her own learning (Guglielmino & Guglielmino, 1994). In a self-reported measure, Marcela selected discovery learning as her learning style, preferring to explore and learn independently, and disliking structure and routine. Novelty of technology and convenience were rated as the most important factors in her decision to participate. Opportunity for peer interaction was rated as somewhat important, while the opportunity to obtain CME credits was rated as not at all important. Marcela introduced herself to the group during the Icebreaker as follows:

> Hello, I am Marcela from Quebec, where I do a mix of in-patient, ER, and office work. (At the moment I'm in Chisasibi, James Bay, where I also work as a depanneur). A relatively low percentage of my office patients are geriatric—I probably have one new onset AD patient every one to two years. I'd like to learn more about the state of Alzheimer's research (PL 2)

Despite her medium level of computer literacy, Marcela had never participated in CME online and anticipated that her competency level would be low. She accessed the AD Program with a conventional modem (56.6 kb/sec) which, combined with an unfriendly platform such as WebCT, occasionally produced frustration and uncertainty.

Marcela's distinctive characteristics were in being one of the least experienced members of the group in AD, and the one with the smallest AD clientele, as well as being a locum physician with the need to travel to remote areas with no access to a computer. Despite her frequent trips, she successfully completed the AD Program. Consistently informing the educator of her travel plans was of great help.

As documented by the objective measures, there is some evidence of Marcela's learning (RQ#1). In the section on MCQ, she showed an increase in scores (Pre-test, 74; Post-test, 96; and 1Month-Post test, 96) and her mean (88) was above the group mean. In the section on case-based instruction, she scored 58 in the Pre and Post-tests and 61 in the 1Month-Post test. Her mean (59) was below the group mean (64).

As with the majority of her peers, Marcela's highest perceived gap was in AD treatment and specifically in: (a) selecting appropriate therapy for early, moderate, and severe AD; (b) discriminating treatment options for the early stage of AD; and (c) being aware of drug-drug interaction. Marcela's progress in AD treatment was documented throughout the AD Program by a variety of measures. In the MCQs on treatment, she increased her scores (Pre-test, 55; Post and 1Month-

Post tests, 89). In problem solving clinical cases on treatment, she also showed an increase in scores (Pre-test, 24; Post-test, 54; 1Month-Post test, 55).

Marcela's participation in two Plenaries was medium (11% of total on-task statements from the 8 RFPs) where she discussed 14% of all the diagnostic concepts and 13% of the managerial concepts used by the group. She also stated that a substantial part of the AD Program confirmed her diagnostic practice, specifically patient history and the use of assessment scales (e.g. MMSE).

Regarding the extent to which the AD Program contributed to her learning (RQ#2), Marcela rated the overall effectiveness of the AD Program's features as medium (for 20 features, a mean of 3 on a 5-point Likert scale, Appendix W). Some of the most highly effective features were additional Web resources, the educator's performance, two optional practice activities (i.e., review of modules and quiz on treatment), Modules on treatment and management, and Plenaries. Her preference for exploring additional Web resources suited her discovery learning style. Despite being the participant who practiced the least, Marcela consistently scored at the group mean for the Pre and Post-tests, and above the group mean for the 1Month-Post test.

Marcela rated Modules 1-3 and the Post-test as medium effective features. The least effective features were Module 4, Pairs, navigating on WebCT and the Log. Marcela and Mathew constituted the least effective team in Paired activities.

Marcela's negative experience in Paired activities was influenced by a combination of factors: (a) not having discussed with her partner, Mathew, the logistics for online collaboration that would facilitate the task and anticipate potential barriers; (b) the lack of a challenging complexity in cases to be solved; (c) the lack of coordination with her partner, who was usually late in answering Marcela's postings; and (d) the limited match between Marcela's learning style and the structure of Paired activities. When describing her experience in this AD Program, she added: "The Plenary sessions really played up the advantage of a Web-based course, more than the Paired discussions, maybe because they were more free form and less time-sensitive" (Marcela, PL 4).

As with her peers, Marcela preferred Plenaries to Paired activities. She engaged in critical thinking as documented by her statements focused on elaborating her disagreement (21% of her statements), agreeing (16% of her statements), reflecting on her knowledge gaps and dilemmas in her clinical reasoning (16% of her statements), and identifying barriers to clinical practice (16% of her statements). For example, she initiated a discussion by raising the issue of the quality of a patient's history needed to arrive at a correct diagnosis, and the delicate task of announcing an uncertain diagnosis to the patient and her family. She contextualized these issues, and linked them to her practice by elaborating her premises and hypothesizing a possible solution. She was also conscious of her knowledge gaps, openly expressing: "I find it difficult to know what to do in such cases…this really presents a dilemma" (Marcela, PL 1). She later articulated and supported her position which differed from that of the majority of the group on the use of CT scans for screening early AD.

The organization of the Plenary provided opportunities to gain the support of peers, the facilitator and educator. The democratic climate of the interaction provided openness and comfort in dealing with disagreement. Marcela considered that she was highly attentive to her peers' opinions, and was very comfortable in discussing, receiving and providing constructive feedback. She rated as extremely interesting those discussions that helped her learn more about AD. Specifically, the most helpful aspect was the possibility of "receiving updated literature posted by the facilitator on controversial issues regarding the use of CI in AD tx, as well as discussing difficult issues involved in actual cases" (PRQ-I-Q31). Marcela learned from the group something that she may not have learned from working alone, citing "the possibility of changing from one CI to another in case of tx failure, and the importance of discussing the dx with the patient early on" (Marcela, PRQ-I, Q35).

Regarding the extent to which the AD Program had an impact on Marcela's reports of her clinical practice (RQ#3), the Barometer indicated some changes in her perception of her AD practice. From the stage of *examining* how she practiced, Marcela moved to the stage of considering as *acceptable* her AD practice after the completion of the AD Program.

Marcela argued that the AD Program will have some impact on her AD practice in the future because:

> My practice is fairly young, and I rarely see patients with new onset dementia. However, I will be more aggressive in following up on concerns expressed by patients about their older family members, since I now feel I have more to offer. I will spend more time discussing with patients and families the stages of AD, their understanding and fears of the disease, and the resources, medical and otherwise, available. I will be more comfortable in deciding to whom CI's should be offered and how to guide patients and families in making an informed choice in such cases" (Marcela, Post-test, Q23).

None of the anticipated changes were implemented due to lack of AD patients at the time of the completion of the Log. However, Marcela would recommend the AD Program to her peers for the following reasons:

> For the useful and interesting content, and the opportunity to participate in the plenary sessions with the direct participation of an Alzheimer's expert, although with reservations about some of the difficulties in navigating the site due to lack of a high-speed connection (PL 4 – 689).

She reflected on her experience at the Closure Plenary, and indicated that overall the AD Program was supportive of her learning process:

> Absorbing and reviewing material over an extended period of time will help with long term retention, I think –as opposed to the conference or presentation experience, from which I usually only hope to take away an easily forgotten pearl or two. I definitely wouldn't have devoted as much time to learning more about managing Alzheimer's without the deadlines built into the course, or the gentle and encouraging pressure to fulfill them provided by Francesca (PL 4).

In summary, despite caring for a relative small clientele of AD patients, having a limited technological infrastructure, and constantly being on the move because of her profession, Marcela was motivated to follow the AD Program which she successfully completed. The AD Program supported her learning process as documented by objective measures results. She increased her knowledge and confidence levels, and changed from a state of *examining* her current practice to being satisfied and considering her AD practice as *acceptable*. Except for Paired activities and WebCT, Marcela was satisfied with and rated as medium the effectiveness of the AD Program's features to support her learning process. Plenary discussions contributed the most to her learning and collaboration with the group. The Plenary format better suited Marcela's self-directed learning style and preference for less structured activities and discovery learning. She actively participated in Plenaries, where she articulated and defended her views with solid arguments and introduced new ideas to the group. Marcela's partner in Paired activities was Mathew whose story is presented next.

4.1.8 Mathew

Mathew is a RFP in the 47-57 years age bracket and practicing in a community of less than 10,000 inhabitants in Ontario. For the past 25 years his individual (solo) practice has been in a clinic/private office where locum coverage is low. His office is located less than 200 km from a secondary referral center, specialist services, and high technology health care facilities. Mathew was affiliated with four medical associations (CFPC, SRPC, the Coalition of Family Physicians of Ontario, and the Canadian Medical Association). At the time of the study, the size of his AD clientele was fairly large and varied (26 – 50 patients at the mild stage, 11 – 25 at the moderate stage, and 1 – 10 at the severe stage).

As an average self-directed learner, Mathew was not fully comfortable with handling the entire process of identifying his learning needs, and planning and implementing his learning (Guglielmino & Guglielmino, 1994). In a self-reported measure, he stated that a mixture of guided and discovery learning represented his preferred learning environment. Convenience of access, interaction with peers, novelty of technology, interest in AD, and the opportunity to receive Mainpro-C credits from the CCFP were equally rated as very important in motivating Mathew to participate in the AD Program.

Mathew's distinctive characteristic was his limited engagement in the AD Program. In fact, even though he benefited from an advanced computer literacy background and the highest level of expertise in OCME in the group (he had already completed four interactive Web-based CME courses with a medium comfort level) and in AD (caring for one of the largest AD clienteles in the group), Mathew could have participated more actively in the AD Program. Although he did not fully take advantage of this opportunity he openly acknowledged this fact in his reflections.

As documented by the objective measures, there is some evidence of Mathew's learning (RQ#1). In the MCQ section, Mathew's progress was reflected by an increase in his scores (Pre-test, 63; Post-test, 88; 1Month-Post test, 96) but his mean (82) was below the group mean (88). In the case-based instruction section, he did not increase his scores (Pre-test, 60; Post-test, 65; 1Month-Post test, 57) and again his mean (61) was below the group mean (64).

Mathew's highest perceived gap was in treatment, specifically in: (a) selecting therapy appropriate for early, moderate, and severe stages; (b) discriminating treatments for the early stages of AD; (c) being aware of drug interaction effects; (d) recognizing side-effects of CI; and (e) monitoring and modifying tx appropriately. In the MCQ section on treatment, he increased his scores (Pre-test, 70; Post-test, 89; 1Month-Post test, 89) and his mean (83) was slightly below the group mean (84). In the case-based instruction section on treatment, Mathew also increased his scores (Pre-test, 43; Post-test, 66; 1Month-Post test, 55) and his mean (55) was above the group mean (52).

Mathew has been in rural family practice for more than 25 years and a substantial part of the AD Program confirmed the manner in which he treated his AD patients, particularly the aspect on the:

> Safety and efficacy of cholinesterase inhibitors; the importance of involvement and care for caregivers, family and other agents in the care and management of early AD; and the careful and regular follow-up with attempts to measure change and plan for possible new events (PRQ-I).

Mathew also reflected on the impact of what he learned from the AD Program on AD treatment as follows: "Treating cases is certainly worthwhile, improving function in some patients, but particularly in delaying worsening in most cases" (Activity 22). In the area of AD management, he learned to:

> Become familiar with the services that do exist in your area and do use these functions to the best advantage of your patients, work to improve these and work to add those services which may be of great benefit but not yet available locally (Activity 27).

Mathew's participation in Plenary discussions was low (9% of total on-task statements from the 8 RFPs) and he discussed 7% of total diagnostic concepts, 9% of total therapeutic concepts, and 5% of total managerial concepts used by the group.

Regarding the extent to which the AD Program contributed to his learning (RQ#2), Mathew rated as medium the overall effectiveness of the AD Program's features (for 20 features, a mean of 3 on a 5-point Likert scale, Appendix W). The most highly effective features were: the Module 5 on diagnosis, three practice activities (quiz on treatment, review of modules, Case-Library) the educator's performance, and Plenaries. Despite expressing satisfaction with the format and content of the practice opportunities, Mathew was among those who practiced the least (3 times). He rated the Log, Modules 1-3, and additional Web resources as medium effective features. The least effective features were Module 4, Pairs, WebCT, and the facilitator's performance.

In the past, Mathew had occasionally collaborated with peers on the Web with a medium level of comfort and low level of competency. Despite having anticipated the need to frequently log to ensure online collaboration with Marcela, Paired activities were the least effective activity for supporting his learning process due to: "Lack of commitment to a group project that I signed for…" He also recognized that: "My own greater attention to schedule…and timely participation (PRQ) would have facilitated the process". He believed that there was potential for positive paired work but "I do not think it happened, we did not really make it happen, strength existed as a possibility…I simply did not take advantage of the opportunities, sorry (PRQ-I)."

Although he lacked a commitment to Paired activities, Mathew participated in Plenary activities which he considered as very interesting and helpful for his learning process on AD. During Plenary discussions, Mathew's statements were mostly focused on agreeing with the group, elaborating on his agreement (55% of his own statements), and identifying barriers to practice (18% of his own statements); that is, arguing that scarce resources were one of the main barriers to implement AD guidelines to rural practice. When asked what he had learned from Plenary 1 on diagnosis, he stated: "CT scans serve everyone well" (Activity 16). From Plenary 2 on treatment, he learned that "Treating cases is certainly worthwhile…improving function in some patients, but particularly in delaying worsening, generally in most cases" (Activity 22). In Plenary 3 on management, Mathew learned that:

> Efforts pay off. Nothing like trying to apply our best knowledge to help patients. Team approach is most effective with medical and social services working together to help families look after their loved ones with AD (Mathew, PL 3).

Specifically, the most helpful aspect of participating in Plenaries was the possibility to "hear others' experiences, especially reports of good clinical practice" (PRQ-I). He suggested "more and faster expert input" (PRQ-I) for improving Plenary discussions. Overall, Plenaries offered Mathew the opportunity to share, confirm and update information, and make links to his own practice and clinical practice in general.

According to Mathew's records the AD Program, combined with additional AD resources outside the AD Program (i.e., literature), might have had some impact on his AD practice (RQ#3). Another relevant resource was the experience gained through clinical practice with a large AD clientele. In fact, when Mathew completed the Log, his clientele comprised 1-10 patients suspected of AD as well as 22-32 patients diagnosed with AD. During the same period, he rated the facts he learned/confirmed in the AD Program as very relevant to his practice (Log).

Initially, Mathew expressed *dissatisfaction* with some aspects of his AD practice, but in the end, perceived his practice as *acceptable* (Barometer). He also partially implemented the two following anticipated changes into his AD practice: "better initiation of care and better follow-up". The non-anticipated change was: "More staff discussion on awareness, sensitivity to patient's signs and symptoms, family reports, nurse observations, etc…" (Log, Mathew).

At the Closure, Mathew described his experience in the AD Program as a "satisfying review and update on a new therapeutic area with a big future" (Mathew, PL 4). He was interested in continuing to network with his colleagues who participated in the AD Program for the following reasons: (a) to exchange current information on AD, (b) to share information on community services for AD patients and their caregivers, (c) to discuss complex AD cases and professional issues related to his rural practice, and (d) to discuss medical topics other than AD (PRQ-II).

In summary, although he was an experienced RFP with one of the largest AD clienteles, a high level of computer literacy and the most experience in OCME, Mathew did not participate as actively as anticipated due to his limited engagement and busy work schedule. In spite of this, the AD Program supported his learning as documented by the increase in his scores in the MCQs section. On the other hand, no relevant differences in scores were reported in case-based instruction, except in the area of AD treatment which was his highest perceived gap. As documented by the self-reported measures, Mathew was by and large satisfied with the AD Program's effectiveness in supporting his learning process, and confirming and updating his AD practice.

The AD Program, combined with literature accessed outside the AD Program and having to care for a large clientele, might have had some impact on Mathew's AD practice (RQ#3). Initially, he had expressed dissatisfaction with some aspects of his practice (particularly in treatment and management). Later, at the Closure, he perceived his practice as acceptable and partially implemented anticipated and non-anticipated changes in his AD practice.

The within-case analysis described the experience of the 8 RFPs who participated in the AD Program. The next section focuses on the cross-case analysis that compares and contrasts those 8 mini-cases through categorical aggregation (Stake 1995) as a means of exploring if common themes or patterns emerge.

4.2 Cross-case Analysis

This section presents the results of the cross-case as analysis organized by research question. Evidence of participants' learning is presented first (RQ#1), followed by results that demonstrates how the AD Program supported the participants' learning (RQ#2). The results that demonstrate the impact the Program may have had on their clinical AD practice (RQ#3) are presented last.

4.2.1 Research Question # 1: Evidence of Learning

The participants' learning was assessed through objective and self-reported measures and, an analysis of the use of concepts in the Plenaries. This section begins with the results of objective measures that include the Pre-test, Post-test, and 1Month-Post test. Each test covered two sections: (a) multiple choice questions (MCQs), and (b) clinical cases. The second part of this section presents the results of self-reports on the extent to which the AD Program confirmed the participants' prior knowledge. The third part presents results of the participants' use of AD concepts during Plenary discussions.

4.2.1.1 Objective Measures: Multiple-Choice Questions

Table 4.1 shows the results of the section on multiple-choice questions that was repeated for each of the three tests. Pre-test scores were considered as baseline to be compared with subsequent tests (Post-test and 1 Month-Post test). Participants' scores were ranked from highest (George) to lowest (Mathew).

Table 4.1

Participants' % of Correct Responses to Multiple-Choice Questions on Three Tests

RFPs	Pre-test	Post-test	1M-Post	Mean across 3 tests
George	85.5	92.8	100	92.77
Luc	79.1	95.7	100	91.60
Norma	71.2	100	100	90.40
Marcela	73.6	95.7	95.5	88.27
Mark	87.9	91.3	84.8	88.00
Ronald	72.7	95.7	86.4	84.93
Diana	62.4	85.5	100	82.63
Mathew	63	88.1	95.5	82.20
Group mean	74.43_a	93.1_b	95.28_b	87.60
SD	9.37	4.69	6.3	4

Note. Means with different subscripts differ significantly at p < .05 by the t test

Scores in Table 4.1 represent the percentage of correct answers out of 22 questions in the three tests. The differences between the means of the Pre-test and Post-test, the Pre-test and 1Month-Post test and between the means of the Post-test and 1Month-Post test were calculated by a 2-tailed t test with paired samples as shown in Table 4.2.

Table 4.2

Paired Samples T Tests (Section Multiple-Choice Questions)

Pairs	N	M	SD	SE	95% CI Lower	95% CI Upper	t	df	Sig (2-tailed)
Pre-Post	8	-4.16	2.10	0.74	-5.91	-2.40	-5.602	7	.001
Pre-Mp	8	-4.58	2.81	0.99	-6.93	-2.24	-4.622	7	.002
Post-MP	8	-0.43	1.68	0.59	-1.83	0.98	-.716	7	.497

Note. Pre = Pre-test; Post = Post-test; MP = 1Month-Post test. p < .05

An alpha level of .05 was used for all statistical tests. As shown in Table 4.2 the difference between the Pre-test and Post-test means was statistically significant (sig .001). The difference between the Pre-test and 1Month-Post test means was also statistically significant (sig .002). These results suggest that RFPs acquired new knowledge across the categories of AD diagnosis (dx), treatment (tx) and management (mg). Also the difference between the Post-test and the 1Month-Post test was not significant (ns .497), implying that the majority of RFPs confirmed and maintained their acquired knowledge throughout the month between the Post-test and 1Month-Post test.

4.2.1.2 Objective Measures: Problem Solving Clinical Cases

Besides answering multiple-choice questions on the dx, tx, and mg of AD, participants solved five clinical cases. Three cases were solved at the Pre-test (31 open-ended questions, Appendix G), one case at the Post-test (30 open-ended questions, Appendix H), and one case at the 1Month-Post test (29 open-ended questions, Appendix I). Table 4.3 illustrates the participants' scores across the three tests.

Table 4.3.

Participants' % of Correct Responses to Clinical Case Questions on Three Tests

RFPs	Pre-test	Post-test	1MPost	Mean across 3 tests
Mark	81	73	74	76
Norma	75	71	69	72
George	66	67	70	68
Luc	63	67	62	64
Marcela	61	59	62	61
Mathew	56	65	60	60
Ronald	54	57	65	59
Diana	51	59	55	55
Group mean	63	65	65	64
SD	9.6	5.5	5.9	6.6

Table 4.3 ranks participants' scores from the highest (Mark) to the lowest (Diana). The differences between the means of the Pre-test and Post-test, the Pre-test and 1Month-Post test and between the means of the Post-test and 1Month-Post test were calculated by a 2-tailed t test with paired samples as shown in Table 4.4.

Table 4.4

Paired Samples T Tests (Section Clinical Cases)

Pairs	N	Mean	SD	SE	95% CI Lower	95% CI Upper	t	df	Sig (2-tailed)
Pre-Post	8	-1.13	4.76	1.68	-5.11	2.86	-.668	7	.526
Pre-Mp	8	0.50	5.53	1.95	- 4.12	5.12	.256	7	.805
Post-Mp	8	1.63	4.98	1.76	-2.54	5.79	.922	7	.387

Note. Pre = Pre-test; Post = Post-test; Mp = 1Month-Post test. $p < .05$

An alpha level of .05 was used for all statistical tests. As shown in Table 4.4 results of the 2-tailed t test indicate that there were no significant differences between the Pre and the Post-tests (ns .526), nor between the Post and 1Month-Post tests (ns .805), nor between the Pre and 1Month-Post tests (ns .387). These results suggest that RFPs were knowledgeable in problem solving clinical cases before participating in the AD Program. Their problem-solving skill was maintained throughout the AD Program.

Table 4.5 illustrates the participants' scores for the problem solving of five clinical cases focusing only on AD treatment. This area was the only one of the three (i.e., diagnosis, treatment, and management) where the t test reported significant differences.

Table 4.5

Participants' % of Correct Responses to Clinical Case Questions on AD Treatment

RFPs	Pre-test	Post-test	1MPost	Mean
Norma	64	72	77	69
Mark	38	68	68	58
Mathew	45	66	54	55
George	30	57	70	52
Luc	29	64	59	51
Marcela	33	54	55	47
Diana	29	56	55	47
Ronald	25	46	60	44
Group mean	37_a	60_b	62_b	53
SD	12.7	8.58	6.22	7.95

Note. RFPs = rural family physicians.

Means with different subscripts differ significantly at $p < .05$ by the t test

Scores in Table 4.5 represent the means calculated on 21 open-ended questions on AD treatment. At the Needs Assessment participants identified their highest knowledge gap in AD treatment. The differences between the means of the Pre-test and Post-test, the Pre-test and 1Month-Post test and between the means of the Post-test and 1Month-Post test were calculated by a 2-tailed t test with paired samples as shown in Table 4.6

Table 4.6

Paired Samples T Tests (Section Clinical Cases on AD Treatment)

Pairs	N	M	SD	SE	95% CI Lower	95% CI Upper	t	df	Sig (2-tailed)

Pre-Post	8	-23.75	8.08	2.86	-30.51	- 16.99	-8.309	7	.001
Pre-Mp	8	-25.63	10.57	3.74	-34.46	-16.79	-6.858	7	.001
Post-Mp	8	-1.88	8.73	3.08	-9.17	5.42	-.608	7	.562

Note. AD = Alzheimer's disease; Pre = Pre-test; Post = Post-test; Mp = 1Month-Post test
$p < .05$

An alpha level of .05 was used for all statistical tests. Table 4.6 shows that there were significant differences between the means of the Pre-test and Post-test (sig .001), and between the Pre-test and 1Month-Post test means (t test sig .001).

4.2.1.3 Participant Reaction Questionnaire: Confirmation of Knowledge

The Participant Reaction Questionnaire (PRQ-I) is a self-reported measure of the participants' learning (RQ#1). At the end of the Instructional phase, participants reflected on the extent to which the AD Program confirmed the way they diagnosed, treated, and managed early AD. Furthermore, they were asked to specify the main concepts and/or procedures that were confirmed by the educational intervention for each of the three categories (i.e., dx, tx, and mg). The PRQ-I results are presented separately under the categories of dx, tx, and mg, as follows.

4.2.1.3.1 Diagnosis. In response to the question: "To what extent did the AD Program confirm the way you diagnose early AD?" all participants stated that a substantial part of the AD Program confirmed the way they usually diagnosed early AD. They were also asked to specify which main concepts/procedures were confirmed. In the category of dx, a total of 31 statements were thematically analyzed and grouped into the subcategories of Investigations (31%), Follow-up procedures (24%), and Assessment scales (21%). Investigations included the selective use of diagnostic tests and general diagnostic modalities. Follow-up procedures centered on serial visits covering a longer time frame, and referrals. Assessment scales included the screening of cognitive and functional aspects, and the use of the cognitive scale called Folstein's Mini-Mental State Examination (MMSE).

4.2.1.3.2 Treatment. In response to the question: "To what extent did the AD Program confirm the way you treat early AD?" 5 participants stated that a substantial part of the AD Program confirmed the way they usually treated early AD. Two participants stated that the entire AD Program confirmed the way they usually treated early AD. One participant stated that a small part of the AD program confirmed the way she usually treated early AD. In the category of tx, a total of 26 statements were thematically analyzed and grouped under the subcategories of Pharmacotherapy (65%), and Follow-up procedures (19%). The former includes safety, efficacy and contraindications of cholinesterase inhibitors (CI), and drug-drug interactions. The latter covered careful and regular follow-up, patient's compliance, and treatment expectations.

4.2.1.3.3 Management. In response to the question: "To what extent did the AD Program confirm the way you manage early AD?" 7 participants stated that a substantial part of the AD Program confirmed the way they usually managed early AD. In the category of mg, a total of 23 statements were thematically analyzed and the most frequent concepts were grouped under 2 subcategories, namely, AD Patient (48%) which included the monitoring process of AD, and Caregiver (52%)

which included issues regarding the caregiver's support and the use of social services.

Overall, the PRQ-I results indicated that participants reported that a substantial part of the AD Program confirmed the way the majority of them usually diagnosed, treated, and managed early AD. This indicates the relevance of the educational intervention to their clinical practice. The category of treatment presented a greater variety of opinions than did diagnosis and management.

4.2.1.4 Plenary Discussions: Use of AD Concepts

The purpose of this section is to show the extent to which participants used the concepts presented in the AD Program during Plenary activities. This section is presented in two parts: (a) the type of concepts used and their relation to the learning outcomes of the AD Program, and (b) the frequency with which participants used those concepts during Plenary activities.

4.2.1.4.1 Part A: Type of Concepts Used in Relation to the Learning Outcomes. The learning outcomes of the AD Program (Appendix F) included a total of 67 concepts subdivided into three categories. The category of diagnosis (dx) included 39 concepts, the category of treatment (tx) included 14, while the category of management (mg) covered 14 (Appendix S). Table 4.7 presents the concepts used by the RFPs in relation to the concepts derived from the learning outcomes of the AD Program.

Table 4.7

Rural Family Physicians' Use of Concepts in Relation to Concepts Derived from Learning Outcomes

AD Program	Frequency of Concepts in LOs	Frequency of Concepts used by RFPs	% of Concepts used by RFPs
Dx	39	22	33
Tx	14	7	10
Mg	14	10	15
Total	67	39	58

Note. Dx = diagnosis; Tx = treatment; Mg = management; LOs = learning outcomes; RFPs = rural family physicians

Overall Table 4.7 shows that RFPs used a total of 39 concepts across the categories of diagnosis, treatment and management. This total represents 58% of the total of concepts derived from the 67 learning outcomes of the AD Program. Participants used diagnostic concepts more frequently than treatment and management concepts.

Table 4.8 presents the concepts used by the facilitator during Plenary activities in relation to the concepts derived from the AD Program's learning outcomes.

Table 4.8

Facilitator's Use of Concepts in Relation to Concepts Derived from Learning Outcomes

AD Program	Frequency of concepts in LO	Frequency of concepts used by facilitator	% of Concepts used by facilitator
Dx	39	20	
Tx	14	5	
Mg	14	4	
Total	67	29	43

Note. LO: Learning outcomes; Dx: diagnosis, Tx: treatment, Mg: management.

Table 4.8 shows that the facilitator used a total of 29 concepts which represents 43% of the total of concepts derived from the learning outcomes of the

AD Program. The facilitator also used diagnostic concepts more frequently than treatment and management concepts.

Part B of this section presents the frequency with which participants used those 39 concepts relating to the learning outcomes of the AD Program. Frequency results are presented separately under the categories of AD diagnosis, treatment, and management.

4.2.1.4.2 Part B: Use of Diagnostic Concepts. Participants used 22 concepts out of the 39 included in the learning outcomes of the AD Program (Table 4.7). Table 4.9 summarizes the diagnostic concepts used across Plenaries 1, 2, and 3. These diagnostic concepts were grouped into eight subcategories.

Table 4.9

Frequency of Use of Diagnostic Concepts in the Three Plenaries

DXS	RFPs' use of dx concepts in each Plenary					Facilitator's use of dx concepts in each Plenary				
	P1	P2	P3	Tot	%	P1	P 2	P 3	Tot	%
IN	35	3	1	39	32	12		12	12	25
AD	16	1	2	19	16	0				
DDx	20	0	0	20	16	2			2	4
EAD	9	6	0	15	12	0	3	2	5	10
TD	7	5	1	13	11	10			10	21
CO	12			12	10	1			1	
DE						16			16	33
OT			4	4		2			2	4
Total	99	15	8	122	100	43	3	2	48	100

Note. DXS = subcategories on diagnosis. RFPs = rural family physicians, P = Plenary; dx = AD diagnosis. IN = investigations; AD = Alzheimer disease; DDx = differential diagnosis; EAD = early Alzheimer disease; TD = types of dementia; CO = co-morbidities; DE = dementia; OT = other.

Table 4.9 shows that Plenary 1 provided the longest discussion where all participants and the facilitator were engaged. The majority of diagnostic concepts were discussed during Plenary 1. This is to be expected as it followed Modules 4 and 5 which focused on AD diagnosis. The most frequently used concepts by RFPs across Plenaries related to the subcategory Investigations which included the following: costs of CT scans, guidelines' criteria for the administration of CT scans, basic laboratory tests, and the clinical judgment required to guide one in the selection of appropriate tools for the diagnosis of AD. Participants expanded the discussion on laboratory tests with a consideration of additional tests currently required in their practice.

The second most frequently used concepts were classified under the subcategories Differential Diagnosis (e.g. concept of differential diagnosis in general, as well as concepts relating to the specific criteria to be applied when making a differential diagnosis) and Alzheimer Disease (e.g. concepts of AD, early AD). The least frequently used diagnostic concepts were grouped under the following subcategories: (a) Approach to Early AD that covered the steps required to reach an early AD dx (e.g. patient's history); (b) Types of Dementia (i.e., mixed dementia, Frontotemporal, Lewy Body) and Mild Cognitive Impairment (MCI); and (c) Co-morbidities (i.e., diabetes, and depression).

Throughout Plenary activities the facilitator's use of concepts indicates that she was on task in explaining concepts relating to the learning outcomes of the AD Program. Her most frequently discussed concepts were included in the subcategories Dementia (33%), Investigations (25%), and Types of Dementia (21%). In the first subcategory, the concept of dementia was broadly used. In the subcategory Investigations the most frequently used concept was that of CT scan. In the subcategory Types of Dementia and in reply to Luc's question, the facilitator expanded on the relationship between AD and mild cognitive impairment (MCI) through evidence-based references. MCI had been briefly included in the AD Program and was defined as a risk factor for AD.

The majority of diagnostic concepts discussed were related to the learning outcomes of the AD Program. Participants did not include any new diagnostic concepts but elaborated on existing ones such as: (a) the effects of a variety of co-morbid conditions that increase the complexity of diagnosing AD, (b) the use of CT scans in the context of rural practice, and (c) the relation between MCI and AD. Some concepts relating to the learning outcomes were left out, such as the use of seven scales for assessing a patient's cognitive and functional status, and four scales for assessing the caregiver's health (Appendix S). The only cognitive scale that was discussed was the Folstein's test (MMSE).

4.2.1.4.3 Part B: Use of Treatment Concepts. AD treatment was the largest identified gap in RFP's knowledge. Participants used 7 out of the 14 concepts relating to the learning outcomes of the AD Program (Table 4.7). Table 4.10 summarizes the frequency with which those 7 concepts were used by the participants and facilitator during the Plenaries 1, 2, and 3.

Table 4.10

Frequency of Use of Treatment Concepts in the Three Plenaries

TXS	RFPs' use of tx concepts in each Plenary					Facilitator's use of tx concepts				
	P1	P2	P3	Tot	%	P1	P2	P3	Tot	%
PH	5	17	2	24	55	7	9	0	16	67
Tx AD	5	2	1	8	18	2	1	0	3	
T-D	4	3	0	7	16	3			3	
CO	2	2	1	5	11					
AM	0	0	0	0			1		1	
G-TX	0	0	0	0			1		1	
Total	16	24	4	44	100	12	12		24	

Note. TXS = treatment subcategories; RFPs = rural family physicians, P = plenary; PH = pharmacotherapy; Tx-AD = treatment of Alzheimer's disease; T-D = types of dementia; CO = co-morbidities; AM = alternative medicine; G-TX = Guidelines on treatment

Table 4.9 shows that the majority of therapeutic concepts were discussed during Plenary 2 which is to be expected as it followed the treatment module of the AD Program. However, the discussion that took place during Plenary 2 was the shortest and, despite its current relevance, apparently did not engage all members of the group.

Concepts used across Plenaries were grouped into six subcategories. The most frequent subcategory on Pharmacotherapy covered 55% of the total of therapeutic concepts used included: (a) the efficacy and safety of cholinesterase inhibitors (CI), (b) the switching of different types of CI, and (c) the administrative concerns relating to the cost and insurance coverage of CI. The second most frequent subcategory was Treatment of AD (18% of total therapeutic concepts) which covered treatment of early stages of AD. The third most frequent subcategory was Types of Dementia (16% of total therapeutic concepts), including Frontotemporal, Vascular or Mixed, Lewy body and Mild Cognitive Impairment (MCI). The least frequently used concepts (11%) related to Comorbidities, including the treatment of depression.

The therapeutic concepts most frequently used by the facilitator across the three Plenaries were related to Pharmacotherapy (67%), which was also the subcategory most frequently used by participants (55%).

Participants did not include any new therapeutic concepts but elaborated on existing ones such as: (a) administrative issues involved with the switching of cholinesterase inhibitors (CI) medication, (b) treatment of MCI, and (c) treatment of two types of dementia (Frontotemporal and Lewy body). Despite their inclusion in the AD Program's learning outcomes the topics of alternative medicine, treatment of advanced stages of AD, and the comparison between CI agents were not discussed.

4.2.1.4.4 Part B: Use of Management Concepts. Participants used 10 out of the total of 14 concepts included in the learning outcomes of the AD Program (Table 4.7). Table 4.11 illustrates the frequency with which those 10 concepts were used by the participants and facilitator during the Plenaries 1, 2, and 3.

Table 4.11

Frequency of Use of Management Concepts in the Three Plenaries

MGS	RFPs' use of mg concepts					Facilitator's use of mg concepts				
	P1	P2	P3	Tot	%	P1	P2	P3	Tot	%
Caregiver										
NS			28	28				1	1	
Help			16	16				2	2	
RT		4		4				2	2	
CHS			8	8				2	2	
Subtotal				56	74				7	64
AD PT										
MT			10	10				1	1	
AT			5	5						
RF	1			1		1	1		2	
Subtotal				16	22				3	27
MG-AD								1	1	
AD		4		4						
Subtotal				4	5				1	9
Total	1	4	71	76	100	1	1	9	11	100
Grand Tot				87						
%				87					13	

Note. MGS = Management subcategories; NS = caregiver's needs & safety; RT = caregiver's report about the AD patient; CHS = Canadian health system; AD-PT = Alzheimer's disease patient; MT = monitoring AD patient; AT = assistance provided to the AD patient by physicians; RF = referral for AD patient; RFPs = rural family physicians; P = Plenary; MG-AD = AD management;

Table 4.11 presents the frequency of use of management concepts by the participants and facilitator. The majority of management concepts were discussed during Plenary 3 which is to be expected since it followed the management Module of the AD Program. Plenary 3 focused on the discussion of AD management, starting with the case of Mrs. Robinson who was stressed and burned-out from caring for her mother, an AD patient. This appeared to be a case of abuse of the elderly. All RFPs posted one or more messages pointing out the main issues of this case which reminded them of similar cases of abuse of the elderly encountered in their clinical practice.

Across Plenaries participants used a total of 87 management concepts that were grouped into 10 subcategories (Table 4.11). Caregiver was the subcategory most frequently discussed (74%), and included a variety of concepts such as caregiver's health, coping strategies and negative feelings, as well as the safety and well-being of the caregiver's family. Caregiver's Help included services offered by the community to the caregiver. Discussion of the Canadian Health System dealt with participants' criticism of the system's inability to provide appropriate assistance to the caregiver. Caregiver's Report included the caregiver's observations on the patient's activities of daily living.

The second most frequently discussed subcategory was the AD Patient (22%) which included monitoring and evaluating the disease's progression, the sharing of community services, and referrals for the AD patient.

The facilitator used a total of 11 concepts on AD management. The most frequently used subcategory was Caregiver (54%).

Participants did not introduce any new concepts across Plenaries but expanded on the majority of concepts included in the learning outcomes of the AD Program. Some of the concepts covered in the AD Program which were not discussed included the clinical characteristics of the seven stages of AD.

Table 4.12 shows a summary of the frequency of use of concepts on diagnosis, treatment and management by RFPs and the facilitator during Plenaries 1, 2 and 3.

Table 4.12

Summary of Frequency of Use of Concepts in the Three Plenaries

AD Categories	Dx	Tx	Mg	Total frequency
User				
RFPs	122	44	76	242
%	50	18	31	
Facilitator	48	24	11	83
%	58	29	13	
Total	170	68	87	325

Note. AD = Alzheimer's disease. Dx = diagnosis, Tx = treatment, Mg = management, RFPs = rural family physicians

Table 4.12 indicates that participants used a total of 242 concepts across the categories of diagnosis, treatment and management. Half of these concepts used by RFPs during Plenary activities focused on AD diagnosis. One third of the concepts used focused on AD management. Despite AD treatment being the group's highest perceived gap in AD knowledge, discussion focusing on this category comprised only 18% of the total of concepts used.

The facilitator used a total of 83 concepts during Plenary activities. Diagnostic concepts were those most frequently used (58%), followed by tx (29%) and mg (13%). These results matched the participants' results where diagnostic concepts were more frequently discussed than those on treatment and management. However, the facilitator used treatment concepts more frequently than did the RFPs.

4.2.1.5 Triangulation of Measures

In order to present evidence of participants' learning from the AD Program, the results of two measures (which were previously presented in this chapter) were triangulated. One of these measures is Plenary Transcripts which recorded the concepts discussed in the group. The second measure is the Participant Reaction Questionnaire which reported that a substantial part of the AD Program confirmed the way RFPs diagnosed, treated and managed their AD patients.

Table 4.13 presents the triangulation of results from the Participant Reaction Questionnaire (PRQ-I) and Plenary Transcripts.

Table 4.13

Triangulation of Measures: Confirmation of Participants' AD Knowledge

Source	Diagnosis	Treatment	Management
Plenary Transcripts	Investigations	Pharmacotherapy	Caregiver
	32/122	24/44	56/76
	32%	55%	74%
PRQ-I.	Investigations	Pharmacotherapy	Caregiver
	10/31	17/26	12/23
	31%	65%	52%

Note. Results of Plenary Transcripts were presented in Tables 4.9; 4.10 and 4.11 respectively. For PRQ-I results see pp. 161- 62. PRQ-I = Participant Reaction Questionnaire

Table 4.13 indicates that the most frequently used concepts in Plenaries matched the most frequently confirmed concepts as reported by the PRQ-I. In other words, the concepts most frequently used during Plenary activities were those grouped under the subcategories Investigations (32%), Pharmacotherapy (55%) and Caregiver (74 %). The results of the Participant Reaction Questionnaire (PRQ-I) shows that in the category of diagnosis, the most frequently confirmed concepts were grouped under the subcategory Investigations (31%). In the category of treatment, the most frequently confirmed concepts were grouped under the subcategory Pharmacotherapy (65%), while the most frequently confirmed concepts in the category of management were grouped under the subcategory Caregiver (52%). The participant's use of concepts in Plenaries matched the type of concepts/ procedures that the AD Program confirmed (as reported by the PRQ-I). Consequently, this triangulation of sources indicates that the AD Program's content was relevant and confirmed certain aspects of the participants' clinical practice of early AD.

4.2.1.6 Participants' Final Score in the AD Program

The participants' final score was derived from a variety of measures each having a different weight. The Pre-test's weight was 5% because it was used as baseline to compare with the Post-test and 1Month-Post test. The measurement of participants' learning and collaboration over the 9-month period constituted the main objective of this study. Therefore, the Post-test (30%) and the 1Month-Post test (30%), as well as collaborative activities (20%), were weighted higher than other measures.

The collaborative activities, the Participant Reaction Questionnaire (PRQ) and the Log (which will be discussed later in this chapter for supporting RQ#3) were all allocated full points for participation/completion.

Table 4.14 shows the participants' final scores in the AD Program.

Table 4.14

Participants' Final Score in the AD Program

Measures	Pre	Post	1MP	PL	PRQ	Log	Max Final score
Weight	5%	30%	30%	20%	10%	5%	100%
RFPs							
Norma	3.60	25.65	25.35	20.00	10.00	5.00	89.60
George	3.70	23.97	25.50	20.00	10.00	5.00	88.17
Mark	4.20	24.64	23.82	20.00	10.00	5.00	87.66
Luc	3.50	24.60	24.30	20.00	10.00	5.00	87.40
Marcela	3.30	23.20	23.62	20.00	10.00	5.00	85.12
Mathew	2.90	22.96	23.32	20.00	10.00	5.00	84.18
Ronald	3.10	22.90	22.71	20.00	10.00	5.00	83.71
Diana	2.80	21.67	23.25	20.00	10.00	5.00	82.72
Group mean							86.07

Note. Percentages indicate the weight a measure has in the final score. Pre = Pre-test; Post = Post-test; 1MP = 1Month-Post test; PL = Plenaries; PRQ = Participant Reaction Questionnaire.

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Table 4.14 shows the participants' final individual scores in the AD Program which resulted in a group mean of 86.07 (SD 2.46). Four participants (Norma, George, Mark, and Luc) scored above and 4 (Marcela, Mathew, Ronald, Diana) below the group mean.

4.2.1.7 Summary of Research Question # 1

Overall, the triangulation of results on objective and self-reported measures (Table 4.15) provides evidence that the AD Program supported the rural family physicians' learning about AD (RQ#1).

Table 4.15

Triangulation of Measures Providing Evidence of Learning (RQ# 1)

Learning outcome	Measure	Data to support accomplishment of learning outcomes
1. Acquire declarative knowledge	MCQ	Significant increase of declarative knowledge on AD (t test, p. <.05)
2. Apply procedural knowledge	Clinical Cases	Significant increase in AD tx knowledge only (t test, p. <.05)
3. Use of concepts related to the LOs of the AD Program	Plenary discussions	Concepts used • 22/39 diagnosis (56%) • 7/14 treatment (50%) • 10/14 management (71%) • Tot 39/67 concepts used 242 times
4. Confirm prior knowledge on AD	Self-report (PRQ-I)	A substantial part of the AD Program confirmed the AD knowledge of all participants in the areas of: • Investigations • Pharmacotherapy • Caregiver

Note. AD = Alzheimer's disease; Tx = treatment; LOs = Learning outcomes; PRQ-I = Participant Reaction Questionnaire.

Table 4.15 summarizes evidence of participants' learning from the AD Program (RQ#1). Participants significantly increased their knowledge on AD as demonstrated by tests' scores, specifically in the section on MCQs across AD diagnosis, treatment, and management. Significant differences were reported only in the AD treatment with regard to the application of acquired AD knowledge to the problem solving of clinical cases.

Participants applied concepts derived from the learning outcomes of the AD Program during Plenary discussions. A total of 39 concepts were used by participants 242 times across the three Plenaries. These concepts represent 56% of the diagnostic concepts, 50% of treatment concepts, and 71% of management concepts derived from the learning outcomes of the educational intervention.

Finally, the self-reported measure (PRQ-I) showed that the majority of RFPs reported that a substantial part of the AD Program confirmed their AD practice. Concepts confirmed by the AD Program matched the most frequently used concepts across Plenaries. These concepts were grouped under the subcategories Investigations, Pharmacotherapy and Caregiver.

The next section presents evidence to support RQ#2.

4.2.2 Research Question # 2: AD Program's Support of Learning

This section presents the results that document the effectiveness of the AD Program's features for supporting the RFPs' learning (RQ#2). The evidence is presented in the following sequence: the description of the ratings of the AD Program's features is followed by the participants' coded discussions during three Plenary activities.

Participants rated the effectiveness of 20 features of the AD Program (Appendix W) to support their learning in several self-report measures including: the PRQ (sections I and II), Check-out quizzes, and the Technological Support quiz. Overall the AD Program's effectiveness was rated as moderate (mean of 3 on a 5-point Likert-scale for 20 features, Appendix W). Five features were rated as high (Table 4.16), nine as medium (Table 4.19), and six as low (Table 4.22).

The effectiveness of the AD Program in supporting RFPs' learning might be inferred from the fact that all participants would recommend it to their peers for the following reasons: (a) a flexible, convenient, and ready access to learn online through a body of well structured and pertinent materials; (b) the opportunity to ask questions, and share information relevant to their current practice with an AD expert and their peers, and (c) the opportunity to learn new technology, and to access accredited CME. Norma's message illustrated well the opinion of her peers:

> I would absolutely recommend this course. I think there is much useful information, and I think that becoming familiar with Internet courses is certainly important, and will become more important as time goes on. It is

> very convenient to be able to log on when time permits; although sometimes hard to find that time! Also, as the population ages, there will be more and more patients with AD (Norma, PL 4 - 678).

Furthermore, all participants except for Marcela and Mark were interested in continuing networking with their peers who had participated in the AD Program. In order of importance, the most relevant reasons were: (a) to exchange current information on AD, (b) to discuss other medical issues beyond AD, (c) to discuss complex AD cases and professional issues relating to rural practice, and (d) to share community services information targeting AD patients and their caregivers. These results were confirmed and expanded on by the participants at the Closure Plenary. Effective features are presented from highest to lowest in this section.

4.2.2.1 Most Effective Features of the AD Program

Participants rated five (25%) of the AD Program features as the most effective in supporting their learning process as shown in Table 4.16.

Table 4.16

Rating of Most Effective Features of the AD Program

Features	Educator	Mod 5 (Dx)	Practice Quiz (Tx)	Practice Review	Plenary
RFPs					
Marcela	4.8	5	4	4	5
Mathew	4.2	5	5	4	4
George	5	5	5	4	5
Diana	4.2	4	4	4	3
Luc	4.6	3	4	4	3
Mark	3.6	3	3	3	4
Ronald	3.8	5	4	4	4
Norma	5	4	4	5	4
Group Mean	4.4	4.25	4.13	4	4

Note. Effectiveness was rated on a 5-point Likert-scale (1 = not effective, 5 = very effective). RFPs = rural family physicians; Educator = performance of the educator in 5 functions; Mod 5 Dx = module 5 on AD diagnosis; Tx = treatment; Practice Review = reviewing modules; Plenary = refers only to the level of interest of the Plenary

The five most effective features of the AD Program are the educator, Module 5 on diagnosis, Practice quiz focused on treatment, the possibility to review past modules at any time, and the level of interest of Plenary activities (Table 4.16). The researcher played the role of educator. The educator's performance was rated as the most effective feature of the AD Program's design to support RFPs' learning. Her performance was rated in five functions as shown in Table 4.17.

Table 4.17

Rating of Effectiveness of the Educator's Functions

Functions	Answer email	Create supportive	Prompt Particip	Answer D-B	Explain rules	M
RFPs						
Marcela	5	5	5	5	4	4.8
Mathew	5	4	4	4	4	4.2
George	5	5	5	5	5	5
Diana	4	4	4	5	4	4.2
Luc	5	5	5	5	3	4.6
Mark	4	4	4	3	3	3.6
Ronald	4	4	4	4	3	3.8
Norma	5	5	5	5	5	5
Group mean	4.6	4.5	4.5	4.5	3.8	4.4

Note. Effectiveness was rated on a 5-point Likert-scale (1 = not effective, 5 = very effective). Answer email = answer electronic mail; Create supportive = create supportive environment; Prompt particip = prompt participation; Answer D-B = answer Discussion Board messages;

The educator's performance covered five functions: (a) creating an open and supportive environment, (b) explaining the rules of participation, (c) providing timely prompts for the RFP's participation, (d) responding to messages on the Discussion Board, and (e) responding promptly to e-mail messages. RFPs rated all of these functions as highly effective. The educator's effectiveness was confirmed spontaneously by all participants at the Closure Plenary. For example, Marcela stated:

> I definitely wouldn't have devoted as much time to learning more about managing AD without the deadlines built into the course, or the gentle and encouraging pressure to fulfill them provided by Francesca (Marcela, PL 4 - 688).

The second most effective feature of the AD Program was the Module on diagnosis. This module focusing on AD diagnosis was structured as were other Modules (i.e., purpose, learning outcomes, mini-lecture, required individual and collaborative activities, and optional practice activity).

The third most effective features were two opportunities to practice, namely, a quiz focused on AD tx, and the possibility of reviewing the Modules' content at anytime. Table 4.18 shows the participants' overall frequency of practice during the AD Program.

Table 4.18

Participant's Frequency of Practice Opportunities

RFPs	Frequency Practice
Norma	7
George	7
Mark	4
Luc	11
Marcela	2
Mathew	3
Ronald	12
Diana	9
Total	55

The AD Program lasted from May 2003 to February of 2004 and Practice Opportunities were taken 55 times from July to December 2003 (Table 4.18). Practice Opportunities could be taken more than once.

The fifth most effective feature of the AD Program was the level of interest in the three Plenaries. The main topics discussed included the controversial issue of CT scans for screening early AD, pharmacotherapy for the AD treatment, and caregiver's needs as illustrated by Mrs. Robinson's case. Other features of the Plenary activities are discussed further on in this chapter.

4.2.2.2 Medium Effective Features of the AD Program

Table 4.19 presents the AD Program's features that were rated as medium effective for supporting the RFPs' learning.

Table 4.19

Rating of Medium Effective Features of the AD Program

Features	Mod 7	Mod 6	Mod 8	PL	OPD	Pre	Post	1MP	Tech
RFPs									
Marcela	4	4	5	4	1.5	4	3	4	n/a
Mathew	4	3	3	4	3.5	2	3	2	3
George	4	5	3	3	4.5	5	5	3	2
Diana	4	3	2	2	3.5	2	2	3	n/a
Luc	4	3	3	3	4	3	4	4	3
Mark	3	2	3	4	2	2	3	3	3
Ronald	4	3	3	4	3.5	3	5	5	2.5
Norma	4	4	4	4	4	3	2	3	4
Group Mean	3.88	3.38	3.25	3.50	3.31	3	3.38	3.38	3

Note. Effectiveness was rated on a 5-point Likert-scale (1 = not effective, 5 = very effective). Mod 7 = Module on management; Mod 6 = Module on treatment; Mod 8 = Module on optional resources; PL = Plenary support to learning; OPD = overall Program design; Pre = Pre-test; Post = Post-test; 1MP = 1Month-Post test; Tech = technological support; AD = Alzheimer's disease

Table 4.19 shows that nine features were rated as medium effective for supporting the RFPs' learning process. These features included: (a) objective measures (Pre-Post and 1Month-Post tests), and (b) content focused on three AD Modules (Module 6 focused on tx, Module 7 on mg and Module 8 on optional Web resources). The rating of the overall design of the AD Program included the mean of two ratings (at the end of the Instructional phase and at the Closure). The technological support offered by the McGill team was also rated twice (at the end of the Instructional phase and at the Closure). This feature was not used by all participants.

Table 4.19shows that the effectiveness of Plenary activities to support RFP's learning was rated as effective. This result matches the evidence provided by Individual Reflective activities where participants specified what had been learned from Plenary activities. All participants learned something from the three Plenary discussions. In the area of AD diagnosis, RFPs learned about the following themes: (a) following a step by step approach, (b) starting early and actively in AD dx, (c) clarifying issues on mild cognitive impairment (MCI), (d) questioning the use of CT scans, (e) using timelines for AD patients' reassessment, (f) disagreeing with the application of current AD guidelines, and (g) screening potential AD patients with appropriate tools.

RFPs learned about the following themes in the area of AD treatment: (a) considering the complexity of the disease and a variety of therapeutic approaches; (b) clarifying expectations vis-à-vis therapy results, and therefore becoming more aggressive in prescribing; (c) raising the awareness in treating both patient and caregiver; (d) sharing new information on AD with peers and the AD specialist; (e) critically appraising the applicability of the recommendations by the Canadian Consensus Guidelines created in tertiary centers to the rural clinical practice; (f) assessing the challenge of caring for AD patients and caregivers with far less resources than in urban centers; and (g) sharing new titration procedures for CI drugs.

Finally, all participants learned something about AD management, with the main learned points being: (a) seeing the caregiver alone without the presence of the AD patient; (b) sharing the complexity of AD management with their peers; (c) considering a multidisciplinary approach; (d) regularly following-up AD patients and their caregivers; and (e) supporting and educating AD patients and their caregivers.

After the Instructional phase, all participants completed the PRQ-I where they rated the social and instructional contexts of the Plenary activities that might have enhanced or limited their learning process. Table 4.20 shows the social context of Plenary activities where RFPs rated their comfort level in a variety of situations in small group work.

Table 4.20

Rating of Plenary Activities' Social Context

Social context	Comfort level
Discussing own ideas	3.6
Providing constructive feedback	3.7
Receiving constructive feedback	4.4
Dealing with disagreement	3.6
Ability being attentive to partner's opinions	3.6
Group mean	3.78

Note: Comfort level was rated on a 5-point Likert-scale (1 = not comfortable; 5 = very comfortable

Overall, participants rated their comfort level during five situations in the Plenary activities as medium-high (3.78). A similar comfort level across the same situations had been anticipated by participants in the Needs Assessment (mean 3.06). The most effective situation of the social context of Plenary activities was the receiving of constructive feedback (4.4).

Participants also evaluated other features of the Plenaries' effectiveness to support their learning process, such as their democratic climate, and the ease in gaining support from the facilitator, educator and peers, all as shown in Table 4.21

Table 4.21

Rating of Effectiveness of Plenary Characteristics

RFPs	Democratic	Peers support	Facil support	Educator support	Mean
Marcela	4	3	3	3	3.25
Mathew	3	4	4	4	3.75
George	5	5	5	5	5
Diana	2	2	2	4	2.5
Luc	2	3	3	3	2.75
Mark	3	3	3	3	3
Ronald	3	4	4	4	3.75
Norma	4	4	3	3	3.5
Group mean	3.25	3.5	3.38	3.63	3.44

Note: Effectiveness was rated on a 5-point Likert-scale (1= not effective; 5 = very effective). RFPs = rural family physicians; Facil = facilitator.

Table 4.21 shows that the Plenary environment was characterized by a moderately democratic level with relatively easy access to support from the educator, peers, and the facilitator. George rated the Plenary characteristics the highest, with Luc and Diana rating them the lowest.

The PRQ-I also reported that the most helpful aspect of Plenary activities for the RFPs' learning process was the possibility to share experiences on common problems encountered in their clinical practice on AD, such as: (a) discussing the controversial use of CT scans; (b) sharing approaches to the management of crisis situations such as the one described in Mrs. Robinson's case, (c) prescribing cholinesterase inhibitors (CI), and (d) updating their knowledge through the discussion of current AD literature.

When reflecting on the effectiveness of Plenary discussions, the majority of participants stated that they learned from each other and could identify one or two topics which they probably would not have learned from working alone. The most common themes included: (a) the use of CT scans, (b) the care of AD patients combined with the support provided to their caregivers, (c) the switching of CI drugs when the first one fails, and (d) the discussion of updated references on AD.

All participants suggested ways to improve Plenary activities, with the most commonly expressed ones being: (a) the facilitator should be more involved and be better able to re-focus the discussion when participants digressed, (b) all participants should answer messages promptly to allow for a more efficient pace, (c) the use of automated warnings sent to personal e-mails to encourage active participation and timely responses, and (d) the inclusion of a smaller group which might facilitate logistics.

4.2.2.3 Least Effective Features of the AD Program

Table 4.22 presents the least effective features of the AD Program to support participants' learning.

Table 4.22

Rating of Least Effective Features of the AD Program

Features	WebCT	PA	Mod 4	Log	Facilitator	Mod 1-3
RFPs						
Marcela	1	1	1	1	2.5	3
Mathew	2	1	1	3	2.5	3
George	3	4	4	3	3.67	3
Diana	3	3	3	3	1.83	2
Luc	3	2	2	2	1.17	2
Mark	1	1	2	2	3	3
Ronald	1	2	1	2	4	2
Norma	2	2	3	3	3	4
Group mean	2.00	2.00	2.13	2.38	2.71	2.75

Note. RFPs = rural family physicians; WebCT = navigation on this platform; PA = Paired activities; Mod 4 = Module 4 was focused on AD diagnosis. Mod 1-3 = Module 1 provided an overview of the AD Program; Module 2 focused on Practice-based learning method; Module 3 provided information about Technological support.

Table 4.22 shows that the least effective feature for supporting the RFPs' learning process was navigation on WebCT which was confirmed by other measures, as well as by the facilitator who qualified such a platform as "somewhat archaic" and not user-friendly.

The Log and Modules 1-3 were also rated as low. In the Log, RFPs reflected on the extent to which the anticipated and non-anticipated changes in their clinical practice had been implemented. Modules 1-3 covered the rules and logistics of the AD Program and the two tutorials (one on the PBL method and the other on technological support). Paired activities that were covered by Module 4 and the facilitator's performance are explained more extensively as follows.

*4.2.2.3.1 Paired Activities***.** This section focuses on evidence of the extent to which Paired activities supported participants' learning. It begins with a report on participation in pairs in terms of frequency of posted messages, followed by participants' evaluation of Paired activities for supporting their learning and the perceived social context; and ends with comments on the strengths and weaknesses of Paired activities.

During the Instructional phase of the AD Program, participants were required to exchange messages through six Paired activities that are listed in Table 4.23.

Table 4.23

Frequency of Messages in Paired Activities

Paired activity	Frequency messages
Icebreaker with partner	19
Mrs. Gerber initial dx	118
Mr. Singh initial dx	99
Mrs. Gerber final dx	66
Mr. Singh final dx	62
Mr. Singh tx	82
Total messages	446

Note. dx: diagnosis; tx: treatment

Table 4.23 shows that during Paired activities, a total of 446 messages were exchanged between the educator and the participants, as well as between partners.

The participants' evaluation showed that the levels of effectiveness and usefulness of Paired activities for supporting the participants' learning process were rated as low (mean of 2 and 2.63 respectively). Consequently, the Paired activities Transcripts were excluded from the data to be coded.

Social context and group dynamics might influence the quality of a discussion. Hence, participants rated their comfort level in five situations (discussing their own ideas, speaking up when confused or uncertain, providing constructive feedback, receiving constructive feedback, and dealing with disagreement), and their ability to be attentive to their partner's opinion during Paired activities in Table 4.24.

Table 4.24

Rating of Participant's Comfort in Paired Activities' Social Context

Social context	Comfort level
Discussing own ideas	3.7
Speaking up when confused	3.6
Providing constructive feedback	3.2
Receiving constructive feedback	3.4
Dealing with disagreement	3.4
Ability being attentive to partner's opinions	3.7
Group mean	3.5

Note. Comfort level was rated on a 5-point Likert-scale (1 = not comfortable; 5 = very comfortable)

Table 4.24 describes the social context of Paired activities where the participants' comfort level in six situations was rated as medium/high (3.5).

Participants' reflection on Paired activities included a critical look at their strengths and weaknesses, at what had been learned from this experience, and suggestions on how to improve team work. The majority of participants considered that the most important strength of Paired activities was the "Exposure to a second opinion and another way of thinking" (George, PRQ-I). Five participants gave a specific example of something learned from their Paired work or from their partners that he/she may not have learned from working alone. For instance, Luc explained what he had learned from his partner as follows: "The fact that he (Mark) would have ordered a scan irrespective of the Consensus guidelines in almost all cases of suspected dementia. This confirms a tendency that I share" (Luc, PRQ-I).

As reported by participants' self-assessment (in Individual Reflective activities), all participants (except Marcela) reported that they had learned something from Paired activities. The most frequent-learned diagnostic topics were:

(a) confirming diagnostic practice, (b) valuing the opportunity to ask a colleague for a second opinion, (c) following a step-by-step approach, (d) focusing on the patient's history, (e) sharing alternate AD approaches, (f) increasing the importance of history-taking for reaching a dx; (g) starting with a wider differential dx, and (h) sharing community resources.

The most frequent-learned therapeutic topics were: (a) using multiple drugs and therapeutic approaches, and (b) considering the co-morbid conditions more attentively.

The most frequent-learned managerial topics were: (a) systematically following-up both the AD patient and caregiver through several visits, (b) integrating community resources (e.g. wandering registry), and (c) discussing legal and financial issues, as well as the driving ability of the AD patient.

All participants considered the most important weakness of the Paired activities to be the time lag between the posting of a question on the Discussion Board and the waiting for a response. Even Diana, who interacted frequently with George, argued that this slow pace made you lose interest over time" (PRQ-I). Furthermore, when she posted a message to which nobody responded, she wondered: "What is going on, are we on strike? Nobody seems to be in the AD Program" (Diana, 0903).

Despite offering a moderately comfortable social context to discuss relevant issues, Paired activities were rated as one of the least effective features in the AD Program to support participants' learning. Participants made suggestions for improving Paired team work that ranged from (in order of importance) changes in a partner's availability, the activity's design, and technical infrastructure. The topic of a partner's availability included: (a) timely participation and more efficient coordination, and (b) more stability in the initial pairing up. The topic relating to the activity's design pointed out that the cases were not controversial enough to promote argumentation during the discussion, and that there were too many repetitive questions and answers. The topic on technical infrastructure showed a requirement for: (a) a more user-friendly platform that facilitates the answering of questions and keeping track of progress, (b) a higher computer literacy background for participants, and (c) a more efficient hardware to access the AD Program.

Another of the least effective features of the AD Program was the facilitator's performance that is presented next.

4.2.2.3.2 Facilitator. The facilitator plays an important role in moderating online discussions in the context of a Plenary. Although the facilitator was an expert in AD, and familiar with the PBL method, she had never moderated an online discussion on WebCT. In Table 4.25, all participants including the facilitator evaluated her performance in covering the following functions: (a) creating a stimulating environment, (b) encouraging RFP's participation, (c) keeping the discussion on target, (d) prompting RFPs' reflection, (e) summarizing the key points, and (f) providing RFPs with timely feedback.

Table 4.25

Rating of the Effectiveness of Facilitator's Functions

Functions	A	B	C	D	E	F	Mean
RFPs							
Marcela	4	3	3	0	5	0	2.50
Mathew	2	3	2	3	2	3	2.50
George	4	5	4	0	4	5	3.67
Diana	2	2	2	0	2	3	1.83
Luc	2	1	1	1	1	1	1.17
Mark	4	3	3	2	3	3	3.00
Ronald	4	4	4	4	4	4	4.00
Norma	4	3	3	3	3	2	3.00
Group Mean	3.25	3	2.75	2.6	3	2.62	2.71
Facilitator	2	2	2	2	2	2	2

Note. Effectiveness was rated on a 5-point Likert-scale (1= not effective; 5 = very effective). A = providing timely feedback; B = creating a stimulating environment; C = encouraging RFP's participation; D = keeping the discussion on target; E = prompting RFPs' reflection; F = summarizing key points.

Table 4.25 shows that overall the facilitator received moderate feedback from the group (2.71), which was similar to her rating (2). Seen from the participants' perspective, the facilitator's best performance was in providing timely feedback and creating a stimulating environment. On the other hand, the data revealed that there was room for improvement in her ability to summarize and focus discussions. Luc consistently rated all of the facilitator's functions as the lowest, whereas Ronald rated them the highest. Despite having been instructed not to lecture, Luc stated that the facilitator occasionally did tend to do so. Other members of the group might have felt uncomfortable in openly challenging her lecturing style, or they simply did not notice it because of their expectation that the facilitator would function as a resource person, a situation that they had become used to in the past.

From the facilitator's perspective, the three most important factors which directly influenced her performance were: (a) having miscalculated the time required for this task which was on top of her already hectic schedule, (b) having misunderstood her role as PBL moderator and (c) facing a new type of teaching environment.

The facilitator raised a relevant teaching issue with regards to the second factor: "how to answer the learner's questions without being perceived as lecturing?" On this point, the facilitator wondered if instead of lecturing she should have implemented a method more in line with the PBL method. In her own words:

> Also I am not sure how I should have replied to very specific questions from an audience who expects specific answers, well supported by current evidence-based literature, without being perceived as lecturing. Perhaps I had somehow misunderstood my role and I should have allowed or guided them to find answers by themselves, rather than trying to answer their questions (even if they appeared to be directly addressed to me); this is in fact what we usually try to do for medical students and residents (Member checks).

On the subject of the third factor the facilitator, as a novice WebCT user, pointed out that the lack of user-friendliness of this platform was one of the most important weaknesses of the AD Program. Furthermore, this type of online learning environment presented a new way for the instructor and learners to interact. In her own words:

> There were often long delays, of up to several days until members made comments, responded or interacted with each other. The rural family physicians were very busy, too, and had different schedules. It is very different from what I am used to in our small teaching groups were we talk, not write (Member Checks).

The AD Program's design included Plenary activities as a means of providing participants with the opportunity to discuss and engage in collaboration. Results of online discussions are presented next.

4.2.2.4 Plenary Activities: Content Analysis

Evidence of participants' collaboration in Plenary activities emerged from the content analysis of Plenary Transcripts with a multilevel coding which examined: (a) level of Participation, (b) Interaction (i.e., sub-levels of Connectivity and Quality of Interaction), and (c) Emergent Patterns of Discussion.

4.2.2.4.1 First and Second Levels of Coding: Participation and Interaction. Interdependence and independence (Ingram & Hathorn, 2004) were the indicators used to assess whether collaboration occurred during the three Plenary activities. Interdependence which "requires that each member contribute actively to the group discussion" (Ingram and Hathorn, 2004, p. 225), was measured by a first level of coding (i.e., frequency of Participation), and then by a second (i.e., Interaction that included two sub-levels; that is, Connectivity to other statements, and Quality of Interaction). Independence is the ability to sustain a discussion within the group with limited input from the facilitator, and which was measured by the number of messages addressed to the facilitator and/or the group. A comparative analysis of three Plenaries is presented at the levels of Participation and Interaction in Table 4.26.

Table 4.26

Summary of Coding: Levels of Participation and Interaction

Principles	Indicators	Dx P1	Tx P2	Mg P3	Tot
Interdependence	PARTICIPATION				
	Messages	24	14	10	48
	Statements	95	48	62	205
	Threads	3	2	1	6
	Number of RFPs	8	5	8	
	INTERACTION				
	Connection to Previous				
	Messages				
	Direct comments	75/95	41/48	47/62	
		79%	85%	75%	
	Direct responses	20/95	7/48	15/62	
		17%	15%	25%	
	QUALITY				
	INTERACTION				
	Add information	74/95	43/48	42/62	
		78%	90%	67%	
	Simple agreement	21/95	5/48	20/62	
		17%	10%	33%	
Independence	Messages addressed to the	22/24	12/14	62/62	
	group or to a group member	92%	86%	100%	

Note. Dx: diagnosis; Tx = treatment, Mg = management; P = Plenary; RFPs = rural family physicians

Table 4.26 shows that throughout the three Plenaries participants posted a total of 48 messages and 205 statements classified under six threads. Participants posted more messages/statements than the facilitator and educator. The majority of these messages were usually addressed to the entire group which indicates a level of independence from the facilitator and the educator.

The relatively high number of on-task messages/statements provides evidence of the active engagement of learners who shared common interests derived from their clinical practice. The on-task discussions during the three

Plenaries were highly connected, as indicated by the frequency of statements coded as Direct comments, thereby enriching the discussion with Additional information. At the level of Quality of Interaction, the discussion focusing on AD management differed somewhat from those focusing on AD diagnosis and treatment as evidenced by the lowest number of statements coded as Add Information (67%) and the highest number of statements coded as Simple Agreement (33%). The extent of a participant's engagement in Participation and Interaction are considered as evidence of effectiveness of the Plenary activities in supporting RFP's collaboration.

Each of the three Plenaries is briefly described here. Plenary 1 which covered three threads (Appendix X) was the longest, lasting over 67 days during which participants sent 24 on-task messages, or an average of 0.4 messages per day. The majority (93%) of on-task statements focused on AD dx. This result is aligned with the learning outcomes of Modules 4 and 5 focusing on dx of early AD. Only 7% of on-task statements were classified as social. The first thread focused on the topic of Mild Cognitive Impairment (MCI) and was the shortest. It was initiated by Luc who posted two questions which were promptly answered by the facilitator. Two RFPs posted short messages. This thread lasted 2.5 weeks with the timing of participants' responses ranging from 5 to 8 days.

An open-ended question on issues encountered in solving Mrs. Gerber and Mr. Singh's diagnoses which was posted by the educator initiated the second thread. Four RFPs and the facilitator participated in this discussion which lasted 2 . 5 weeks. The timing of response ranged from 6 to 9 days.

The longest and deepest thread, and the one with the highest level of Quality of Interaction, was thread #3. Its quality was measured by: (a) the timing of response; (b) type of topic; (c) number, size and quality of messages; and (d) the number of participants involved. All participants except Luc engaged in this thread which focused on the controversial issue of when and on whom to perform a CT scan to diagnose AD, a topic which was covered by the Consensus Canadian Conference on Alzheimer's disease (CCCAD, 1999) in Module 5. The implementation of the CCCAD's recommendations was debated in relation to the constraints of rural practice and of clinical practice in general.

The Plenary 2 discussion focusing on AD treatment was the shortest, lasting approximately 1 month (Appendix Y). Five participants along with the facilitator and educator interchanged 14 messages, an average of 0.5 messages per day. The majority of on-task statements (84%) focused on the discussion of AD tx which was aligned with the learning outcomes of Module 6. A small proportion of statements (16%) were focused on social themes. The discussion in Plenary 2 included two threads focusing on: (a) the efficacy and safety of cholinesterase inhibitors for AD tx, and (b) issues encountered in monitoring AD progression and tx response in patients similar to Mr. Singh. George, who posted an article from a peer-reviewed journal, initiated the first thread. Except for the educator whose response was prompt, the timing of response from 3 RFPs ranged from 2 to 4 weeks.

The educator, who posted an open-ended question on the issues encountered in solving Mr. Singh's case, initiated the second thread. Four RFPs actively participated in this discussion over a two week period. The timing of posting was shorter than that encountered in thread #1, which probably indicated a higher level of interest in the subject matter (Appendix Y).

Plenary 3 focused on AD management (Appendix Z). All participants, including the facilitator and educator, posted 10 messages, representing an average of 0.5 messages per day. The discussion during Plenary 3 centred on one thread, and all the messages were addressed to the group. The educator, who posted an open-ended question on the issues encountered in solving Mrs. Robinson's case, initiated this thread. All RFPs participated in the discussion which lasted 16 weeks. The timing between the postings of messages ranged from 1 day to 2 months.

The facilitator actively contributed to the discussion with relevant and current information during Plenaries 1 and 2. She openly acknowledged the expertise of the group, and this presented opportunities for mutual enrichment on the topic of dementia. The facilitator participated less in Plenary 3 than in previous Plenaries due to a technological glitch. She contributed to the discussion by confirming what had been said regarding the importance of monitoring AD patients as well as their caregivers.

In summary, and based on the principles of interdependence and independence, Plenary activities supported group collaboration in the common task of discussing clinical cases and issues relating to the dx, tx and mg of AD. The third level of coding focusing on Emerging Patterns of Collaboration is presented next.

4.2.2.4.2 Third Level of Coding: Emerging Patterns of Collaboration. This section presents the content analysis results of the Transcripts of three Plenary discussions at the inferential level of Emerging Patterns of Collaboration as shown in Table 4.27.

Table 4.27

Summary of Coding: Level of Emerging Patterns of Collaboration

Plenary	ST	AG %	DG %	IE+ %	KA %	IB %	LP %	QU %
1	95	16	13	11	7	20	16	12
2	48	7	0		14	14	33	21
3	62	43	0	16		14	10	0
Total	205							

Note: Each statement could be classified into more than one subcategory to a maximum of two subcategories. ST = statement; AG = agreement; DG = disagreement; IE+ =illustrate a new idea with an example; KA = knowledge assessment; IB = identified barriers to practice; LP = link to practice; QU = questioning.

Table 4.27 indicates a total of 205 statements coded into six subcategories. The most frequent subcategories in Plenary 1 focusing on dx were Identified Barriers to Practice (20%), Link to Practice (16%) and Agreement (16%). George's argumentation illustrated both subcategories when debating the controversial issue of when and on whom to perform a CT scan to diagnose AD, and the applicability of the AD guidelines in relation to the constraints of rural practice. George argued that:

> Regarding CT scans in early Alzheimers, I think there is the issue of whether of not to do a CT on Mr. Singh. I think it is a fair question for us Family Physicians…Yes I am familiar with the Canadian recommendations but the devil is always in the details…I am aware that the Canadian recommendations have been validated for use in tertiary hospitals but have they ever been evaluated in community settings? Personally I do a CT on everyone whom I suspect has early AD" (George, PL 1- 553).

The most frequent subcategory in Plenary 2 focusing on tx was Link to Practice (33%) which is illustrated by the following example. When Diana reflected on the impact of what she had learned from the AD Program on her tx practice, she pointed out: "I guess I will be less shy to start treating these AD patients…
" (Diana, PL21- 594).

The unique characteristic of the case-based discussion on AD management in Plenary 3 was the highest frequency of the subcategory of Agreement (43%) which reflected the existing consensus in the group on the crucial role that caregivers play in monitoring the progression of AD, and the scarce support provided by the Canadian Health System. Scarcity of resources to support caregivers was coded under the subcategory Barriers to Practice (14%). In the subcategory Illustrate a New Idea with an Example (16%), Luc contributed by providing an example from his clinical practice and type of resources offered by his rural community, stating:

> …I would spend more time assessing how the kids (Mrs Robinson's kids) are coping with the situation. This in itself would be valuable in order to evaluate whether they themselves need targeted help. In our area, the local CLSC provides adult baby-sitting services, so that on-going short respite periods can be provided for main caregivers… (Luc, PL 3-618).

In summary, as documented by the results of the content analysis of the Plenary Transcripts, Plenary discussions provided an effective learning environment where RFPs engaged in collaboration and discussion of their clinical practice. Participants elaborated and expanded the discussion focusing on the concepts covered in the AD Program by linking them to their practice and/or general clinical practice.

4.2.2.5 Closure Plenary

The participants' experiences presented at the Closure Plenary confirmed the evidence reported by other measures previously presented in this section. Regarding the acquisition and retention of knowledge**,** participants increased their knowledge and confidence in dealing with AD patients and their families. RFPs confirmed and updated their AD approach with new options and therapies. Long term retention of knowledge was enhanced by the duration of the course (9 months) as opposed to shorter traditional CME conferences. RFPs increased their ability to predict problems in AD and gained awareness of the limited applicability of AD guidelines in the complex area of AD within the context of rural family medicine.

Participants also reported that the AD Program should be recommended to the College of Family Physicians of Canada because it offers a good example of interactive vs. passive traditional CME. This interactive model could be exploited for any other type of content within the medical field and to other professions.

RFPs also expressed their satisfaction in having invested time and energy in learning a new technology. This resulted in an increased level of confidence. The most attractive features that enhanced their learning were: (a) ready access to a whole body of well structured and pertinent materials, (b) the opportunity to discuss in Plenaries which were less structured than Paired activities, (c) the creation of a sense of community whose members wished to continue discussing and sharing resources, and (d) the effective follow-up from the educator.

RFPs mentioned the following barriers to active participation: (a) limited technological infrastructure to access the AD Program, (b) the unfriendly platform and their initial lack of comfort in using it, (c) length of the course which made it difficult to sustain attention, (d) hectic work schedule, and (e) limited success in Paired activities due to the time lag in responding, and the lack of disagreement needed to stimulate discussions.

Participants' suggestions to improve the AD Program included: (a) providing short print-out tutorials on how the AD Program works, (b) repeating the description of cases when there are questions to be answered, and (c) keeping deadlines because of their usefulness in monitoring and encouraging participation.

4.2.2.6 Summary Research Question #2

The goal of the AD Program was to support learning through appropriated instruction to fulfill the learning outcomes. Evidence of the AD Program's features to support learning (RQ#2) was documented by self-reported measures and content analysis of the Plenary discussions.

Participants rated the effectiveness of 20 of the Program's features as moderate (Appendix W). The educator's performance was rated as the AD Program's most effective feature. She played an important role in orchestrating the AD Program by taking care of logistics and providing technical and emotional support. The MCQ quiz on tx was the most effective practice activity. This might be related to the fact that AD tx was the RFPs' highest perceived gap.

The majority of participants were satisfied with the Program's effectiveness as expressed in their intention to continue networking with the same group who had participated in the AD Program, as well as recommending it to their peers.

Despite the fact that the overall design of the AD Program was twice rated as effective, there was room for improvement in the type of platform, level of facilitation and the design of Paired activities.

Overall, RFPs expressed a medium level of satisfaction with the Plenary characteristics as indicated by the mean (3.42) of the 7 rated features. The level of interest in the discussion was rated as the highest and the facilitator's performance as the lowest. All participants learned something from Plenary activities in the dx, tx, and mg of AD. The majority of participants stated that they learned from each other and could identify one or two topics which they may not have learned from working alone. The most commonly expressed weakness of Paired and Plenary activities was the time lag between postings on the Discussion Board.

Finally, results from the multilevel coding of the Plenary Transcripts indicated that, according to the criteria of independence and interdependence, participants collaborated in Plenary activities. Furthermore, they engaged in patterns of discussion focused on argumentation, reflection on their knowledge gaps, and the complexity of caring for AD patients with limited resources from the Canadian Health Care System.

Findings to support research question #3 are presented in the next section.

4.2.3 Research Question # 3: Participants' Reports of Impact on Clinical Practice

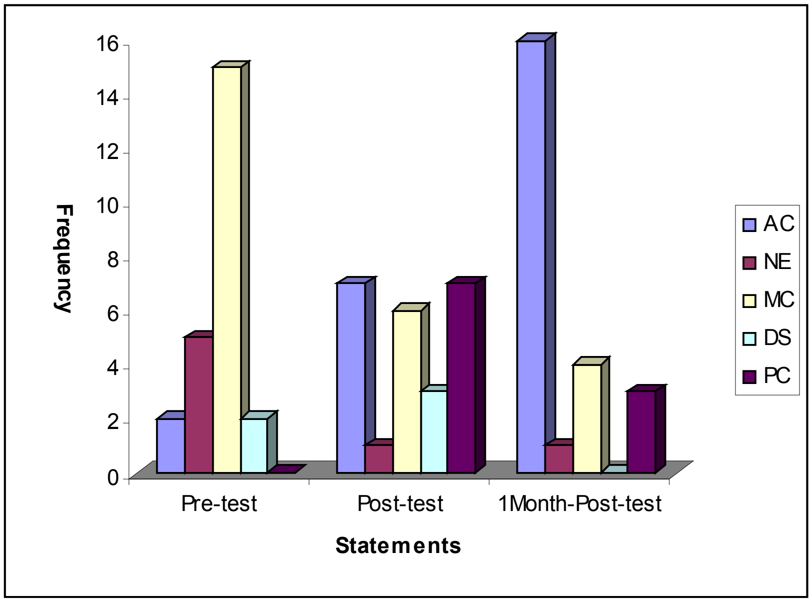
In order to answer RQ#3 (i.e., how does the online AD Program impact the rural family physicians' reports on their AD practice?) four measures prompted the participants' reflection on the relevance and impact of the AD Program on their clinical practice. This section begins with the Barometer's results, followed by three Individual Reflective activities. It concludes with the results of the Log followed by the triangulation of measures that provide evidence of the AD Program's impact which was described in the participants' reports of their AD practice.

4.2.3.1 Readiness to Change Clinical Practice

The Barometer provided evidence of the participants' readiness to change their clinical practice in the areas of AD diagnosis, treatment and management. Participants completed this self-reported measure at the Pre-test, Post-test and at the 1Month-Post test. Rural family physicians selected one of the five stages that best described their clinical AD practice. The Barometer's five stages include: (a) no change due to satisfaction with current practice (*acceptable*), (b) verification of appropriateness of practice (*need to examine*), (c) possibility to change some aspects of practice (*might change*), (d) level of dissatisfaction with practice (*dissatisfied*), and (e) planning to change clinical practice (*plan to change*). Figure 4.1 summarizes the Barometer's results on participants' readiness to change their clinical practice in the areas of diagnosis, treatment and management of AD.

Figure 4.1

Frequency of Statements Selected by Participants in the Barometer



Note: N = 8. In the Barometer, participants selected a statement that best described their current AD practice. AC = the way I practice AD is acceptable to me. NE = I need to examine how I practice AD to verify its appropriateness. MC = I might change some aspects of my practices for AD. DS = I am dissatisfied with the way I practice AD. PC = I plan to change the way I practice.

Figure 4.1 indicates that some changes occurred in the participants' perception of their AD clinical practice as evidenced by the Barometer results in the areas of AD diagnosis, treatment and management (Appendix Z-a) . At the Pre-test, the category with highest frequency of statements was *might change* clinical AD practice. At the Post-test, the most frequent categories were: a) considering AD clinical practice as *acceptable*; and b) *plan to change* AD practice. Finally, at the 1Month-Post test, considering AD practice as *acceptable* was the most frequently selected category.

After participating in Plenary and Paired discussions, participants were required to complete three Individual Reflective activities which constitute the focus of the next section.

4.2.3.2 Reflection on Impact of Learning on Clinical Practice

Participants reflected on the impact of what they had learned or confirmed from the collaborative activities for their clinical practice. Driven by the self-assessment principle, three Individual Reflective activities (i.e., #16, 22 and 27) indicate that, in general, the lessons which participants had learned from Paired and Plenary activities had some impact on their clinical AD practice (a portion of these results were already presented in supporting RQ#2).

In Module 4 focusing on diagnosis, participants were required to complete an Individual Reflective activity that prompted them to reflect on lessons learned in Paired and Plenary activities, and how they would impact their AD practice. Results indicate that several points learned from the AD Program would be transferred to their AD practice (Activity 16). To better diagnose AD patients, participants would use the correct tools and resources such as regular visits extending over a few months. They would also start the treatment of AD earlier, spend more time with family members in order to clarify their expectations with regard to this condition, and appropriately manage mild cognitive impairment (MCI) and memory loss.

During Activity 22, RFPs also listed several lessons learned from the AD Program that they would apply to their clinical practice. Participants would more frequently use peer-to-peer consultation for sharing and confirming medical information, realizing that this was an undervalued resource which could be beneficial to their rural practice. RFPs would use CT scans for screening AD. They would also prescribe CI with increased confidence, and would be more open to prescribing new CI agents. Participants would follow-up with their AD patients more systematically, and finally, would remain updated by participating in CME online interactive programs similar to the AD Program.

During Activity 27, participants stated that they would transfer several aspects learned from the AD Program to their rural practice. Specifically, they would develop a Dementia checklist to guide and ensure a comprehensive, preventive, and regular approach to AD management. Participants would also better integrate the use of community resources into their AD management approach. Finally, they expected to deal more comfortably with management issues in caring for AD patients and their caregivers.

Overall, Individual Reflective activities provided an opportunity to assess what participants had learned or confirmed during the Paired and Plenary activities, and the impact on their clinical practice. Participants went from self-assessment to action which they monitored with the Log, which is the fourth measure that provided evidence for answering RQ#3, and is presented next.

4.2.3.3 Implementing Change in Clinical Practice

For a month after the Instructional phase, participants were required to complete a Log for monitoring possible changes in their AD practice. Twenty-two questions prompted participants to reflect on the extent to which they applied what they had learned and/or confirmed from the AD Program, and possibly from other resources that they might have accessed during the same period, to their AD clinical practice. The Log's questionnaire covered a variety of areas: (a) the size of *suspected* and *diagnosed* AD clientele cared for during the last month; (b) additional AD resources that participants might have accessed outside the AD Program, and which might have generated change in their clinical practice; (c) relevance of the content learned from the AD Program for their clinical AD practice; (d) relevance of the PBL method for the family physicians' rural practice; (e) level of implementation of the three anticipated changes; and (f) barriers and enablers that influenced the implementation of those anticipated and non-anticipated changes in clinical practice.

The learning outcomes of the AD Program focused on optimizing RFP's clinical practice in early AD. Therefore, in order to investigate the potential impact of the AD Program on their practice (RQ#3), RFPs described the size and type of their early AD clientele during the month under study. The majority of participants (6 out of 8) cared for 1 to10 patients suspected of AD. Diana and Marcela did not care for any patient suspected of AD. During the same month, 6 of the participants diagnosed from 1-10 patients with AD. Mathew diagnosed the highest number (22-32), whereas Marcela did not diagnose any.

Potential changes in participants' AD practice might have been influenced by the AD Program as well as other AD resources. All participants (except Marcela and Diana) accessed AD resources outside the AD Program during the month under study. Mathew, Luc and Norma accessed AD literature; Mark and Ronald consulted peers who did not participate in the AD Program and George was the only one who accessed Web resources. All RFPs (except Marcela) rated as high (mean of 3.57 on a 5-point Likert scale) the relevance of the modules' content for their AD practice, as well as of the PBL method used in the AD Program.

At the Post-test, participants anticipated that they might change three aspects of their clinical practice. Over the next month, RFPs completed the Log where they monitored the extent to which those anticipated changes were implemented, and described the barriers and enablers that influenced their level of implementation. This section also describes non-anticipated changes in the RFPs' AD practice. Table 4.28 summarizes all anticipated changes in the participants' AD practice regardless of their implementation level.

Table 4.28

Summary of Anticipated Changes to Participants' AD Practice

Change	Dx	Tx	Mg	Total
First	3	2	3	8
Second	0	1	7	8
Third	1	3	4	8
Total	4	6	14	24
%	17	25	58	100

Note. Dx = diagnosis; Tx = treatment; Mg = management

As shown in Table 4.28, participants anticipated implementing 24 changes in their AD clinical practice. Anticipated changes in the area of AD management were more frequent (58%) than those in the area of treatment (25%) or those in the area of diagnosis (17%). Table 4.29 indicates the extent of implementation of the anticipated changes in AD practice.

Table 4.29

Implementation of the Anticipated Changes to AD Practice

AD Practice	Dx	Tx	Mg	Total	%
Implementation					
Not applicable	1	1	0	2	8
Not implemented	0	2	5	7	29
Partially	3	2	9	14	58
Completely			1	1	4
Total	4	5	15	24	100

Note. Dx = diagnosis; Tx = treatment; Mg = management

Table 4.29 shows that there was a fairly high level of implementation of the anticipated changes by participants. Almost two thirds of the anticipated changes were partially implemented, one third was not implemented, and only 4% was fully implemented. Table 4.30 lists only those partially implemented anticipated changes by participants.

Table 4.30

Partially Implemented Anticipated Changes to AD Practice

Changes	Dx	Tx	Mg	Total
First	2	1	2	5

Second	0	1	4	5
Third	1	0	3	4
Total	3	2	9	14
%	21	14	64	100

Note. Dx = diagnosis; Tx = treatment; Mg = management

Table 4.30 shows that participants partially implemented 14 anticipated changes of which 9 focused on management, 3 on diagnosis, and 2 on treatment.

Participants reflected on the enablers and barriers that influenced the implementation of the anticipated changes. The most common enablers for change were: (a) the need to transfer to practice what was learned and/or confirmed during the AD Program; (b) new clinical cases where the acquired knowledge or skills could be applied; (c) confidence gained during the AD Program on dx, tx and mg of AD; (d) improved awareness of aspects to include during clinical reasoning; (e) the request from a patient's family, staff and/or other professionals; and (f) admission of the AD patient to the hospital.

The most commonly mentioned barriers that limited anticipated changes were: (a) the lack of new AD patients, (b) time constraints due to the increased volume of work, (c) the challenge of managing complex cases (e.g. AD patient's co-morbidity) with limited resources, and (e) the lack of systematically planned visits with clear objectives.

Participants described additional change(s) in their AD practice which they did not anticipate at the Post-test, and also listed relevant enablers that influenced the implementation of such changes. All participants, except Marcela and Norma, described non-anticipated changes and enablers. All non-anticipated changes focused on AD mg, which matched with the majority of anticipated changes that were mentioned earlier. These non-anticipated changes increased the participants' awareness on: (a) the importance of caring for the caregivers of AD patients, (b) the length and complexity of AD, and (c) the need for a broader multidisciplinary approach.

In summary, RFPs cared for a relatively small (1-10) clientele of suspected and diagnosed AD patients for a period of approximately one month. During the same period, the majority of participants accessed additional AD resources, the most frequent being AD literature (50%) followed by consultation with other peers who did not participate in the AD Program (30%). All participants, except for Marcela, rated the facts in all three Modules (on dx, tx, and mg) as being relevant to extremely relevant to their AD practice. Almost two thirds of anticipated changes in practice were partially implemented and focused mostly on AD management. The commonly mentioned enablers that influenced the implementation of change were increased confidence and awareness gained from the AD Program which, in turn, helped RFPs transfer to their practice what had been learned and/or confirmed. For example, Diana was motivated to implement anticipated changes by:

> … what I learned with diagnosed patients, while waiting to find new ones!... more at ease treating patients and prescribe CIs and monitor their efficacy and side effects because now I feel more ready than before to treat AD… (Diana, Log).

On the other hand, the most commonly mentioned barriers to implementing anticipated changes were limited resources (e.g. time) due to overwork, and the lack of new AD patients. Six participants implemented changes in AD mg that they had not anticipated at the Post-test. The most common enabler for change was participation in the AD Program which raised their sensitivity and awareness of the complexity of caring for AD patients and their caregivers.

4.2.3.4 Summary Research Question #3

The results of the three self-reported measures (Barometer, Individual Reflective activities and Log) are presented in Table 4.31 to provide evidence that supports RQ#3; that is, how does the online AD Program impact the rural family physicians' reports of their AD practice? The first column of this Table lists the AD Program's learning outcomes; the second presents the type of measures where participants reflected on their practice in the fields of dx, tx and mg of AD, and the third lists evidence for each measure to support the corresponding learning outcome.

Table 4.31

Evidence of AD Program's Impact on Participants' AD Practice (RQ# 3)

Learning outcome	Measure	Data

Assess readiness to change AD clinical practice	Barometer	At the Pre-test, the majority of RFPs were not satisfied with their AD practice and contemplated changing it. After completion of the AD Program, the majority of participants were satisfied and considered as acceptable the way they practiced AD.
Assess the relevance of the AD Program content to AD clinical practice	Individual Reflective activities	All AD Program content was relevant to RFPs' AD practice.
Assess the impact of learning on clinical practice	Individual Reflective activities	All participants listed several lessons learned from the AD Program that they would transfer to their clinical practice.
Monitor implementation of anticipated and non-anticipated changes into clinical practice	Log	58% of anticipated changes were partially implemented, and may have been influenced by the increased confidence and awareness gained from the AD Program as well as by external resources 6 RFPs implemented non-anticipated changes that were all focused on AD mg

Note. RFPs = rural family physicians; AD = Alzheimer's disease; Dx = diagnosis, Tx = treatment, Mg = management.

The Barometer results indicate a perceived readiness by RFPs to change their AD practice. At the beginning of the AD Program, the majority of participants were dissatisfied with their practice and contemplated changing it. These findings were in agreement with the Gap Analysis results reported at the Needs assessment. By the end of the AD Program, the majority of RFPs considered their AD practice as acceptable.

In the Individual Reflective activities, RFPs assessed what they had learned or confirmed from the AD Program, and listed examples of how it could be transferred to their clinical practice. Through the Log, participants systematically monitored the level of implementation of the anticipated and non-anticipated changes to their AD practice. The triangulation of measures shows that the AD Program impacted the field of AD management more than the fields of AD diagnosis and treatment.

Overall, the triangulation of measures indicates that the AD Program, combined with the caring of AD patients and external resources that participants had accessed (i.e., peer consultation and AD literature), had some impact on RFPs' reports of their AD clinical practice (RQ#3).

4.3 Summary

In order to explore how the AD Program supported the RFP's learning about AD, the results of this descriptive and collective case study were presented in two sections; that is, the within-case analysis followed by the cross-case analysis. Results were presented by research question in order to provide evidence of the participants' learning (RQ#1), the way in which the AD Program design supported their learning (RQ#2), and the AD Program's perceived impact on their reports of their AD practice (RQ#3).

The within-case analysis presented the experience of each participant in order to highlight his/her uniqueness, as well as to document potential changes in knowledge and transfer to his/her clinical AD practice. Although the sample was small, it was varied and covered different levels of experience in family medicine, in the area of AD, and in computer literacy ranging from the computer-savvy (Mark) to the novice (Diana). Level of geographic transiency was represented by 2 locum physicians (Marcela and Norma) who could successfully complete the AD Program despite the need for constant travel and their hectic work schedule.

The cross-case analysis compared and contrasted the 8 mini-cases in order to explore if common patterns emerged from their participation in the AD Program. The participants' construction of AD knowledge was assessed through objective and self-reported measures (RQ#1). Results indicate that all RFPs significantly increased their declarative AD knowledge as measured by the MCQ questionnaires in the three tests. On the other hand, in case-based instruction, all RFPs significantly improved their problem solving skills only in the category of AD tx. It is worth noting that in these objective measures, the most experienced participants (Diana, Ronald and Mathew) consistently scored under the group mean.

All RFPs stated that a substantial part of the AD Program confirmed the way they diagnosed, treated and managed AD patients. During Plenary activities, RFPs had the opportunity to apply and discuss the concepts presented in the Modules, thereby making the link with their own or general AD clinical practice. RFPs used a total of 22 dx concepts in the Plenary activities, which represent 56% of the total of 39 diagnostic concepts derived from the AD Program's learning outcomes (LOs). Participants also discussed seven concepts on tx which represent half of the therapeutic concepts derived from the AD Program's LOs. Finally, RFPs discussed 10 concepts on mg, which represents 71% of mg concepts derived from the AD Program's LOs. Overall, participants used 39 concepts on dx, tx, and mg which represents 58% of the total of concepts (67) derived from the AD Program's LOs. It is worth noting that, despite being the group's highest perceived gap in AD knowledge, concepts focusing on AD treatment were less frequently employed during Plenary discussions.

Results from a variety self-reported measures provided evidence of the effectiveness of the AD Program design for supporting the participants' learning process (RQ#2). Overall, the AD Program's effectiveness to support learning was rated as medium (mean of 3 in a 5-point Likert scale). Five of the 20 features were rated as high, 9 as medium, and 6 as low.

The most highly rated effective features were (in order of importance): (a) the educator, (b) Module 5 focused on AD dx, (c) the optional practice quiz on AD tx (d) the optional practice of reviewing past modules, and (e) level of interest of Plenary activities.

The moderately effective features were: (a) the overall design of the AD Program, (b) the objective measures (three tests), (c) two AD Modules, (d) the Plenary activities, and (e) the technological support. The least effective features were: (a) ease in navigating on WebCT, (b) Paired activities, (c) the Log, (d) the facilitator's performance, and (e) Modules 1-3 (Introduction and two tutorials, one on PBL and the other on technological support). Paired activities' effectiveness was rated as low due to a combination of factors: (a) limited timely responses from partners, (b) some degree of instability in the initial pairing up due to dropping out, (c) cases to be discussed were not controversial enough to promote discussion, and (d) number of repetitive questions following the PBL method.

Evidence regarding the collaborative activities' effectiveness showed that Plenaries were preferred to Paired activities. This evidence came from several sources, such as extent of engagement and collaboration in a community of practice, level of higher-order thinking (i.e., argumentation and reflection on knowledge assessment), and exposure to multiple perspectives.

Of the seven rated Plenary features, the level of interest in the discussions was rated as the highest (4) and the facilitator's performance as the lowest (2.77). Participants also learned from each other and identified those topics that they may not have learned from working alone.

Within the social context of Plenaries, receiving constructive feedback was rated as the highest (4.4). All participants suggested ways to improve Plenary activities, with the most commonly expressed being: (a) increasing the facilitator's involvement, and (b) shortening the delays in posting and answering messages to allow for a more efficient pace. Finally, due to the numerous benefits gained by virtue of its innovative and effective format, all participants would recommend the AD Program to their peers and to the College of Family Physicians. Furthermore, the majority of RFPs were interested in continuing to network with their peers who had participated in the AD Program.

Results of the content analysis of the Transcripts of three Plenaries indicate that the AD Program supported a certain level of participants' collaboration as indicated by the principles of independence and interdependence. Participants' independence from the facilitator and educator was documented by the number of posted messages/statements addressed to the entire group. Interdependence was illustrated by the active engagement of learners who posted a relatively high number of on-task messages/statements and took advantage of resources shared within the group.

Plenaries provided the participants with the appropriate learning environment to reflect on and discuss the transfer of what they had learned or confirmed in the AD Program to their clinical practice (RQ#3). The nature of collaboration was productive as evidenced by the use of argumentation and knowledge assessment which entailed critically reflecting on the applicability of the AD guidelines to rural practice, and openly sharing the knowledge gaps within the group. The most controversial and highly attended Plenary focused on diagnosis, while the least controversial focused on treatment which happened to be the area with the participants' highest perceived knowledge gaps.

The triangulation of three self-reported measures and the content analysis of Plenary Transcripts provided evidence of the relevance and impact of the AD Program on the participants' reports of their clinical practice (RQ#3). However, caring for AD patients as well as accessing external AD resources (i.e., peer-consultation and AD literature) might have also added to the AD Program's impact on the participants' reports of their clinical practice.

The sequential administration of the Barometer before and after the AD Program documented a change in the participant's perception of readiness to change their clinical practice, going from being dissatisfied with their AD practice to being satisfied and considering it as acceptable. Two thirds of anticipated changes in AD practice were partially implemented. The majority of RFPs, whose highest gap was in AD tx, implemented at least one anticipated change in this area. A common barrier to implementation of anticipated changes was the lack of AD patients. Unanticipated changes were all focused on AD management.

Overall, the within- and cross-case analyses showed commonalities and differences in the way the AD Program supported the rural family physicians' learning. The results presented in this chapter to support the three research questions are analyzed further in the next chapter focusing on Discussion.

CHAPTER FIVE: DISCUSSION

The purpose of this study was to explore rural family physicians' (RFPs) learning in an online continuing medical education (OCME) environment. In order to observe and analyze this phenomenon, an Alzheimer's disease (AD) Program was designed, delivered and evaluated to investigate its effectiveness in supporting learning and impact on the participants' reports of their clinical practice.

This chapter will summarize overall learning outcomes reported as a result of the analysis of the data to answer the following central research question: How does an online continuing medical education environment (OCME) support the rural family physicians' learning? Three subquestions derived from the previous one are: (a) What is the evidence of the participants' learning about Alzheimer's disease knowledge? (b) How effective is the AD Program in supporting the participants' learning process? (c) What is the evidence of impact of the AD Program on the participants' reports of their clinical AD practice?

This chapter will also discuss conclusions, interpretations, limitations, and implications for further research on online learning and contributions to the field.

5.1 Summary

The purpose of this descriptive, collective case-study was to explore online learning by rural family physicians (RFPs). An OCME program was designed, delivered, and evaluated to observe and analyze this phenomenon. This study also investigated the Program's effectiveness in the support of online learning (RQ#2), evidence of participants' learning (RQ#1) and its impact on the participants' reports of their AD clinical practice (RQ#3).

The effectiveness of the Program in supporting participants' learning about Alzheimer's disease and transfer to practice was evaluated at various levels: participation, satisfaction, learning, competence and performance. Data analysis included within- and cross-case analyses. Member checks, data triangulation, long-term observation and thick description were used to verify the quality of the study.

Eight RFPs from Ontario and Quebec completed the accredited AD Program which lasted 9 months and took place in a Web-based learning environment. The majority of RFPs did not know each other and never met face-to-face during their participation in the AD Program. Most participants had never taken an online CME program, engaged in peer-driven online collaborative tasks and forum discussions, or used WebCT. The facilitator, who was a family physician with expertise in AD, moderated the online discussions on AD. The researcher, who also took on the dual role of designer and educator, coordinated logistics and monitored participation.

5.2 Conclusions

This case- study described how an online continuing medical education environment supports the rural family physicians' learning and their reports on the impact on clinical practice. Themes and patterns emerged from the within- and cross-case analyses.

The study provided evidence of the participants' learning about Alzheimer's disease knowledge (RQ#1). Participants significantly increased their declarative knowledge in all areas of care of AD (diagnosis, treatment and management). Furthermore, of the three areas, the RFPs only significantly increased their procedural knowledge in the area of treatment, which was where they initially showed the largest gap. All RFPs stated that a substantial part of the AD Program confirmed the way they diagnosed, treated and managed AD patients. It is worth noting that the most experienced participants in the group consistently scored under the group mean in the Pre- Post- and 1Month-Post tests.

A major conclusion was that, for the most part, participants reported that the AD Program was effective in supporting their learning process (RQ#2). The educational intervention provided the opportunity to participate in a community of practice that offered support and peer-consultation on common issues of rural clinical practice. Triangulation of measures showed that the content discussed in the multiple activities of the AD Program was relevant to physicians' AD clinical practice. Application of clinical guidelines for screening AD was questionable due to pragmatic concerns. Participants tended rather to support an approach more tailored to the limited resources available in their rural context. All RFPs indicated that they would recommend this educational intervention to their peers and to accrediting bodies. The majority of participants reported that they would continue networking with the participating group, which is an indication of the AD Program's sustainability.

This study provided evidence of some impact of the AD Program, in combination with additional external resources, on the participants' reports of their clinical AD practice (RQ #3). Change in clinical practice was partially implemented mostly in the area of AD management.

The argument that guided this study was that for a CME educational intervention to be effective to support online learning, its design should be driven by theories of learning and instruction instead of by technological innovation and commercialization. Furthermore, the educational intervention's effectiveness to support learning and the participants' reports on the transfer to clinical practice should be comprehensively assessed (Moore, 2003, 2007). Consequently, critical reviews of the theoretical framework that guided this study (Integrated Practice-Based Learning Framework, IPBLF) and of the evaluation of the educational intervention are presented in the next section.

5.3 The Integrated Practice-Based Learning Framework

Findings of this study are consistent with what other researchers from different fields (Ahmad & Lajoie, 2001; Davis et al. 1995; Kanuka, 2001; Koschmann et al. 1994; Mansouri & Lockyer, 2007; Moore, 2003, 2007; Sugrue, 2000) have noted with regard to the complexity of investigating online learning and the need for an integrated theoretical framework with a multi-method approach to deal with this complexity. The Integrated Practice-Based Learning Framework (IPBLF) integrates principles from cognitive and social constructivism, as well as situated cognition and instructional design. Lessons learned from the application of the IPBLF principles of learning and instruction are discussed as follows.

Activeness: This is one of the most important principles in the IPBLM and was operationalized through interactivity. Results of this study are consistent with the results of other studies (Anderson, 2004; Moore, 2007; Sugrue, 2000) that advocate interactivity at various levels (student-content, content-content, student-student and student-instructor) to ensure acquisition and elaboration of declarative and procedural knowledge. Furthermore, the interactive and innovative format of the AD Program was in agreement with the most effective CME format in changing physicians' competence and performance as demonstrated by a recent meta-analysis and the emerging instructional theory on CME effectiveness (Mansouri & Lockyer, 2007). Effective educational interventions include interactive, and case-based, multifaceted programs with multiple sessions that address a small group of participants from the same discipline (Mansouri & Lockyer, 2007).

Results from this study indicated that access to optional resources was a useful feature to fulfill the needs of highly self-directed learners. As learning is an active process of constructing meaning, CME providers should provide a wide range of activities to accommodate a variety of learners with different prior-knowledge and self-directed learning profiles.

Collaboration: From a socio-constructive perspective, this principle implied interactivity among participants as well as with the facilitator.

As the literature review revealed, participation in computer-mediated conferences (CMC) is still not a well understood phenomenon and one which requires further investigation. Findings of this study reflect the work of Curran and colleagues (2003) who also concluded that a variety of factors influence the frequency and type of online participation, namely, participants' characteristics, degree of alignment of instructional design principles, type of facilitation and level of perceived privacy. The present study shows that the content to be discussed, the structure of the task, available resources and type of social environment also appeared to be relevant factors that influence online participation and collaboration.

In this study, peer-consultation within a community of practice may have enhanced collaboration and broken the isolation of rural family physicians (Dillenbourg, 1999; Jonassen et al. 1995; Lave & Wenger, 1991; Moore &

Pennington, 2003; Parboosingh, 2002). The AD Program appears to have provided a safe, open, democratic environment where participants expressed their viewpoints on relevant issues that emerged from their clinical practice and on which they received constructive feedback. They had the opportunity to collaborate, negotiate meaning, articulate their knowledge gaps and receive support from peers and the facilitator in the context of Paired and Plenaries activities. This study provides evidence supporting the importance of the social context of learning in fostering participation and collaboration in online discussions (Bonk & Cunningham, 1998; Goodyear et al. 2004; Koschman, 1996). However, collaboration cannot be taken for granted. As shown in the present study, the implementation of the same principle in different contexts can provide opposite results. Paired activities were rated as one of the least effective features whereas Plenary activities were rated as one of the most effective features in supporting participants' learning.

Problem solving: The way physicians usually learn is by problem solving specific or general problems (Slotnick, 1999). In the AD Program, participants were required to individually solve clinical cases and then discuss them during collaborative activities. However, the time-lag associated with problem solving online during collaborative activities may have limited the effectiveness of Web-based instruction (Hill et al. 2004).

In the context of problem solving ill-structured problems (Jonassen, 1997), articulation has been useful to document participants' integration of knowledge (concepts and procedures from the AD Program) when building their argument. Articulation was implemented through written discourse (which is a resource to be systematically exploited) in asynchronous communication on the Web. The type of content discussed may have influenced participants' articulation of their thinking through writing. Controversial topics, such as the use of CT scans, activated articulation and argumentation which enhanced critical judgment among peers in Plenary discussions (Parboosingh, 2002). Elaboration through small group discussion fostered active processing of new information (Barrows, 1994; Schmidt, 1993). However, change in conceptual knowledge should be investigated more in depth to illustrate construction and/or confirmation of knowledge.

Application: This principle represents one of the key desired outcomes of effective CME; that is, applying what has been learned or confirmed during an educational intervention to clinical practice. Participants reported on the application of changes in their clinical practice which were also influenced by other external resources. Participants' self-reports should be triangulated with more objective measures such as chart audits and simulated patients. As other researchers have argued (Grant, 1999; Norman & Schmidt, 2000) the causality between the reported effect and the educational intervention is difficult to demonstrate due to the complexity of clinical practice.

Self-monitoring: The literature review highlighted the importance of providing opportunities to activate metacognitive strategies, such as monitoring progress, in order to limit disorientation in a Web-based learning environment (Hill & Hannafin, 1997; Jonassen, 1997; Kanuka, 2001; Sugrue, 2000). At the time of this study, WebCT did not offer any feature for monitoring the learner's progress in completing the activities in the AD Program. Consequently, the educator's scaffolding and other WebCT features (e.g. Check-out quizzes, reminders in Calendar) were used to support participation and compliance. This was particularly needed because participants were busy professionals, and most of them were novice OCME-users. However, most participants relied on the support provided by the educator instead of systematically checking the reminders in the Calendar. Future studies should include automated features to support learners in monitoring their progress thereby limiting their disorientation which could lead to frustration and, ultimately, dropping out.

The Barometer provided the opportunity for monitoring participants' perceived learning stage and readiness for change in clinical practice. Future studies should gather additional information on the factors that influence participants' perceived change from one stage to another (Slotnick, 1999; Slotnick & Shershneva, 2002).

Self-assessment: Self-assessment is an individualized learning strategy that requires critical self-reflection, a difficult task for learners in general, as well as for most physicians (Eva & Regehr, 2005; Fox & Miner, 1999; Parboosingh, Badat, &

Wooster, 2003). The AD Program offered a variety of opportunities (e.g. Need Assessment) to activate participants' self-assessment in an effort to support their learning process. It is worth noting that self-assessment emerged spontaneously in Plenary activities as participants reflected and articulated their knowledge gaps when faced with the complexity of AD practice. This finding has also been reported during practice-based learning in live small groups (Barrows, 1994).

At the end of the educational intervention, participants appreciated receiving individualized and comprehensive feedback on their performance in the AD Program (i.e., Member checks). Future studies could offer feedback in a more systematic way after each phase of the educational intervention and discuss it with the group. However, as feedback is rarely discussed amongst peers this topic warrants further investigation. A variety of self-assessment programs such as Self-learning by the College of Family Physicians of Canada, learning contracts, and learning portfolios could assist physicians' self-assessment and thereby enhance their continuing professional development (Parboosingh, Badat & Wooster, 2003).

Authenticity: This principle afforded opportunities for situated learning at two levels. Firstly, authentic cases for case-based instruction were offered. However, despite being "authentic", these cases were not complex enough to foster discussion in Paired activities. Secondly, collaborative authentic activities provided opportunities for peer-consultation and access to specialized resources, as in real life (e.g. hospital rounds). Collaborative activities appeared to provide a safe environment to discuss issues directly related to the RFPs' clinical practice.

Scaffolding: In order to support online learning, scaffolding was provided during all phases of the educational intervention. Scaffolding to ensure acquisition of knowledge was provided by automatic feedback from WebCT. Human involvement in scaffolding is a specific feature of Web-based instruction and one which should be fully exploited (Sugrue, 2000). In this study, human scaffolding was provided by the facilitator and educator in different areas. The literature review indicates the need for trained facilitators to ensure the effectiveness of OCME programs. The facilitator's training should be driven by theories of learning and instruction (Sargeant et al. 2006). Participants rated the facilitator's scaffolding as low and the educator's as high. The facilitator was expected to follow the Practice-based learning method (Barrows, 1988), a method with which she was familiar in her face-to-face teaching with residents and medical students. The facilitator's low performance and her reflections (in Member checks) indicated that the type of training for moderating the online discussions in AD Program was not as effective as expected. Hands-on sessions with role playing should be included as well as a clear specification of the expected outcomes of the scaffolding process following the PBL method. Consequently, facilitators and educators should be trained according to the instructional method underlying the educational intervention's design.

Effective scaffolding from the educator was a must: to ensure participation, compliance with assignments, technological support and comfort in an open and safe social environment. Overall, both types of scaffolding were regarded as equally important to ensure online learning. This result is in agreement with a study pioneered by Sargeant and colleagues (2001) which focused on online learning by rural family physicians in Nova Scotia.

In the present study, it is worth noting that RFPs engaged in collaborative discussions with a relatively high independence from the facilitator. This may be explained by George's leadership role, the distributed scaffolding within a hetereogenous community of practice, and the relatively low performance of the facilitator (Parboosingh, 1993).

The educator's key roles in creating a supportive learning environment were consistent with research in Web-based instruction that indicate the need to support both the cognitive and socio-emotional processes of learners in a virtual community (Anderson, 2004; Garrison & Anderson, 2003; Kreijins, Kirschner & Jochems, 2003). Findings of this study also reflected a more recent study in OCME (Sargeant et al. 2006) that used of group management techniques (e.g. icebreaker) and scaffolding strategies to ensure physicians' participation.

Self-directed learners: Self-directed learning (Knowles, 1975) facilitates life-long learning in medical education and CME (Barrows, 1991). In the present study, the SDL profiles (Guglielmino & Guglielmino, 1994) of all participants, except one, ranged from average, above average to high. High achievers (i.e., Norma and George) presented high self-directed profiles, whereas low achievers (i.e., Diana) registered a low self-directed profile.

Ease with technology: A medium level of computer literacy was required to participate in the AD Program. Online tutorials for novice Web users and technological support were provided. The tutorial offered to novice Web-users could be improved to ensure its effectiveness. Furthermore, lessons learned from this study indicate that future educational interventions should implement more user-friendly platforms because busy rural family physicians have limited patience and time to invest in increasing their easiness with technology. Effective scaffolding should be provided particularly at the beginning of an OCME program and as soon as participants's familiarity with the tools increases, scaffolding fades away (Collins, Brown & Newman, 1989). At the beginning of the AD Program, the novice Web-users expected to be spoon-fed, in part due to the limited time they had to learn the new platform, but also because they were probably accustomed to a different format of CME which tended to be shorter, more directive, and which might have encouraged a more passive way of learning. Gradually, novice participants gained confidence and transformed their initial frustration with technology into a success story. The newly-acquired skills helped them to complete other interactive OCME programs similar to the AD Program. These findings support the argument that novices may need time to gradually develop social comfort in online environments (Curran et al. 2003; Sargeant et al. 2006).

This interactive format was tailored to the participants' limited desktop computing power which implied the adoption of a text-format instead of exploitation the multimedia features of WebCT. As high-speed access to the Internet becomes more accessible to rural regions, and RFPs continue to increase their comfort level in navigating on the Web, future theory-driven designs will be better able to enrich the aridity of text-based materials with multimedia resources (Larreamendy-Joerns & Leinhardt, 2006)

Other learner's characteristics: Other attributes which may have influenced participants' online learning were: readiness to participate, type of content to be learned, and readiness to learn and change clinical practice. Novelty of the technology, the convenience of access and the relevance of content to be learned were the main factors that indicated RFPs' readiness to participate in the AD Program. Furthermore, the majority of participants showed some readiness to learn and change clinical practice (Slotnick, 1999; Slotnick & Shershneva, 2002).

Assessment: The present study raised a variety of issues regarding the assessment of learning in online environments. For specific categories of CME credits, accrediting bodies require interactivity through the posting of messages on forums. However, criteria and standards to assess the level and quality of participation to enhance critical reflection are not specified (Curran et al. 2003). Furthermore, more research is needed to effectively assess a bystander's participation in forums. For example, all participants in this study reflected on and specified what they had learned from Plenary discussions and how this would have an impact on their clinical practice. Later, the researcher verified that the learned topics listed by bystanders matched the content discussed by the group in the Plenaries.

Evaluation of the educational intervention: At the time of this study, the effectiveness of CME programs was generally assessed at the levels of participation and satisfaction only. The AD Program's effectiveness, on the other hand, has been evaluated so as to include the additional levels of knowledge, competence and performance (Moore, 2007). The effectiveness of the educational intervention is presented in the next section.

5.4 Effectiveness of the Educational Intervention

The purpose of this section is to discuss the AD Program's effectiveness in supporting the participants' learning process (RQ#2), and the extent to which participants learned (RQ#1) and transferred what they learned or confirmed to their clinical practice (RQ#3). The educational intervention's effectiveness will be examined from five levels starting from the more common evaluation levels of participation and satisfaction to a discussion on more meaningful levels of effectiveness, namely, that of acquiring knowledge, competence and performance.

5.4.1 Participation

Assessing effectiveness in terms of participation means determining whether or not attendance goals of an educational intervention were met (Moore, 2003a, 2007). Eight RFPs and a facilitator participated and completed the AD Program. The attendance goals in this study were met despite a relatively high drop-out rate (67% attrition rate over 2 years) which was also reported by a similar OCME study (Sargeant et al. 2001).

'Dropping out' is a major contextual factor that should be anticipated when planning resources for the design and delivery of future OCME programs. Drop-out rates could be reduced by: (a) more user-friendly platforms, (b) more effective online tutorials adapted to the computer literacy level of participants, (c) more effective scaffolding for novice Web-users, and (d) a precise estimate of resources required for participants to complete the task in a timely fashion (Sargeant et al. 2001; Sargeant et al. 2006).

5.4.2 Satisfaction

Satisfaction with an educational intervention is defined as "the degree to which the expectations of the participants about the setting and delivery of the CME activity were met" (Moore, 2003, p.251). The widespread satisfaction surveys in CME have often been "denigrated as a happiness index" (Moore, 2003, p.252) because they only collected the participants' reactions with regard to the educational setting of a CME activity (Moore, 2003). Moore (2003) argues that a well designed survey provides valuable information to CME providers. Findings of this study also support the view that well designed surveys may enrich the formative and summative evaluations of the educational intervention. Satisfaction surveys seemed to be even more necessary in longitudinal OCME for systematically recording the participants' feedback spread out across the duration of the educational intervention.

The assessment of effectiveness of the AD Program in terms of satisfaction level was positive. The majority of participants were interested in networking with the same group and would recommend this program to other physicians and to the College of Family Physicians of Canada. These results are consistent with the majority of early efficacy studies (Hayes & Lehman, 1996; Horn et al. 1997; Peterson et al. 1999) as well as more recent research (Curran et al. 2000; Fordis et al. 2005; Wutoh, Boren & Balas, 2004).

An increase in the user-friendliness of WebCT, in the availability of the facilitator, and a shortening of the time of response in collaborative activities were suggestions offered to improve the AD Program's effectiveness in supporting learning. Assessing participants' satisfaction was a useful but not sufficient step to gather evidence of participants' learning and transfer to practice. Consequently, additional measures were used to evaluate learning from the AD Program. Learning was assessed at the levels of knowledge, competence and performance which are presented next.

5.4.3 Knowledge

The first research question of the present study (i.e., what is the evidence of the participants' learning about Alzheimer's disease knowledge?) sought evidence to show that participants acquired, retained and confirmed knowledge during the AD Program. Evaluating the educational intervention's effectiveness at the level of knowledge includes assessing the participants' declarative and procedural knowledge (Moore, 2007; Slotnick, 1999).

An alpha level of .05 was used for all statistical tests. Findings of 2-tailed t tests with paired samples indicate that all participants significantly increased their declarative knowledge (i.e., MCQs) from the Pre-test to the Post-test (sig. 001) and from the Pre-test to the 1Month-Post test (sig. 002). Acquired and/or confirmed knowledge was retained during the month between the Post and 1Month-Post tests when no significant changes were recorded (ns.497).

5.4.4 Competence

Competence is defined as the ability to demonstrate the application of what participants have learned (declarative and procedural knowledge) in the context of the educational intervention (Moore, 2007; Slotnick, 1999). Assessing professional competence is a complex matter and one that requires further investigation to identify what and how should be measured (Charlin et al. 2000a; Moore, 2008; Van der Vleuten, 1996).

In this study, participants' competence in the area of AD was demonstrated through individual application of what was learned to problem solving of clinical cases at the Pre, Post and 1 Month-Post tests. Evidence showed that participants were somewhat competent in solving AD clinical cases before the AD Program. Most of their scores on cases did not significantly change during the 9-month course, with the exception of their scores on AD treatment cases. A significant increase in AD knowledge was reported between the Pre-test and Post-test (.001) and between the Pre-test and 1Month-Post test (.001). Since the participants' largest reported knowledge gap at the Needs Assessment was in the area of treatment, it was gratifying to discover that, not only had they gained knowledge, but were also able to demonstrate competence in the application of that knowledge to solve clinical cases.

The traditional didactic format of CME (e.g. lecture, panel) has been criticized because it tends to foster a passive way of learning when used alone, and does not usually provide opportunities to apply and practice what was learned (Moore, 2007). To address this criticism, the AD Program provided numerous opportunities to apply newly acquired knowledge to solve cases to demonstrate competence and to provide formative feedback. Self-report data showed that the effectiveness of practice opportunities to support learning was highly rated by participants and is consistent with previous research (Ahmad, 2000; Anderson, 1983; Fordis et al. 2005; Salomon, et al. 1991; Zeitz & Glaser, 1996). However, the CME literature (Barrows, 1994; Moore, 2007) suggests that a more effective approach to demonstrating competence would be the use of virtual simulated or standardized patients followed by feedback from faculty. This type of practice could not be offered by the AD Program due to the participants' low desktop computing power and limited budget. Future studies could offer more authentic practice opportunities in the online environment and systematically provide feedback in order to enhance participants' competence.

In summary, lessons learned from the present study reveal the complexity of measuring physicians' competence within an educational intervention, and the need for tools for assessing competence in the online environment.

5.4.4.1 Characteristics of the Experienced Group that May Have Influenced Knowledge and Competence Outcomes

An unexpected result of this study was that the 3 most experienced RFPs in AD scored below the group mean on the three tests that included multiple-choice questions (MCQs) and cases. This experienced subgroup differed from the least experienced subgroup in three major aspects, namely: (a) the type of clinical practice; (b) length of clinical practice, and (c) the size and type of AD clientele.

The most experienced subgroup in AD was composed of Diana, Ronald and Mathew who had been in individual practice in family medicine for the past 25 years and, at the time of the study, cared for a large AD clientele, including patients in the early, moderate and severe stages of AD.

Diana and Ronald were novice web-users with limited computer literacy which may have partially limited their learning due to the additional effort and cognitive load required on their part (Kanuka, 2001). On the other hand, since Mathew benefited from an advanced computer-literacy level and the highest level of expertise in OCME in the group, it seems that other factors, which are presented later, may have influenced his low performance in the AD Program.

The least experienced subgroup in AD included Norma, Marcela, Luc and Mark who had been in group practice for the past 6-15 years, and George for the past 20 years. These 5 RFPs cared for a small AD clientele, mostly at the mild stage. As expected, the youngest of the group (e.g. Mark, Norma, and Marcela) were more computer literate than their older peers (CMA, 2000; Sullivan & Buske, 1998).

The participants' profiles revealed two types of participants: those in individual practice who were the most experienced in AD, and those in group practice who were less experienced in AD.

As the literature review indicates, learning does not occur in a vacuum. Rather, it is influenced by cognitive, metacognitive, social (including technology), and affective factors as well as the learner's individual differences (American Psychological Association, 1997; Bonk & Cunningham, 1998). Level of expertise in AD was the trait shared by the most experienced group and will now be examined in search of an explanation for their lower performance.

5.4.4.1.1 Level of Expertise in Alzheimer's Disease. Expertise in AD was the essential element shared by the 3 participants of the experienced subgroup. The difference in performance between the most and least experienced physicians could be explained by the Script Theory (Charlin et al. 2000a) which is grounded in cognitive psychology and the emerging theory of medical expertise (Boshuizen & Schmidt, 1995). Script theory explains the development of clinical competence using the concept of *illness scripts* which are "…schemas associated with sequences of events that occur frequently in a specific order, and knowledge about illnesses includes information about the spatio-temporal sequence of event in illness development" (Charlin, Tardif, and Boshuizen, 2000b, p. 183). Scripts have the following characteristics:

> (1) They are pre-stored knowledge structures; (2) they are activated almost unconsciously from initial clinical clues; (3) they are made of known links among clinical features including enabling factors, fault, and consequence; and (4) they function by memory association, not by causal reasoning (Charlin et al. 2000b, p. 186).

The underlying assumption of Script theory is that the clinical reasoning of experienced versus less experienced physicians differs. During clinical reasoning, experienced physicians activate illness scripts which are elaborate and rich networks of knowledge that contain stored memories of previous patients. Through memory association, expert clinical reasoning compares the current patient with previous ones (Charlin et al. 2000a). Experienced physicians solve ill-defined clinical cases with elaborate scripts built through years of professional practice (Jonassen, 1997). Assessing professional competence is a complex matter (Charlin, et al. 2000a) and represents "an area of turmoil in the health sciences" (Van der Vleuten, 1996). The difficulty in assessing professional competence lies in the fact that:

> At the core of professional competence are judgment and insight which rest on tacit knowledge. That kind of knowledge is neither visible nor tangible, and it cannot be evaluated easily using multiple-choice questions; yet it is the touchstone of competent professional practice. It is revealed only in action, in authentic situations when practitioners have to reflect on real concerns (Charlin, Roy, Brailovsky, Goulet and Vleuten, 2000a, p.189)

Findings in the present study suggest that the most experienced subgroup's low scores may be due to the limitations of assessment tools used to measure their performance. In other words, the AD Program performance measures may not have been sophisticated enough to effectively tap into Diana's, Ronald's and Mathew's tacit knowledge. A distinctive characteristic of this subgroup's responses to questions in cases was that they tended to be shorter than those of the less experienced subgroup. This may be attributed to the fact that experienced physicians might have solved the cases by pattern recognition which activates "…a non-analytical ability to recognize and handle situations efficiently and effectively (acquired from clinical experiences)" (Van der Vleuten, 1996, p. 53). Van der Vleuten (1996) argues that thoroughness instead of efficiency and efficacy is often rewarded in written assessment measures. This explanation is supported by empirical research that has:

> …repeatedly shown the puzzling fact that experienced clinicians score little better and sometimes worse than less experienced clinicians or students (Van der Vleuten, 1996). A possible reason for this is that most methods measure clinical factual knowledge rather than the organization of knowledge that allows clinicians to recognize and handle situations effectively. In so doing, they place experts, whose strength is organization of knowledge rather than linear accumulation of knowledge, at a disadvantage (Charlin, Tardif, Boshuizen, 2000a, p. 188).

Lesgold and colleagues' (1988) empirical study on the acquisition of expertise in radiology provides a possible additional explanation for the lower performance of the most experienced subgroup in the AD Program. The acquisition of expertise in a specific skill (e.g. diagnosing x-rays pictures) follows a similar path to that of the general cognitive development in children. The learning process of experienced physicians mirrors a "U-shaped curve" where superficial and deep methods conflict. Being the most experienced in the group, Diana, Ronald and Mathew might have developed a schemata from many hours of caring for their numerous AD patients. However, in order to increase their expertise, this meant acquiring "an ever more refined version of schemata developing through a cognitively deep form of generalisation and discrimination" (Lesgold et al. 1988b p. 340). In order to achieve this type of schemata, the assumption is that the learning process is not linear; it has ups and downs which imply making mistakes in order to increase their learning. Even though these experienced RFPs might have the ability of "deeper processing" by accessing their schemata, this "does not always produce a better outcome. That is the price to pay to develop expertise" (Lesgold et al. 1988b. p.340).

In conclusion, this study suggests that a possible interpretation for the lower performance of the 3 most experienced RFPs may have been the use of limited measures to assess their clinical reasoning process. Think-aloud protocols would assist future studies in examining whether the clinical reasoning approach used by the most experienced physicians in AD significantly differed from that of the least experienced physicians.

Mathew's level of engagement and Diana's beliefs and values may have influenced their low performance and are presented next.

5.4.4.1.2 Mathew: Level of Engagement. Mathew attributed his limited performance in the AD Program to his lack of engagement resulting from his busy schedule. This can be interpreted by Weiner's Attribution Theory (Weiner, 1976) which focuses on the impact of "the learner's beliefs about success and failure on achievement related behavior" (Gredler, 1997). This theory focuses on three dimensions of the social – context of learning. The first dimension is the *locus of causality*, which in this case, was *internal* since the origin of the perceived attribution was the individual and not the environment. The second dimension is *stability*. In Mathew's case, the durability of the perceived attribution was *unstable* because of his lack of engagement and effort. The third dimension is *controllability*. In Mathew's case, effort was *controllable* which, in turn, triggered feelings of guilt. In fact, feelings of embarrassment, guilt and shame were affective reactions that were spontaneously expressed to the group when reflecting on his experience in the AD Program (Mathew, PL 38). These feelings are usually related to an *internal* cause of negative outcomes. This interpretation was confirmed by Mathew in Member checks. Consequently, Mathew's lack of engagement in the AD Program was probably a direct influence on his low performance in the three tests.

5.4.4.1.3 Diana: Beliefs and Values. Diana's reflections in Member checks provided additional information which helped the researcher interpret her low performance in the AD Program on the three tests. This low performance might be better explained by using the *transformational* learning theory (Kegan and Lahey, 2001) which states that *immunity to change* is a barrier to personal change. As a force of nature, *immunity to change* is composed of all those behaviours people engage in that work against their ability to change. The difficulty lies in the fact that the individual is captive to his *immunity to change,* a condition often unrecognized because "we live inside of them (barriers). We do not have them, they have us" (Kegan & Lahey, 2001, p. 6). Diana believed that CI drugs had a "modest" beneficial effect on her patients. This belief was consistent with her personal values and evidenced by her reluctance to prescribe CI drugs to her AD patients. Consequently, her *immunity to change* might have worked as a silent barrier that negatively affected her performance in the tests. This interpretation by the transformational learning theory is in agreement with the definition of problem solving as an activity that engages and requires not only different types of cognitive components and skills, but also knowledge about self, which is defined as being capable of: "articulating prior knowledge, articulating sociocultural knowledge, articulating personal strategies, and articulating cognitive prejudices/weaknesses" (Jonassen, 1997, p.66). In other words, problem-solvers should reflect not only on their prior-knowledge but also on their own biases and beliefs. Diana spontaneously described her beliefs in the nature of her rural clinical practice as follows:

> a fine balance between art and science… 25 years in practice gives me only the notion that medicine solves very little; the doctor needs to interpret for his patient what is going on to the best of our knowledge and help him or her make their own decisions with our relenting support…AD is one of our major challenges in this respect! (PL2, 39)

Diana's problem space for solving the ill-structured problem of AD treatment was silently in conflict with one of the learning outcomes of the AD Program which was the initiation of pharmaceutical treatment of AD patients as early as possible. She believed that her role as a physician was to use her professional judgement to interpret her patients' needs and provide them with support. Her patients' safety and well-being were clear priorities for her. Even though Diana increased her knowledge and confidence in prescribing CI drugs, her reluctance to prescribe them may have been a barrier in achieving higher performance outcomes. Diana was probably not even aware of her biases towards some aspects of the AD Program. Only afterwards, when reflecting during Member checks on her low performance, she articulated her tacit knowledge and beliefs with regard to the implicit or explicit pressure from pharmaceutical companies to treat AD patients as early as possible. Diana's story raises the crucial issue that even though the accredited AD Program was unbiased and free from commercial pressure from the pharmaceutical industry, it was still perceived as such.

In summary, the cross case-analysis indicates that those RFPs in individual practice with the most experience in AD consistently scored lower than those in group practice with less experience in AD. Participants' online learning does not occur in a vacuum. Therefore, besides limited measures to evaluate experienced clinical reasoning, additional social and affective factors might also have influenced the low performance of the most experienced participants. Diana and Ronald shared low self-directed learning profiles and computer-literacy levels, and an initial discomfort with technology which produced some frustration and disorientation. Mathew's attribution of his low performance to his lack of engagement, Diana's immunity to change due her deep-seated beliefs against prescribing CI drugs, and Ronald's slow connection to Internet have been pointed out as relevant factors that likely influenced their learning process and product.

The next section focuses the discussion on the evaluation of the AD Program at the performance level (Moore, 2003, 2007).

5.4.5 Performance

Performance is defined as the physician's ability to transfer what was learned in a CME program to the work setting (Moore, 2003 & 2007; Slotnick, 1999). The performance outcome is related to the field of knowledge translation into clinical practice, an emerging topic in the CME field (Davis, 2006; Canadian Institute of Health Research, 2005). The field of knowledge translation is a complex one to research because it interrelates a variety of micro and macro systems, such as health services, quality improvement and patient safety. The present study investigated knowledge translation through the principle of application at the micro-level. However, as it was not possible to observe the actual transfer of what was learned in the AD Program into the participants' clinical practice, self-reported measures were used (i.e., Barometer and the Log).

Findings of the present study indicate that 58% of anticipated changes were partially implemented according to the participants' reports of their clinical practice. The majority of anticipated changes and all non-anticipated changes were implemented in the area of AD management where participants were most knowledgeable. With regard to AD diagnosis, the lack of new patients was the main reported barrier for implementing anticipated diagnostic changes. AD treatment was the area in which participants were the least knowledgeable. Despite the fact that RFPs significantly increased their therapeutic knowledge and were examining the possibility of prescribing new drugs, changing prescription habits is a process that requires time (Putnam & Campbell, 1989).

Most RFPs reported some reluctance in implementing the AD guidelines recommendations into their clinical practice. The main reported barrier to implementation was that AD guidelines had been validated in tertiary hospitals and not in rural community settings characterized by scarce resources. These findings could be interpreted following the work of Cochrane and colleagues (2007) in that despite their knowledge about the clinical AD guidelines, RFPs reported that behavioural (i.e., environmental factors and support system) and attitudinal (i.e., lack of confidence due to limited clientele of early AD patients) barriers limited the implementation of these guidelines into rural family practice. The implication here is that a physician's experiential knowledge and awareness of the contextual factors that influence clinical practice should be taken into account in the facilitation of knowledge translation. CME educators could play "…a leadership role in promoting the organization's valuing of qualitative research, the experiential knowledge of physicians, and the potential of clinicians to play a partnering role in advancing practice refinements" (McWilliam, 2007, p. 77). Instead of the dominant top-down approach, CME should consider a more bottom-up approach which better identifies those areas in a physicians' performance that need to be improved (Moore & Pennington, 2003), as well as other learner-driven approaches that might foster knowledge translation (McWilliam, 2007).

In conclusion, assessing the impact of the AD Program in terms of participation, satisfaction, knowledge, competence and performance provided a variety of lenses for examining its effectiveness. Overall, the AD Program was effective in supporting the RFPs' learning (RQ#1 and #2) and reported transfer to clinical practice (RQ #3). Despite a high drop-out rate, 8 RFPs completed the AD Program. Participants' expectations about participating in an innovative OCME program were fulfilled and their satisfaction was expressed.

The next section focuses the discussion on the limitations of the present study.

5.5 Limitations of the Study

This section focuses on the limitations of the present study and how the researcher attempted to circumvent them. The first limitation was the reduced size of the sample. The target sample originally included 12 participants which was later reduced to 8. Findings derived from a limited sample do not allow for generalizations as do experimental studies that follow sampling logic to represent a larger universe. Nevertheless, the descriptive nature of this study provided indicators of participants' online learning.

Secondly, some of the instruments employed in the study were not standardized. Consequently, a variety of methods were implemented to increase the validity of those instruments. Intercoder and intracoder procedures were used to increase the accuracy and reliability of the coding schemes for the content analyses. Furthermore, the accuracy and relevance of the content of the Pre, Post and 1 Month-Post tests were reviewed by three family physicians and two medical education professors.

Thirdly, the majority of data was collected through self-reported measures, and findings were not triangulated with more objective measures such as chart audits and/or simulated patients. However, data triangulation and member checks ensured internal validity of the study.

Fourthly, due to the length of the AD Program and the absence of a control group, the impact of the educational intervention on the participants' learning and transfer to practice could have been influenced by other contextual variables, such as the practice effect acquired when caring for their AD patients, and/or the use of external resources during their participation in the AD Program. In order to partially circumvent this limitation, participants identified additional sources accessed outside the AD Program.

5.6 Implications for Future Research

Several implications for future research emerged from this descriptive and collective case-study. A few patterns emerged from the cross-case analysis. It is worth noting that the most experienced participants consistently scored lower than the group mean. Level of expertise in AD and type of setting of clinical practice (individual or group) are variables that warrant further research which could shed more light on this pattern. As the measures used in this study might not have accurately measured the most experienced physicians' competence and performance, future research should employ standardized tools such as the Script Concordance test (SCT) which is driven by the Script theory (Charlin et al. 2000a).

A holistic description of the context of the phenomenon investigated was provided in this study. However, more research is needed to explore the interrelation between participants' values and beliefs regarding the content to be learned and its translation into clinical practice. Despite the fact that findings from this study cannot be generalized, those contextual indicators that might have influenced online learning; i.e., readiness to participate, learn and change clinical practice; and readiness for self-directed learning could be tested using quantitative research designs with larger samples.

Given the scarcity of resources in the Canadian health system, innovative studies that investigate and support peer-consultation are needed. In rural family medicine, peer-consultation appears to be a rich but still untapped resource which might facilitate collaboration and knowledge translation. As critical reflection on clinical practice is not a natural process for most physicians, future research should integrate effective online tools to promote this skill and measure its impact on knowledge translation (Eva & Regehr, 2005; Fox & Miner, 1999; McWilliam, 2007).

The recruitment and support of participants who lack the traits of the ideal learner for Web-based instruction (Horton, 2000) and who are not accustomed to distance education might be a real challenge. Lessons from this study seem to indicate that ease with technology may have influenced online learning. Consequently, future studies should measure self-efficacy in novice Web-users (Bandura, 1977), carefully select appropriate media, and effectively scaffold online learning. As an emerging field, the design and implementation of OCME can be enhanced by the involvement of interdisciplinary research teams from the fields of distance education and educational psychology (Olson & Shershneva, 2004).

5.7 Contributions to the Field

The originality of the present study is reflected in its comprehensiveness and contributions to the emergent field of research on OCME. This investigation designed, delivered and evaluated an educational intervention which was the only one accredited as MAINPRO-C by the College of Family Physicians in the province of Quebec during the period 2000-2003 (CFFC, 2008).

Effective July 2007, Canadian physicians are now required to follow CME programs to re-validate their medical license. As rural family physicians (RFPs) cannot easily attend live CME, a viable option to overcome their isolation appears to be online CME (OCME) which provides just-in-time accredited CME tailored to their needs, as well as the opportunity to network within a community of practice. The advantages of OCME can also be extended to other physicians and professionals who cannot attend live professional training (Ahmad, 2000). For example, the increasing number of female physicians who have been early adopters of OCME (Harris, Novalis-Marine, Harris, 2003) may also benefit from this type of educational format. A major contribution of the present study was to demonstrate the feasibility of OCME (given the reality of busy professionals) and its practical implications for rural family medicine and related fields.

As the literature review indicates, technological feasibility does not automatically imply effectiveness in supporting learning and transfer to practice. Other considerations should be emphasized. The design of this study was driven by theories of learning and instruction, instead of by technological innovation and commercialization (Larreamendy-Joerns & Leinhardt, 2006; Salmon, 2002). Face-to-face CME programs tend to use the predominant teacher-centered lecture format which has been shown to have limited effectiveness in transforming physician's learning and clinical practice (Davis et al. 1999). Most OCME programs from the late 90s to 2006 reproduced the same didactic and episodic format focusing mostly on lectures (Fordis, 2005; Sklar, 2006). This study, on the other hand, adopted an innovative, learner-centered, collaborative format which has the potential to support self-directed and practice-based learning.

Instructors, professionals, CME providers and accrediting bodies may benefit from the findings of this study because all stages of design, development, delivery and evaluation of the educational intervention were included.

Scholars, CME providers and accrediting bodies are encouraged to work collegially in implementing effective instructional models aimed at optimizing physicians' learning and transfer to clinical practice (Fox, Davis, & Barnes, 2003). The present study provides insights for further developing more rigorous accreditation requirements (Sargeant et al. 2004).

OCME provides practitioners with just-in-time resources 'at their fingertips' for updating their knowledge and re-validating their medical license. Further, OCME affords a unique opportunity for enhancing peer-consultation and accessing expert knowledge, thereby facilitating the sharing of practical knowledge within a specific community of practice regardless of geographical boundaries. There are endless possibilities yet to be discovered and fully exploited in the emerging field of OCME.

In conclusion, this study shows that a theory-driven OCME is a viable option to support learning and reported transfer to practice by rural family physicians. In the face of CME reforms that question the effectiveness of current CME programs in ensuring physicians' competence and the improvement of health-care outcomes, OCME can play a major role as a facilitator of change in the development of the still "unrealized potential of CME" (Regnier et al. 2005).

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Appendix A: Glossary

In this study, these terms are defined as follows.

Accreditation Council for Continuing Medical Education (ACCME®): The ACCME is the most important accreditation body in the US. Its mission is "the identification, development, and promotion of standards for quality continuing medical education (CME) utilized by physicians in their maintenance of competence and incorporation of new knowledge to improve quality medical care for patients and their communities" (**www.accme.org**)

Catchment area: the rural "community plus the area beyond it, that is served by the health care workers (nurses, physicians, pharmacists) of such community" (Adam et al. 2003, p. 2)

Formal Continuing medical education (CME): It includes a variety of formats "ranging from passive, didactic, large-group presentations to highly interactive learning methods, such as workshops, small groups, and individualized training sessions. Examples of such educational activities include rounds, educational meetings, conferences, refresher courses, programs, seminars, lectures, workshops, and symposia" (Davis, D. A. et al. 1999, p. 868).

Interactive CME techniques: Case discussion, role-play, or hands-on practice sessions usually are more effective in changing physicians' performance or improving patient care (Davis, D. A. et al. 1999).

Diagnosis: includes all information that the physician gathers through tests, exams, patient's history, for investigating and/or recognizing the signs and symptoms of a condition or disease. For example, interviewing the patient on the existence of chronic diseases in her family.

Icebreaker: initial session of AD Program where each participant briefly introduced himself/herself to the group

Locum: "A short term substitute for a health professional in the event of absence from work for any reason e.g., holiday, sickness. The locum must be able to provide the same level of advice/treatment/care (Adam et al. 2003, p. 2).

Management: covers all actions and information the physician uses to implement, and to monitor the patient's compliance with the treatment, e.g. providing information about community resources on AD, referring a patient to a specialist, interviewing the caregiver about the patient's behavior and memory.

The Alzheimer's Disease (AD) Program: The CME accredited online educational intervention on the diagnosis, treatment and management of early Alzheimer's disease for rural family physicians. This AD Program was designed and implemented by Francesca Luconi.

On-call: "Where a physician is on standby (either on-site, e.g., emergency room or by phone/pager) for his/her own patients/consultations or for patients/consultations other than his or her own" (Adam et al. 2003, p. 2).

*Primary healthcare: "*Basic curative care including simple diagnosis and treatment and referral of complex cases to higher level, preventative care and essential health education provided at the point of entry into the health care system" (Adam et al. 2003, p. 2).

Secondary referral centre: "Centre designed for specialized care requiring more sophisticated and complicated diagnostic and treatment than that provided at the primary health care level; services include inpatient family medicine, emergency, medical, surgical, anesthesia, psychiatry, pediatrics, obstetrics and gynecology" (Adam et al. 2003, p. 2)

Tertiary referral centre: "Centre specifically designed to provide highly specialized diagnostic and therapeutic services, staffed and equipped for this purpose (e.g. coronary bypass, neonatal intensive care)" (Adam et al. 2003, p. 2).

Treatment includes all actions and information to cure a disease with pharmacologic and/ or alternative therapies such as prescribing a drug.

Appendix B: Sample of the Self-directed Learning Readiness Scale (Guglielmino & Guglielmino, 1994)

	Almost never true of me; I hardly ever feel this way.	Not often true of me; I feel this way less than half the time.	Sometimes true of me; I feel this way about half the time.	Usually true of me; I feel this way more than half the time.	Almost always true of me; there are very few times when I don't feel this way.
41. I'm happy with the way I investigate problems.	1	2	3	4	5
42. I become a leader in group learning situations.	1	2	3	4	5
43. I enjoy discussing ideas.	1	2	3	4	5
44. I don't like challenging learning situations.	1	2	3	4	5
45. I have a strong desire to learn new things.	1	2	3	4	5
46. The more I learn, the more exciting the world becomes.	1	2	3	4	5
47. Learning is fun.	1	2	3	4	5
48. It's better to stick with the learning methods that we know will work instead of always trying new ones.	1	2	3	4	5
49. I want to learn more so that I can keep growing as a person.	1	2	3	4	5
50. I am responsible for my learning — no one else is.	1	2	3	4	5
51. Learning how to learn is important to me.	1	2	3	4	5
52. I will never be too old to learn new things.	1	2	3	4	5
53. Constant learning is a bore.	1	2	3	4	5
54. Learning is a tool for life.	1	2	3	4	5
55. I learn several new things on my own each year.	1	2	3	4	5
56. Learning doesn't make any difference in my life.	1	2	3	4	5
57. I am an effective learner in the classroom and on my own.	1	2	3	4	5
58. Learners are leaders.	1	2	3	4	5

Appendix C: Reality Check Tool

Rank the relative importance of each of the following items that influenced your decision to drop the CME online program. (1 = most important; 5 = least important). Circle your option.

1. Frustration due to technology	1	2	3	4	5
2. Lack of time to figure out WebCT	1	2	3	4	5
3. Lack of technological guidance	1	2	3	4	5
4. Lack of patience to figure out WebCT	1	2	3	4	5
5. Poor design of the modules	1	2	3	4	5
6. High instructor's expectations to comply	1	2	3	4	5
7. Conflict with summer vacations	1	2	3	4	5
8. Lack of convenient access	1	2	3	4	5
9. Extra-workload due to summer	1	2	3	4	5
10. Limited locum coverage	1	2	3	4	5
11. Being lost & confused in the Program	1	2	3	4	5
12. Unfriendly software	1	2	3	4	5
13. Level of effort required	1	2	3	4	5
14. Lack of interest for pairs discussion	1	2	3	4	5

15. Other reasons, please explain.

Appendix D: Consent Letter

McGill University

Faculty of Education & Dept. Family Medicine

A Doctoral Thesis

Title: Exploring rural physicians' learning from a Web-based accredited continuing medical education program in Alzheimer Disease

Seeking Family Physicians to participate in a research study

What is the study?

The focus of the research is on-line learning during an interactive Web-based accredited continuing medical education program (CME) on Alzheimer Disease (AD).

The researcher is seeking a total of:
12 rural family physicians/GPs in Quebec with:

- Access to a computer
- Access to Internet
- Intermediate computer skills
- Fluency in English
- Interest to discuss AD issues on-line with peers and trained facilitator
- Total participation 6 hrs over 1 month: NOVEMBER 2001

What are the benefits for participating physicians?

- Acquire credits from FMOQ*
- Acquire MAINPRO C credits (CFPC)*
- Acquire knowledge and skills about the diagnosis, treatment and management of AD patients
- Collaborate to develop innovative approaches to continuing medical education.
- Contribute to research about your learning process and use of technology.
- Contribute to your profession.
- Opportunity to co-author papers arising out of the study
- Receive a token of appreciation of your time and commitment (500$)

What are your commitments?		Approximately, how much of your time is required?
Step 1.	Complete a short survey on the Web	Step 1 = 15 minutes
Step 2	Participate in an initial information session (telephone or e-mail)	Step 2 = 20 minutes
Step 3	Over 1 week, complete: a) Pre-test on AD that includes quizzes and 2 AD cases; b) questionnaire on self-directed learning readiness.	Step 3 = 2 hours maximum
Step 4.	Over 2 weeks, work closely in dyads and participate in an online asynchronous guided discussion forum on AD.	Step 4 = 2.5 hours
Step 5.	Complete Post-test on AD.	Step 5 = 15 minutes
Step 6.	Complete a post-program questionnaire on level of satisfaction with the program and suggestions for improving the CME program.	Step 6 = 15 minutes
Step 7.	Two months after the program, complete a questionnaire on impact of the program on your practice.	Step 7 = 15 minutes
		Estimated total time = 6 hrs to be completed over 1 month

Your Consent:
I have read the above information and agree to participate in the research study. I understand that at anytime I may withdraw from the study. I understand that all personal information I disclose will remain confidential within the study. Signature ___________________________

I would require further information about the study protocol. Signature ________________________

Date ---------------------------

Appendix E: The Ethics Certificates

DATE OF I.R.B.
APPROVAL
JUN 17 2002
Faculty of Medicine
McGill University

McGill Faculty of Medicine
Institutional Review Board
-Continuing Review-

Principal Investigator: __Dr. Louise Nasmith__ Department/Institution: Dept of Family Medicine, McGill University

IRB Review Number M - 1458 Study Number (if any):: _A02-E01-01__ Review Interval: ___________________

Title of Research Study: Exploring rural physicians' learning on a Web-based Continuing Medical Education Program: A pilot study.

Date of initial IRB approval: Feb 12 , 2001 Date of previous continuing review (if applicable): NA_________________

INTERIM REPORT (PLEASE CHECK OR SPECIFY)

Current Status of Study:

Active Study: ______X_________ On Hold:_______________________ Closed to Enrolment: ____________

Interim Analysis: ____________ Final Analysis:___________________ Study Not Activated*: ____________

*If the study has not become active at McGill, please provide correspondence to explain; enclosed: ___________________________

McGill hospital(s) where study is being conducted and has received approval of local Research Ethics Board(s) (if applicable):

JGH: ☐ MUHC/MCH: ☐ MUHC/MGH: ☐ MUHC/MNH-MNI: ☐

MUHC/RVH: ☐ SMH: ☐ Douglas ☐ Other: ☐ ____N/A_________________

McGill hospital(s) where study has not received approval of local Research Ethics Board(s) (if applicable):______N/A_______If the study sponsorship or financial support has changed, please provide correspondence to explain; enclosed: _N/A__________

Number of subjects to be enrolled by the McGill PI: _0___ Number of subjects enrolled by the McGill PI to date: 11_________

Number of subjects enrolled by the McGill PI since last review: __11_____

Have any of these subjects withdrawn from the study?: __2 PHYSICIANS HAVE WITHDRAWN. One has moved and the other is too busy and seems not interested anymore.

Has the study been revised since the last review?: ___YES____ Have the study revisions been approved by the IRB?: __NO______

Has the consent form been revised since the last review?:___YES_________ Date of the current consent form: APRIL 2002

Are there new data since the last review that could influence a subject's willingness to provide continuing consent?: _THE NUMBER OF HOURS OF THE CONTINUING MEDICAL EDUCATION COURSE HAVE INCREASED FROM 5-6 TO 12-14.

Have there been any serious adverse experiences (SAEs)?: _____NO____X____

Have all serious adverse experiences (SAEs) and safety reports relevant to the study been reported to the IRB?: __N/A_______

SIGNATURES: Principal Investigator: Louise Nasmith Date: May 31 2002

IRB Chair: ______________________ Date: 18 JUN 2002

Appendix E: The Ethics Certificates (continuation)

MCGILL UNIVERSITY
FACULTY OF EDUCATION
CERTIFICATE OF ETHICAL ACCEPTABILITY FOR
FUNDED AND NON FUNDED RESEARCH INVOLVING HUMANS

Received
NOV 21 2003
McGill University
Associate Dean (Academic Programs, Graduate Studies and Research)

The Faculty of Education Ethics Review Committee consists of 6 members appointed by the Faculty of Education Nominating Committee, an appointed member from the community and the Associate Dean (Academic Programs, Graduate Studies and Research) who is the Chair of this Ethics Review Board.

The undersigned considered the application for certification of the ethical acceptability of the project entitled:
Exploring rural physicans' learning on a web-based continuing medical education program on Alzheimer's disease: A pilot study
as proposed by:

Applicant's Name FRANCESCA LUCONI Supervisor's Name CYNTHIA WESTON

Applicant's Signature/Date 11/20/03 Supervisor's Signature

Degree / Program / Course PhD Granting Agency SOCIAL SCIENCES & HUMANITIES RESEARCH GRANTS SUBCOMMITTEE

Grant Title (s)

The application is considered to be:

A Full Review ____ An Expedited Review ____

A Renewal for an Approved Project ✓ A Departmental Level Review ____

Signature of Chair / Designate

The review committee considers the research procedures and practices as explained by the applicant in this application, to be acceptable on ethical grounds.

1. Prof. René Turcotte
   Department of Kinesiology and Physical Education
   Signature / date
2. Prof. Ron Morris
   Department of Integrated Studies in Education
   Signature / date
3. Prof. Ron Stringer
   Department of Educational and Counselling Psychology
   Signature / date
4. Prof. Joan Russell
   Department of Integrated Studies in Education
   Signature / date
5. Prof. Helen Amoriggi
   Department of Integrated Studies in Education
   Signature / date
6. Prof. Ada Sinacore
   Department of Educational and Counselling Psychology
   Signature / date
7. Member of the Community
   Signature / date

Mary H. Maguire Ph. D.
Chair of the Faculty of Education Ethics Review Committee
Associate Dean (Academic Programs, Graduate Studies and Research)
Faculty of Education, Room 230
Tels: (514) 398-7039/398-2183 Fax: (514) 398-1527

Mary Maguire November 21, 2003
Signature / date

Office Use Only
REB #: 361-0601 **APPROVAL PERIOD:** Nov. 21, 2003 to Nov. 21, 2004
(Updated September 2003)

Appendix F: Specific Learning Outcomes of the AD Program

Learning outcomes related to diagnosis

1. Formulate a differential diagnosis of early AD
2. Differentiate between dementia and delirium
3. Describe what to include in an accurate patient history of patients suspected of AD
4. Describe how to perform a comprehensive physical exam of patients suspected of AD
5. Select the appropriate diagnostic tests for patients suspected of AD
6. Identify what to assess in the mental status of patients with AD
7. Select appropriate assessment tools.

Learning outcomes related to treatment

1. Identify and explain the pharmacotherapy for AD
2. Identify and analyze the comorbid conditions that could complicate the treatment of AD
3. Identify and analyze the treatment of behavioural problems in AD
4. Explain the effects of some alternative therapies in the treatment of AD

Learning outcomes related to management

1. Explain your responsibilities and the caregiver's roles in the management of AD
2. Explain reasonable expectations from the cholinesterase inhibitor therapy
3. Describe the clinical characteristics of the progressive stages of AD
4. Examine the main issues in monitoring the disease progression and treatment response
5. Describe appropriate reasons to refer AD patients to specialists.

Appendix G: Pre-test: Section (A) Multiple-Choice Questionnaire

Screen 1

Introduction
Welcome to the second part of the Pre-test that includes 22 multiple-choice questions on dementia and AD. The weight of the Pre-test in the final Pass score is 5%. The correct response for each question is scored 1. After the test is submitted, feedback is provided. This section of the Pre-test provides an opportunity to:

a) Identify your gaps in knowledge concerning the caring of AD patients
b) Track possible changes in the acquisition and retention of knowledge about AD over an 8-month period. The Pre-test results will be compared to the results of the Post-test and 1Month-Post test.

1. Match each disease to the correct speed of onset.

DISEASE	SPEED OF ONSET
a. Alzheimer's disease	1. Rapid
b. Vascular dementia	2. Slow
c. Delirium	3. Sudden

2. Match each disease to the correct natural history.

DISEASE	NATURAL HISTORY
a. Alzheimer's disease	1. Plateau with stepwise deterioration
b. Vascular dementia	2. Fluctuating course
c. Delirium	3. Slowly progressive course

3. Match each disease to the appropriate time course.

DISEASE	TIME COURSE
a. Alzheimer's disease	1. Irreversible but may fluctuate
b. Vascular dementia	2. Usually reversible
c. Delirium	3. Irreversible

4. Match each disease to the appropriate cognitive deficit.

DISEASE	TYPE of DEFICIT
a. Alzheimer's disease	1. Fluctuant cognitive
b. Vascular dementia	2. Progressively global cognitive
c. Delirium	3. Depends on the extent of impairment

5. For a patient whom has a clinical presentation consistent with AD with typical cognitive symptoms or presentation, which of the following laboratory test is NOT required. Check one option.
   a. Complete blood count
   b. Serum calcium
   c. Serum glucose
   d. Serum electrolytes
   e. Uric acid
   f. Thyroid stimulating hormone
6. Which of the AD stages the primary pharmacologic therapy does NOT treat with proven efficacy?
   a. Mild AD
   b. Moderate AD
   c. Severe AD

7. How long does it usually take for the benefits of primary pharmacologic therapy to become evident? Check one option.
   a. After 1 week of treatment
   b. Between 6 and 12 weeks of treatment
   c. After 1 year of treatment
   d. After 4 weeks of treatment

8. What do rivastigmine, donepezil, galantamine inhibit? Match the following items with the appropriate drug.

a. AChE + BuChE	d. Galantamine
b. AChE + allosteric nicotinic receptor modification	e. Donepezil
c. AChE	f. Rivastigmine

9. What are the half-lives of rivastigmine, donepezil, and galantamine? Match the following items with the appropriate drug.

a. 7-8 hours	d. Donepezil
b. 1-2 hours	e. Galantamine
c. 70 hours	f. Rivastigmine

10. What type of medication can prevent AD? Check one option.
   a. Rivastigmine
   b. Donepezil
   c. Galantamine
   d. Ginkgo Biloba
   e. Vitamin E
   f. None of the above

11. If a patient in the early stages of AD is taking a cholinesterase inhibitor (CI), what could be a reasonable expectation from the treatment? Check one option.
   a. Cure of the disease
   b. Improvement in severe behavioural problems
   c. Lack of adverse effects
   d. Decrease in wandering
   e. Improvement in patient's mood and contentedness

12. Which of the following is true when prescribing a cholinesterase inhibitor to a patient with mild to moderate AD?
   a. If a cholinesterase inhibitor fails, it can be replaced by another agent in the same class.
   b. Cholinesterase inhibitors cannot improve cognitive performance and global functioning.
   c. Cholinesterase inhibitors' rapid dose increase will augment therapeutic success.
   d. Cholinesterase inhibitors are contraindicated when prescribing other psychotropic drugs.
   e. All of the above
   f. None of the above

13. Which of the following item is NOT a contraindication for using cholinesterase inhibitor medications? Check one option.
   a. A history of uncontrolled seizure disorder
   b. Severe chronic obstructive pulmonary disease (COPD)
   c. Arrhythmias
   d. Cardiac conduction abnormalities: Atrioventricular (AV) block.
   e. Urinary tract obstruction
   f. Right bundle branch block

14. Which of the following statements in the approach to depression in an AD patient is false?
Check one option.

a. Never forget that depression and AD may coexist.
b. The symptoms may be in reaction to cognitive problems, in this sense; the use of a cholinesterase inhibitor may help.
c. In the presence of predominant affective symptoms, the use of an antidepressant should be considered.
d. Interactions between cholinesterase inhibitor and antidepressants of the SSRI are a major clinical problem.
e. All of the above
f. None of the above

15. Which of the following must be addressed when managing AD patients?

a. Monitoring disease progression
b. Monitoring treatment response
c. Compliance with medication.
d. Monitoring safety (with car, stove, locks, money)
e. Assisting with advance directives planning.
f. Managing caregiver's needs.
g. All the above
h. None of the above

16. Which of the following statements is NOT an appropriate reason (suggested by the Canadian Consensus Conference on Dementia) to refer an AD patient to a geriatrician, geriatric psychiatrist, neurologist, or other professional. Check one option.

a. The presence of persistent uncertainty about the diagnosis after initial assessment and follow up.
b. The presence of a slow and progressive evolution of AD.
c. The presence of significant depression, especially if there is no response to treatment.
d. The presence of treatment problems or failure with new specific medications for AD.
e. The need for additional help in patient management (e.g. behavioural problems)
f. The need for genetic counselling.

17. Which of the following statements is NOT the responsibility of the primary care physician in managing and monitoring caregivers of AD patients.

a. Assisting with advance directives planning
b. Monitoring and treating caregivers for depression and other illnesses
c. Discouraging caregivers to take advantage of respite care.
d. Encouraging caregivers to take advantage of support offered by the Alzheimer Society of Canada and provincial AD societies.
e. All of the above
f. None of the above

18. Express your opinion vis-à-vis the following statement: The absence of a caregiver is a major predictor of earlier institutionalization of patients with dementia.

True = 1 False = 2

19. Match each item in the progression of AD with the appropriate stage in the Reisberg scale' stages.

1.Cannot be left alone anymore, increased functional dependency	Stages: 1 2 3 4 5 6 7
2. Incontinence, depression, move patient to institution	Stages: 1 2 3 4 5 6 7
3. Mild functional deficit; forgetful	Stages: 1 2 3 4 5 6 7
4. Difficulty managing personal affairs	Stages: 1 2 3 4 5 6 7
5. Loss of speech	Stages: 1 2 3 4 5 6 7

Barometer

20. Reflect on your practice and select the statement that best describes your current ability to diagnose early AD. Check one option.

a. The way I diagnose AD is acceptable to me
b. I need to examine how I diagnose AD to verify its appropriateness.
c. I might change some aspects of my diagnostic practices for AD
d. I am dissatisfied with the way I diagnose AD
e. I plan to change the way I diagnose AD

21. Reflect on your practice and select the statement that best describes your current ability to treat early AD. Check one option.

a. The way I treat AD is acceptable to me
b. I need to examine how I treat AD to verify its appropriateness.
c. I might change some aspects of my treatment practices for AD
d. I am dissatisfied with the way I treat AD
e. I plan to change the way I treat AD

22. Reflect on your practice and select the statement that best describes your current ability to monitor and manage early AD. Check one option.

a. The way I monitor and manage AD is acceptable to me
b. I need to examine how I monitor and manage AD to verify its appropriateness.
c. I might change some aspects of my monitoring and management practices for AD
d. I am dissatisfied with the way I monitor and manage AD
e. I plan to change the way I monitor and manage AD

Appendix G: Pre-test: Section (B) Clinical Cases

Mrs Gerber's Case: Screen 1

Introduction

Welcome to the third part of the Pre-test that includes: the description of Mrs. Gerber's case and seven questions on her diagnosis. Your will not receive feedback about the correctness of this case because it will be discussed later in Pairs and in Plenary. To participate in these discussions you will need to refer back to your initial diagnosis for Mrs. Gerber. Therefore, we encourage you to print it and keep it at hand.

Description of Mrs. Gerber's case

- 61 years old, patient for 2 years
- Overweight; has dyslipidemia, hypertension, mild diabetes, carotid bruit on one side
- RX for almost 2 years: ACE-inhibitors, statin, diuretic, with no side effects
- Husband bring her in, says she has been acting strangely for 2 weeks
- She walks unsteadily due to a weakening in her right leg
- She alternates between being hostile and frightened
- She has trouble getting undressed

Questions on Mrs. Gerber's case

1. What are the key observations in Mrs. Gerber's case?
2. What are the co-morbid conditions in this case?
3. What is your preferred initial working diagnosis for this case?
4. What are the features that support your initial diagnosis for this case?
5. What additional information (e.g. questions to patient, examinations, investigations) would you need that might confirm or disconfirm your initial diagnosis for this case?
6. In the following scale, rate your confidence level in your initial diagnosis for this case (1= none; 5= very high)
7. Rate your agreement with this statement: "I have worked with at least one case that is very similar to this case" (1= strongly disagree; 5 = strongly agree)

Mr. Singh Case: Screen 2

Introduction

Welcome to the fourth part of the Pre-test that includes: the description of Mr. Singh's case, six questions on his diagnosis, and ten questions on his treatment. Your will not receive feedback about the correctness of this case because it will be discussed later in Pairs and in Plenary. To participate in these discussions you will need to refer back to your initial diagnosis and treatment for Mr. Singh. Therefore, we encourage you to print them and keep them at hand.

Description of Mr. Singh's case

- 69 years old, patient for many years
- Generally in good health, isolated systolic hypertension diagnosed last year
- RX for 10 years: calcium antagonist; B.P. 140/95 mmHg with no side effects
- Daughter is concerned about his memory loss; it has been increasing gradually since he retired 3 years ago.

Questions on Mr. Singh's case

1. What are the key observations in Mr Singh's case?
2. What are the co-morbid conditions in this case?
3. What is your preferred initial working diagnosis for this case?
4. What are the features that support your initial diagnosis for this case?
5. What additional information (e.g. questions to patient, examinations, investigations) would you need that might confirm or disconfirm your initial diagnosis for this case?
6. Rate your agreement with this statement: "I have worked with at least one case that is very similar to this case" (1= strongly disagree; 5 = strongly agree)
7. In accordance with your preferred diagnosis, what is your treatment's objective (s) for Mr. Singh?
8. What is your treatment plan for Mr. Singh?
9. Why have you selected this type of treatment for Mr. Singh?
10. How effective is the selected treatment for the purpose you are employing it?
11. What is the inconvenience or discomfort associated with the selected treatment?
12. What are the conditions that would increase the risk for patients using this type of treatment?

13. What is the expected natural course of the disease you are treating in Mr. Singh's case?
14. Does the treatment you selected offer a better outcome than no treatment?
15. What is the likelihood Mr. Singh will understand and comply with your treatment program?
16. In the following scale, rate your confidence level in your treatment plan for Mr. Singh (1-5)

Mrs. Robinson's Case: Screen 3

Introduction

Welcome to the fifth part of the Pre-test that includes: the description of Mrs. Robinson case and eight questions. Your will not receive feedback about the correctness of this case because it will be discussed later in Pairs and in Plenary. To participate in these discussions you will need to refer back to your management plan of Mrs. Robinson. Therefore, we encourage you to print it and keep it at hand.

Description of Mr. Robinson's case

Mrs. Jane Robinson is 50 years old. She arrives in your office for a health maintenance examination. She is a single parent living in a condo with her mother and two children who are completing their education. Mrs. Robinson is a legal secretary and she reports feeling extremely stressed. Her mother used to help a lot with the kids but now Mrs. Robinson is providing care for her mother. You diagnosed Alzheimer's disease in Mrs. Robinson's mother a year ago. Mrs. Robinson has not brought her mother to see you for more than a year.

1. Mrs. Robinson's brothers are not living in town and are not involved in their mother's care. Her mother spends the day alone and there are no friends or other family members coming to visit. Mrs. Robinson has told the rest of the family that all is well, but she seems to have feelings of guilt in relation to the care of her mother. You explore this a bit and discover that Mrs. Robinson has little patience left for her mother's condition. She is frustrated by her mother's decline and by the lack of help dealing with her mother. Mrs. Robinson also feels that it is getting harder to control her anger. She feels the "system" has let her down by placing this huge responsibility on her shoulders.

Questions on Mrs Robinson's case

1. What is the problem in this situation?
2. How would you manage Mrs. Robinson's case?
3. What is the rational for your management plan for Mrs. Robinson's case?
4. When solving Mrs. Robinson's case would you have liked to consult AD resources?
5. If you need to consult AD resources, what would you have liked to consult?
6. What additional information would you seek in the AD resources for Mrs. Robinson's case?
7. Rate your agreement with this statement: "I have managed at least one case that is very similar to Mrs. Robinson's case"
8. If you had managed similar cases to Mrs. Robinson, how did you manage them?

Appendix H: Post-test: Section (B) on Mrs. Jones' Case

Screen 1

Description of the first visit

Mrs. Jones is 72 years old and she has been a widow for close to 15 years. She is active in the volunteer organization of her community hospital. She retired from her position as senior accountant with the office of the county administration at 65 years of age. She takes no medications and has enjoyed good health.

Other volunteers in the organization have slowly taken the accounting responsibilities away from Mrs. Jones. She cannot understand this because she claims to be, "as honest and dedicated a person as they will find." She indicates a degree of suspicion about one of the younger volunteers who is taking over her duties but "may not be trustworthy." Mrs. Jones supports her claim of accounting competency by reporting that she managed the county office single-handedly for nearly a decade. To your surprise, only minutes later, she repeats this story as if you have never heard it.

As you are talking you measure her blood pressure at 127/69. You watch as she gets her sweater back on. You see that she struggles trying to put the sweater back on while one sleeve has been turned inside out. You assist her with the sleeve and she jokes about being upset by the volunteer organization.

You ask her about depression and she indicates she enjoys her family and finds the hospital volunteer work fulfilling. She expresses interest in continuing to be of value to her community as long as possible. She laughs when you ask if she has had any troubling thoughts, including thoughts of death or dying. She says she is too busy enjoying all the people in her life for any thoughts like those. Mrs. Jones continues by saying she and her daughter are spending more time together lately and she really enjoys her company.

Your observations indicate she is attentive with good concentration throughout the interview. Her thought content seems reasonably appropriate and logical. As she prepares to leave you ask how she got to the office. She says she rarely drives now because of all the crazy drivers on the road. Her long time friend and neighbour drives

her most places and has brought her today.
You tell Mrs. Jones that you are concerned about what has been happening in her personal life and at the volunteer organization. You ask her to return for a visit to review her situation in more detail and to perform some examinations. You ask if her daughter can attend with her at the next visit. She agrees.

You walk with her to the reception desk and ask the staff to give her a card recording the appointment information and the request to have her daughter in attendance. The return visit is booked at the end of a block of patients so you can spend the time necessary to be thorough.
The appointment arrangements are made in the presence of the friend who is driving Mrs. Jones for this visit. The friend is asked to help Mrs. Jones to attend the next visit with her daughter.

Screen 2

Questions at the first visit

1. What are the key observations in Mrs. Jones' case?
2. What is your initial diagnosis for Mrs Jones' case?
3. What features help confirm your initial diagnosis?
4. What will determine the timing of the follow-up visit?
5. What will be on the agenda when Mrs Jones returns for a follow up visit with her daughter Kathy?

Screen 3

Introduction

Welcome to the continuation of Mrs. Jones' case. Please answer the four questions regarding Mrs. Jones' diagnosis. Then proceed to the next quiz on Mrs. Jones' treatment.

Mrs. Jones tests' results

- The lab tests are normal. You elected not to do a CT scan.
- She scores = 22/30 on the MMSE losing 2 points for date, 1 point on DLROW, 3 points for recall, 1 point for repeating the phrase "no ifs, ands, or buts", and 1 point for the pentagrams which are drawn as non-intersecting rhomboids.
- The clock has the "12" in the "9" position and one hand points to the "10" and the other to the "11". The clock was to read 11:10.
- When naming 4-legged animals she gets only 6 in one minute.

Questions at the second visit

1. What is your diagnosis of Mrs. Jones?
2. List the key features that support your diagnosis for Mrs Jones and those that do not support it.
3. Rate your confidence level in your diagnosis for Mrs. Jones.
4. What will you want on the agenda for the third visit 2 weeks later with Mrs Jones and her daughter?

Screen 4

Mrs Jones second visit

Mrs. Jones returns for the follow-up visit accompanied by her daughter, Kathy. The daughter appears to be a caring individual who expresses genuine concern for her mother. She states she is worried about her mother's memory. She repeats stories and misplaces things often. Kathy tells you how her mother put her apartment keys in a teacup in the cupboard and could not find them for a few days. When she came across the keys she asked Kathy if she done this to play a joke on her. She also recalls an incident where she failed to recognize Kathy's daughter who is twenty years old. This granddaughter visits Mrs. Jones several times a year.

You ask Mrs. Jones if she has noticed any problems with her memory and she looks to her daughter and says, "Well, only the usual things. Wouldn't you say, Kathy?" You ask her who does her banking and bills and she responds by saying her daughter helps her a bit with her finances. You ask how long her daughter has been helping with her finances and she looks to her daughter and says, "Oh, I don't know. Kathy, how long would you say?" Kathy interjects and says it has been nearly a year that she has been helping out and visiting more often because she was concerned that bills were not being paid on time or were being paid twice. Mrs. Jones says she doesn't believe this is completely accurate. She wonders if she may have become too busy to give her full attention to personal matters.

Kathy is able to confirm that there is no past history of diabetes, arterial disease, high blood pressure, atrial fibrillation, or previous malignancy.

You perform a physical examination while you are talking and observing Mrs. Jones.

Questions at the second visit

1. During the second visit, what will you search for in the physical examination?
2. How would you assess Mrs. Jones mental status?
3. What essential diagnostic tests does the Canadian Consensus Conference on Dementia recommend?
4. Would you request a CT scan? Explain your decision.

Screen 5

Questions at the third visit (2 weeks later)

1. In accordance with your preferred diagnosis, what is your treatment objective for Mrs. Jones?
2. What is your pharmacological treatment plan? Name specific drug therapy you would use if any.
3. Why have you selected this type of treatment?
4. How effective is the treatment for the purpose for your specific purpose?
5. What is the inconvenience or discomfort associated with the selected treatment?
6. What are the conditions that would increase the risk for patients using this type of treatment?
7. What is the expected natural course of the disease you are treating?
8. Does the treatment you selected offer a better outcome than no treatment? Please explain.
9. What might increase the likelihood that Mrs. Jones will understand and comply with your treatment program?
10. Rate your confidence level in your treatment plan for Mrs. Jones (5-point Likert-scale)
11. What is your non-pharmacological management plan for Mrs. Jones?
12. What is the rationale for your non-pharmacological management's plan for Mrs Jones?
13. Rate your agreement with this statement "I have managed at least one case that is very similar to this case"
14. If you have managed similar cases to Mrs. Jones's, what are the management issues you feel most uncertain about?
15. When completing Mrs. Jones' case, would you have liked to consult AD resources?
16. List what resources you would have liked to consult when completing Mrs. Jones' case?
17. What type of information would you seek as you consult other resources when completing Mrs. Jones' case?

Appendix I: 1Month-Post test: Section (B) on Mr. Roper's Case

Screen 1

Description Mr. Roper's case: First visit

Mr. Mike Roper is 67 years of age and is a long time patient of yours. He visits your office every two years for a driver's medical so he can continue to operate his motor home. His wife, Emma, accompanied him for his most recent visit because she wanted to "make sure he tells you everything." He complained with a smile that he "can't get away with a thing when she is around." She expressed concern about his increasing tendency to retell stories. This has been getting progressively worse in the last year. She now does all the family finances.

The examination today has been completed with no physical abnormalities identified but you are concerned about his vague answers to some of your questions. You ask if he has taken the motor home on a trip recently. Mike looks at his wife and asks, "Where have we been lately, honey?" Mr. Roper was a very shrewd businessman who owned his own company and made enough money to retire in comfort. He is very independent and you are quite surprised that his wife is accompanying him on this visit.

You ask Mike if he is enjoying his retirement and travelling. He indicates that he loves it. Emma interjects that he can no longer use the video camera, so it sits in a box in the basement. They have no recordings of their trips with the motor home.

Mike is always the driver when they go out. He comments that he has been driving for 50 years and has never had an accident. Emma reminds him that he scraped the side of the car trying to exit through the entrance of the supermarket parking lot after dropping her off. She says he is much better off when she is there to give instructions.

Screen 2

Questions Mrs. Ropers' case: first visit

1. What are the key observations in Mr. Roper's case?
2. What is your initial diagnosis for Mr. Roper?
3. What features help confirm your initial diagnosis?
4. What other questions would you have for the Ropers before they leave the office?
5. What important tasks have been accomplished at the first visit?
6. How would you assess the driving risk in Mr. Roper's case?
7. When would you bring Mr. Roper back for follow-up?
8. What would be on the agenda for the second visit of Mr Roper and his wife to your office?
9. What essential diagnostic tests does the Canadian Consensus Conference on dementia recommend?
10. Would you request a CT scan? Explain your decision.

Screen 3

Description Mr Roper's tests' results: Second visit

There are deficits on the mental status examination. The MMSE score is 23/30.

The clock has the numbers in the wrong places and there are spoke-like lines across the clock face.

Questionsat the second visit

1. What is your final diagnosis for Mr. Roper?
2. What features would support your final diagnosis for Mr. Roper and what features tend no to support it?
3. How would you rate your confidence level in your final diagnosis for Mr. Roper? (5-point Likert scale)
4. In accordance with your preferred diagnosis, what is your treatment objective for Mr. Roper?
5. What is your pharmacological treatment plan? Name specific drug therapy you would use if any.
6. Why have you selected this type of pharmacological treatment plan?
7. How effective is your specific treatment?
8. What is the inconvenience or discomfort associated with the selected treatment?
9. What are the conditions that would increase the risk for patients using this type of treatment?
10. What is the expected natural course of the disease you are treating?
11. Does the treatment you selected offer a better outcome than no treatment? Please explain.
12. What might increase the likelihood the patient will understand and comply with your treatment program?
13. In the following scale, rate your confidence level in your treatment plan for Mr. Roper.
14. What is your non-pharmacological management plan for Mr Roper's case?
15. What is your rationale for your non-pharmacological management plan for Mr. Roper?
16. If you have managed cases similar to Mr. Ropers', what are the management issues you feel most uncertain about?
17. List what resources you would have liked to consult when completing Mr.

Roper's case.

18. What type of information would you seek as you consult other resources when completing Mr. Roper's case?
19. When would you schedule a third visit?

Appendix J: Sample of the Alignment between Learning Outcome, Instructional Activities and Assessment

Learning outcomes	*Cognitive Processes*	*Instructional Activity*	*Assessment*
1. List the required steps to formulate a differential diagnosis	Remember Recognizing	Check what should be ruled out to arrive at an accurate differential dx for early AD. Select all that apply	1 point (MCQ in Pre-Post-1Month Post-tests).
2. Distinguish early AD from other disease or condition presenting similar symptoms (i.e. differential diagnosis)	Understand Inferring	After reading this text, list the main criteria to differentiate 4 types of dementia (Activity # 11).	Non-scored Advanced organizer before introducing module 5 on Differential dx
3. Differentiate between AD, vascular dementia & delirium	Understand Comparing	Match each disease (AD, vascular dementia, delirium) with its appropriate speed of onset, natural history, time course and cognitive deficit	1 point each MCQ (3 MCQs in Pre-Post-1Month Post-tests).
4. Differentiate the characteristics of Aricept, Rivastigmine & Galantamine	Understand Comparing	What do Aricept, Rivastigmine & Galantamine inhibit? Match the following items to the appropriate medication (MCQ in Pre-Post-1Month Post-tests).	1 point each MCQ (3 MCQs in Pre-Post-1Month Post-tests).
5. Discuss the main issues in monitoring the disease progression & tx response in the AD patient and her caregiver	Analyze Organizing	What are the main issues in Mrs Robinson's case? (Problem-solving Plenary activity # 24).	Level of participation in collaborative discussion (20% final score)
6. Explain an initial treatment plan for Mr. Singh	Create Planning	Design a plan for Mr. Singh's treatment (Problem-solving Paired activity # 8).	Participation in collaborative discussion (20% final score)
7. Explain an initial diagnosis for Mrs. Gerber's case	Create Generating	Explain your initial diagnosis and supporting features for Mrs. Gerber's case (Problem-solving, Paired activity # 8).	Participation in collaborative discussion (20% final score)

Note. C = Conceptual. Dx = diagnosis; Tx = treatment; Mg = management; AD = Alzheimer's disease; RQ = Research question; MCQ: multiple choice questions

Appendix K: Participant Reaction Questionnaire (Section I)

This research project is focused on documenting how physicians learn on a Web-based environment. As you know, this is a pilot study and therefore your constructive comprehensive feedback on how to improve this AD Program is extremely important. Please be assured that all information you provide will be kept confidential. You will be prompted to answer the PRQ at different times of the AD Program: (a) at this time, when you have completed the Instructional phase, and (b) at the Closure of the AD Program. The PRQ is not scored but its completion is required for passing the course. Together sections I and II of the PRQ are weighted 10% in the pass score. The PRQ fulfills a variety of purposes:

- To gather your constructive feedback about the technological and instructional aspects of the Program
- To provide constructive feedback on the facilitator's and educator's performance
- To enhance your reflection on monitoring your problem-solving process in Paired and in Plenary activities.

Confirmation of AD practice

1. Select the statement that best describes the extent to which this AD Program has confirmed the way you diagnose early Alzheimer's disease.
    a. This AD Program has not confirmed how I diagnose early AD
    b. A small part of this AD Program has confirmed how I diagnose early AD
    c. A substantial part of this AD Program has confirmed how I diagnose early AD
    d. Everything in this AD Program has confirmed how I diagnose early AD.
2. If a small or substantial part of this AD Program has confirmed how you diagnose early AD, please list the main concepts and/or procedures that were confirmed by this AD Program.
3. Select the statement that best describes the extent to which this AD Program has confirmed the way you treat early Alzheimer's disease.
    a. This AD Program has not confirmed how I treat early AD
    b. A small part of this AD Program has confirmed how I treat early AD
    c. A substantial part of this AD Program has confirmed how I treat early AD
    d. Everything in this AD Program has confirmed how I treat early AD.

4. If a small or substantial part of the AD Program has confirmed how you treat early AD, please list the main concepts and/or procedures that were confirmed by this Program.

5. Select the statement that best describes the extent to which this AD Program has confirmed the way you manage early Alzheimer's disease.

   a. This AD Program has not confirmed how I manage early AD
   b. A small part of this AD Program has confirmed how I manage early AD
   c. A substantial part of this AD Program has confirmed how I manage early AD
   d. Everything in this AD Program has confirmed how I manage early AD.

6. If a small or substantial part of this AD Program has confirmed how you manage early Alzheimer's disease, please list the main concepts and/or procedures that were confirmed by this Program.

Feedback on Pairs Interaction

7. Overall, how effectively did your pairs work together in solving the cases of Mrs. Gerber, Mr. Singh and Mrs. Robinson? Please select one option (1= poorly, 5 = extremely effectively)

8. Overall, how useful was the problem-solving experience in pairs in helping you learn about AD? Please select one option (1= not at all useful, 5 = extremely useful)

9. How would you rate your level of comfort in discussing your ideas to solve the 3 cases (Mrs. Gerber, Mr. Singh and Mrs. Robinson) with your partner? (1= none; 5 = very high)

10. How would you rate your level of comfort in speaking up when working with your partner when you were confused, puzzled or uncertain? (1= none; 5 = very high)

11. How would you rate your level of comfort in providing constructive feedback to your partner? (1= none; 5 = very high)

12. How would you rate your level of comfort in receiving constructive feedback from your partner? (1= none; 5 = very high)

13. How would you rate your level of comfort in dealing with disagreement with your partner? (1= none; 5 = very high)

14. How would you rate your ability for being attentive to your partner's opinions (1= none; 5 = very high)?

15. What have been the strengths of problem solving in pairs? Please, explain

16. What have been the weaknesses of problem solving in pairs? Please, explain.

17. Suggest two changes that would have improved your paired team work.

18. Give one specific example of something you learned from the paired work or your partner that you probably wouldn't have learned working alone
19. Give one specific example of something your partner learned from you that probably s/he wouldn't have learned working alone.

Feedback on Plenary Discussions
20. Did the Plenary discussions help you gain support from your peers. Please select one option. (1= did not help at all; 5 = extremely helpful)
21. Did the Plenary discussions help you gain the facilitator's support? Please select one option (1= did not help at all; 5 = extremely helpful)
22. Did the Plenary discussions help you gain Francesca Luconi's support? Please select one option. (1= did not help at all; 5 = extremely helpful)
23. How democratic were the Plenary discussions? Please select only one option. (1= not democratic; 5 = extremely democratic)
24. How would you rate your level of comfort in discussing your ideas to solve the 3 cases (Mrs. Gerber, Mr. Singh and Mrs Robinson) with your peers? (1= none; 5 = very high)
25. How would you rate your level of comfort in providing constructive feedback to your peers? (1 = none; 5 = very high)
26. How would you rate your level of comfort in receiving constructive feedback from your peers? (1 = none; 5 = very high)
27. In the Plenary, how would you rate your level of comfort in dealing with disagreement? (1 = none; 5 = very high)
28. In the Plenary, how would you rate your ability for being attentive to your peers' opinions? (1 = none; 5 = very high)
29. Overall, how interesting did you find the Plenary discussions? Select one option. (1 = totally boring; 5 = extremely interesting)
30. Overall, did the Plenary discussions help you learn about AD? Select one option. (1 = useless; 5 = extremely useful)
31. For your learning process, what did you find most helpful in the Plenary discussions? Please list one or two specific examples.
32. For your learning process, what did you find least helpful in the Plenary discussions? Please list one or two specific examples.

33. How could the Plenary discussions have been improved? Please list one or two specific examples.
34. Give one specific example of something you learned from the group that you probably wouldn't have learned working alone.
35. Give one specific example of something the group learned from you that probably they wouldn't have learned otherwise.

Feedback on the facilitator

36. How effective was the facilitator in creating a stimulating environment? Select one option (1 = not effective; 5 = very effective)
37. How effective was the facilitator in creating an atmosphere that encourages physicians' participation? Select one option (1 = not effective; 5 = very effective).
38. When you diverged, how effective was the facilitator in appropriately guiding you back to focus on the topic of discussion? Select one option. (1 = not effective; 5 = very effective).
39. How effective was the facilitator in prompting physicians to reflect and elaborate on their prior-knowledge instead of providing them with quick answers? (1 = not effective; 5 = very effective).
40. How effective was the facilitator in regularly summarizing the discussion? Select one option.
41. How effective was the facilitator in providing constructive, timely, descriptive feedback? Select one option. (1 = not effective; 5 = very effective).

Feedback on the educator

42. How effective was the educator in creating an open and supportive environment? Select one option. (1 = not effective; 5 = very effective).
43. How effective was the educator in providing timely prompts for the physicians' participation in the AD Program? Select one option. (1 = not effective; 5 = very effective).
44. How effective was the educator in answering your messages posted on the Discussion Board? Select one option. (1 = not effective; 5 = very effective).
45. How effective was the educator in clearly explaining the rules for participation in the AD Program? Select one option. (1 = not effective; 5 = very effective).

46. How effective were the additional Web resources in supporting your learning process? Select one option (1= not effective; 5 = very effective)

Feedback on other features of the AD Program

47. How easy was to navigate within the AD Program? Select one option. (1= not at all easy; 5 = very easy)

48. Did the overall design of the AD Program support your learning process? Select one option. (1 = not effective; 5 = very effective).

49. Did the technical support help you resolve technical problems?

(1 = not effective; 5 = very effective).

Appendix L: Participant Reaction Questionnaire

(Section II)

Welcome to the closure of the AD Program! As you know, this is a pilot study and therefore your constructive comprehensive feedback on how to improve this program is extremely important. Please be assured that all information you provide will be kept confidential. This short version of the PRQ is not scored but its completion is required for passing the course. Together sections I and II of the PRQ are weighted 10% in the Pass score. The purpose of the PRQ is to gather your constructive feedback about the AD Program's optional and required activities and resources available during the last month and a half.

1. How effective was the monthly log for monitoring possible changes in your AD rural practice? Select one option (1 = not effective, 5 = very effective)
2. How effective was reviewing the past modules in reinforcing your learning process? Select one option (1 = not effective; 5 = very effective).
3. How effective was the Case Library in supporting your learning process? Select one option (1 = not effective; 5 = very effective).
4. In the last month and a half, how effective were the non-guided optional discussions with other participants in triggering your interest and motivation to participate in the AD Program? Please select one option (1 = not effective; 5 = very effective).
5. How effective was the 1Month-Post test in supporting your learning process? Select one option (1 = not effective; 5 = very effective).
6. In last month and a half, how effective was the technical support in helping you resolve technical problems? Select one option (1 = not effective; 5 = very effective).
7. In the last month and a half, how effective was the educator (Francesca Luconi) in answering your e-mail messages promptly? Select one option.
8. How effective was the overall design of the program in supporting your learning process? Select one option (1 = not effective; 5 = very effective).
9. Would you be interested in continuing to network with the physicians who participated in the AD Program? (0 = I do not know; 1 = No; 2 = Yes)
10. Select from this list, what would be your motivation to continue to be in touch with the network of physicians who participated in the AD Program? Select all that apply.
    a. Exchange current information on Alzheimer's disease

b. Discuss complex AD cases
c. Share information about community services for AD patients and their caregivers
d. Share information about AD specialists
e. Discuss professional issues related to your rural practice
f. Discuss other medical topics beyond Alzheimer's disease
g. Socialize
h. Other

Thank you for completing this questionnaire.

Click here to participate in the last Plenary activity # 38.

Appendix M: Feedback on Technological Support
(3 weeks after the launching of the AD Program)

Introduction

This research project is focused on documenting how physicians learn on a Web-based environment. As you know, this is a pilot study and therefore your constructive comprehensive feedback on how to improve this AD Program is extremely important. Please be assured that all information you provide will be kept confidential.

1. In the last 3 weeks, have you ever requested technological help? (1 = Yes; 2 = No; 3 = I do not remember)
2. In the last 3 weeks, how often did you use the WebCT phone help line? (1 = never; 5 = always)
3. In the last 3 weeks, how often did you use the WebCT help button? (1 = never; 5 = always)
4. In the last 3 weeks, how often did you send e-mails to WebCT support? (1 = never; 5 = always)
5. In the last 3 weeks, how often did you post a message on the Discussion Board requiring technological support? (1 = never; 5 = always)
6. In the last 3 weeks, how would you rate your comfort level in using the WebCT help button? (1 = none; 5 = very high)
7. In the last 3 weeks, how would you rate your comfort level in using the WebCT phone help line? (1 = none; 5 = very high)
8. In the last 3 weeks, how would you rate your comfort level in sending e-mails to WebCT support? (1 = none; 5 = very high)
9. In the last 3 weeks, how would you rate your comfort level in posting messages on the Discussion Board requesting technological support? (1= none; 5 = very high)
10. In the last 3 weeks, rate the level of effectiveness of the McGill phone-help line for solving your technological problems? (1 = none; 5 = very effective)
11. In the last 3 weeks, rate the level of effectiveness of the WebCT help button to solve your technological problems (1 = none; 5 = very high)
12. In the last 3 weeks, rate the level of effectiveness of exchanging e-mails with the WebCT support to solve your technological problems (1 = none; 5 = very high).

13. In the last 3 weeks, rate the level of effectiveness of posting messages on the Discussion Board for solving your technological problems (1 = none; 5 = very high).

Appendix N: Log

Introduction

Welcome to the monthly log that provides a way for monitoring possible changes in your Alzheimer's disease (AD) practice. Short questions will help you reflect on caring for AD patients and the potential application of what you learned from the AD Program and from other resources you might have accessed during the 2 month period before the closure of the Program. The self-monitoring of practice log is a valuable resource to gather information needed to complete the final 1Month- Post test.

1. How many patients suspected of Alzheimer's disease did you care for this month?
    a. None
    b. 1-10
    c. 11- 21
    d. 22 - 32
    e. > than 32
    f. I do not recall
2. How many diagnosed Alzheimer's disease patients did you care for this month?
    a. None
    b. 1-10
    c. 11- 21
    d. 22 - 32
    e. > than 32
    f. I do not recall
3. Have you accessed additional sources of information on Alzheimer's disease outside the AD Program since the completion of the Post-test?
    (a. = Yes; b. = No; c. = I do not recall)
4. If yes, select which resource (s) from the following list. Select all that apply.
    a. Face-to face workshops
    b. CME workshops
    c. CME Web-based programs
    d. Conferences on AD
    e. Literature on AD
    f. Discussions with sales representatives

g. Discussions with peers who are not participating in the AD Program
h. Web resources on AD
i. Other
j. Not applicable

5. Reflect on what you have learned in the AD Program. In the last month, how relevant have been the facts in the modules on Alzheimer's disease diagnosis for your rural practice? (1 = not relevant; 5 = very relevant)

6. Reflect on what you have learned in the AD Program. In the last month, how relevant have been the facts in the modules on Alzheimer's disease treatment for your rural practice? (1 = not relevant; 5 = very relevant)

7. Reflect on what you have learned in the AD Program. In the last month, how relevant have been the facts in the modules on Alzheimer's disease management for your rural practice? (1 = not relevant; 5 = very relevant)

8. Reflect on what you have learned in the AD Program. In the last month, how relevant has been the problem-based learning method for your rural practice? (1 = not relevant; 5 = very relevant)

Commitment to Change

In the Post-test, you listed 3 measurable changes that you wished to implement in your practice in the caring of Alzheimer's disease patients. Now, 6 weeks following the Post-test, please reflect on the extent to which those changes have occurred. Rate the level of change as well as describe the enablers and barriers that influenced those anticipated changes.

1. Change #1

1. Describe briefly one of the three measurable changes listed in the post-test, which you wished to implement in your practice in the caring of Alzheimer's disease patients.

1.2. Select the item that best describes to what extent in the last month, you have implemented change #1 (listed in the Post-test) in your practice (1 = not implemented; 3 = completely implemented).

1.3 In the last month, what have been relevant enablers to implement change #1? Please explain.

1.4 In the last month, what have been relevant barriers for not implementing change #1? Please explain.

2. Change #2

2.1 Restate the original anticipated change.

2.2 Select the item that best describes the level of change #2 in the last month. Check one option (1 = not implemented; 3 = completely implemented).

2.3 In the last month, what have been relevant enablers to implement change #2? Please explain.

2.4 In the last month, what have been relevant barriers for not implementing change #2? Please explain.

3. Change #3

3.1 Restate the original anticipated change.

3.2. Select the item that best describes the level of change #3 in the last month. Check one option (1 = not implemented; 3 = completely implemented).

3.3 In the last month, what have been relevant enablers to implement change #3? Please explain.

3.4 In the last month, what have been relevant barriers for not implementing change #3? Please explain.

Unanticipated changes in AD practice

4.1 Please describe other change(s) in your AD practice that might have emerged in the last month, which you did not anticipate at the post-test.

4.2 In the last month, what have been relevant enablers to implement changes in your practice that you did not anticipate at the post test? Please explain.

Thank you for having completed this monthly Log for self-monitoring your AD practice

Appendix O: Needs Assessment (Section I)

Introduction

The purpose of this needs assessment is to investigate your challenges and level of satisfaction in the diagnosis, treatment, monitoring and management of Alzheimer's Disease (AD). The enclosed questionnaire complements the WebCT survey on your computer literacy level and technological access. Your experienced opinion contributes to target and develop an online CME for Family Physicians in this therapeutic area.
We kindly ask you to complete the following questions about your clinical experience. We anticipate the questionnaire will take you approximately 10 minutes to complete.

Gap Analysis

For the following questions mark with an X your degree of agreement (1 = Low, 5 = High) with each statement contrasting your current ability level with the desired ability level of practice:

1. With regard to diagnosing Alzheimer's Disease

Present level		Ability to	Desired level	
Low	High		Low	High
		1. Conduct interviews appropriately for history taking to detect early AD symptoms		
		2. Administer correctly the Mini-Mental State Examination (MMSE) test to detect early stage of AD		
		3. Differentiate AD from depression		
		4. Differentiate AD from Vascular Dementia		
		5. Differentiate AD from other conditions (aphasia, dysarthria, psychosis, blindness, deafness, amnesia)		
		6. Select appropriate laboratory tests as recommended by the CCCAD (Canadian Consensus Conference on the Assessment of Dementia, 1998)		
		7. Select appropriate radiology tests		
		8. Identify the Mild stage of AD		
		9. Identify the Moderate stage of AD		
		10. Identify the Severe stage of AD		
		11. Conduct diagnostic procedures within time realities of family practice		

2. With regard to treating Alzheimer's Disease:

Present level		Ability to	Desired level	
Low	High		Low	High
		1. Select therapy appropriate for early stage of AD		
		2. Select therapy appropriate for moderate stage of AD		
		3. Select therapy appropriate for severe stage of AD		
		4. Discriminate treatments for early stage of AD		
		5. Be aware of drug interaction's effects		

With regard to managing Alzheimer's disease:

Present level		**Ability to**	**Desired level**	
Low	High		Low	High
		1. Involve a reliable caregiver		
		2. Manage the combination of patient's and caregiver's emotional problems (i.e. stress)		
		3. Timely refer patients to appropriate specialists		
		4. Use instruments to monitor treatment response		
		5. Provide appropriate support & resources for AD patient & caregiver(s)		
		6. Monitor and modify treatment appropriately		

Barometer

2. Reflect on your practice and select the statement that best describes your current diagnostic, treatment, and management practices of AD. In the Barometer, select one statement in each column with an X.

1. Diagnosis of Early AD	2. Treatment of Early AD	3. Management
a. The way I diagnose AD is acceptable to me. b. I need to examine how I diagnose AD to verify its appropriateness. c. I might change some aspects of my diagnostic practices for AD. d. I am dissatisfied with the way I diagnose AD e. I plan to change the way I diagnose AD	a. The way I treat AD is acceptable to me b. I need to examine how I treat AD to verify its ppropriateness c. I might change some aspects of my treatment practices for AD d. I am dissatisfied with the way I treat AD e. I plan to change the way I treat AD	a. The way I manage AD is acceptable to me b. I need to examine how I manage AD to verify its appropriateness c. I might change some aspects of my management practices for AD d. I am dissatisfied with the way I manage AD e. I plan to change the way I manage AD

3. What is your preferred format of CME to learn about Alzheimer's disease? Select with an X all that apply.

Lecture
Hands-on session

Case-based discussion
Colleague-to-colleague sharing of best practices
Literature, journal articles
Combination of all the above

Appendix P: Needs Assessment (Section II)

1. What would be the most convenient time for you to participate in this Web-based CME on Alzheimer's disease? Please select one choice.

2. From what location will you most frequently access this Web-based CME on Alzheimer's disease?

3. What type of technology will you use to access this Web-based CME on Alzheimer's disease?

4. If you use a conventional modem to access this Web-based CME on Alzheimer's disease, please specify what type.

5. How many interactive Web-based continuing medical education (CME) courses have you completed?

6. How often do you participate in the following Internet activities? (1= never, 5 = very often)

- E-mail
- Discussion groups
- Collaborative work with peers
- Multimedia
- Bibliographic database
- Medical journals
- CME courses

7. How would you rate your level of comfort using the following Internet activities? (1 = never; 5 = very often)

- E-mail
- Discussion groups
- Collaborative work with peers
- Multimedia
- Bibliographic database
- Medical journals
- CME courses

8. Have you ever used WebCT (or other course delivery platform, e.g. FirstClass, Lotus)?

1. Yes
2. No

3. I do not know

9. If you have used WebCT (or other course delivery platform, e.g. FirstClass, Lotus) how would you rate your competency? (1 very low; 5 very high)

10. How would you rate your level of competency using the following Internet activities? (1 never; 5 very often)

- E-mail
- Discussion groups
- Collaborative work with peers
- Multimedia
- Bibliographic database
- Medical journals
- CME courses

11. In your continuing medical education, have you ever participated in a case-based problem-solving in small groups?

12. Rate your level of comfort in case-based problem-solving in small groups (1 none; 5 very high)

- Presenting your hypothesis to solve the case
- Discussing with peers your hypothesis to solve the case
- Speaking up when you are confused
- Providing constructive feedback
- Receiving constructive feedback
- Dealing with disagreement
- Being attentive to the discussion

Appendix Q: Summative Evaluation

Facilitator's Feedback

Introduction

This research project is focused on documenting how physicians learn in a Web-based environment. Therefore, your constructive feedback on how to improve this program is extremely important. Please be assured that all information you provide will be kept confidential. In each multiple-choice question, please underline your response.

1. Rate each of the following statements. (1 = strongly disagree, 5 = strongly agree).

a. The program was relevant to family practice	1	2	3	4	5
b. The program met the stated objectives	1	2	3	4	5
c. The program met my expectations	1	2	3	4	5
d. The program was credible and non-biased	1	2	3	4	5
e. The program was well organized	1	2	3	4	5
f. I was able to interact with other participants	1	2	3	4	5
g. There was adequate time to participate	1	2	3	4	5
h. My role as facilitator was clearly explained	1	2	3	4	5
i. I will recommend this program to other FPs	1	2	3	4	5

2. Describe two particularly strong features of this program
3. Describe two areas of weakness you would like to see changed
4. List two ways you will change your practice because of this program
5. List the topics you would like to see addressed in the future in CME programs focused on the area of dementia
6. General comments and suggestions
7. How effective were you in creating a stimulating environment? (1= not effective; 5 very effective)
8. How effective were you in creating an atmosphere that encourages physicians' participation? (1= not effective; 5 very effective)
9. When some of the participants diverged, how effective were you in appropriately guiding them back to focus on the topic of discussion? (1= not effective; 5 very effective)

10. How effective were you in prompting physicians to reflect and elaborate on their prior knowledge instead of providing them with quick answers? (1= not effective; 5 very effective)

11. How effective were you in regularly summarizing the discussion? (1= not effective; 5 very effective)

12. How effective were you in providing constructive, timely, descriptive feedback? (1= not effective; 5 very effective)

13. How effective was F. Luconi in clearly explaining your role as facilitator in this program? (1= not effective; 5 very effective)

14. When you start participating, how easy was to navigate within the program? (1 = not easy at all; 5 = extremely easy)

15. Did the McGill technical support team help you resolve technical problems? (1 = Did not help at all; 5 = extremely helpful)

16. Would you be interested in continuing to network with the physicians who participated in this program?

a) I do not know; b) No; c) Yes

17. If not, select from this list possible explanations. Select all that apply.

a. No time to participate
b. The level of discussion on dementia is not interesting
c. I do not need networking in the area of dementia
d. Other, please explain

18. If yes, select from this list, what would be your motivation to continue to be in touch with the network of physicians who participated in this program? Select all that apply.

a. Exchange current information on AD
b. Discuss complex cases
c. Share information about community services for AD patients and their caregivers
d. Discuss professional issues related to your AD practice
e. Discuss other medical topics beyond AD
f. Socialize
g) Other, please explain

Appendix R: Scoring System of Participants' Responses to Clinical Cases

Table R.1

Sample of Scoring System: Question 1 in Mrs Gerber' Case

	MODEL RESPONSE						
Key observations in Mrs. Gerber's case	Item 1	Item 2	Item 3	Item 4	Item 5	Sum items points	RFP Score
Judges scores	Abrupt onset of symptoms	Her health puts her at risk for cerebrovascular disease	Gait disorder	Emotional lability	Impaired executive function		
Judge 1 score	1	2	3	4	5		
Judge 2 score	1	4	2	5	3		
Judge 3 score	1	2	4	5	3		
Judge 4 score	1	2	3	5	4		
Mean	**1**	**3**	**3**	**5**	**4**		
Converted Score in points	5	3	3	1	2	**14**	
RFP							**RFP score**
Marcela	Recent, sudden decline	Risk factors for stroke	Unilateral weakness	Behavioural changes	Difficulty undressing		14 = **100%**
Diana	Sudden deterioration	With vascular risks factors					= 8/14 = **57%**

In this table, the researcher coded Marcela and Diana's responses into categories that matched the model response items (e.g. the item sudden deterioration was coded under the category Abrupt onset of symptoms). Secondly, each item in Marcela's and Diana's responses received the same points as the item in the model response. All item points were then summed up. The participant's score for a question was calculated as a percentage of the model response score and represents the extent to which a participant's response matched the model response. In question #1 of Mrs. Gerber's case, Marcela scored 100% because the sum of the items in her response (14) matched the sum of the items in the model response (14), whereas Diana scored lower because her response was incomplete and only included some of the required items in the model response. Consequently, her score (8) represents only (57%) of the model response. RFPs = rural family physicians.

Appendix S: List of Concepts Covered by the AD Program and Discussed in Plenary Activities

Category: Diagnosis (Mod 4-5)

List of themes/concepts on diagnosis covered by the AD Program and grouped by subcategories

<u>Dementia</u>

1. Dementia
2. Prevalence of dementia
3. Biologic approach

<u>Types of Dementia and Mild Cognitive Impairment (MCI)</u>

4. Vascular dementia or Mixed dementia
5. Frontotemporal dementia
6. Lewy bodies
7. MCI

<u>Alzheimer's disease</u>

8. Alzheimer's disease
9. Early AD

<u>Differential diagnosis</u>

10. Differential diagnosis
11. Rapidity of onset
12. Speed of progress
13. Nature of symptoms
14. Functional loss
15. Nature of cognitive problems
16. Delirium

<u>Co-morbid conditions</u>

17. Co-morbid conditions
18. Diabetes
19. Depression

<u>Approach to early AD</u>

20. Several visits,
21. Patient's records
22. Patient's history
23. Physical exam

<u>Investigations</u>

24. Basic laboratory tests
25. Magnetic resonance imaging (MRI)
26. Cranial CT
27. Guidelines

<u>Mental assessment</u>

28. Mini-mental State Examination (MMSE) (Folstein, Folstein & McHugh, 1975)
29. 29. Clock Drawing test (Brodaty & Moore, 1997)
30. Brief cognitive rating scale (BCRS) (Reisberg & Ferris, 1988)
31. Bristol activities of daily living (Bucks, Ashworkth, Wilcock & Siegfried (1996)
32. Disability assessment for dementia (DAD) (Feldman et al. 2001)
33. Barthel index (Novak, Johnson, Greenwood, 1996)

34. Up & Go (Podsiadlo & Richardson, 1991)
35. Functional assessment staging (FAST) (Reisberg, Ferris, de Leon, & Crook, 1982)
36. Geriatric depression scale (GDS) (Yesavage et al. 1983)
37. Clinical dementia rating (CDR) (Morris, 1993)
38. Burden interview (Zarit et al. 1980)
39. Problem checklist & strain scale (Gilleard, 1984)

Total: 39 concepts

List of diagnostic concepts used by participants across three Plenaries grouped by subcategories

<u>Investigations</u>

1. Clinical judgment
2. CT scans
3. Guidelines
4. Basic lab tests
5. Additional lab tests

<u>Alzheimer disease</u>

6. Alzheimer's disease
7. Early Alzheimer's disease

<u>Differential diagnosis</u>

8. Diagnosis
9. Differential diagnosis

<u>Approach to early AD</u>

10. Patient history
11. Several visits
12. Physical exam

<u>Types of dementia</u>

13. Mixed dementia
14. Frontotemporal dementia
15. Dementia with Lewy body
16. Mild Cognitive Impairment (MCI)
17. MCI progression to AD

<u>Co-morbid conditions</u>

18. Diabetes
19. Smoking

<u>Mental assessment</u>

20. Mental assessment
21. MMSE
22. Assessment of Caregiver's state

Total: 22 concepts/themes

Category: Treatment (Mod 6)

List of themes/concepts on treatment covered by the AD Program and grouped by subcategories

<u>Pharmacotherapy</u>
1. Pharmacotherapy
2. Efficacy CI drugs
3. Monitoring responses
4. Switching CI
5. Contra-indications to CI therapy
6. Comparison available CI drugs
7. Polypharmacy

<u>Co-morbid conditions</u>
8. Depression
9. Cerebro-vascular diseases

<u>Treatment of behavioural problems</u>
10. Advanced stages of AD

<u>Treatment of types of dementia</u>
11. Frontotemporal
12. Vascular

<u>Guidelines</u>
13. Guidelines

<u>Alternative medicine</u>
14. Alternative medicine

Total: 14 concepts/themes

List of treatment themes/concepts used by participants across three Plenaries

<u>Pharmacotherapy</u>
1. Cholinesterase inhibitors (CI) efficacy
2. Switching CI
3. CI administrative concerns

<u>Treatment for Alzheimer's disease</u>
4. Behavioural problems in advanced stages

<u>Treatment for types of dementia</u>
5. Frontotemporal
6. Vascular
7. Co-morbid conditions

Total: 7 concepts/themes

Category: Management (Mod 7)

List of themes/concepts on management covered by the AD Program and grouped by subcategories

<u>Management of AD</u>
1. Referrals
2. Progression of AD following the Reisberg scale
3. Informing the patient and caregiver

<u>AD Patient</u>

4. Managing behavioural disorders of the AD patient
5. Monitoring disease progression in the AD patient
6. Expectations from a reasonable treatment of AD
7. Compliance
8. Driving
9. Advance directives

<u>Caregiver</u>

10. Support for caregivers
11. Managing caregiver's and AD patient's expectations
12. Monitoring and treating caregivers for depression and other illnesses
13. Caregiver's report about the AD patient
14. Caregiver's needs

Total 14 concepts/themes

List of management concepts used by participants across three Plenary activities

<u>Caregiver</u>

1. Needs
2. Safety of caregiver's family
3. Help
4. Canadian Health system resources
5. Caregiver's report on AD patient

<u>AD Patient</u>

6. Canadian Health care system resources for the AD patient
7. Monitoring AD patient disease progression

<u>Management of AD</u>

8. Referrals,
9. Activities of daily living (ADL)
10. Informing the patient and caregiver.

Total: 10 concepts/themes

Appendix T: Sample from the Three Codebooks on Use of Concepts

Example of concepts and definitions	Codes	Examples coded statements
Codebook on diagnosis		
Patient history: "precipitating factors such a stroke, types of changes in behaviour/personality, family history, drug abuse". (AD Program p. 14)	Dx H	"The history is everything…" (Marcela, PL 5-549)
Guidelines: criteria to apply guidelines, consensus for practice following the recommendations Canadian Consensus Conference on the Assessment of Dementia (CCCAD, 1998).	DxGU	"I understand what the current consensus is about basic lab tests, but I find the recommendations extremely limiting" (Luc, PL 1-540).
Mental status assessment: the mental status assessment of a patient suspected of dementia includes: memory (lapses), knowledge of current affairs; aphasia, apraxia, agnosia, insight and judgment, abstract thinking, executive function and attention/concentration (Patterson et al. 1999)	DxMA	"…but often it consists of a few examples of memory lapses which don't always sound that alarming or unusual" (Marcela, PL 1- 549).
Codebook on treatment		
Pharmacotherapy: the treatment of disease and especially mental illness with drugs (Merriam-Webster). In the AD Program it includes cholinesterase inhibitors such as donezpril, rivastigmine, galantamine.	TxCI	"It will certainly be a major change in our practices, if the 3 cholinesterase inhibitors become the most prescribed drugs as the baby boomers age proactively in the next few years!" (Diana, PL 1 - 554).
Cholinesterase inhibitors (CI) efficacy: refers to the rate and type of response, time for trial, and safety issues. CI belongs to the anticholinesterase therapy defined as: "any of several drugs that prevent destruction of the neurotransmitter acetylcholine by the enzyme acetylcholinesterase within the nervous system" (Encyclopaedia Britannica online).	TxCIE	"I tend to be impatient. You do have to give each medication a good 6-month trial" (George, PL2 - 560).
Codebook on management		

Management of Activities Daily Living: refers to the AD patient's activities related to hygiene, eating, sleeping, walking, dressing and undressing (AD Program).	MgAD L	"I often just ask: Is he (or she) any better or worse than they were 6 months ago or about the same? Then I get more specific and ask if the patient, for example, seems to get lost less often or require more or less help to dress or handle money?" (George, PL 2- 560).
Referral: the process of directing or redirecting (as a medical case or a patient) to an appropriate specialist or agency for definitive treatment (Merriam- Webster)	MgR	"…especially when access to a neurologist or Alzheimer's specialist is not easy" (George, PL 1-553).

Appendix U: Codebook for Coding Collaboration

Connectivity

Connectivity (Ingram and Hathorn, 2004) was assessed by 4 types of statement:

1. *Independent statement (CIS)* is a standalone comment that favors exchange of information but does not necessarily lead to collaboration. It does not respond to a comment nor generate a response. No example was found in the Transcripts.

2. *Direct response (CDR)* is a comment or answer to questions that require little insight. In direct response, participants may also repeat others' ideas by rewording their statements or may agree with statements without explanations. For example: "Dr W, your detailed comments about MCI and progression +/- to AD are very interesting." (Diana, CDC, PL 1 - 554).

3. *Direct comment (CDC)* occurs when participants attempt to take the interaction further by adding new information to or insights into the interaction and are based on the prior discussion. Some examples are as follows. In response to the question "What are the main issues you encountered in solving Mrs. Gerber's and Mr. Singh's diagnoses?" (Educator, PL 1 - 541). Marcela answered with a *direct response*: "In the case of Mr. Singh, I wouldn't normally come to any diagnostic conclusion at all without much more information. (Marcela, CDR, PL1 - 549). Then, Marcela added a *direct comment*: "At the same time, in similar real life scenarios, the physical exam and investigations most often yield nothing of significance. The history is everything, but often it consists of a few examples of memory lapses which don't always sound that alarming or unusual" (Marcela, CDC, PL 1 - 549).

4. *Indirect comment (CIC)* is a statement that includes a new idea or a comment added to the interaction, but the connection to prior interaction is not clear. No examples were found in the Transcripts.

Quality of Interaction

Quality of interaction (Ingram and Hathorn, 2004) was assessed by 3 types of statement:

1. *Simple agreement (QISA)* means repeating information, for example, "George, how lucky we chose Donezepil and Rivastigmine to treat Mr. Singh!" (Diana, QISA, PL 2-593).

2. *Adding information (QIAI)* means adding to the statement, disagreeing or adding new information *(QIAI)*, for example, "Moreover, the diagnosis is not always clear and one finds overlapping problems" (Luc, QIAI, PL 1 - 540).

3. *Reference (QIRE)* means adding new information through references to published sources, for example, "Hot off the press, article in today's (Sept 16, 2003) CMAJ: Efficacy and safety on cholinesterase inhibitors and AD: A meta analysis" (George, QIRE, PL 2 - 557).

Appendix V: Codebook for Coding Emerging Patterns of Collaboration

The following eight categories emerged from the data and were included in the coding scheme at the level of Emerging Patterns of Collaboration. Each category is defined as follows:

1. *Agreement (PA)* is a category that includes two topics: *Simple Agreement* and *Elaboration to justify agreement*

1.2 *Simple Agreement (PAS)* entails agreeing with the discussion without elaboration and articulation of an explanation and/or introducing new concepts to the discussion, for example: "I agree with Diana and George. Don't want abuse of the elders, and the neglect is actually already happening" (Ronald, PAS, PL3, 599). *Simple Agreement* corresponds to the category of Description from Donald's taxonomy (2002)

1.3 *Elaboration to Justify Agreement (PAE)* means articulating an explanation of an opinion by backing it up with arguments, ideas, and concepts from a variety of sources. Elaboration is directly related to articulation and implies cognitive processes such as analysis, synthesis, paraphrasing, and making a connection between prior and new knowledge, for example:
"I agree with all that has been said by others in this Plenary. It seems to be becoming more frequent that these sorts of situations come to a crisis point, the main caregiver(s) snaps" (Norma, PAE, PL3 - 603).

2. *Disagreement (PD)* includes two topics; namely, *Simple Disagreement* and the *Elaboration to Justify Disagreement.*

2.1 *Simple Disagreement (PDS)* means to disagree with the discussion without elaboration and articulation of an explanation, and/or introducing new concepts to the discussion, for example: "I understand what the current consensus is about basic lab tests, but I find the recommendations extremely limiting" (Luc, PDS, PL1 - 540).

2.2 *Elaboration to Justify Disagreement (PDE)* involves playing the role of 'devil's advocate and disagreeing with the discussion. It implies articulating and introducing arguments to back up the RFP's opinion, and to move the discussion further with new perspectives. An argument could include concepts from the AD Program as well as new ideas and hypotheses not included in the AD Program. The disagreement could be related to the literature, guidelines or opinions of other participants. *Elaboration* *to Justify Disagreement* offers evidence of the following cognitive processes: analysis, synthesis, paraphrasing, and making connections between prior and new knowledge. For example, Marc disagreed with the guidelines' recommendations for the use of CT scans and argued:

"… but I also feel, given the small cost of the CT scan in relation to just what one year of medication will cost, that it should be considered a 'basic' investigation" (Marc, PDE, PL1 - 561).

3. *Link to Practice (PLP)* means to explicitly refer to the RFP's clinical practice and/or to the discussion of any of the cases included in the AD Program (e.g. Mr. Singh's case)**.** Therefore, the pronoun "I" or "we" is usually the subject of the sentence. This implies making the link between clinical cases presented in the AD Program and the participants' clinical practice. For example, Mathew reflected on the applicability of the guidelines for selecting basic tests for screening AD, and stated: "But like Dr Luc, I tend to look broadly for problems in patients …B12, LFT's, etc…special patients often get special investigations and treatment…" (Mathew, PLP, PL 1 - 612). Statements coded in the category *Link to Practice* imply the following cognitive processes: demonstration, application by providing a context, synthesis so as "to develop a course of action" (Donald, 2002, p.64), and executing or implementing (Anderson et al. 2001). It also implies the use of procedural knowledge defined as" knowledge of skills, algorithms, techniques and methods that are subject specific or discipline specific" (Anderson, et al. 2001, p. 53).

4. *Illustrate a New Idea with an Example (PIE)* is a category that covers new ideas that contribute to the discussion by triggering more comments from the group. A new idea could be of two types: (a) an idea that had been covered by the AD Program but had not been discussed in the Plenary (e.g. Folstein test), and (b) an idea that had not been included in the AD Program, for example:

> Just a few things to add to what's been said. I would spend some time assessing how the kids are coping with the situation. This in itself would be valuable in order to evaluate whether they themselves need targeted help… (Luc, PIE, PL 3 - 618).

The PIE category differs from the *Elaboration to Justify Disagreement* category because it does not imply disagreeing with the current discussion. In Donald's taxonomy, the PIE category is included in Representation, which implies: "illustrate elements and relations" (Donald, 2002, p.27) by making the parts clear by means of examples, and illustrating the connection between things.

5. *Knowledge Assessment (PKA)* implies that participants identified gaps, doubts, or lack of experience on a topic by articulating them during the discussion. These dilemmas are usually triggered by the complexity of ill-defined problems, such as diagnosing AD. Knowledge assessment is embedded in the principle of adaptation/accommodation, which implies: (a) arguing constructively with oneself and others; (b) self-questioning about the nature of prior-knowledge; and (c) self-reporting of learning where participants clearly express what they have learned from the AD Program, and show the coherence of their current understanding. For example:

> The course has made me more aware of Lewy Body and Frontal Lobe; whereas before I would have lumped them all as Alzheimer's. Now, I don't put the Frontal Lobe on cholinesterase inhibitors" (Ronald, PKA, PL 2 - 570).

6. *Identified Barriers to Practice (PIB)* means that physicians reflected on their practice or on clinical practice in general and identified barriers that directly or indirectly influenced the effectiveness and efficiency in achieving a patient's health outcome. This category is related to the principles of argumentation and articulation. Two types of barriers emerged from the Plenary discussions**:**

6.1 *Structural Barriers (PIBS)* originated from the structure of the Health system. Here the physician did not have any power of decision for changing or abolishing those structural barriers. In solving ill-defined problems, Jonassen (1997) suggests analyzing the context with all the involved stakeholders who could influence the solution of such problems. For example, when reflecting on Mrs. Robinson, who is a 'worn out' caregiver of an AD patient, George argued:

> "…Easy to say, very hard to do in an obsolete Canadian Health-Care System that is not geared up for this type of case. Yes, the health-care 'system' has let this patient down," (PIBS, PL 3 - 596).

6.2 *Controversial Issues (PIBC)* are barriers in relation to the problem-solving and decision making of grey areas typically found in ill-defined clinical cases or problems where medical insight and judgment are required. The co-morbid conditions (e.g. hypertension, diabetes) were considered barriers because they increased the complexity of the AD diagnosis, treatment, and management. For example, George reflected on the controversial issue of requiring a CT scan for the screening of AD and stated:

> As for CT scans in early Alzheimer's, I think there is the issue of whether or not to do a CT on Mr. Singh. I think it is a fair question for us…whether we should do a CT scan on 'everyone' whom we suspect as having Alzheimer's disease. (George, PIBC, PL 1 - 553).

7. *Predicting (PP)* includes predicting the outcomes of events on the basis of current understanding. In Donald's taxonomy, this category corresponds to Inference and the subtopic of Hypothesizing which means to "suppose or form a proposition as a basis for reasoning" (2002, p. 27). For example, Diana stated:

> "It will certainly be a major change in our practices if the 3 cholinesterase inhibitors become the most prescribed drugs as the baby boomers age proactively in the next few years!" (Diana, PP, PL 1 - 554).

8. *Questioning (PQ)* includes three types of questions located at the beginning, middle, or end of a message. When coding on-task statements at the level of connectivity, initiation of a discussion is an important step. Ingram and Hathorn's (2004) framework includes *initial statements* but it does not make the distinction between a question and a sentence. For the learning process, the development of on-task questions about the learned material implies a variety of cognitive processes such as articulation, accessing prior knowledge, identifying critical relations, as well as taking the risk of asking an irrelevant or weak question. In the Plenaries, questions were usually addressed to the facilitator or to the group as a whole. Three types of questions emerged from the data as follows:

8.1 *Focused Question (PFQ)* is a question raised by one of the group and directly related to the discussion. Each Plenary was focused on a specific topic. Plenary 1 was focused on diagnosis, Plenary 2 on treatment, and Plenary 3 on management. For example: "I agree that the 'pick-up' for CTs is low, but how low in a 'community setting' to make it worthwhile?" (George, PFQ, PL1 - 553).

8.2 *Out-of-focus Question (POFQ)* is a question focused on the scenario of AD but introduces a topic different from the one specified in the Plenary. For example, asking a question about treatment when Plenary 1 was focused on diagnosis:

> Given the horrendous nature of AD, is there any evidence that early administration of CI inhibitors for MCI has any potential to decrease the risk of full-blown AD?" (Luc, POFQ, PL1 - 540).

8.3 *Focused Question to Facilitator Not Answered (PFQN)* includes questions posed by the participants to the facilitator which were not answered. For exploring the dynamics of the discussion, it was important to identify those questions posed by the participant to the facilitator or to the group that were not answered. For example: "Could Dr W comment on 'mixed dementia' management for someone who has been diagnosed with AD, but then also found to have vascular insults at a later time?" (Norma, PFQN, PL 1 - 551).

Appendix W: Rating of the Effectiveness of 20 Features of the AD Program

RFP	**Rw**	**Li**	**Pr**	**Po**	**1P**	**In**	**Dp**	**Dx**	**Tx**	**Mg**	**Ed**	**De**	**Wr**	**Wt**	**Lg**	**Pl**	**Ps**	**Tc**	**Fc**	Qz	M
Ml	4	n/a	4	3	4	3	1	5	4	4	4.8	1.5	5	1	1	4	1	n/a	2.5	4	3.09
Mt	4	4	2	3	2	3	1	5	3	4	4.2	3.5	3	2	3	4	1	3	2.5	5	3.06
Gg	4	3	5	5	3	3	4	5	5	4	5	4.5	3	3	3	3	4	2	3.7	5	3.86
Dn	4	2	2	2	3	2	3	4	3	4	4.2	3.5	2	3	3	2	3	n/a	1.8	4	2.93
Lc	4	2	3	4	4	2	2	3	3	4	4.6	4	3	3	2	3	2	3	1.2	4	2.99
Mk	3	2	2	3	3	3	2	3	2	3	3.6	2	3	1	2	4	1	3	3	3	2.55
Rd	4	2	3	5	5	2	1	5	3	4	3.8	3.5	3	1	2	4	2	2.5	4	4	3.13
Nr	5	4	3	2	3	4	3	4	4	4	5	4	4	2	3	4	2	4	3	4	3.57
GM	4	2.71	3	3.38	3.38	2.75	2.13	4.25	3.38	3.88	4.4	3.31	3.25	2.00	2.38	3.50	2	3.00	2.71	4.13	3.15

Note. Rw = review past modules; Li = Case-Library; Pr = Pre-test; Po = Post-test; 1P = 1Month-Post test; In = Introduction that covered Modules 1-3; Dp = Module 4 focused on diagnosis and Paired activities; Dx = Module 5 focused on diagnosis; Tx = Module 6 focused on treatment; Mg = Module 7 focused on management; Ed = educator; De = Overall design of the AD Program; Wr = Module 8 focused on Web resources; Wt = WebCT; Lg: Log; Pl: Plenary activities; Ps = Paired activities; Tc = Technological support questionnaire; Fc = facilitator; Qz = Practice Treatment quiz; M = mean; GM = Group mean; RFP = Rural family physician; Ml = Marcela; Mt = Mathew; Gg = George; Dn = Diana; Lc = Luc; Mk = Mark; Rd = Ronald; Nr = Norma.

5-point Likert scale (1 not at all effective; 5 extremely effective).

Appendix X: Plenary 1: Participation Organized by Sequential Threads

Plenary characteristics				Number of Messages				Number of statements				
Participants	Main Topic's Thread	Message ID Number	Date	To F	To individual in group	To entire group	Total	To F	To individual in group	To entire group	Subtotal	Total
Thread 1	MCI TX											
Luc		540	9/4/03	1			1	4			4	
F		548	9/9/03		1		1		9		9	
Diana		554	9/14/03	1			1	2			2	
Mathew		612	10/22/03			1	1			6	6	
Subtotal							4	6	9	6	21	21
Thread 2	DX											
Educ		541	9/5/03			1	1			1	1	
Marcela		549	9/11/03			1	1			7	7	
Ronald		550	9/12/03			1	1	7			7	
Norma		551	9/12/03			1	1	1	1		2	
F		582	9/21/03		1		1		4		4	
Mathew		613	10/21/03			1	1	1		1	2	
Subtotal							6	9	5	9	23	23
Thread 3	CT scans											
George		553	09/13/03			1	1			7	7	
Diana		555	09/14/03		1		1		1	2	3	
George		556	09/14/03			1	1			4	4	
Mark		561	09/15/03			1	1	1		7	8	
Marcela		569	09/16/03			1	1			2	2	
Mathew		614	10/22/03		1		1		1	1	2	
F		598	10/08/03		1		1		1	3	4	
F		597	10/08/03			1	1			5	5	
Ronald		600	10/08/03			1	1			2	2	
George		629	11/05/03			1	1			1	1	
Marcela		631	11/06/03			1	1			4	4	
George		632	11/07/03			1	1		1	2	3	
Norma		633	11/07/03		1		1		1	2	3	
Subtotal							13	1	5	42	48	48
Mathew	Depression Dementia	616	10/24/03			1	1			3	3	3
Total				2	6	16	24	16	19	60		95

Note. #M = identification number of the message in threaded discussion in WebCT; Date = Month, day, year; F = facilitator; Educ = Educator; MCI = Mild cognitive impairment

Appendix X: Plenary 1: Participation Organized by Sequential Threads (continuation)

Table X.2

Plenary 1: Synthesis of Level of Participation

RFP	Number messages				Number of statements			
	To Fac	To IG	To EG	Total	To Fac	To IG	To EG	Total
Geor			4	4			15	15
Marcel			3	3			13	13
Math		1	2	3	1	1	8	10
Diana	1	1		2	1	2	2	5
Ron	1		1	2	7		2	9
Norma	1	1		2	2	1	2	5
Luc			1	1	4			4
Mark			1	1	1		7	8
Subtot	3	3	12	18 75%	16	4	49	69 72%
Facilit		3	1	4		14	8	22
Educ			2	2			4	4
Subtotal				6 25%			12	26 28%
Total	3 13%	6 25%	15 63%	24	16 17%	18 19%	61 64%	95

Note: To Fac = to facilitator; To IG = to individual in the group; To EG = to entire group
Geor = George; Marcel = Marcela; Ron = Ronald

Second Level of Interaction in Plenary 1

Once on-task messages were coded at the level of Participation, they were analyzed at the level of Level of Interaction that included the categories of Connectivity and Quality of Interaction. Table X.2 presents the results of this analysis where each on-task scenario statement was coded twice: (a) in the category of Connection to Previous Messages, and (b) in the category of Quality of Interaction.

Table X.2

Plenary 1: Level of Interaction: Connectivity and Quality of Interaction

Connection to Previous Messages						Quality of Interaction					
Threads	*INS*	*IS*	*DC*	*DR*	*Total*	*B*	*A+*	*A+Ref*	*SA*	*Total Quality*	*Total codes*
1	1	0	15	3	19	2	14	2	3	21	42
2	1	0	15	3	19	2	17	0	3	22	43
3	2	0	40	9	51	0	34	1	9	44	91
Total	4	0	70	15	89	4	65	3	15	87	176
%			79	17		5	75	3	17	100%	

Note. INS: initial statement; IS: independent statement; DC: direct comment**;** DR: direct response; Blank: not applicable; A+ = add information; A+ Ref = add information with a reference; SA = simple agreement

In the category Connectivity to previous messages, the majority of statements (79%) were coded as *direct comments*, which indicates that participants added new information or insights directly related to the prior discussion. Only 17% of statements were coded as a *direct response* which means that participants added a comment or answered questions that required little insight, such as agreeing with statements without giving reasons. The absence of *independent* statements indicated that all the discussion focused on those topics covered by the AD Program (i.e., dx, tx of AD).

With regards to the category Quality of Interaction, Table X.2 shows a high level of quality because 78 % of the statements (adding up A+ and A+Ref) contributed to the discussion by adding relevant information to the discussion. Only 17% of statements were coded as *simple agreement*.

Appendix Y: Plenary 2: Participation Organized by Sequential Threads

Table Y.1
Participation Organized by Sequential Threads

RFP	#M	Date	Number messages				Number of statements			
			To F	To individual in group	To entire group	Total	To F	To individual in group	To entire group	Total
Thread 1										
George	557	09/15/03			1	1			5	5
Educator	559	09/15/03		1		1		1		1
Diana	593	09/30/03		1		1		1		1
Ronald	601	10/8/03		1		1		1		1
Mathew	636	11/10/03			1	1			1	1
Subtotal						5				9
Thread 2										
Educator	558	09/15/03			1	1			1	1
George	560	09/15/03			1	1			11	11
Ronald	570	09/18/03			1	1		1	6	7
Diana	594	09/30/03			1	1			2	2
Luc	572	09/20/03	1			1	1		4	5
Facilitator	581	09/21/03			1	1			4	4
Facilitator	583	09/21/03		1		1		3		3
Luc	584	09/21/03	1			1	3			3
Facilitator	585	09/22/03		1		1		3		3
Subtotal						9				39
Grand total						14				48

Note. #M = identification message in threaded discussion in WebCT. Date = Month, day, year

Table Y.2
Plenary 2: Synthesis of Level of Participation

RFP	Number messages				Number of statements			
	To F	To individual in group	To entire group	Total	To F	To individual in group	To entire group	Total
George			2	2			16	16
Diana		1	1	2		1	2	3
Ronald		1	1	2		2	6	8
Mathew			1	1			1	1
Luc	2			2	4		4	8
Subtotal	2	2	5	9	4	3	29	36
				64%				75%
Educator		1	1	2		1	1	2
Facilitator		2	1	3		6	4	10
Subtotal		3	2	5		7	5	12
				36%				25%
Grand total	2	5	7	14	4	10	34	48

Second Level of Interaction in Plenary 2

Once messages were coded at the level of Participation, on-task messages focusing on AD were analyzed at the level of Interaction. In Table Y.3, each on-task statement was coded twice in the categories of Connection to Previous Messages, and Quality of Interaction**.**

Table Y.3

Plenary 2: Quality of Interaction: Patterns of Discussion

Connections to Previous Messages						Quality of Interaction				
Threads	INS	IS	DC	DR	Total Conn.	B	A+	A+ Ref	SA	Total Interaction
1	1	0	5	1	7	0	3	2	2	7
2	1	0	30	3	34		32	0	2	34
Total	2	0	35	4	41		35	2	4	41
%			85	15			85	5	10	

Note. INS = initial statement is counted; IS = independent statement; DC = direct comment; DR = direct response. Blank = not applicable; A+ = add information; A+ Ref = add information with a reference; SA = simple agreement

Table Y.3 shows that in the category Connection to Previous Messages, the majority of statements (85%) were coded as *direct comments*, which indicates that participants added new information or insights directly related to the prior discussion. Only 15% of statements were coded as a *direct response* which means that participants added a comment or answered questions that required little insight. The absence of *independent* statements indicates that the discussion was focused on the scenario (i.e. mostly on AD tx).

In looking at the category of Quality of Interaction, table Y.3 illustrates the high quality of discussion as evidenced by the fact that 90% of statements (A+ and A+Ref) contributed to and lead to further discussion by adding relevant information, some of which (5%) was supported by evidence-based studies. Only 10% of statements were coded as a *simple agreement*. This implies that participants briefly agreed or disagreed with the information previously presented, and did not attempt to take the interaction further.

Appendix Z: Plenary 3: Participation Organized by Sequential Threads

Table Z.1 indicates that participation in Plenary 3 is organized chronologically by one thread, and the frequency and sequence of on-task messages and statements.

Table Z.1

Participation Organized by Sequential Thread

RFP	#M	Date	Number messages				Number of statements			
			To F	To IG	To EG	Total	To F	TO IG	To EG	Total
Thread 1										
Educator	553	09/13/03			1	1			1	1
Diana	595	09/06/03			1	1			5	5
George	596	09/07/03			1	1			11	11
Ronald	599	10/08/03			1	1			7	7
Norma	603	10/18/03			1	1			9	9
Luc	618	10/27/03			1	1			10	10
Marcela	619	10/07/03			1	1			4	4
Mark	638	10/07/03			1	1			6	6
Mathew	642	11/12/03			1	1			4	4
Facilitator	620	11/28/03			1	1		1	4	5
Total						**10**				**62**

Note. #M = identification message in threaded discussion in WebCT; Date = month, day, year. F = facilitator; IG = to the individual in the group; EG = to the entire group.

Second Level of Patterns of Discussion in Plenary 3

Once messages were coded at the level of Participation, the on-task messages focusing on AD (excluding social statements) were analyzed at the level of Patterns of Discussion. In Table Z.2, each on-task scenario statement was coded twice: in the category of Connection to Previous Messages, and in the category of Quality of Interaction.

Table Z.2

Plenary 3 Quality of Interaction: Patterns of Discussion

Connection to Previous messages						Quality of Interaction				
Thread 1	INS	IS	DC	DR	Total Con.	B	A+	A+ Ref	SA	Total Quality
Total	0	0	44	14	**58**	0	38	1	19	**58**
%			75	25			66		33	

Note. Social statements were excluded from this table.

INS = initial statement is counted; IS = independent statement; DC = direct comment; DR = direct response; Con = Connectivity; Blank = not applicable; A+ = add information; A+ Ref = add information with a reference; SA = simple agreement

In the category Connection to Previous Messages, 75% of statements were coded as *direct comments*, which indicate that participants added new information or insights directly related to the prior discussion. Twenty-five per cent of statements were coded as a *direct response*, meaning that participants added a comment or answered questions that required little insight (i.e. agreeing with previous statements without giving reasons). The absence of *independent* statements indicates that all the discussion was focused on the management of AD.

As for the category of Quality of Interaction, Table Z.2 shows that 67% (adding up A+ A+ Ref) of the statements added relevant information which contributed to and lead the discussion further. Thirty-three percent of statements were coded as *simple agreement*. This implies that participants briefly agreed or disagreed with the information previously presented, and did not attempt to take the interaction further.

Appendix Z-a: Frequency of Statements Selected by RFPs in the Barometer

Statement	*AC*	*NE*	*MC*	*DS*	*PC*	*Total Frequencies*
Measures						
PRE-TEST						
Dx	2	2	4			
Tx		2	5	1		
Mg		1	6	1		
Subtotal	2	5	15	2		24
POST-TEST						
Dx	4		1	1	2	
Tx	2		2	1	3	
Mg	1	1	3	1	2	
Subtotal	7	1	6	3	7	24
1MONTH-POST						
Dx	6		1		1	
Tx	5		2		1	
Mg	5	1	1		1	
Subtotal	16	1	4		3	24
Total frequencies	25	7	25	5	10	72
%	35	10	35	7	14	100

Note: N = 8. In the Barometer, each participant selected a stage that best described current AD practice in the areas of diagnosis (Dx), treatment (Tx), and management (Mg) respectively. AC = The way I diagnose AD is acceptable to me. NE = I need to examine how I diagnose AD to verify its appropriateness. MC = I might change some aspects of my diagnostic practices for AD. DS = I am dissatisfied with the way I diagnose AD. PC = I plan to change the way I diagnose.