

**CANADIAN FAMILY MEDICINE RESIDENTS' CLINICAL  
TRAINING IN DIABETES MELLITUS**

By:

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A Thesis submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfilment of the requirements of the degree of

**MASTER OF SCIENCE**

Department of Community Health Science

University of Manitoba

Winnipeg

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## **Abstract**

### **Problem**

The College of Family Physicians of Canada (CFPC) has identified diabetes as one of the top five priority topics for assessment of competence in residency training, and has established evaluation objectives to clearly describe the domain of competence that should be tested for managing diabetes. Unfortunately, little is known as to whether Canadian Family Medicine Residency programs are providing adequate training to residents in managing diabetes.

### **Methods**

A multi-method self reported survey approach (paper and electronic) was utilized for this study to determine the level of diabetes experience received by graduating family medicine residents in Canada. Eleven Family Medicine departments provided permission to survey graduating residents (5 in Western Canada and 6 in Eastern Canada). All subjects were surveyed using the electronic questionnaire, and residents in Western Canada received an intensified survey approach using both electronic and paper methods.

### **Results**

The final response rate was 30.56% (n=136). Residents within the intensified survey approach had a significantly higher response rate ( $\chi^2=30.108$ ; 1 df;  $p<.001$ ) than residents who only received the electronic survey method.

Results demonstrated that residents did not receive adequate training in the areas of diabetes management cited within the CFPC evaluation objectives. Training was considered most adequate in diagnosing of diabetes, however results showed that 94% of respondents had little to no experience in diagnosing Type 1 diabetes. Training in

diabetes medications noted that 74% of respondents had little to no experience in initiating insulin, and routines that were initiated were representative of traditional approaches (sliding scales and BID routines). Residents noted that training in initiating oral anti-hyperglycemic agents was adequate in only 40% of respondents, with exposure occurring only within first line therapies. Finally, clinical experience in managing acute diabetes complications was low for hypoglycemia (68.7% of respondents), DKA (64.2% of respondents), and HHNS (88.0% of respondents).

### **Conclusions**

Residency programs need to improve diabetes training to ensure that residents receive the key features identified by the CFPC as essential for competent management of diabetes in clinical situations.

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## INTRODUCTION TO THE PROBLEM

Family physicians are faced with the task of being the gatekeeper for management of a large number of clinical conditions. Postgraduate residency training programs in family medicine are responsible for ensuring that residents, upon graduation, are well trained and clinically competent to assume this gate-keeping responsibility. This is especially true in the management of conditions that are common clinical issues in family practice caseloads.

Diabetes mellitus is a common chronic condition that continues to increase in prevalence in Canada and worldwide. Health Canada in its document Diabetes in Canada reports a 4.8% prevalence of diabetes (physician diagnosed) in Canadian adults (1), which implies that approximately 1.5 million Canadians live with diabetes (2). It has been suggested however that this is a gross under-estimation and that the true prevalence rate (based on population based studies) may be greater than 7% (2). The overall prevalence of diabetes in Canada continues to increase over time due to demographic trends of an aging population, the surging growth rate of the Canadian Aboriginal population (3% annually) (3), and the ongoing immigration of populations at high risk for developing diabetes (4). By 2010, it is estimated that Canada will have 3 million individuals diagnosed and living with diabetes.

Based on these statistics, managing diabetes is a significant burden on the health care system, both in terms of economic costs and human resource requirements. In 1998, it was suggested that the financial impacts of diabetes in Canada was approximately US \$4.76 to 5.23 billion (4, 5). A recent publication by Ohinmaa et al has projected that the

overall health care costs for diabetes in Canada will rise to greater than \$8 billion by the year 2016 (6).

The impact on health care human resources from diabetes is equally significant. The workload on family physicians is directly impacted by the growing burden that diabetes places on the healthcare system. Diabetes is the seventh most frequent reason for visits to family physicians (7), and these visits to family physicians account for 80% of all office visits for diabetes (8). The reduction to the fasting blood sugar diagnosing criteria for diabetes that occurred within the 1998 Clinical Practice Guidelines (2) has increased the prevalence of diabetes by about one third, and family physicians workload correspondingly (9).

Many family physicians consider diabetes more difficult to treat compared to other conditions such as angina, hypertension, arthritis, and hyperlipidemia (8). In particular, the literature suggests that diabetes medications are hard to regulate, and the condition is more labor intensive to manage than other conditions due to its constant fluctuation in glycemic control and its complications and comorbidities (8).

The recently released Diabetes in Canada Evaluation (D.I.C.E.) study evaluated the management and control of Type 2 diabetes in Canada by family physicians. A random sample of 3,000 family physicians were approached, and a final sample of 300 primary care physicians were included in this study. Each physician was responsible for recording information on the first 10 patients with diabetes that visited their offices. It was found that one in two patients with type 2 diabetes was poorly controlled according to target guidelines in the Clinical Practice Guidelines. The longer that individual's lived with diabetes, the more likely they were to be poorly controlled. Further assessment of

associated diabetes conditions showed that 63% had hypertension, 59% had dyslipidemia, 28% had one or more macrovascular condition, and 38% had one or more microvascular condition. The DICE study highlights the burden of diabetes on the family physician, suggesting that this complex disease is challenging to manage independently, and therefore requires a multidisciplinary approach to care (10, 11).

In addition to the clinical challenges highlighted, many studies have documented the shortcomings in physicians behaviors regarding adherence to implementation of the diabetes clinical practice guidelines and level of intensity of treatment implemented (12, 13, 7, 14, 8). This may be a result of workload demands and/or how challenging diabetes is medically to manage, combined with concerns that many of the diabetes clinical guidelines are based on low grade evidence and expert professional opinion (15).

A recent publication from the Manitoba Diabetes Care Project Executive Committee highlights that the diabetes clinical practice guidelines had a negligible impact on changing physician behavior (16). Within the scope of this project, a physician friendly desk format of the diabetes clinical practice guidelines was created and distributed to over 1200 family physicians in Manitoba. The purpose was to provide “easy access to information about testing strategies, targets and frequency of monitoring for glycemic control and complications”. Results showed that, within the sample of approximately 63,000 patients, hemoglobin A1C testing (a three month average blood sugar test) fell well below the recommended level of four times per year in the clinical practice guidelines (4). Only 10% of individuals within this study were tested as per the recommended frequency. In addition, over one third of the population with diabetes in this study did not receive a single hemoglobin A1C test over the year studied. These

findings suggest that physicians are not following guidelines related to monitoring of glycemic control, and as a result have reduced clinical data to facilitate interventions to reduce the incidence of diabetes related complications.

### **STATEMENT OF THE PROBLEM**

Based on the number of skills and conditions needed to be evaluated within residency training, it is not surprising that some skills and the managing of certain conditions go un-assessed in this process. However, it is surprising that little is known as to whether Canadian Family Medicine Residency programs are providing adequate clinical experience in diabetes management to prepare residents for professional practice. This is especially true considering the workload and challenges that diabetes places on the profession and that diabetes is one of the more common conditions seen by family physicians.

Diabetes mellitus, similar to most health problems, is first addressed in the primary care setting (15), and it is apparent through the literature that the management of diabetes by family physicians is both clinically challenging and labour intensive. Family medicine residency programs are responsible for providing training to ensure the development of residents into skilled clinicians (one of the four core Principles of Family Medicine) (17). Although ongoing evaluation occurs throughout training rotations via formative processes (18), little is documented about individual residents' management of individual medical conditions, unless specifically noted as a learning objective. As noted by Wendling (2004), "Unfortunately, most clinical evaluations are still based on end-of-rotation summary recollections of presentations, notes, and discussions, rather than on contemporaneously observed assessment of clinical abilities" (19). As a result,

evaluation focuses on the broad principles of family medicine rather than specifics (17). Summative evaluations are conducted at the end of an experience or residency training to determine whether a defined standard has been met in a certain rotation or overall for graduation (18). Overall, “the prevailing opinion remains that rotation evaluations are skewed, subjective, unreliable, and of questionable usefulness” (20).

In March 2006, the College of Family Physicians of Canada (CFPC) released a document that identified diabetes as one of the top ten priority topics (#5) for assessment of competence in residency training (21). Through a national survey of practicing family physicians, data was gathered identifying priority topics in Family Medicine from a pre-determined list of 100 topics, and results were finalized using focus groups on other family physicians. These results are felt to be valid based on the use of practicing physicians who base their responses on their understanding of real life issues in Family Medicine. Overall, this research reinforces the importance of diabetes management experience within residency program training to ensure that graduates are ready for independent practice.

There have been no studies published that have looked specifically at the level of experience provided in managing diabetes mellitus within the residency training process. In general, most studies that assessed teaching and learning experiences in residency programs were based on single programs, and focused globally on the entire scope of clinical responsibilities.

### **PURPOSE OF THE STUDY**

This study attempts to determine the level of experience obtained in managing diabetes mellitus by all graduating family medicine residents in Canada. The ultimate

purpose is to provide perspective on the volume and adequacy of diabetes experience from the “users” of the residency programs and the training structure provided. A secondary purpose of the study is to assess and compare the effectiveness of multiple survey approaches on response rates by Family Medicine Residents.

### **RESEARCH QUESTIONS**

#### **Primary Questions:**

- 1.) What volume of clinical experience have family medicine residents received within residency training on core diabetes management skills? (eg: diagnosing different types of diabetes, initiation of insulin and oral agents and dose adjustment, foot assessment, management of acute complication risk and obesity counseling).
- 2.) What aspects of the Family Medicine training environment impact the volume of diabetes experience obtained?
- 3.) What level of didactic (classroom) experience have family medicine residents received within the same core diabetes management skills?
- 4.) How difficult do graduating family medicine residents feel diabetes (Type 1 and 2) is to manage clinically and what is their perceived confidence level, relative to their confidence level of other common medical conditions.
- 5.) What are the priority training issues that residents identify for managing diabetes, and is the overall training experience in diabetes adequate to provide perceived competence in managing diabetes upon graduation?

#### **Secondary Question:**

6.) Does the survey method chosen (paper versus electronic survey) affect the response rates of Family Medicine Residents?

### LITERATURE REVIEW

No similar studies were found in the literature review related to quantifying diabetes experience in medical school or residency training. Therefore, a review of the literature was conducted to assess the adequacy of clinical training and experience (generally) of medical students and medical residents. Although this study is in relation to residency program training, it is necessary to consider issues within medical school training to fully appreciate the complexity of the problem. All variables documented in the literature that impacted training or experience were considered for appropriateness in relation to this study. In addition, a further review was conducted around assessment of competence and confidence in medical training, and the level of experience that is defined in the literature as adequate for developing competence in clinical skills.

Many studies in the literature note deficiencies in medical school and residency training regarding exposure to common problems and technical procedures (22, 23, 24). This is highlighted well in the following quote from Jolly and MacDonald (1989):

“Attention has been drawn to poor coordination of training phases and the failure of undergraduate and residency experiences to equip doctors with a range of skills and sensitivities” (24).

It has been further documented that medical residents may graduate without being observed by a faculty member while performing such fundamental skills as performing a patient history and physical examination (25). As such, researchers have questioned the quality of the medical students and residents that are graduated, considering the concerns regarding the comprehensiveness of clinical training provided (24, 25, 26, 27).

A thematic review of 101 studies of teaching and learning in ambulatory care settings suggested that clinical experience is characterized by “variability, unpredictability, immediacy, and lack of continuity” (28). This review of 97 journal articles and 4 unpublished doctoral dissertations were predominantly from single programs and descriptive in nature. These studies were across departments of family medicine, internal medicine, pediatrics and other settings in medical training. Results from this review (which primarily used student log reports) noted a large diversity in clinical problems seen, however only a few cases of any given medical problem were seen. It was also noted that students often failed to see many of the common medical problems. Students in community clinics and in private practice offices consistently saw more patients and a greater variety of medical problems than did students in residency based or University clinics.

#### *Factors Related To Training Experience*

The literature highlights several factors that are related to deficiencies in training and experience in medical schools and residency programs. First, it is difficult to ensure that all students receive a level of experience that represents an adequate breadth and depth of typical patient problems (25). This is due, in part, to the reliance on opportunistic clinical exposure and chance patient encounters to provide the necessary educational opportunities in various clinical conditions (22). This unstructured approach to clinical experience allows the potential for levels of experience to differ substantially from resident to resident (29, 30). The use of checklists or clinical logs has been shown to have potential value for increasing exposure in medicine to core training areas (28, 31). It is also highlighted as a key tool for in-training assessment of clinical performance by

learners and overall competency (32). As such, this is a potential variable to monitor within this study.

Second, the level of experience, as noted in the literature, is impacted by the training location. Studies have consistently shown that experiences are greater in community clinics compared to residency based academic clinics (28, 33). Within the scope of this study, this variable will be assessed in regards to urban versus rural differences in experience, and community versus teaching hospital settings.

Third, private practice experiences, which typically represents a fee for service model of physician billing, also offered a greater volume and diverse mixture of patient problems (28), compared to residency based academic clinics. Considering the variety of fee structures that primary preceptors' work under, this variable has the potential to impact the level of experience that residents receive in managing diabetes mellitus.

The individual characteristics of the primary preceptors are noted in the literature to have the potential to impact learning. Studies indicate that learners often endeavor to become the type of physician that they are observing or working with (34). This further becomes reflected within the care patterns for specific medical conditions (35), as these patterns learned in residency training often become incorporated into later practice.

The gender of the preceptor is also a potential influence, as their care patterns are role modeled to the Family Medicine resident. The Canadian Institute of Health Information (2004) notes that in Canada, Family Medicine physicians are approximately 63% male and 37% female (36). Studies have documented that female physicians more commonly provide preventative services to their patients (37, 38), yet others have not

shown this (15). Thus, the preceptor gender could impact the level of experience that residents' receive related to managing diabetes and its related complications.

The gender of the resident also has the potential to have an impact on the experience received in training, and overall confidence levels. A study by Brienza notes that rotation evaluations were found to show a gender bias whereby male residents received significantly better evaluations from male attending physicians than from female attending physicians in many of the domains. The same may also be true for female residents, in that there was a trend toward higher evaluation scores from female attending physicians in most of the domains, although this finding was not statistically significant (39). A further study indicates that program directors rate male trainee's higher in overall competence compared to female trainees (40). These articles suggest a potential for variable experiences and evaluations based on the gender of the resident. Therefore, the gender of the resident combined with the preceptor gender could have the potential to impact the residents' confidence level at graduation.

There was no documentation from the literature regarding the impact of variables such as age of the resident, or years of experience of the preceptor, in relation to quantity of experience obtained by students in medical schools or residency training programs.

### Competence and Confidence

It is important to note that experience in managing specific conditions does not necessarily lead to learning, competence or confidence. Competence is "more than just factual knowledge and the ability to solve problems with clear cut solutions; it is defined by the ability to manage ambiguous problems, to manage uncertainty, and make decisions with limited information" (41, 42). This is a developmental process, and complex to

assess. Residency training should provide students with the opportunity to “synthesize knowledge and skills acquired in previous years into clinical competence”, which helps lead to increased clinical confidence (33).

Some literature has suggested that confidence in management of specific conditions is often far greater than the actual clinical experience and competence that medical students and/or residents have in managing the condition (31). A study of internal medicine residents emphasizes this point; it found that most residents felt they did not need additional training related to diabetes, although clinical performance via chart reviews were consistently below clinical practice standards (35). Other studies have suggested a link between inadequate practical experience and lower confidence levels (33). Based on this information, it is important within the context of this study to attempt to assess both experience and confidence in managing diabetes related issues.

Overall, no literature is available that relates directly to the adequacy of diabetes training in family medicine residents in Canada or abroad. With the exception of procedural and emergency medicine skills, all literature reviewed focused on the general concept of training rather than specifics of certain conditions or skill sets (43, 44, 25). The majority of published studies are based on single programs or schools, and were typically descriptive in nature (28). This study will be valuable to gain perspective in identifying gaps in diabetes specific clinical experience within Canadian Family Medicine residency programs.

#### *Competency Based Assessment in Residency Training:*

Medical school training and post graduate residency training is moving rapidly towards use of competency based measures that are done in controlled representations of

professional medical practice (45). Competency based assessment processes are suggested to provide better accountability for quality and safety of physicians produced, and appear to provide better training outcomes relative to the old structure and process based educational system (46).

The initial movement towards competency based evaluation was through the establishment of the Canadian Medical Education Directions for Specialists (CanMEDS 2000) project. This project was established in 1993 to delineate a competency based framework for post graduate medical education to ensure that postgraduate training was “fully responsive to societal needs” (47). The creation of this initiative was through a working group within the Royal College of Physicians and Surgeons of Canada, and it has become a powerful national movement towards standardization of physician competence. Its overarching goal is to establish an organized framework for graduate medical education in Canada (48). A framework was established that identified seven key competencies:

1. Medical Expert
2. Communicator
3. Collaborator
4. Manager
5. Health Advocate
6. Scholar
7. Professional

As a result, all specialty residency programs (including family medicine) were directed to rewrite their core educational objectives in the CanMEDS format, with evaluations being based around the core competencies (48). Although all these competencies are important in the management of diabetes, several stand out as key competencies. As a family medicine specialist, the role of medical expert states the

physician must be able to demonstrate diagnostic and therapeutic skills for effective care. In addition, the role of manager emphasizes the need for physicians to be able to allocate finite health care resources, and utilize resources effectively to balance patient care.

In the United States, the process of assessing the outcomes of residency education falls under the Accreditation Council for Graduate Medical Education (ACGME). This organization began enforcing that all post graduate residents were evaluated around six core competencies, effective July 2002. These competencies were established in 1998 as:

1. Patient Care
2. Medical Knowledge
3. Practice Based Learning and Improvement
4. Interpersonal and Communication Skills
5. Professionalism
6. Systems-Based Practice

As a result of the implementation of this process (the “Outcome Project”), residency programs in the United States were required to define the specific knowledge, skills, and attitudes required and provide supporting educational experiences (49). The main criterion for having an evaluation item was that it was considered an important attitude, skill or knowledge that a medical resident should possess and which faculty should monitor (49). Management of diabetes would therefore fall into the competencies of patient care, medical knowledge, and system based practice (being responsive to system needs and practicing cost effective care).

There is no literature from the CanMED 2000 project nor the United States experience in using the “Outcome Project” that identifies or quantifies the volume of experience that is needed for competency in a clinical skill. In fact, the ACGME has deliberately not provided standards to reach these competencies, as it was preferred to allow standards to be set based on individual discretion of individual training programs

(49). Therefore, even the most recent competency based literature does not identify standards of experience needed for competency.

In March of 2006, the College of Family Physicians of Canada published a document highlighting the key features for evaluation of diabetes training in Family Medicine (50). They represent the elements that are considered essential for competent management of diabetes in a clinical situation. The following key features were highlighted in this document:

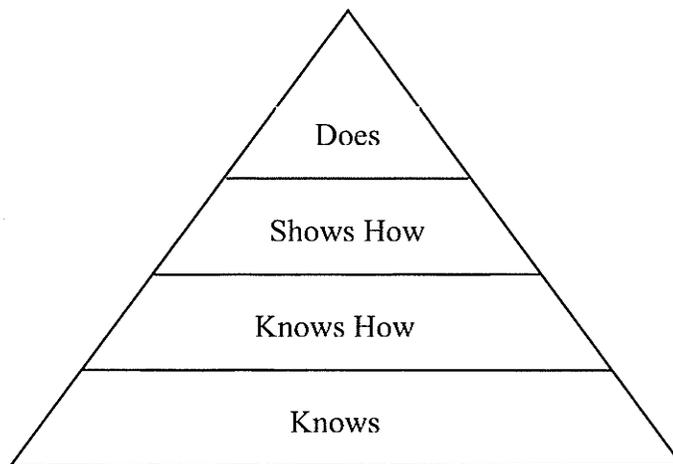
- Diagnosis of diabetes
- Treat and modify treatment according to disease status (insulin, oral diabetes medications, diet and exercise)
- Advise about and treat hypo and hyperglycemic states
- Educate effectively about self management
- Complication assessment
- DKA and HHNS diagnosis and treatment

These evaluation objectives are important markers to determine the overall adequacy of diabetes training across the Canadian Family Medicine residency system. They will be utilized throughout the course of this study as a benchmark of the important diabetes training areas, thereby allowing contrast of the study results against the standard set by the CFPC.

#### *What is Adequate Clinical Experience?*

The Miller Pyramid is a classification scheme within the scientific literature that is used to assess clinical competence in medical education settings (see figure #1). The four stages relate to the progression of knowledge into practice.

Figure #1: Miller's Pyramid for Clinical Competence



The "Know" and "Know How" stages are tested by multiple choice questions, simulation tests, and objective structured clinical examinations (OSCE's), and are seen through medical school training. The "Shows How" and "Does" stages are assessed by performance in normal practice settings and are typically seen in late medical school and post graduate residency training. This model suggests that any comprehensive assessment of clinical ability cannot be based on a single demonstration of expertise, but rather a gathering of different experiences over a period of time, and at minimum suggests that more than 2 clinical experiences should be obtained to reach the "does" stage of the pyramid (51, 52). As mentioned earlier, competence is a developmental process. Ensuring experience in clinical management of diabetes essentially standardizes the opportunity to synthesize the knowledge learnt through medical school and residency training with the skills practiced in clinical settings, thereby leading to clinical competence.

### Canadian Clinical Practice Guidelines

In Canada, the Canadian Diabetes Association 2003 Clinical Practice Guidelines document is the clinical reference to assist with evidence based decision making for managing diabetes mellitus (4). Due to the fact that there were no standardized objectives related to diabetes training in medical training at the initiation of this project, it was necessary to utilize the current diabetes clinical practice guidelines as a reference guide to establish the key areas of clinical practice to assess within the scope of this project.

The 2003 clinical practice guidelines are structured into topics under three broad categories of care, identified as management, complications, and diabetes in special populations. The management category provides guidelines related to the diagnosis of diabetes, use of diabetes medications (insulin and oral medications), monitoring of glycemic control, physical activity, nutrition, obesity, and management of hypoglycemia. The complications section provides evidence based guidelines on clinical assessment for complications and management of macrovascular complications, nephropathy, neuropathy, foot care, erectile dysfunction, and retinopathy. Finally, the section on diabetes in special populations provides guidelines on management of children with diabetes, diabetes in pregnancy, and diabetes in the Aboriginal population.

It was therefore determined that the development of the survey instrument as well as the presentation of results for this project should reflect the same structure and concepts within these categories in the clinical practice guidelines document.

### Methodological Issues of Surveying Physicians and Residents

Prior to initiation of this study, it was important to consider what barriers or issues might be present in obtaining data related to residency training in diabetes. A literature review was conducted related to survey approaches and response rate challenges in surveying residents and physicians in Canada.

There have been no published national surveys done (in Canada or abroad) regarding resident training in any specific clinical area including diabetes mellitus (28). Recently however, the 2004 National Physician Survey was conducted in Canada through a collaborative effort by The College of Family Physicians of Canada (CFPC), The Canadian Medical Association (CMA), and The Royal College of Physicians and Surgeons of Canada (RCPSC). As part of this process, second year medical residents were surveyed on issues such as future practice settings, financial concerns, plans to conduct procedures in practice, and intentions for involvement in professional activities. Some methodological issues arose with this process, in terms of access to residents for survey purposes. Due to confidentiality issues within medical schools across Canada, it was determined that permission would be necessary from each Family Medicine department to allow for the survey process to occur. As a result, a lengthy permission process occurred, and surveying occurred through distribution from the Family Medicine departments via an online survey. Second year family medicine residents were surveyed along with specialty medicine residents, with an overall response rate of 31.4%. The overall physician survey had an overall response rate of 35.9% from a sample of 59,389 physicians surveyed (53).

In 1999 and 2001, there was a further national survey of residents (1<sup>ST</sup> and 2<sup>nd</sup> year) that was conducted by the Section of Residents survey committee of the College of Family Physicians of Canada (CFPC). This process was a continuation as an annual initiative that began in 1995, in efforts to survey residents across Canada about their residency programs. The most recent surveys collected information on issues such as learning environment, choice of country for practice, and future practice profile (54). The 1999 survey was distributed by mail to approximately 1500 Family Medicine residents, with a response rate of 63.5% (55). In 2001, 1442 residents were surveyed by mail, with a response rate of 55%. Sample lists were generated from the CFPC database, which provided a streamlined approach to obtaining study subject contact information (56), and improved overall response rates.

Overall, the response rates from Canadian studies involving family medicine residents have been variable over time. The differentiating factor affecting response rates appears to be related to methodological differences in accessing the national sample of residents.

As such, the secondary analysis of this study will be to compare the survey approach used by the National Physician Survey with an alternative survey approach that intensifies distribution through electronic and paper medium simultaneously. There have been no studies published that have compared different survey methods and response rates for Family Medicine residents in Canada or abroad.

## **STUDY INITIATION PROCESS**

The project proposal was forwarded to the Health Research Ethics Board at the University of Manitoba for review on January 10, 2005. Final ethics approval was officially approved on February 24, 2005 (Appendix #1).

A proposal for grant funding was submitted on August 14, 2004 to the Manitoba Medical Service Foundation (MMSF). Funding for this project was successfully obtained through the MMSF as of December 20, 2004.

## **METHODS**

A multi-method self reported survey approach (paper and electronic) was utilized for this study, in an effort to determine the level of diabetes experience received by family medicine residents in Canada. There were several advantages noted to using a survey approach for data collection within this study. First, the rapid turnover in data collection allows for results to be disseminated quickly, thereby documenting what gaps exist in volume of experience for family medicine residents in Canada (57). Second, in order to assess diabetes experience near graduation from residency training, only a small window of time (6-8 weeks) was available for data collection each year, hence the process needed to be able to be expeditious. Third, the economy of the design of surveys was more cost effective than conducting in-person interviews or using observational techniques throughout residency programs across Canada (57).

Data collection was based on self administered questionnaires (as opposed to face-to-face interviews), which was felt to be the best ethical choice considering the potential sensitivity of collecting data that involve experience levels within a professional

occupation. This format also provided the protection of anonymity to the respondents, which is an important issue to consider in a preceptor / resident relationship.

### Study Population

The study population was all second year graduating residents in English Family Medicine programs in Canada in the spring of 2005. French Family Medicine residency programs were excluded from this process as validation of a French instrument was felt to be beyond the scope of this study. All Family Medicine residents in English programs in Canada were eligible to participate in the study (N=549, according to the Canadian Resident Match Service CaRMS, and assuming full match of resident to spots available), representing 12 family medicine departments (5 in Western Canada and 7 in Eastern Canada) (58). Many of these departments have multiple units, which provide both urban and rural training locations.

### Survey Development

The survey instrument was developed specifically for the purpose of this study, since there was no established questionnaire to utilize from previous research studies. The questions were developed based on key sections of the 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada (4). Within the Management section of the guidelines, survey questions were developed to identify experience in the diagnosis of diabetes, insulin therapy, pharmacological management of Type 2 diabetes, acute diabetes complications, and the management of obesity in diabetes. Within the Complication section, survey questions were developed on foot care issues, and use of flow-sheets for diabetes complication assessments. Finally, survey

questions were derived from the Diabetes in Special Populations section to assess experience in managing diabetes in the Aboriginal population.

In addition, questions were included in the survey instrument that assessed classroom training, confidence levels, difficulty in managing various clinical conditions, their perceived importance of training in various diabetes topics, and their perceived adequacy of training received in various diabetes topics.

#### Pre-testing of the Instrument

Upon receipt of ethics approval, the process was initiated to pretest the survey instrument for this study. A focus group was conducted on March 30, 2005 with four Community Medicine residents in order to validate the content of the survey as well as to ensure the proper format and functioning of this instrument. Utilization of Community Medicine residents was felt to be appropriate as they were accessible through the Department of Community Health Sciences at the University of Manitoba, and because they have completed their two year Family Medicine Residency, including the CCFP examination. Therefore they have received the same training specialization as the population under study, and as such, provided a solid panel of experts on the subject.

The average time of survey completion in the pre-test was approximately 13 minutes. It was felt to be reasonable in terms of completion time. Overall, the questions were considered appropriate, although many format or wording changes were suggested. Additional questions were requested on the Clinical Practice Guidelines that explored the extent that residents have read the guidelines and whether reading had altered their practice patterns in managing diabetes. It was suggested that condensing of the repetitive questioning on classroom training into a table format would be more functional. There

was consensus that this project topic was a worthwhile endeavor to explore for residency training, however it was thought to be important to ensure that the survey differentiates Type 1 from Type 2 in a clear manner. Finally, suggestions were made regarding presentation of the e-mail, survey envelope and cover letters. It was suggested that the initial subject line needs to be catchy for the email to draw curiosity. It was further suggested that all correspondence (mail, email, electronic survey) have the University of Manitoba Logo and Department of Family Medicine letterhead as this will provide credibility to the residents being surveyed.

### The Final Survey

One survey instrument was utilized within this study, which was administered in two distinct mediums, electronically and paper (Appendix #2). An electronic survey was designed specifically for this research project through the Survey Monkey electronic platform. The survey included the University of Manitoba logo, as suggested by the pre-test group. The paper survey had a full footer on each page with both the University of Manitoba Logo, as well as text denoting Faculty of Medicine, Department of Family Medicine. Final printing was done on a light blue 11 x 17 paper, with printing on both sides. This minimized the final paper survey to 8 pages, which appeared like a manageable survey length.

## **MEASURES**

Dependent Variables– Based on the diabetes clinical practice document, questions were established to obtain information on experience in areas of diabetes management that were felt to be an important attitude, skill or knowledge that a medical resident should possess upon graduation. The final survey instrument contained additional questions, however since they were

not used within the context of this project, they will not be discussed. The following dependent variables were analyzed within the context of this study, using the 3 broad subheadings of the clinical practice guidelines to categorize the topics:

**Management Section:**

1. Diagnosis of Diabetes - The physician must be able to demonstrate diagnostic and therapeutic skills for effective care. This is one of the fundamental criteria within the “medical expert” category for competency based assessment within the CanMed 2000 project (47). Responses related to experience in diagnosis was requested for Type 1, Type 2, gestational diabetes, and prediabetes.

The original survey requested responses related to experience in diagnosis to be categorized into one of five possible categories:

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

Based on the results obtained and the desire to dichotomize the variables for regression analysis, the data was transformed into two categories:

- Little to No Experience (2 times or less)
- Some to Lots of Experience (greater than 2 experiences)

This transformation process was carried out consistently in all dependent variables related to clinical experience within this study. It provided a clear comparison between groups, and highlights situations of more experience versus situations that lacked in experience. It also matches well with what was defined as adequate experience within the literature review, in that more than 2 experiences would be needed to achieve the “does” stage of the Miller pyramid concept.

2. Insulin Therapy – This variable was assessed to identify experience in using insulin as a therapeutic treatment in diabetes management. The amount of experience in initiating insulin, as well as adjusting of insulin dosages was queried. In addition, information was requested on the type of insulin routines used for initiating insulin.

The original data collection related to insulin experience was again within one of five possible categories (as noted in the diagnosis section), and later dichotomized into two categories. Data gathered on types of insulin routines was used strictly as descriptive information.

3. Oral Antihyperglycemic Agents – To further assess experience in the pharmacological management of diabetes, the survey respondents were asked about experience in starting oral diabetes medication routines, and to identify the types of agents that they had experience initiating.

The original data collection related to experience in initiating oral antihyperglycemic agents was again within one of five possible categories (as noted in the diagnosis section), and later dichotomized into two categories. Data gathered on types of oral medication initiated was used strictly as descriptive information.

4. Acute Complications – Primary care physicians must be aware of acute diabetes complications, as they can increase hospitalizations if not managed appropriately (59). The level of experience was requested in managing hypoglycaemic reactions, diabetic ketoacidosis (DKA), and hyperglycaemic hyperosmolar non-ketotic syndrome (HHNS). All data gathered on questions related to acute complications were originally within five categories and later dichotomized using the same two category experience scale noted above in other dependent variables.

5. Obesity and Diabetes – Obesity is the main modifiable risk factor for the prevention of Type 2 diabetes and its presence directly impacts glycemic control due to effects on insulin resistance (4). This variable was assessed through questions on experience in primary prevention of Type 2 diabetes by lifestyle counselling, and experience in management of obesity in diabetes through lifestyle counselling or use of anti-obesity drugs.

All data gathered on questions related to obesity were originally within five categories and later dichotomized using the same two category experience scale noted above in other dependent variables.

**Complications Section:**

6. Foot Care – Foot complications are a major reason for hospital admissions, accounting for approximately 20% of all diabetes related admissions (4). The level of foot care was assessed through questions on experience in conducting foot assessments, use of monofilaments for assessing peripheral neuropathy, and treatment of foot ulcers. All data gathered on questions related to foot care were originally within five categories and later dichotomized using the same two category experience scale noted above in other dependent variables.
7. Chronic Complications – Primary care physicians can expect to deal with patients with diabetes that are living longer and have more advanced stages and complications of the disease (60). Therefore, routine complication assessments are important in practice to help prevent or minimize the risk of development and/or progression of diabetes related complications. This variable was assessed through a question related to whether their training provided experience in using a structured diabetes checklist / flowsheet to assess

complication risk profiles. The original data was within two distinct categories (yes or no) and remained within this format for analysis.

**Special Populations:**

8. Diabetes in Aboriginal People – Type 2 diabetes and related complications are at epidemic levels among Aboriginal people in Canada (4). This variable was assessed through obtaining information on cultural and environmental issues of Aboriginal people. Questions were asked related to experience working in Aboriginal communities (to assess the environmental perspective) and their level of understanding of how Aboriginal people think or feel about having and living with diabetes (to assess cultural understanding / sensitivity).

Responses related to work within Aboriginal communities remained within its original dichotomous format (yes or no) and was later regressed. Responses related to the respondents level of understanding of how Aboriginal people think and feel about having diabetes was originally gathered using four distinct categories:

- No understanding
- Some understanding
- Good understanding
- Excellent understanding

Final results were transformed into a dichotomous variable of:

- No understanding
- Some to excellent understanding

**Additional Dependent Variables**

In addition to variables within the three broad subcategories of the clinical guidelines, the following dependent variables were also within the context of this study:

9. Clinical Practice Guidelines - In Canada, the Canadian Diabetes Association 2003

Clinical Practice Guidelines document is the clinical reference to assist with evidence based decision making for diabetes mellitus (4). To gauge the use of the clinical practice guidelines in residency training, questions were asked related to the extent that the guidelines have been read and the impact that reading has made on clinical practice patterns related to managing diabetes.

Responses related to the extent that respondents read the 2003 guidelines was originally gathered using four distinct categories:

- Have not read
- Skimmed over
- Read important sections only
- Read extensively

Final results were transformed into a dichotomous variable of:

- Not extensively
- Extensively

10. Classroom Training in Diabetes – To gauge experience, it is important to assess both the clinical experience and didactic teaching done within a residency training environment. Therefore, survey respondents were also asked to rate their classroom training in the categories of variables listed above (dependent variables 1-8).

Responses were gathered using a 4 point scale of:

- No training
- A little training
- A lot of training
- Enough training

The overall data within this category was not transformed and is used as descriptive data to complete the overall picture of experience related to the different diabetes specific skills.

11. Difficulty vs. Confidence – Respondents were asked how difficult diabetes was to manage successfully as well as how confident they felt in managing diabetes, relative to other common medical conditions such as congestive heart failure, arthritis, angina, hiatus hernia, hypertension, and hyperlipidemia. These were assessed through two separate questions, using a 7 pt scale, with 1 being “not at all difficult or confident” and 7 being “very difficult or confident”. No transformation of data occurred.  
  
Results of this question were used to create a graphed quadrant analysis. Based on all respondents (n=136), the percentage of responses that were six or seven on the scale were used to create a descriptive graph that compared their confidence in managing a condition with the reported difficulty in managing. This approach was chosen over using mean scores due to the small sample size of this project and its potential to skew overall mean results.
12. Importance vs. Overall Adequacy – Survey participants were also asked to rate the importance of training in the areas noted above (1-8) and their impression of overall adequacy of their training (clinical and classroom combined). These were also assessed through two separate questions, using a 7 pt scale with 1 being “not at all important or adequate” and 7 being “very important or adequate”. No transformation of data occurred.  
  
Results of this question were again used to create a graphed quadrant analysis. Based on all respondents (n=136), the percentage of responses that were six or seven on the scale were used to create a descriptive graph that compared their perceived importance of diabetes training topics with the reported adequacy of the training they received.

## Independent Variables

Questions were added to the survey instrument on independent variables through findings related to training that surfaced within the literature review. Although various scales were used within data collection of the independent variables, all variables were eventually dichotomized based on frequency of responses within categories. Decisions were made as to which variables to include in the regression model based on the frequency of significance of the independent variable in cross-tab results (univariate analysis) with dependent variables, and based on whether adequate cell sizes were present to ensure that confidence intervals were not compromised. This process is detailed in the results section of this document. Data were collected on the following independent variables:

1. Gender of Resident was assessed as a dichotomous variable and used only as a descriptive result upon final analysis. This variable was eliminated from the final multivariate analysis due to a tendency for small cell sizes in cross-tab analysis and its potential to result in unacceptably large confidence intervals.
2. Location of residency training was identified by University affiliation, and was only used as descriptive results overall. These results would not be appropriate for further multivariate analysis as much of the specific program details would be broken out from other independent variables, thus creating risk for multicollinearity issues. There is intention from the conclusion of this project to provide descriptive breakouts for each residency program (assuming there is an adequate number of responses to provide anonymity) of responses within their programs to provide perspective of the adequacy of their training.

3. Urban vs. rural training location was initially identified using a 3 point scale that included a “both” selection to accommodate respondents who may have trained in both urban and rural locations.

- Urban
- Rural
- Both

However, as a result of small response numbers in the “both” category, it was necessary to dichotomize to avoid small cell sizes and large confidence intervals upon inclusion in multivariate analysis. It was decided to combine the responses from “both” and “rural” to create a category of “some rural training”.

4. The type of hospital that the majority of training occurred within (teaching hospital vs. community hospital) was identified by the respondents. These results remained dichotomous for the purposes of multivariate analysis.
5. The presence or absence of an endocrinology elective during training was also identified by respondents, through a yes or no response. Unfortunately, this variable was also eliminated from the final multivariate analysis due to a tendency for small cell sizes in cross-tab analysis and its potential to result in unacceptably large confidence intervals.
6. Respondents identified whether an electronic medical record was used during their family medicine training, using a yes / no response. This variable remained dichotomized in its original form for use in multivariate analysis.
7. Residents were further asked whether a clinical log was used to track clinical experience within their residency training, using a 3 point scale. However, this variable was eliminated from further use in a regression model due to the lack of

significance found between this variable and all dependent variables upon cross-tab analysis.

8. The billing structure of their primary preceptor was requested, using a three point scale:
- Fee for service
  - Salaried academic physician
  - Salaried community based physician

Results were dichotomized into either fee for service or salaried for final multivariate analysis.

9. The gender of their primary preceptor was identified (male or female) and remained a dichotomous variable within the multivariate analysis.
10. Several questions were asked regarding the years of experience that the primary preceptor has worked as a family physician and has been training family medicine residents. Unfortunately, much of this data was responded to in a non-specific manner, suggesting that residents responded with a guess, rather than asking their preceptor directly. In addition, responses were often reported in ranges, with some being as non-specific as 1-30 years of experience. As a result, this information can only be used for descriptive purposes.

## **PROCEDURES**

### **Obtaining Permissions**

Sampling lists for the electronic survey were not directly available for this study due to Department of Family Medicine privacy issues. It was therefore necessary to attempt to obtain permission from each Department of Family Medicine identified for this study to allow survey distribution to their graduating family medicine residents of 2005.

Personalized letters were distributed by mail to the Post Graduate Directors (Appendix #3) of the 12 English based Family Medicine Departments, which included the letter of approval by the U of M Health Research Ethics Board. This was followed up by an email requesting an email response as to the necessary process for approval within their academic systems. The processes that were involved to obtain permission from each Department of Family Medicine were as follows:

1. University of British Columbia – Permission was provided to distribute to residents through the administrative assistants at the six training sites at UBC. No additional documentation or review process was requested.
2. University of Alberta – Initial response to the survey request indicated that submission to the U of A Ethics Board was necessary to obtain permission to distribute this study. Ethics application was submitted for review, and after numerous alterations to documents and additional details requested both by the Department of Family Medicine and the U of A Ethics Board (that were not necessary at the U of M ethics review), ethics approval was granted. This study was further reviewed and approved by the Department of Family Medicine Research Committee as well as the Residency Training Committee (Appendix #4).
3. University of Calgary – Permission was granted after correspondence regarding concern of time commitments on both the residents as well as the administrative assistants. Distribution was designated to the postgraduate director's administrative assistant.

4. University of Saskatchewan – Permission was granted, noting some cautionary statements such as “can’t guarantee any kind of response rate or make the residents do it”. No additional documentation or review process was requested. Distribution was designated to administrative assistants in both the Regina and Saskatoon sites.
5. University of Manitoba – Permission was granted with no additional documentation or review process occurring. Distribution was assigned to the administrative assistants at the 3 training sites at the U of M.
6. University of Western Ontario – Review occurred through the Department Research Committee (DRC) process, which involved several steps. The Request for Support of Research Project form was completed detailing the project. Two DRC members were then assigned to review the application, and once approved, was forwarded to the entire DRC committee for a voting process to allow the project to be conducted at UWO. The DRC committee approved of the project and was further reviewed by the Post Graduate Education Committee and approved. Finally, the project was brought to the Postgraduate Departmental meeting for final review and approval.
7. McMaster University – Unfortunately, the McMaster University Family Medicine Program did not respond to communications that requested their participation in the study. McMaster was therefore eliminated from the sample population for this study.

8. University of Toronto – Permission was slowed by initial correspondence being misplaced at U of T. The U of T requested further information on methodology and study protocol as part of their consideration process. A copy of the survey and consent forms / study information forms were also provided to show the full distribution process to the residents. Permission was granted after further review of the information requested.
9. Queen's University – This project was reviewed by the Post Graduate Education Committee, which granted permission to distribute the survey to the graduating residents through a designated administrative assistant.
10. University of Ottawa – The Post Graduate committee was polled regarding conducting of this study at the University of Ottawa. A copy of the survey was requested by the Department for further review. Final permission was provided to conduct this research on U of Ottawa graduating residents, with distribution occurring through the Postgraduate Coordinator.
11. Dalhousie University – This project was discussed initially at the Post Graduate committee meeting, with a follow up request to review the questionnaire prior to approval. Upon review, permission was granted to survey residents at Dalhousie University with distribution to occur through a designated administrative assistant.
12. Memorial University – Permission was provided quickly, and contacts were provided for electronic distribution. It was suggested that using the administrative residents would be the most appropriate distribution points. No additional documentation or review process was requested.

Overall, the process of obtaining permission by the 12 Family Medicine Departments took seven full weeks to eventually obtain permission from 11 of 12 programs. This represents five Family Medicine Departments in Western Canada and six Family Medicine Departments in Eastern Canada.

Each of the sites in Western Canada were contacted requesting that they also distribute the paper versions of the survey to their graduating residents. All sites agreed to distribute as requested, with stipulations that the mail-outs were to go directly to the administrative assistants at each of their training sites. The exception to this was the University of Alberta, where there were logistical issues noted with distribution. Time and staff resources were noted to be at a premium at the time of data collection, and the second year residents at the U of A apparently do not have mail boxes. This would have resulted in extra administrative time and cost to the study to mail the surveys to their home addresses, which was felt to be unacceptable. Family medicine residents at the University of Alberta were therefore not included in the intensive survey approach.

#### Preparation for Distribution

To prepare for electronic distribution, mock emails were distributed on April 29, 2005 to determine any potential issues. Out of this trial run, it was determined that the electronic link used to access the survey on Survey Monkey.com needed to remain on a single line of the email. If the electronic link was broken into two lines, then the link did not work properly and access to the survey on Survey Monkey was denied. Secondly, it was determined that the email must be forwarded on standard email programs such as Microsoft Outlook to ensure that fonts, bolding and coloring of text remained as designed. Trials using the University of Manitoba webmail program indicated that text

was reformatted into a block text format with no underlining, bolding, or coloring.

Finally, it was determined that the subject line for the email needed to be short in length yet able to draw attention to the purpose of this project. It was determined that the final subject title would be “**Family Medicine Diabetes Survey**”. The email to residents included a brief note highlighting the importance of the study, a link to the electronic survey platform and a study information / consent letter (Appendix #5). This form was for information purposes only, as official consent was not necessary as completion of the survey provided implied consent.

The distribution person at each site was contacted by email on May 01, 2005 to verify that contact information was correct, and to obtain information on the total number of graduating residents in 2005. This allowed for precise calculation of overall population size.

The cover letters for mail distribution were signed in blue ink as per proper Dillman protocol. The final 8 ½ x 11 envelopes were stuffed with a cover letter, consent form (Appendix #6), survey, and return envelope).

### Data Collection

Data collection began officially on May 09, 2005, approximately 1 week after the completion of the CCFP examination. Launching occurred on this date through electronic distribution to the designated contacts at each of the 11 sites, as well as paper distribution to University of British Columbia, University of Calgary, U of Saskatchewan, and University of Manitoba. Distribution contacts were asked to confirm by email the receipt of the survey information as well as the distribution of it to graduating residents.

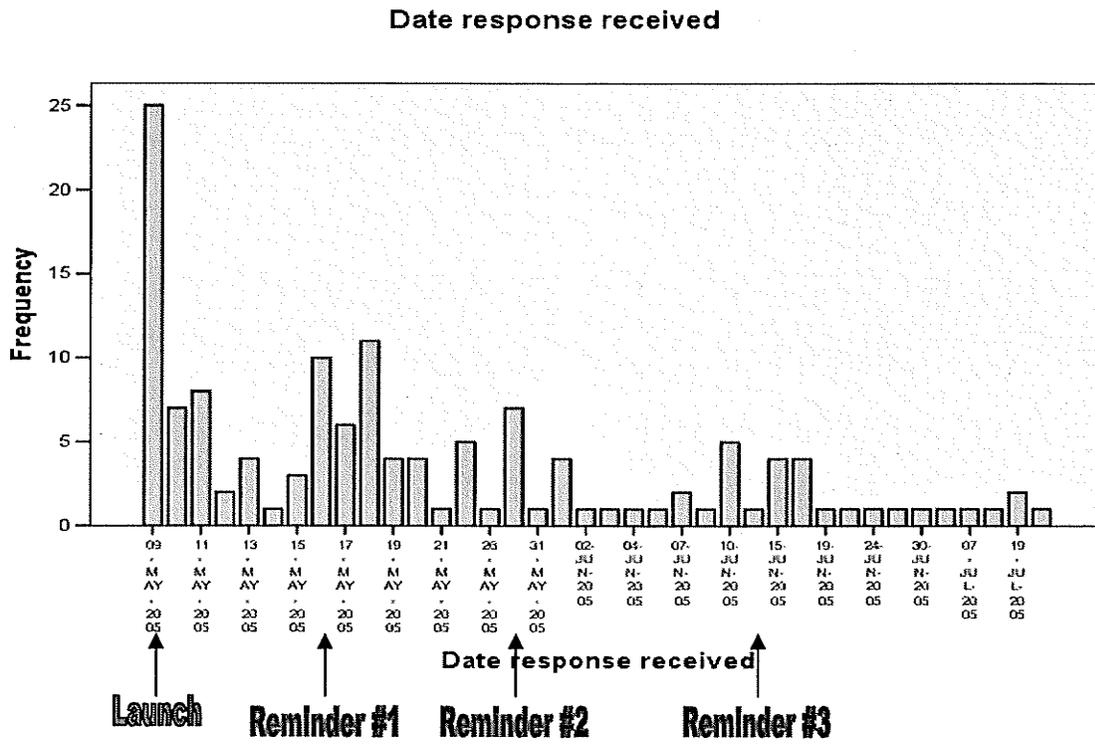
The first e-mail reminder was sent on May 16, 2005 to all subjects through the distribution channel at all sites. However, no further paper distribution occurred at this time.

The second reminder occurred on May 30, 2005, which was approximately three weeks after the initial distribution. At this time, both electronic and mail survey packages were distributed again. The third and final email reminder occurred on June 14, 2005, which was on the sixth week after the initial launch of the survey.

The fact that distribution of electronic and paper was on the same day meant that participant received the email immediately and the paper version 2-3 days later via regular mail. In essence, the staggering effect of receipt of the surveys by participants in Western Canada provided a regular reminder of this project.

The electronic survey was officially closed on July 01, 2005 after an 8 week data collection period. Paper surveys continued to arrive until as late as July 26, 2005. Figure #1 shows the response curve in relation to the reminders sent. As the figure shows, there is an increased response rate after each reminder event occurs.

Figure #2: Response Curve



## RESULTS

### 1. Description of Sample

The descriptive data of the survey respondents is presented in table #1 below.

Comments are based on reported results only. Survey respondents were overwhelmingly female, and from urban training units.

Table #1: Description of Sample

	<b>Descriptive Statistics</b>	<b>Comments</b>
GENDER OF RESIDENT	37 Males 96 Females 3 Unreported	72% female
Urban vs. Rural Training	87 Urban 46 Some Rural Training 3 Unreported	65% reported being exclusively urban trained
Primary Training Hospital	75 Teaching Hospital 57 Community Hospital 4 Unreported	57% reported training in teaching hospitals
Gender of Preceptor	75 Male 51 Female 10 Unreported	59.5% trained by male physicians
Billing Practice Trained Within	72 Fee for Service 57 Salaried Academic MD 7 Unreported	55.8% Fee for Service 44% Salaried

All 11 programs that were involved in the survey were represented in the final total responses. Unfortunately, the response rate varied greatly through different programs across Canada, which skewed the overall study response rate downward (see tables #2 and #3).

Table #2: Program Specific Response Rates

<b>SITE</b>	<b>ELECTRONIC RESPONSES</b>	<b>PAPER RESPONSES</b>	<b>TOTAL RESPONSES</b>	<b>SAMPLE SIZE</b>
<b>UBC</b>	9	21	30	56
<b>ALBERTA</b>	11	-	11	59
<b>CALGARY</b>	10	6	16	48
<b>SASKATCHEWAN</b>	4	5	9	19
<b>U OF M</b>	4	11	15	25
<b>UWO</b>	8	-	8	35
<b>U OF T</b>	23	-	23	84
<b>QUEENS</b>	8	-	8	21
<b>OTTAWA</b>	5	-	5	39
<b>DALHOUSIE</b>	7	-	7	40
<b>MEMORIAL</b>	1	-	1	19
<b>UNKNOWN</b>	3		3	
<b>TOTAL</b>	93	43	136	445

2. Do Response Rates Vary by Survey Method?

The final overall response rate was 30.56%, which is in line with previous national surveys of similar methodology, such as the National Physician Survey in 2004 with an overall response rate of 31.4% (53). The secondary research question within this project was whether response rates within the Family Medicine resident population would vary based on the survey method utilized. The table below highlights the response rates of the group receiving only the online survey compared to the group of residents that received both the online and paper version of the survey instrument (see table #3).

Table #3: Response Rates of Different Survey Methods

SITE	RESPONSE RATE GROUP 1 Electronic Surveys Only	RESPONSE RATE GROUP 2 Electronic and Paper Surveys	TOTAL RESPONSE RATE (%)
UBC		53.57%	
U OF C		33.3%	
U OF SK		47.37%	
U OF MB		60%	
U OF A	18.64%		
UWO	22.86%		
U OF T	27.38%		
QUEENS	38.09%		
OTTAWA	12.82%		
DALHOUSIE	17.5%		
MEMORIAL	5.26%		
<b>TOTALS</b>	<b>AVG: 20.364%</b>	<b>AVG: 48.56%</b>	<b>30.56%</b>

A chi-squared analysis was performed to see whether response rates from each program were significantly different depending on whether the survey was distributed electronically or both electronically and via paper copy (see table #4).

Group #1: Standard distribution by electronic platform only

Group #2: Intensified distribution using electronic platform as well as paper distribution

Table #4: Chi-Squared 2x2 Table of Different Survey Methods

Survey Groups	Did They Respond?		TOTAL
	Yes	No	
Group #2	70 (47.3%)	78 (52.7%)	148
Group #1	63 (21.4%)	231 (78.6%)	294
<b>TOTALS</b>	<b>133</b>	<b>309</b>	<b>442</b>

Note: Total respondents are only 133 of 136 as 3 electronic respondents did not identify location and it was therefore impossible to determine grouping for these results. Therefore, the electronic non-responder total was also reduced by 3 to prevent interpretation that these 3 individuals did not respond when we know they did.

Using Yates correction on absolute values (via 1 df), the final chi-squared calculation becomes:

$X^2=30.1$ ; 1 df;  $p<.001$ :S

Based on this analysis, there is a significant difference in response rates between these two groups. Calculation of an odds ratio allows for comparison of exposure to different survey approaches and quantifies how it affects the outcome (response rates). Using table #4, and through calculation of a cross product ratio, the odd ratio was calculated as 3.29, suggesting that residents within the intensified survey group demonstrated a 3.29 times increased odds of responding to the survey than residents who received the electronic survey alone.

Overall, it is well worth it to pursue survey techniques to residents using multiple distribution options, rather than using a single survey medium. The combination of simultaneous online and paper distribution was shown to be the most effective approach to increase response rates within the population surveyed in this study.

### 3. Univariate (Crosstab) Analysis

Once the final data was coded, initial analysis was conducted at a univariate level, as a stepping stone to identify independent variables that appeared important to include in final regression analysis.

Using SPSS 13, each dependent variable was tested for significance against each independent variable using 2x2 cross tabulation tables and chi squared analysis. The following table highlights the trends seen through this univariate analysis.

Table #5: Crosstab Analysis

Dependent Variable	Significant Main Effects
Type 1 Diabetes	All Non-significant
Type 2 Diabetes	-Gender of Preceptor (X <sup>2</sup> =4.282, p=.039) -Urban (X <sup>2</sup> =5.613, p=.018)
GDM	-Hospital (X <sup>2</sup> =12.616, p=.000) -Urban (X <sup>2</sup> =4.261, p=.039)
Prediabetes	All Non-significant
Start Insulin	-Urban (X <sup>2</sup> =8.820, p=.003)
Adjust Insulin	-Gender of Resident (X <sup>2</sup> =4.266, p=.039) -Billing structure (X <sup>2</sup> =5.884, p=.015) -Gender of Preceptor (X <sup>2</sup> =6.032, p=.014) -Urban (X <sup>2</sup> =5.267, p=.022)
Start Oral Medications	-Hospital (X <sup>2</sup> =11.531, p=.001) -Urban (X <sup>2</sup> =9.805, p=.002)
Foot Assessment	-EMR (X <sup>2</sup> =4.222, p=.040)
10g Monofilament	-Billing structure (X <sup>2</sup> =8.421, p=.004)
Foot Ulcers	-Gender of resident (X <sup>2</sup> =6.648, p=.010)
Acute Hypoglycemia	-Urban (X <sup>2</sup> =9.529, p=.002) -EMR is close (X <sup>2</sup> =3.631, p=0.57)
DKA	-Hospital (X <sup>2</sup> =4.382, p=.036) -EMR (X <sup>2</sup> =3.959, p=.047)
HHNS	-Endocrine elective (X <sup>2</sup> =6.306, p=.012) -Gender of preceptor (X <sup>2</sup> =4.589, p=.032)
DM checklist	-EMR is close (X <sup>2</sup> =3.790, p=0.052)
Work in FN comm.	-Hospital (X <sup>2</sup> =6.424, p=.011) -Urban (X <sup>2</sup> =8.810, p=.003)
Understand FN DM	-Billing structure close to sig. (X <sup>2</sup> =3.80, p=0.051) -Urban (X <sup>2</sup> =4.145, p=.042)
Primary Prevention	-All non-significant
Lifestyle counseling	-All non-significant
Obesity Drugs	-EMR (X <sup>2</sup> =5.813, p=.016)
Reading CPG	-Endocrine (X <sup>2</sup> =6.828, p=.009)

The geographic (urban vs. rural) independent variable demonstrated 9 significant effects within the dependent variables. Both the type of hospital and the availability of an electronic medical record (EMR) variable were found to be significantly associated with 4 dependent variables. The gender of the preceptor was significant for 3 separate variables, and endocrinology, billing structure, and gender of the resident demonstrated two significant effects within the dependent variables. As a result, all these variables

were included in further analysis at initial glance. Upon further review within the analysis process, both the gender of the resident and the endocrinology variables were eliminated. This was necessary due to results being heavily weighted into one category in the crosstab analysis, resulting in inappropriately large confidence intervals within the odds ratio results.

The only variable that showed no significance across all cross tabulations was the use of a clinical logbook. As a result, it was determined that the inclusion of this variable in further regression analysis was not warranted.

## **RESULTS OF DEPENDENT VARIABLES**

### *Analytical Approach of Dependent Variables*

As mentioned previously, the 2003 clinical practice guidelines are structured into topics under three broad categories of care, identified as Management, Complications, and Diabetes in Special Populations (4). Results of this study will be reported within the same structure of these three broad categories in the clinical practice guidelines document. Data is reported by category, and results of each dependent variable are reported by descriptive data first, followed by multivariate analysis.

Caution must be used in interpretation of these results. Due to the limited sample size (n=136), there is a possibility that significant differences may not be able to be seen within the multivariate analysis, simply due to a lack of power. Several of the odds ratios seen within these results demonstrate unusually large confidence intervals, which suggest the presence of Type II errors due to small sample size. The impact of this potential for Type II errors does minimize the statistical conclusions that can be drawn from this study.

## DIABETES MANAGEMENT TOPICS

### Diagnosis of Diabetes

Figure #3: Experience with Diagnosing Diabetes

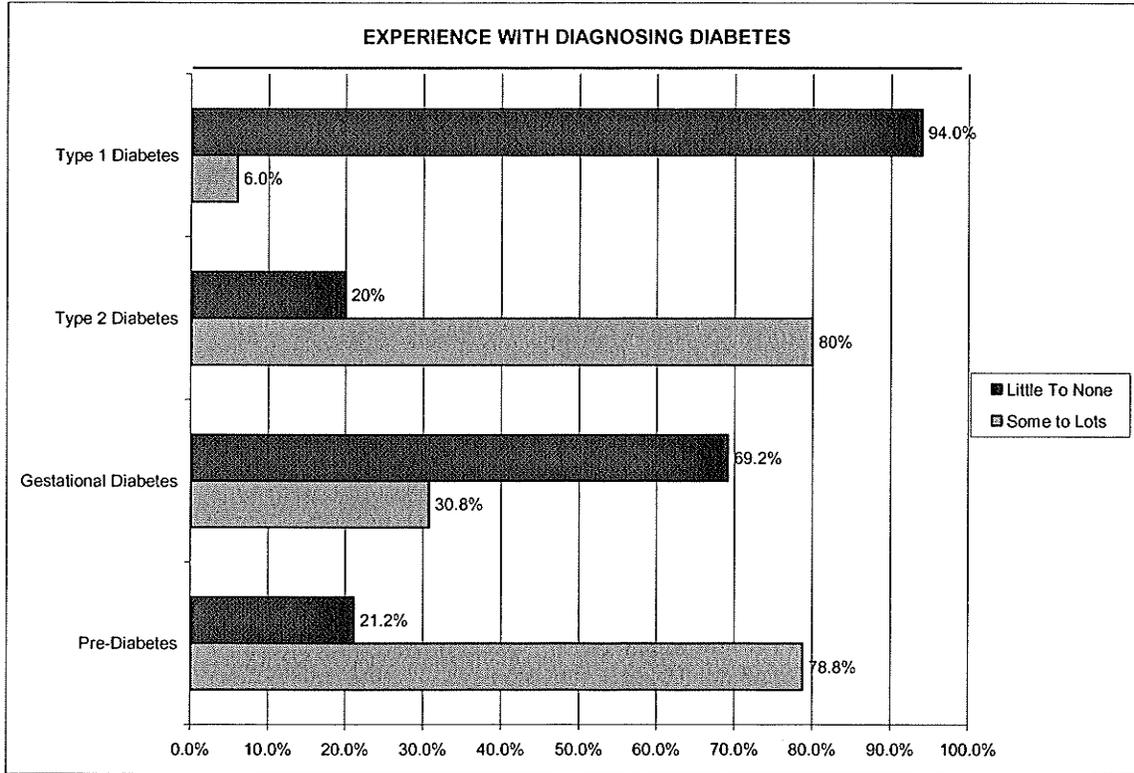


Figure #3 illustrates the experience reported in diagnosing different types of diabetes through postgraduate family medicine training in the 2004-2005 year. These descriptive results show some interesting findings. Postgraduate training in Canadian residency programs appear to provide good experience in the diagnosis of Type 2 diabetes as well as identification of pre-diabetes states. Experience appears to be less than ideal in the diagnosis of gestational diabetes and in particular Type 1 diabetes. Within the snapshot of this study, the diagnosis of Type 1 diabetes was reported as being “little to no experience” in 94% of graduates.

### Multivariate Analysis

Multivariate analysis indicated that none of the independent variables were related to experience in the diagnosis of Type 1 diabetes (see table #6). This may be due to a sample size issue, given that very few respondents indicated having experience with diagnosing Type 1 diabetes. As can be seen in table #6, the confidence intervals were therefore very large, and therefore the potential for type II error (missing significant differences) was present.

None of the variables were significantly related to experience in diagnosing Type 2 diabetes. However, in relation to experience in the diagnosis of gestational diabetes, several independent variables were found to be significantly related to experience. Community hospitals showed approximately 4.4 times greater odds of diagnoses of gestational diabetes. A further significant variable was the use of the electronic medical record within residency training. Results showed that family medicine residents who reported not using an electronic medical record were at a 65% reduced odds of experience in the diagnosis of gestational diabetes.

Multivariate analysis related to experience in diagnosis of prediabetes demonstrated that residents working with salaried physicians reported approximately a 3 times increased odds of diagnosis of prediabetes.

TABLE #6: MULTIVARIATE ANALYSIS OF THE DIAGNOSIS OF DIABETES

<i>Independent Variable</i>	<i>Type 1 Diabetes</i> Odds Ratio (95% CI) p-value	<i>Type 2 Diabetes</i> Odds Ratio (95% CI) p-value	<i>Gestational Diabetes</i> Odds Ratio (95% CI) p-value	<i>Prediabetes</i> Odds Ratio (95% CI) p-value
Community Hospital vs. Teaching	1.305 (.226-7.528) p=.766	1.260 (.445-3.568) p=.664	4.389 (1.687-11.418) <b>p=.002</b>	1.659 (.578-4.767) p=.347
Some Rural vs. Urban Location	5.451 (.881-33.722) p=.068	3.157 (.900-11.072) p=.073	1.209 (.476-3.074) p=.690	1.699 (.548-5.269) p=.358
Non Use of EMR	6.905 (.702-67.917) p=.098	.496 (.175-1.402) p=.186	.362 (.150-.877) <b>p=.024</b>	.653 (.239-1.784) p=.406
Salaried vs. Fee for Service	4.351 (.785-24.107) p=.092	1.590 (.611-4.141) p=.342	.922 (.384-2.217) p=.857	3.038 (1.095-8.429) <b>p=.033</b>
Female vs. Male Preceptor	.690 (.134-3.535) p=.656	.407 (.159-1.041) p=.061	1.354 (.559-3.282) p=.502	.650 (.251-1.682) p=.374

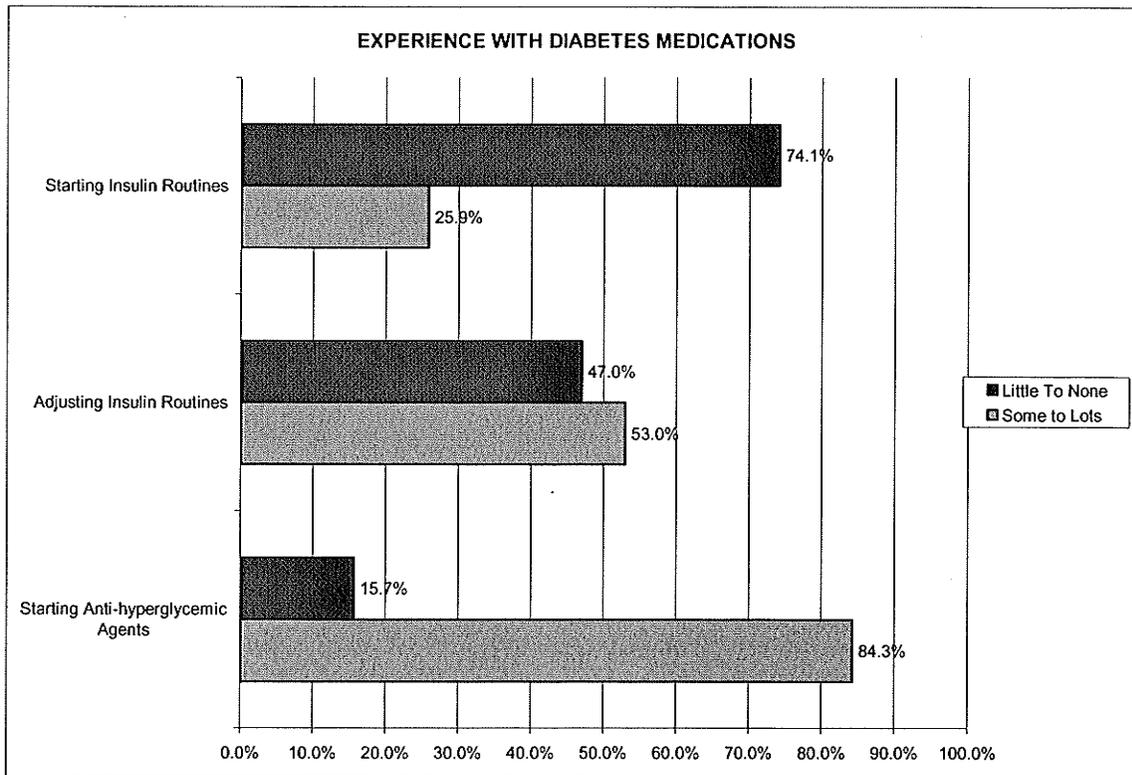
Coding of Variables: Hospital: teaching=1, community=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2

## Diabetes Medications

### a.) Insulin

Descriptive results show that 74.1% of respondents reported little to no experience in starting insulin routines (see figure #4). This is a disturbing trend considering the greater frequency that insulin is being utilized within management routines for diabetes in general. This finding however fits with the previous finding that residents have little experience in diagnosing Type 1 diabetes.

Figure #4: Experience with Diabetes Medications

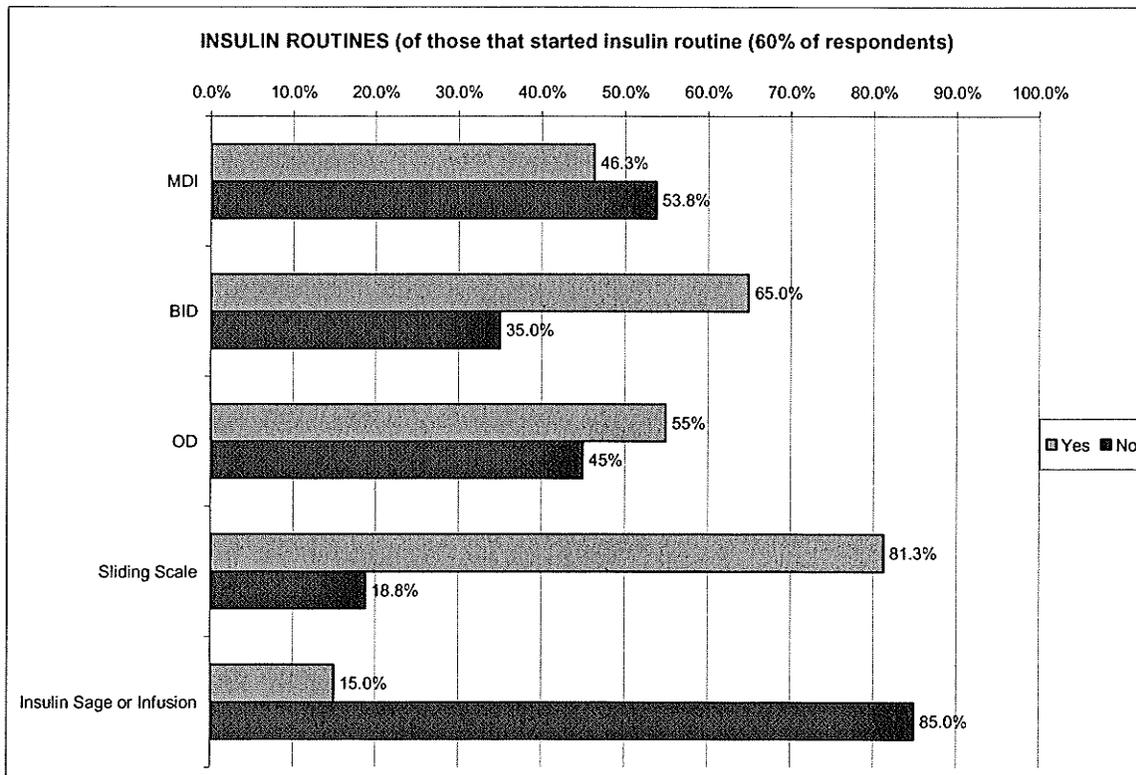


Results for adjusting pre-existing insulin routines in patient care are more encouraging in that 53% of respondents reported some to lots of experience in this respect. This is an important follow up results on initiation of insulin, as this suggests that at least half of residents have evaluated an existing routine and made clinical

judgements related to alteration of insulin routine relative to glycemic control seen in clinic.

When exploring more specifically what kinds of insulin routines were used (see figure #5), the sliding scale was identified most often (81.3%), which is likely associated with its use both in inpatient settings as well as in some outpatient situations. For the remaining insulin routines (once a day = OD, twice daily = BID, and MDI = multiple daily injections), they were initiated in fairly similar frequency, with the twice daily (BID) routine being the most frequent at 65% of respondents.

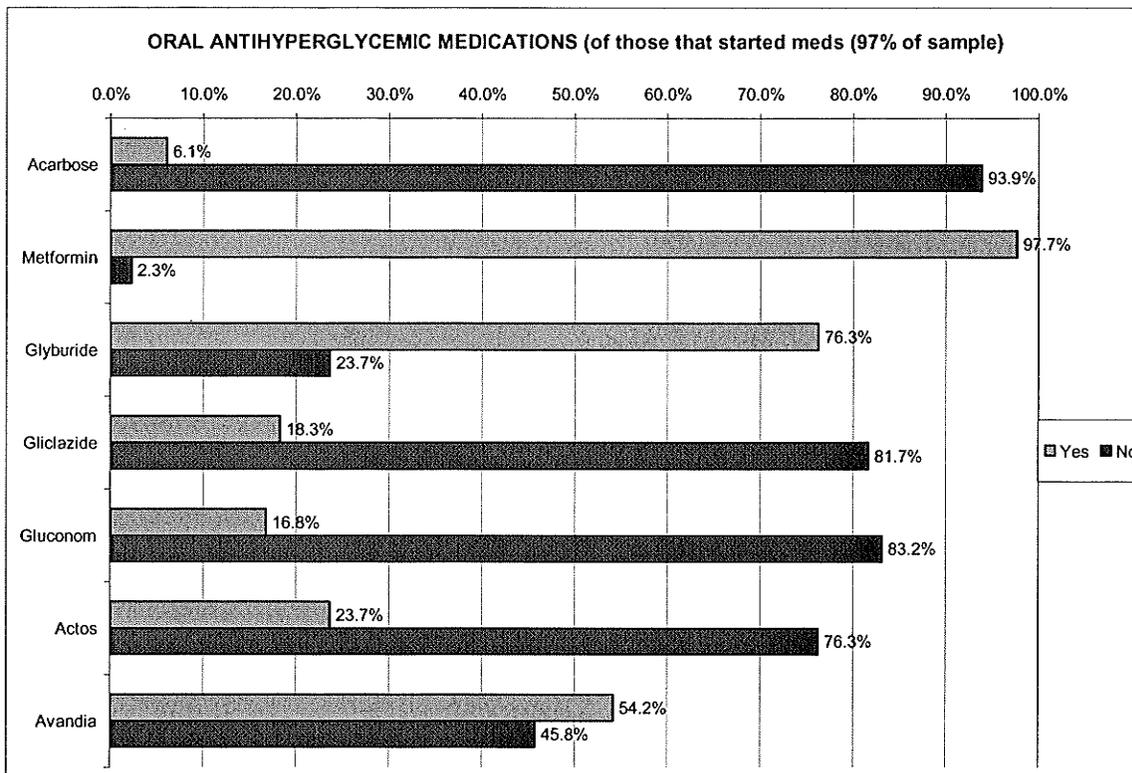
Figure #5: Insulin Routines Initiated



b.) Oral Anti-Hyperglycemic Agents

As shown previously in figure #4, the use of oral anti-hyperglycemic agents appears to be much more frequently seen by residents within training in the Canadian residency system. Approximately 84% of respondents reported some to lots of experience in starting oral anti-hyperglycemic agents on patients with diabetes.

Figure #6: Initiation of Oral Antihyperglycemic Medication



When using anti-hyperglycemic medication in the management of Type 2 diabetes, the physician must assess whether an individual is showing signs of reduced beta cell insulin production or whether insulin resistance is the underlying pathology (4). As a result, it is important to compare experience in initiation of medications to increase insulin production as well as improving insulin sensitivity.

Looking more closely at the kinds of anti-hyperglycemic medications that were initiated using figure #6, nearly all respondents reported experience in the use of Metformin (97.7%), which is indicated for first line therapy for insulin resistance profiles. In addition, 54.2% report experience in initiating Avandia, a first line medication for the treatment of insulin resistance.

In instances of reduced beta cell insulin production, 76.2% of respondents cited experience in the use of Glyburide, which is the standard first line oral therapy for reduced insulin secretion. These findings suggest that graduating family medicine residents are being exposed to the more common or first line therapies for managing Type 2 diabetes. Experience in other options within drug classes or in other less common classes of medications appears to be limited.

#### Multivariate Analysis

Multivariate analysis shows that several variables impact experience obtained in prescribing or adjusting diabetes medications (see table #7). First, family medicine residents training in rural units report approximately 3 times greater odds of experience in adjusting existing insulin routines.

In addition, training in community hospitals demonstrated about 6 times greater odds of experience in starting oral anti-hyperglycemic agents on patients with diabetes.

TABLE #7: MULTIVARIATE ANALYSIS OF EXPERIENCE IN DIABETES MEDICATION (INSULIN OR PILLS)

<i>Independent Variable</i>	<i>Initiating Insulin Odds Ratio (95% CI)</i>	<i>Adjusting Insulin Odds Ratio (95% CI)</i>	<i>Initiating Antihyperglycemic Agents Odds Ratio (95% CI)</i>
Community Hospital vs. Teaching	1.932 (.771-4.840) p=.160	1.062 (.457-2.469) p=.889	6.059 (1.254-29.264) <b>p=.025</b>
Some Rural vs. Urban Location	1.998 (.786-5.077) p=.146	2.923 (1.196-7.146) <b>p=.019</b>	7.875 (.952-65.153) p=.056
Non Use of EMR	1.248 (.514-3.033) p=.624	.531 (.241-1.169) p=.116	.689 (.226-2.098) p=.512
Fee for Service vs. Salaried	1.387 (.588-3.273) p=.455	1.804 (.828-3.931) p=.138	1.614 (.562-4.631) p=.374
Female vs. Male Preceptor	.748 (.310-1.807) p=.519	1.167 (.536-2.540) p=.697	.873 (.306-2.492) p=.800

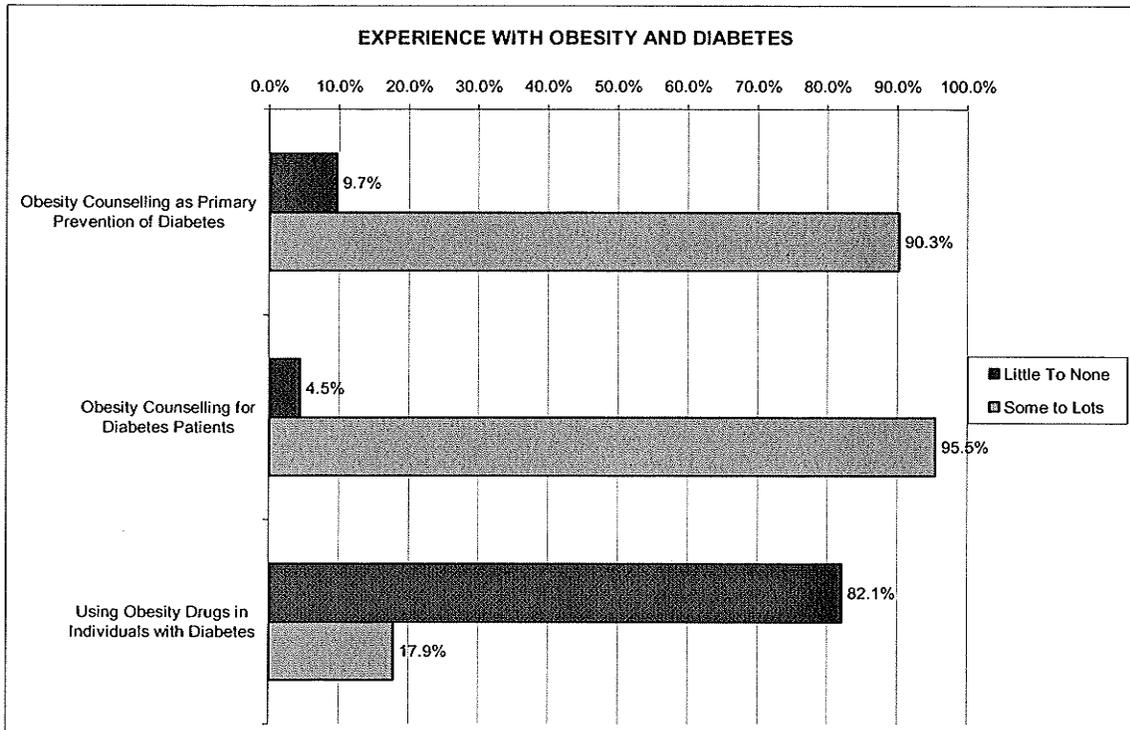
Coding of Variables: Hospital: teaching=1, community=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2

## **OBESITY**

Results from this national sample of residents suggests that Canadian Family Medicine Residency programs are doing an excellent job in ensuring experience in obesity counseling to help prevent the development of Type 2 diabetes (primary prevention). As shown in figure #7, 90.3% of respondents reported primary prevention experience through addressing clinical obesity that fell within the “some to lots” category of experience (greater than 2 clinical opportunities). This is an important finding as obesity remains the main modifiable risk factor related to the prevention of Type 2 diabetes (4).

For clients with pre-existing diabetes, 95.5% of respondents identified “some to lots” of experience in counseling patients with obesity on lifestyle principles. Only 17.9% of respondents reported “some to lots” of experience using anti-obesity medications in this population, suggesting that lifestyle modification remains the primary route in training to manage obesity in Type 2 diabetes patients.

Figure #7: Experience with Obesity and Diabetes



### Multivariate Analysis

None of the independent variables were related to experience obesity counseling for the prevention or management of diabetes (see table #8). In addition, there were no significant variables found to be associated with the use of anti-obesity medications in the management of obesity in diabetes.

TABLE #8: MULTIVARIATE ANALYSIS OF EXPERIENCE IN OBESITY MANAGEMENT

<i>Independent Variable</i>	<i>Primary Prevention of DM through Obesity Intervention Odds Ratio (95% CI)</i>	<i>Lifestyle Counseling of Obese Individuals with Diabetes Odds Ratio (95% CI)</i>	<i>Use of Anti-Obesity Medications in Individuals with Diabetes Odds Ratio (95% CI)</i>
Community vs. Teaching Hospital	1.151 (.294-4.501) p=.840	.908 (.140-5.880) p=.919	1.734 (.593-5.069) p=.315
Some Rural vs. Urban Location	1.075 (.255-4.530) p=.921	1.226 (.169-8.881) p=.840	1.255 (.420-3.754) p=.684
Non Use of EMR	.881 (.242-3.212) p=.847	.349 (.038-3.219) p=.353	.382 (.145-1.007) p=.052
Fee for Service vs. Salaried	.542 (.199-2.337) p=.542	1.364 (.225-8.273) p=.736	1.894 (.707-5.069) p=.204
Female vs. Male Preceptor	.214 (.600-9.832) p=.214	3.464 (.375-31.996) p=.273	.820 (.297-2.262) p=.702

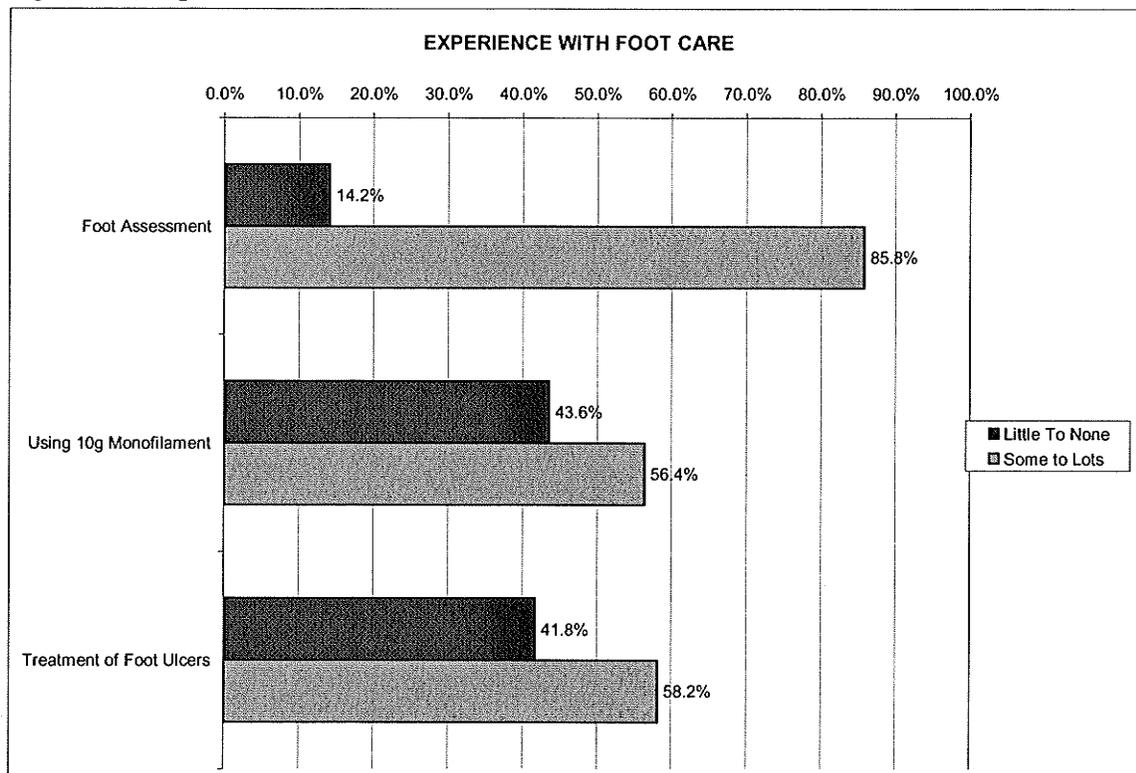
Coding of Variables: Hospital: teaching=1, community=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2

## COMPLICATIONS SECTION

### FOOT ASSESSMENT

Respondents within this survey identified that 85.8% had “some to lots” of experience in conducting foot examinations (see figure #8). When screening for peripheral neuropathy using a 10 g Semmes-Weinstein monofilament, graduating residents in Canada reported that 56.4% had “some to lots” of experience in assessing this complication risk. In relation to experience in treating individuals with foot ulcers, 58.2% of the sample reported “some to lots” of experience in this medical issue.

Figure #8: Experience with Foot Assessment and Care



### Multivariate Analysis

Multivariate analysis revealed several significant findings (see table #9). The use of an electronic medical record was significantly associated with experience in

conducting foot examinations / assessments. The odds of experiencing foot assessments were considerably reduced for residents training in settings without use of an electronic medical record. This suggests that electronic medical records may be beneficial as a clinical reminder to conduct complication assessment processes such as foot examinations.

The other significant finding was that residents training within the practice of salaried physicians reported just over 3.5 times greater experience in assessing peripheral neuropathy using a monofilament relative to residents training in a fee for service environment.

TABLE #9: MULTIVARIATE ANALYSIS OF EXPERIENCE IN FOOT CARE

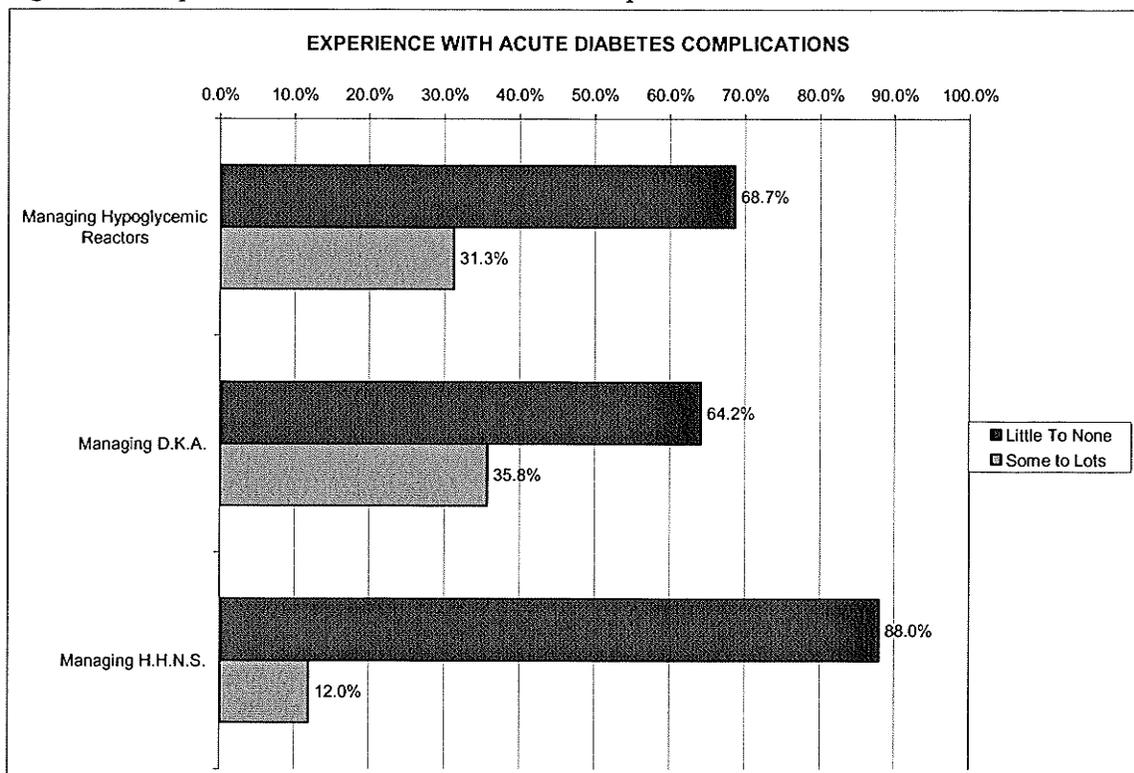
<i>Independent Variable</i>	<i>Foot Assessment Experience</i> Odds Ratio (95% CI)	<i>Use of Monofilaments</i> Odds Ratio (95% CI)	<i>Treating Foot Ulcers</i> Odds Ratio (95% CI)
Community vs. Teaching Hospital	.567 (.173-1.858) p=.349	.834 (.352-1.976) p=.681	.862 (.373-1.990) p=.728
Some rural vs. Urban Location	1.017 (.295-3.508) p=.979	1.095 (.447-2.678) p=.843	1.414 (.587-3.401) p=.440
Non Use of EMR	.208 (.044-.971) <b>p=.046</b>	.708 (.317-1.579) p=.399	.702 (.320-1.543) p=.379
Salaried vs. Fee for Service	.893 (.297-2.687) p=.840	3.540 (1.563-8.015) <b>p=.002</b>	2.057 (.945-4.480) p=.069
Female vs. Male Preceptor	.509 (.170-1.522) p=.227	.492 (.219-1.102) p=.085	.591 (.273-1.281) p=.183

Coding of Variables: Hospital: teaching=1, community=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2

## ACUTE COMPLICATIONS

According to the sample of respondents within the context of this study, 68.7% of respondents reported “little to no” experience in managing an acute hypoglycemic episode (see figure #9). In addition, 64.2% report “little to no” experience in managing diabetic ketoacidosis (DKA), and 88% report “little to no” experience in managing severe hyperglycemia in Type 2 diabetes (HHNS).

Figure #9: Experience with Acute Diabetes Complications



## Multivariate Analysis

Several significant findings appeared in the multivariate analyses related to experience in acute diabetes complications (see table #10). Within the experience reported in managing acute hypoglycemic reactions, residents training in rural units showed 2.8 times increased odds of receiving experience in this area.

In relation to experience in managing DKA, residents who trained in community hospitals showed a 2.5 times greater odds of experience. Finally, residents reported substantially reduced odds of experience in managing HHNS if training with a female preceptor.

TABLE #10: MULTIVARIATE ANALYSIS OF EXPERIENCE IN ACUTE DIABETES COMPLICATIONS

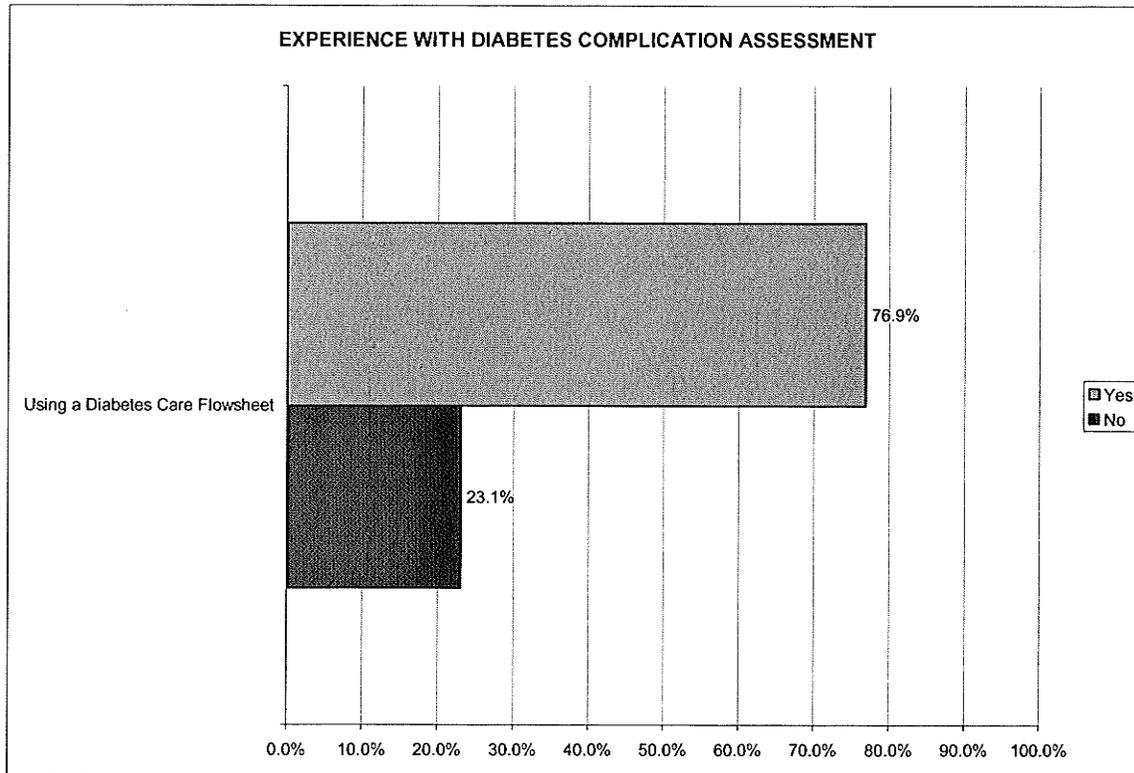
<i>Independent Variable</i>	<i>Experience in Managing Hypoglycemic Reactions Odds Ratio (95% CI)</i>	<i>Diabetic Ketoacidosis (DKA) Experience Odds Ratio (95% CI)</i>	<i>HHNS Experience Odds Ratio (95% CI)</i>
Community vs. Teaching Hospital	1.261 (.516-3.084) p=.611	2.529 (1.063-6.017) <b>p=.036</b>	1.246 (.318-4.878) p=.752
Some Rural vs. Urban Location	2.792 (1.125-6.927) <b>p=.027</b>	.858 (.350-2.103) p=.738	.882 (.213-3.651) p=.862
Non Use of EMR	.506 (.224-1.142) p=.101	.472 (.212-1.052) p=.066	1.302 (.349-4.853) p=.695
Fee for Service vs. Salaried	1.712 (.747-3.927) p=.204	1.296 (.582-2.885) p=.526	.716 (.196-2.612) p=.613
Female vs. Male Preceptor	1.073 (.466-2.468) p=.869	.603 (.265-1.371) p=.228	.112 (.014-.909) <b>p=.040</b>

Coding of Variables: Hospital: teaching=1, community=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2

## CHRONIC COMPLICATIONS

Among respondents of this study, 76.9% were exposed to the use of a diabetes care flowsheet to track complication risk factors (see figure #10).

Figure #10: Experience with Diabetes Complication Assessment Flowsheets



## Multivariate Analysis

There were no significant findings within multivariate analysis related to the use of a diabetes care flowsheet to track diabetes complications (see table #11).

Table #11: Multivariate Analysis of Using a Diabetes Flowsheet

<i>Independent Variable</i>	<i>Complication Assessment Through Use of a Diabetes Flowsheet Odds Ratio (95% CI)</i>
Community vs. Teaching Hospital	1.432 (.550-3.728) p=.462
Some Rural vs. Urban Location	1.329 (.504-3.507) p=.565
Non Use of EMR	.445 (.187-1.060) p=.068
Fee for Service vs. Salaried	.748 (.307-1.823) p=.523
Female vs. Male Preceptor	.642 (.255-1.613) p=.346

Coding of Variables: Hospital: teaching=1, community=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2

### **SPECIAL POPULATIONS**

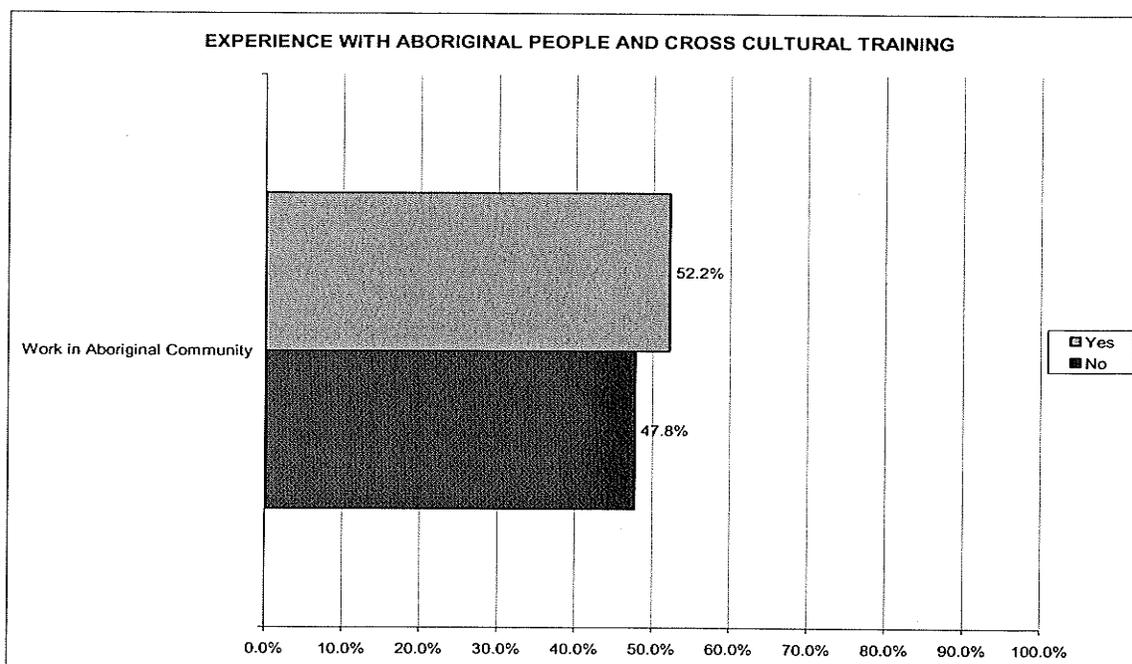
#### **Experience in Aboriginal Communities**

Within the context of this study, it was felt to be important to determine how well family medicine residents are exposed to the Aboriginal culture, and whether any first hand perspective was obtained related to living conditions in Aboriginal communities. The clinical guidelines state that “there must be recognition of, respect for and sensitivity regarding the unique language, culture and geographic issues as they relate to diabetes care and education in Aboriginal communities across Canada” (4).

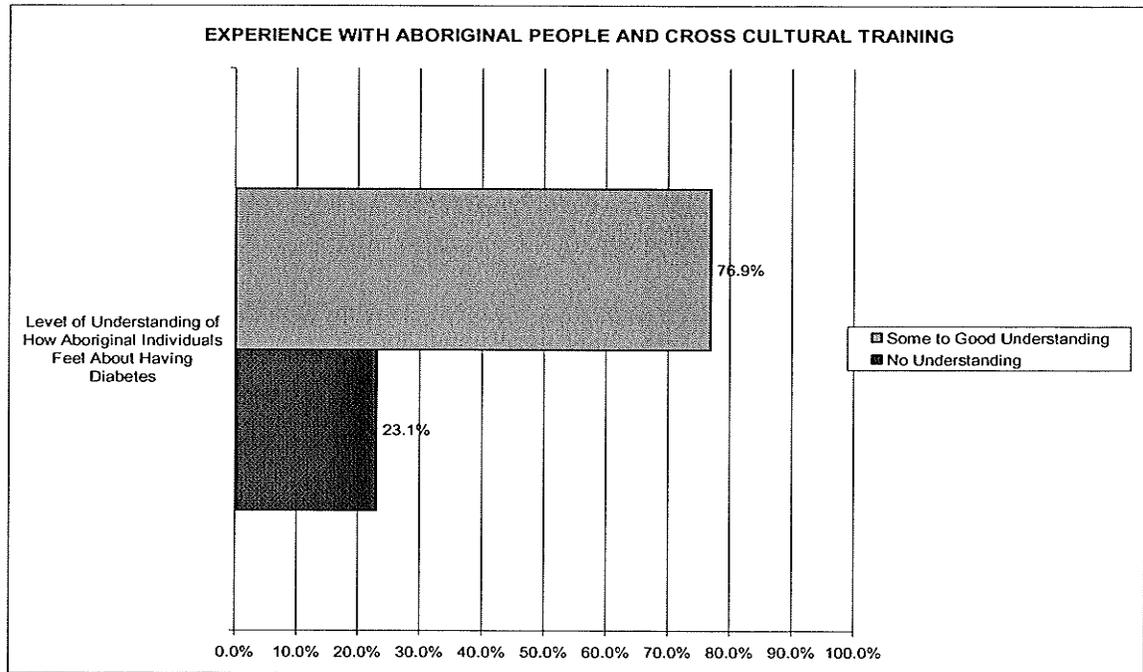
Among respondents, 52.2% were given the opportunity to provide service within an Aboriginal community within their two year residency training (see figure #11).

Although only half of the respondents worked within an Aboriginal community, 76.9% of residents felt that they had “some to good understanding” of how an Aboriginal individual felt about having diabetes (see figure #12). This would suggest that over 75% of graduating residents report recognition and sensitivity towards the Aboriginal clients they see and the plight they face as a population with epidemic levels of diabetes.

Figure #11: Work Experience in Aboriginal Communities



**Figure #12: Understanding of Aboriginal Issues**



Multivariate Analysis

There were several significant multivariate analysis findings within this section (see table #12). An interesting finding was that residents had reduced odds of working within an Aboriginal community if they trained within a rural residency setting. It would be commonly assumed that the opposite would be true, and rural training would provide greater opportunity or exposure to Aboriginal communities.

However, when we analyze the level of understanding of how Aboriginal individuals feel about having diabetes, rural residents report a 3.5 times greater understanding compared to their urban counterparts. This may be related to a greater understanding of the barriers present in rural areas regarding access to medical care, self management supplies, and small town living.

The other significant finding was that residents who trained in a salaried environment reported a 3.4 times greater understanding relative to residents training in a fee for service model.

Table #12: Multivariate Analysis of Aboriginal Issues

<i>Independent Variable</i>	<i>Experience Working in Aboriginal Community Odds Ratio (95% CI)</i>	<i>Level of Understanding of How Aboriginal Individuals Feel About Their Diabetes Odds Ratio (95% CI)</i>
Community vs. Teaching Hospital	.556 (.242-1.279) p=.168	.860 (.323-2.288) p=.762
Some Rural vs. Urban Location	.373 (.154-.900) <b>p=.028</b>	3.574 (1.160-11.009) <b>p=.027</b>
Non Use of EMR	1.230 (.557-2.714) p=.608	.809 (.317-2.066) p=.658
Salaried vs. Fee for Service	.557 (.254-1.219) p=.143	3.426 (1.314-8.936) <b>p=.012</b>
Female vs. Male Preceptor	1.244 (.571-2.710) p=.583	.904 (.365-2.238) p=.827

Coding of Variables: Hospital: teaching=1, community=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2

### Clinical Practice Guidelines

The development of the survey instrument and the structure of the results are based around the main sections of the 2003 Diabetes Clinical Practice Guidelines (4). It was therefore felt to be important to assess the extent to which the sample has read the guidelines document and whether its content has impacted their clinical practice patterns in managing diabetes.

Figure #13: Experience with Diabetes Clinical Practice Guidelines

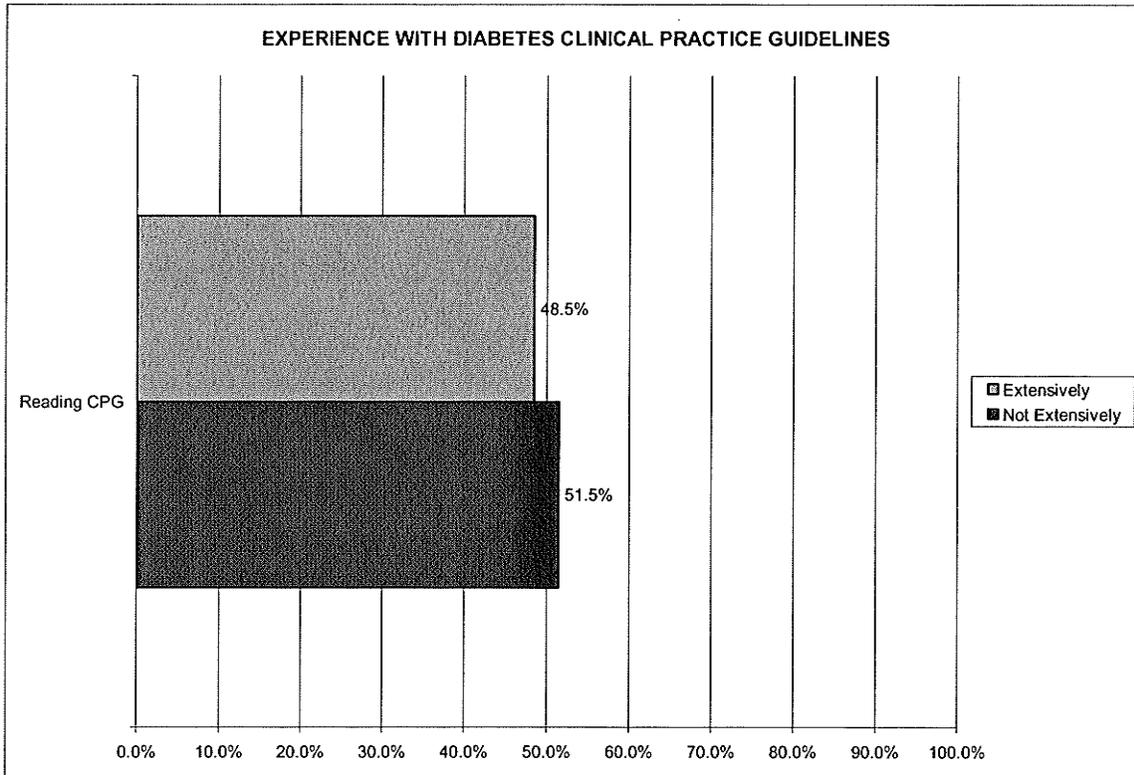


Figure #13 above highlights that only 48.5% of graduating family medicine residents had extensively read the diabetes clinical practice guidelines document. When questioned about whether reading this document had altered their clinical practice of managing diabetes, over half (54.5%) felt it did not.

### **Multivariate Analysis**

There were no significant independent variables found that impacted whether a resident read extensively the 2003 Clinical Practice Guidelines document (see table #13).

Table #13: Multivariate Analysis of Clinical Practice Guideline Issues

<i>Independent Variable</i>	<i>Reading Diabetes Clinical Practice Guidelines Odds Ratio (95% Confidence Interval)</i>
Community vs. Teaching Hospital	.786 (.348-1.774) p=.561
Some Rural vs. Urban Location	1.630 (.696-3.814) p=.260
Non Use of EMR	.891 (.419-1.894) p=.765
Salaried vs. Fee for Service	1.582 (.754-3.321) p=.225
Female vs. Male Preceptor	.864 (.408-1.827) p=.701

Coding of Variables: Hospital: teaching=1, community=2  
 Billing: fee for service=1, salaried=2  
 Preceptor Gender: male=1, female=2  
 Location: urban=1, some rural=2  
 EMR: yes=1, no=2

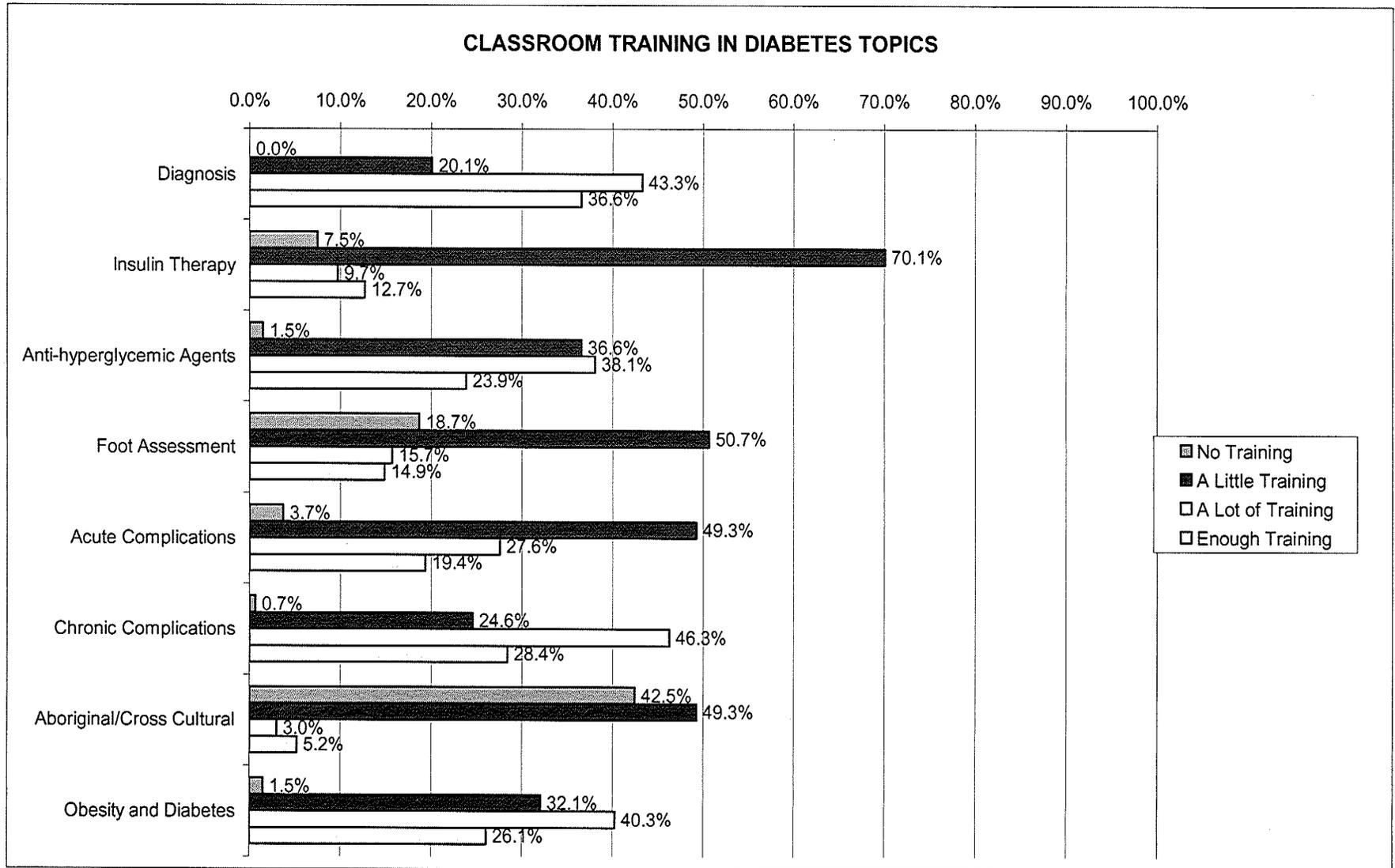
**Classroom Training in Diabetes Topics**

To gauge experience, it is important to assess both the clinical experience and didactic teaching done within a residency training environment. As mentioned earlier, these results are descriptive in nature, in order to assist in providing the overall picture of experience related to the different diabetes specific skills (see figure #14).

Respondents identified that the diabetes topics that were taught the most (identified as having “a lot of teaching” or “enough teaching” were diagnosis of diabetes (79.9%), chronic complications ( 74.7%) and obesity (66.4%). All other topic area’s were identified by less than 50% of respondents as having “a lot” or “enough” teaching.

The diabetes topics that were identified as being taught the least (identified as having “no training” or “a little training”) were Aboriginal cross cultural training (91.8% of respondents), insulin therapy (77.6% of respondents), oral anti-hyperglycemic agents (69.4%) and foot assessment and care (69.4%).

**Figure #14: Classroom Training in Diabetes Topics**



### Difficulty versus Confidence

Respondents were asked how difficult diabetes was to manage successfully as well as how confident they felt in managing diabetes, relative to other common medical conditions such as congestive heart failure, arthritis, angina, hiatus hernia, hypertension, and hyperlipidemia. These were assessed through two separate questions, using a 7 pt scale, with 1 being “not at all difficult or confident” and 7 being “very difficult or confident”.

As noted in figure #15, a quadrant analysis was created from the results of these two questions. Using the percentage of responses that were six or seven on the scale, a descriptive graph was created that compared their confidence in managing a condition with the reported difficulty in managing.

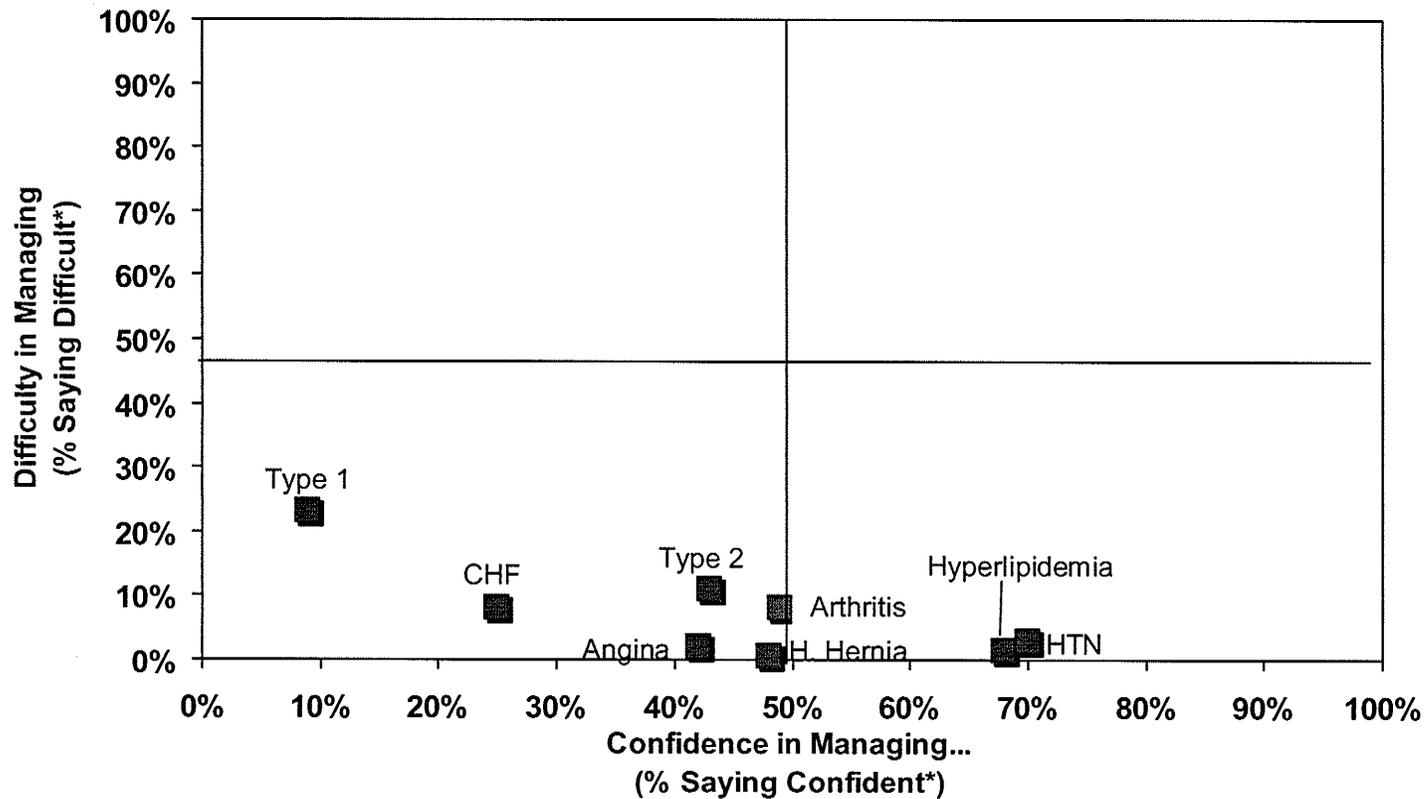
The difficulty level in managing the identified conditions was rated quite low in all conditions. Type 1 diabetes was identified as the most difficult to manage, with just over 20% of respondents scoring the difficulty level as six or seven on the seven point scale. Type 2 diabetes was identified as the next most difficult condition to manage (at just over 10%). Confidence scores varied across the conditions, ranging from very low confidence (Type 1 of <10%) to very confident (hypertension at 70%).

The overall quadrant analysis is also useful to compare levels of difficulty managing various medical issues with residents' self reported confidence level. The quadrants on the left indicate topics that are deemed difficult, with a corresponding lower confidence level being reported in managing the medical condition. This analysis identifies that Type 1 diabetes is rated as the most difficult condition to manage, with residents reporting the least confidence in managing it. Although Type 2 diabetes is considered the second most difficult condition to

manage, respondents noted that their confidence in managing Type 2 was greater than in managing congestive heart failure and angina.

Figure # 15: Quadrant Analysis of Difficulty vs. Confidence

## Perceived Difficulty Versus Confidence Levels in Managing Various Areas of Diabetes Mellitus



\*6 or 7 on a 7 point scale

Base: All Respondents (n=136)

### **Importance versus Adequacy**

Survey participants were also asked to rate the importance of training in various diabetes topics and their impression of overall adequacy of their training (clinical and classroom combined). These were assessed through two separate questions, using a 7 pt scale with 1 being “not at all important or adequate” and 7 being “very important or adequate”.

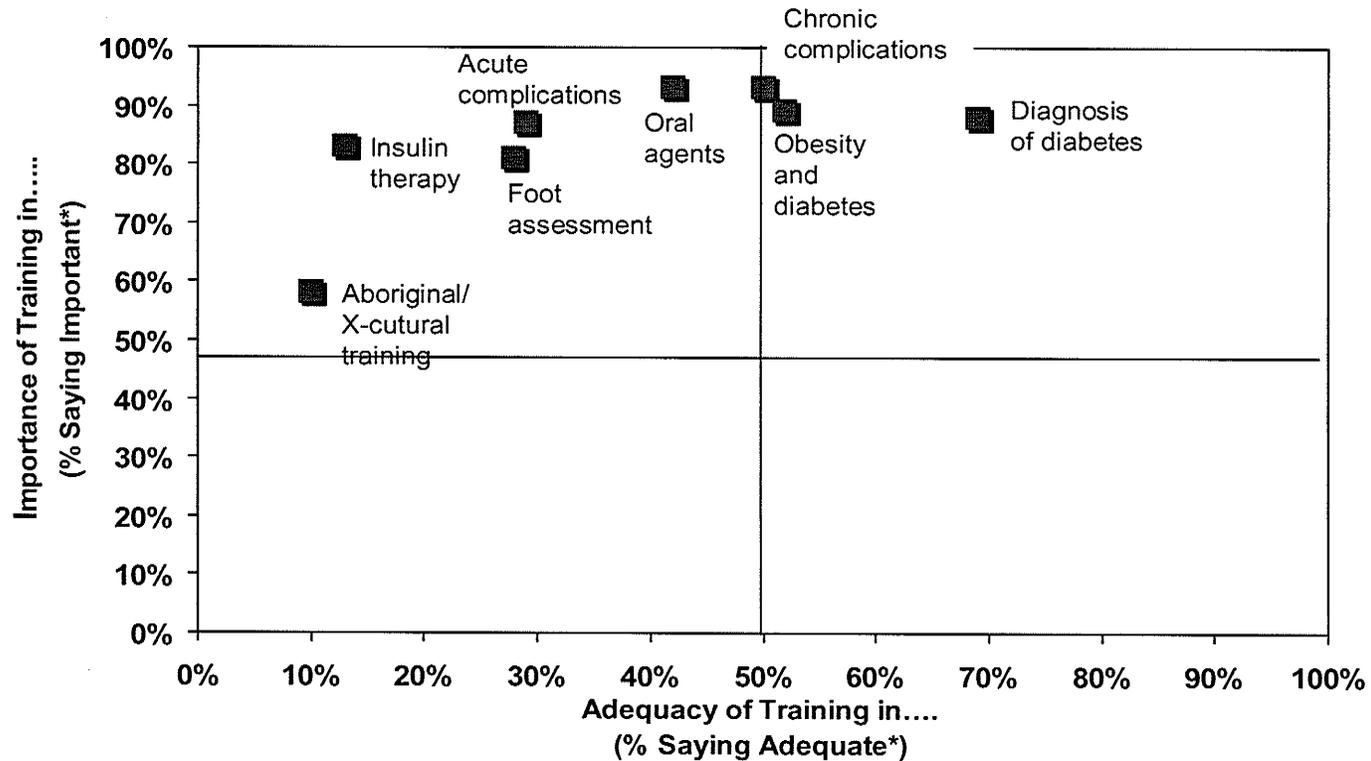
Results of this question were again used to create a graphed quadrant analysis, through identification of the percentage of responses that were six or seven on the seven point scale. As seen in figure #16, all diabetes topics were rated as very important. The least important topic was shown to be diabetes in Aboriginal people / cross cultural training. The most important topics were oral anti-hyperglycemic agents and chronic complications.

The overall quadrant analysis is useful to highlight diabetes topics in which residency training may not be adequate. The top left quadrant indicates topics that are deemed important, yet inadequately trained. The most obvious is that insulin therapy was identified as an important area to learn by graduating residents’, however training was considered the least adequate. In addition, training in diabetes within Aboriginal people was identified within the quadrant analysis as another learning area where training was less than adequate, but was shown to be the lowest importance score for training in diabetes. Training was perceived to be the most adequate in relation to the diagnosis of diabetes.

Training related to acute complications, foot assessment and care, and oral anti-hyperglycemic agents were also identified within the top left quadrant as important, but as less than adequately trained diabetes topics.

Figure #16: Quadrant Analysis of Importance vs. Adequacy

## Perceived Importance Versus Adequacy of Training in Various Areas of Diabetes Mellitus



\*6 or 7 on a 7 point scale

Base: All Respondents (n=136)

## DISCUSSION

The key features for diabetes training in Family Medicine were published in the spring of 2006 by the College of Family Physicians of Canada (50). They represent the elements that are considered essential for testing competence within the management of diabetes in a clinical situation. The following key features were highlighted in the CPFC document:

- Diagnosis of diabetes
- Treat and modify treatment according to disease status (insulin, oral diabetes medications, diet and exercise)
- Advise about and treat hypo and hyperglycemic states
- Educate effectively about self management
- Complication assessment
- DKA and HHNS diagnosis and treatment

The results from this study suggest that the Canadian Family Medicine residency system is not consistently providing an adequate level of diabetes training to meet these key features of diabetes management.

### *Diagnosis of Diabetes*

Primary care physicians can expect to deal with diagnosing an increasing number of patients with diabetes as a result of the reduction in the fasting blood sugar diagnosing criteria from the 1998 Clinical Practice Guidelines for Diabetes (2, 9). Comparison of how important residents thought diagnosis of diabetes was in relation to adequacy of training highlighted that the diagnosis of diabetes is recognized as the most adequately trained diabetes topic. In addition, it is considered one of the top topics of importance for training from a learners' perspective.

When classroom and clinical experience are assessed, it becomes apparent why training is considered adequate in this area. Approximately 80% of respondents felt that

they received either a lot or enough classroom training on the diagnosis of diabetes to meet their knowledge needs. Results of clinical experience show that approximately 80% of respondents received adequate experience in diagnosing the more commonly seen diabetes states, that being Type 2 diabetes and prediabetes.

Working along-side a salaried physician showed increased odds of diagnosis of prediabetes. This would suggest that salaried physicians, within the snapshot of this study, screened more diligently for prediabetes states. Why might this difference be present in clinical practice? This may be related to factors such as greater time for patient care in salaried practices relative to busy fee for service settings or the possibility that salaried physicians have increased presence of multidisciplinary staff, which assists in screening for prediabetes states.

Experience levels were not as high for diagnosis of Type 1 and gestational diabetes, however this is not a surprising finding. Clinical experience in general is variable and unpredictable in volume. Training within the context of an existing physicians practice may result in situations being seen and discussed but diagnosed by the primary preceptor rather than the resident. In addition, when considering that only 2-4% of pregnancies develop gestational diabetes (2), and only approximately 10% of all diabetes cases are Type 1 (61), it is not surprising that experience is less in these forms of diabetes.

This however does not mean that training in these forms of diabetes are less important. These results suggest that training of Type 1 diabetes and gestational diabetes cannot and should not rely on clinical opportunities to ensure adequacy of training. Residency programs should ensure that didactic sessions cover these topics adequately,

and horizontal experience are provided in obstetrical clinics and pediatric diabetes programs to ensure direct clinical experience in the diagnosis and management of gestational diabetes and Type 1.

In addition, emphasizing experience in community hospitals appears to be beneficial for residents to encounter increase odds of diagnosing gestational diabetes. This may be associated with the fact that women's hospitals or labor hospitals have been shifting over time to community hospital settings within the present health care system. In addition, it is possible that community hospitals tend to attract populations that are at a higher risk for the development of gestational diabetes, such as women over aged 35 or within certain high risk ethnic groups.

Findings related to diagnosis of gestational diabetes also support a benefit for the use of electronic medical records (EMR's) within residency training settings. The presence of EMR's most likely assists in ensuring that the 50 gram oral glucose tolerance test is administered as recommended at the 24-28 weeks of gestation, which increases opportunities for diagnosis (4).

### Insulin Therapy

Survey respondents identified that insulin therapy was the second least adequately taught diabetes topic, while being ranked as a topic of high importance from residents' perspective. Approximately 74% of respondents reported little to no experience in the initiation of insulin routines during their Family Medicine residency program. In addition, approximately 50% had little to no experience in adjusting existing insulin routines within their preceptors' practice. This suggests that the overall clinical experience related to use of insulin is perceived as inadequate by residents in training.

Training in rural areas does however demonstrate increased odds of experience in adjusting existing insulin routines. This finding may be related to greater clinical volume in busy rural practices compared to urban training sites, or related to reduced access to endocrinologists, thereby necessitating more clinical decisions on insulin routines.

Classroom training in insulin therapy unfortunately did not fill in the training gaps from a lack of clinical experience. Approximately 78% of respondents reported little to no didactic training on insulin therapy.

Given that both clinical and didactic training appear to be inadequate, it is not surprising to find that confidence levels are reported as very low in the management of Type 1 diabetes. This suggests that the present system and its relative lack of training in insulin therapy is limiting the development of clinical competence and confidence in this diabetes treatment modality. This is a concerning finding when considering the increasing prevalence of Type 1 diabetes and use of insulin in Type 2 diabetes. Individuals with diabetes are living longer as a direct result of improved therapies, complication assessments and treatment outcomes, which is increasing diabetes prevalence over time (60).

A further issue arises within these results regarding the insulin routines that residents are gaining experience with. These results suggest that insulin experience remains based on the traditional approaches to insulin management (the sliding scale and the BID insulin routine). Although any medication routine is to be individualized to the patients' circumstances, the more current insulin routine utilizes multiple daily injections (MDI) to mimic more closely the normal physiological patterns of insulin in non-diabetic states, and to provide greater lifestyle flexibility for clients (4). Results of this study

suggest that only 46% of residents that initiated insulin routines in residency training used an MDI routine at least once.

The sliding scale was used in insulin initiation by 81.3% of respondents at some point during their training. This means that, as a collective sample, graduating Family Medicine residents identify the sliding scale as the insulin routine that has been used clinically the most. This is somewhat surprising as the clinical use of sliding scales is no longer recommended in the literature of late (62, 63). Concerns have been expressed that the sliding scale is a completely reactive approach to hyperglycemic results, and does not provide a medium to prevent hyperglycemia in the first place. In addition, the sliding scale also assumes that insulin sensitivity is uniform for all patients at all times of the day, which is an inaccurate conclusion (62, 63).

What should we make of these results? These results are likely representative of the continued presence of sliding scales for the hospital management of diabetes in Canada, and as a result, the training of this approach by preceptors to residents. There is however no reference to the use of the sliding scale within any section of the current diabetes clinical practice guidelines (4), suggesting that this approach is less based on current evidence and more based on practice discretion.

Overall, insulin training in residency programs does appear to require improvement in clinical and classroom training on MDI routines. These routines are more currently recommended, are proactive to blood sugar issues, and provide flexibility to patients for easy self adjusting, through use of carbohydrate to insulin ratios.

#### Oral Anti-Hyperglycemic Agents

Training in oral anti-hyperglycemic agents was rated by survey respondents as the most important diabetes topic for teaching purposes. Unfortunately, only approximately 40% of respondents identified overall training in this area as adequate. Clinical experience in this area appeared excellent as 84.3% reported clinical experience as adequate (in the “some to lots” category). The adequacy of classroom training was reported at a reasonable level of 62%, showing that a small majority considered didactic teaching in oral agents to be either lots or enough for their learning needs.

It is an expected finding that training in oral anti-hyperglycemic agents would be notably better than insulin therapy. The vast majority of patients seen by residents would have Type 2 diabetes. Since diabetes is a progressive condition of reduced beta cell function over time, it is expected that most individuals seen with Type 2 diabetes will be managed with at least one anti-hyperglycemic agent at some point in the progression of the disease (4, 10).

The reason for poor scores for adequacy of training may be related to the variation found in training across the spectrum of oral agents used in managing Type 2 diabetes. Analysis of the oral anti-hyperglycemic prescribing patterns shows that graduating family medicine residents are being exposed to the more common or first line therapies for managing Type 2 diabetes. Results showed that Metformin (97.7%), Glyburide (76.3%), and Avandia (54.2%) were the oral diabetes agents initiated the most by residents. Unfortunately, other therapies that may be equally effective in managing Type 2 diabetes were typically seen in less than 20% of respondents. This would suggest that broad prescribing patterns were not demonstrated by preceptors, which limits experience in

dosing, therapeutic considerations, and contraindications to the broad range of classes of oral diabetes medications.

The question therefore arises as to whether this is inappropriate training. Based on the low scores related to adequacy of training, the majority of graduating residents indicate that training is inadequate. This does not mean the same as inappropriate training. From a clinical viewpoint, the results seen related to prescribing patterns is not overly surprising. Family physicians are trained to make clinical decisions based on consideration of the clinical presentation, the patient's context, and the overall impact on the health care system (17). As a result, this pattern of using a narrow scope of oral diabetes medications may be a reflection of consideration of medication cost differences, reduced formulary coverage, or unwanted drug side effects, which alter prescribing behaviors in primary preceptors, and influence choices made by residents.

How can training be improved related to oral diabetes medications? Encouraging more rotations in community hospitals may help as results from this study shows a 6x increased odds of experience in initiation of oral anti-hyperglycemic agents. This may be related to the fact that community hospitals tend to have less presence from other specialty physicians and a greater reliance on family physicians to manage care. In addition, these findings may reflect that community hospitals attract different populations compared to tertiary care hospitals, which may represent older demographics or of ethnic groups that are higher risk for diabetes and use of diabetes medications.

### Acute Complications

As mentioned earlier, the College of Family Physicians of Canada has identified diabetes care teaching as the #5 top priority to ensure residents are ready for independent

practice upon graduation (21). Within the evaluation objectives, the College highlights the importance of being able to diagnose and treat issues within an acutely ill diabetic patient such as hypoglycemia and hyperglycemic states (50). Results from this study would suggest that a majority of residents did not identify ample opportunity to obtain competence in managing acute complications within diabetic patients.

Results from the quadrant analysis highlight that training in acute diabetes complications is considered very important by learners, yet only 30% of respondents rated training as adequate overall. The results related to classroom training on acute diabetes complications was essentially split down the middle, as 47% of respondents rated this form of teaching as adequate in their residency experience. This suggests that there was room for more formal teaching in this area within the academic day schedule.

Clinical experience reported in all acute diabetes complications was considered inadequate ("little to no" experience). At least 60% of respondents reported inadequate clinical experience in managing acute hypoglycemic situations, diabetic ketoacidosis (DKA), and hyperglycemic hyperosmolar non-ketotic syndrome (HHNS).

How can the Canadian Family Medicine residency training system improve on training of acute diabetes complications? Experience in these clinical issues are situational and unpredictable, hence standardizing of clinical experience is not possible within the residency system structure. These acute diabetes situations however become important to learn clinically, especially when working within an emergency room situation.

It appears that residents who either train rurally or within community hospitals tend to be receiving greater experience in the management of acute complications. This

is likely related to the expanded inpatient role of family physicians within community hospitals, and the greater likelihood of working in emergency room situations. In addition, it has been shown that individuals with diabetes who reside in rural or Aboriginal communities are nearly twice as likely to have acute diabetes complications (59). This would directly impact clinical experience for residents training in rural or remote settings.

Residency programs should be aware that residents reported substantially reduced odds of experience in managing HHNS if training with a female preceptor. This finding may be related to differing patient profiles in female preceptor practices than males. Typically HHNS is a complication seen in older individuals with Type 2 diabetes, and female family physician practice profiles are often over-represented by younger female patients, with prenatal, obstetrical, and menopausal issues. Alternatively, female preceptors may have less of an emergency room component to their practice, which may alter opportunities to manage some acute diabetes situations such as HHNS.

Finally, for residents who are urban based and/or train in tertiary care hospital settings, the ongoing emergency room call system may not be providing the same breadth of experience in managing acute diabetes complications. This may be a result of the tendency of urban tertiary care hospitals to utilize specialized emergency physicians rather than family physicians in emergency room settings. As a result, it may be necessary in urban training settings to provide greater classroom teaching on the management of acute complications such as DKA and HHNS.

### Chronic Complications

Training on the management of chronic diabetes complications was ranked as the most important diabetes topic, along with training in oral diabetes agents. The survey sample was split in terms of adequacy of training, as approximately 50% reported overall adequacy in the training they received.

Classroom training was considered adequate by approximately 75% of the sample, which suggests that complication assessment and management is a well covered topic within the academic day schedule.

Due to the number of diabetes complications and the complexity involved in managing each of these issues, the clinical experience in each complication was not included in the context of this study. Instead, information was gathered on use of diabetes flow-sheets to track diabetes complications. The process of annual complication assessments within individuals with diabetes has received increased attention over the last few years. Within the Canadian clinical practice guidelines, flowsheets are identified for the purpose of tracking clinical data on an individuals risk level for diabetes complications (4).

Of the respondents, 76.9% reported using some form of a diabetes flow-sheet during their residency training to help track risk factors for diabetes complications. This is a positive finding, and suggests that graduating family medicine residents are being guided on the important clinical indicators and the frequency of tests needed to monitor complication risk factors in diabetes patients.

There were no significant independent variables that were associated with using a diabetes flowsheet. It is not surprising however that the variable closest to significance was whether an electronic medical record (EMR) was used within the residency training

process. Results would indicate that the absence of an EMR was associated (though not significantly) to reduced odds of experience in using a diabetes care flowsheet to track clinical values.

Review of CFPC Evaluation Objectives

The discussion to this point has highlighted the evaluation objectives noted by the CFPC as key diabetes domain areas to test for competency. Results suggest that the Canadian Family Medicine residency system is not consistently providing an adequate level of diabetes training to meet these key features of diabetes management (see table #14)

*Table #14: Review of CFPC Evaluation Objectives*

<b>CFPC “KEY FEATURES” OF DIABETES TRAINING</b>	<b>STUDY RESULTS</b>
<b>Diagnosis of Diabetes</b>	<ul style="list-style-type: none"> <li>■ <i>Most adequately trained area.</i></li> <li>■ <i>Still weak in Type 1 and GDM</i></li> </ul>
<b>Insulin Treatment</b>	<ul style="list-style-type: none"> <li>■ <i>Residents identify as the 2nd worst trained.</i></li> <li>■ <i>Training focuses on traditional insulin routines.</i></li> <li>■ <i>May be why confidence is low in managing Type 1</i></li> </ul>
<b>Oral Anti-hyperglycemic Agents</b>	<ul style="list-style-type: none"> <li>■ <i>Considered most important, but 5th worst trained</i></li> <li>■ <i>Reasonable clinical and didactic experience</i></li> <li>■ <i>Good in 1st line therapies only</i></li> <li>■ <i>Training in rural and community hospitals helps</i></li> </ul>
<b>Acute Complications</b>	<ul style="list-style-type: none"> <li>■ <i>4th worst trained area</i></li> <li>■ <i>Clinical experience is low for hypo’s, DKA, HHNS</i></li> <li>■ <i>Training in rural and community hospitals helps</i></li> </ul>
<b>Chronic Complications</b>	<ul style="list-style-type: none"> <li>■ <i>Considered most important</i></li> <li>■ <i>3<sup>rd</sup> best trained area</i></li> <li>■ <i>~77% report using a flowsheet to track risk for diabetes complications</i></li> </ul>

Obesity

In 2001, the College of Family Physicians of Canada developed Type 2 diabetes education strategies to help increase knowledge and awareness to physicians of physical

activity and dietary principles to use in clinical settings to help reduce the incidence and prevalence of diabetes and its associated complications (64). Based on the results of this study, Canadian Family Medicine residency programs are providing the necessary knowledge and awareness of the obesity epidemic, through appropriate levels of clinical experience and didactic teaching.

Results from this study show that training related to obesity and diabetes was rated as the second highest in terms of overall adequacy of training by residents. It was further considered one of the most important training areas related to diabetes management.

Results related to clinical experience and didactic training in obesity and diabetes highlight why training is considered adequate by a majority of graduating residents. Clinical experience in counseling obese individuals related to primary prevention of diabetes was reported as adequate by 90.3% of respondents. This is an important finding as the scientific evidence shows that lifestyle counseling can reduce the risk of the development of diabetes (65, 66, 67) and family physicians play an important role in disseminating this healthy lifestyle message. In addition, lifestyle management experience of obesity in clients with existing diabetes was also reported as adequate by 95.5% of respondents.

Although there was very little use of anti-obesity agents reported within this survey (17.9% reported adequate experience), this did not appear to impact the scores related to adequacy of training in this area of diabetes management. It therefore would appear that training in anti-obesity agents was not considered a necessary component of training by graduating residents.

Classroom experience appeared to complement the clinical experience well, as 66.4% of respondents reported adequate levels (“a lot” or “enough”) of didactic teaching related to obesity management within their residency training. This adequacy score for classroom experience does not necessarily need to be high as direct clinical experience in obesity management appears to be providing appropriate hands on training in this area.

In summary overall, the training provided on managing obesity related to diabetes appears to be well done within the residency training system in Canada. This is due to reports of good volume of clinical encounters, combined with appropriate presence of obesity as an academic presentation topic by faculty. This is a very positive finding, and suggests that the Type 2 Diabetes Education Strategy from the College of Family Physicians of Canada is reaching its mandate within residency training.

#### Foot Assessment and Care

According to the 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada, a thorough foot examination and screening for peripheral neuropathy should be conducted on an annual basis on all individuals with diabetes (4). Less than 30% of respondents reported adequate overall training in foot assessment and foot care, which translated into the third worst area of training. As with all diabetes topics, residents reported this area to be of high importance for requiring training.

The clinical experience reported in conducting foot assessments on individuals with diabetes was adequate in 85.8% of residents, which is a very positive finding. Within this area, the absence of an electronic medical record (EMR) in training settings significantly reduced the odds of adequate experience. This suggests that EMR’s may

assist in clinical reminders to conduct assessments on clients with diabetes in areas such as foot assessment.

However, the reported experience in using a 10g Semmes-Weinstein monofilament for assessing peripheral neuropathy was only adequate (“some to lots” of experience) in 56.4% of respondents. It therefore appears that related to complete foot assessments, residents are trained better in visual foot examinations for structural abnormalities, vascular issues, or infections. Training is less consistent in assessment of peripheral neuropathy. This is especially true in fee for service training environments, as training in salaried environments showed a 3.5 times increased odds of experience in using monofilament testing. This finding may be due to differences in time available for client assessment in salaried practices or due to factors such as a greater emphasis on preventative health or complication assessments within these practices.

Findings related to foot assessment and peripheral neuropathy testing can easily be addressed within the present residency training system. First, the training on the use of a 10g Semmes-Weinstein monofilament is quick and very easy to learn. It could easily be taught in a classroom session, procedural lab, or even through a computer simulation. Second, there appears to be substantial room to improve on classroom training in the area of foot assessment and foot care. Results of this study show that 69.4% of respondents indicated that they received little to no classroom training. Knowing that clinical practice with monofilaments is not happening as frequently as desired, this skill could be easily implemented into the academic day schedule to improve the clinical use of this instrument in complication assessments.

Clinical experience in foot ulcer management was further reported as adequate in only 58.2% of the sample. Clinical presentation of foot ulcers tend to be more unpredictable and it is therefore more difficult to ensure adequate clinical experience across all residents in training. Therefore, didactic training in foot ulcer management should be incorporated into the classroom schedule for all residents. Ideally, this should involve various ulcer presentations, debridement, and demonstration of wound care products, to simulate a clinical situation and decision making process as closely as possible.

Overall, there appears to be room to improve on foot assessment and foot care training related to peripheral neuropathy testing, as well as in the management of foot ulcers. These assessment and management areas can be easily incorporated into the classroom training provided related to diabetes management in the residency training units.

#### *Diabetes in Aboriginal People*

According to the 2001 census, Aboriginal people account for 4.4% of the overall population in Canada (68), representing one of the largest non-white ethnic groups in Canada. A recent survey through the College of Family Physicians of Canada documented that 11.7% of family physicians in Canada report that Aboriginal patients comprise a substantial proportion of their practice population (ie:>10%) (69).

Recent reports indicate that the age adjusted prevalence of diabetes within this population is three to five times higher than the general Canadian population (4), and as a result, diabetes is considered an epidemic public health issue within Aboriginal people in Canada.

The results from this study related to diabetes in Aboriginal people were somewhat surprising. On the one hand, this area was reported as the diabetes topic that was the least adequately trained, with only 10% of respondents considering training adequate. This was not surprising as the scientific literature has documented a lack of training on cultural issues in Canadian medical school training (70).

However, on the other hand, it was considered the topic of least importance, relative to other diabetes topics within this study. This was a concerning finding as the literature documents clearly that cultural issues can impact the doctor-patient relationship, access to health care, health status, and overall use of health services (70).

Based on these results, it appears that clinical issues are deemed more important from a training standpoint than cultural issues in the overall scheme of diabetes training. If family medicine residents lack the necessary recognition, respect, and sensitivity to culture, language, social and geographical issues as they relate to diabetes management (71), they are not helping to reduce or eliminate racial and ethnic health disparities that exist within the present health care system (72). Considering the epidemic rates of diabetes in Aboriginal populations, family medicine residents appear to need to be made more culturally aware of issues within this population, regardless of whether they think this is important or not.

Classroom training in this area was reported as minimal in the training process. Only 8.2% of respondents reported adequate classroom training. However, direct exposure to Aboriginal communities appears to have been provided in approximately 50% of graduating residents. This suggests that half of the graduating class may be

limited in their understanding and perspective of geographical and cultural issues that affect self care and are unique to living in Aboriginal communities.

Surprisingly, even though classroom training is poor and exposure to Aboriginal communities appears limited, over 75% of graduating residents report recognition and sensitivity towards the Aboriginal clients they see and the plight they face as a population with epidemic levels of diabetes. This finding is from a self rating of their personal level of understanding of how Aboriginal individuals think or feel about having and living with diabetes. The extent to which cultural sensitivity is demonstrated in clinical practice is an issue that could not be examined within the context of this study.

What does this finding tell us? Perhaps residents have a greater understanding of the Aboriginal situation than was expected. It however is equally possible that residents naively think that they understand the struggles of self managing diabetes for Aboriginal individuals, while overlooking the degree of political (e.g. finances and transportation), cultural (e.g. traditional ways), lifestyle (e.g. access to food and activities), and psychological (e.g. seeing many family members and friends die from the disease and feel complications/death is inevitable) barriers that exist. Ultimately, what these findings truly tell us is that more research is needed to identify the degree of cultural sensitivity provided to family medicine residents within their training programs.

#### *Clinical Practice Guidelines*

Questions were added to the survey instrument to assess the degree to which the national clinical practice guidelines on diabetes management were read and implemented into residents' clinical practice. Results showed that only 48.5% of residents had extensively read the clinical practice guideline document. This is a surprising finding considering that residents were

surveyed immediately after completion of their CCFP examination, and it would be expected that clinical guidelines would be studied thoroughly in preparation for writing this examination.

An interesting additional finding is that 54.5% of residents who read the guidelines document (either extensively or skimming over) felt that it didn't alter their management of diabetes clients.

These results suggest that there continues to be difficulty for physicians and residents to read and adhere to the evidence based clinical guidelines that are published in managing disease conditions. This may reflect the perception that guideline documents represent the "science" of medicine, whereas there remains the "art" of medicine (or clinical discretion) that is not able to be represented in print within these guideline documents. As such, much of the content is skimmed over rather than read extensively, and residents may be more influenced clinically by their preceptor's management practices than the national guidelines.

#### *Factors Related to Training*

Location of training was a factor that appears to be important to experience levels in managing diabetes. Residents who trained in a rural unit demonstrated approximately 3 times greater odds of experience in adjusting existing insulin routines, acute hypoglycaemia management, and a 3.5 times greater odds of cultural sensitivity / understanding to Aboriginal people with diabetes. As a result of these findings, it appears that providing some rural training to residents assists in obtaining increased experience in priority areas of diabetes training.

Training in a community hospital also appears to help in obtaining experience in some important areas of diabetes management. Results of this study note a 4.4 times greater odds of diagnosing GDM, a 6 times increased odds of starting oral anti-hyperglycemic agents, and a 2.5 times greater odds of managing DKA situations. This increased experience is likely related to the

increased role that family physicians have within community hospital settings. This finding suggests that training outside of tertiary care hospitals provides important increased exposure to key areas of diabetes management. This is evident when considering that training in oral anti-hyperglycemic agents was identified as the most important area of training by residents, and community hospitals show a 6 times increased odds of experience in this area.

The use of electronic medical records (EMR's) are being shown to help assist in both organization and efficiency of care in medical care settings. Based on the results of this study, EMR's do appear to help in facilitating training in certain areas of diabetes management. The presence of EMR's in training do appear to increase the odds of experience in diagnosing gestational diabetes (GDM) as well as testing for peripheral neuropathy using a 10 g monofilament. This suggests that use of EMR's assist in remembering to conduct a 50g oral glucose tolerance test screen at 24-28 weeks gestation, and conducting peripheral neuropathy checks on diabetic patients. Since EMR's can be programmed to flag or remind clinicians to conduct certain tests, these results may indicate that residents in training are benefiting from these electronic reminders within their preceptors practice.

### **LIMITATIONS**

There are several limitations that were noted within this study process. First, the utilization of a cross sectional design resulted in a snapshot of residents' level of experience that may or may not be representative of actual historical experience patterns obtained in managing diabetes issues. This is due to the uncontrollable fact that educational opportunities rely heavily on opportunistic clinical exposure and chance patient encounters (23). This was viewed as acceptable since the overarching purpose of

this study was to broadly identify potential gaps in clinical experience and assist in strengthening diabetes training in family medicine residency programs.

Second, there was a risk within this study for recall bias, since the level of experience was requested over a two year residency program (residents received their surveys beginning at month 21 of their program). To compensate for this concern, the survey instrument was created to utilize scales that were more broadly defining level of experience rather than specific details.

Third, studies that involve experience and skills within a professional body can be a very sensitive issue. The potential of reactivity or providing socially desirable answers was present within this study. Instructions and instruments were worded carefully to ensure that residents felt that responses would be kept confidential, in efforts to promote the most accurate answers to questions.

The choice of electronic survey platform for this study became a limitation relative to attempting to provide an incentive to encourage increased response rates. Unfortunately, there was no format within the chosen survey platform to include incentives, which was not identified until after the subscription was obtained and pilot testing was done on the survey instrument. As a result, this study missed out on a useful opportunity to enhance response rates across the national sample of graduating residents.

The overall sample size became a significant issue within the context of this study. The response rate (30.56%) in combination with the original sample (N=445) resulted in a final sample size (n=136) that limited the overall power of the findings. As seen in several of the multivariate analysis, a reduced sample size resulted in issues with the confidence interval ranges. Since the overall sample size was small, the variability of

the sample mean was reduced, thereby generating less confidence in the results. In addition, a small sample size may not be reflective of the overall population of graduating residents in Canada. Further analysis would be necessary to assess whether the description of the sample showed similar distribution to the overall population in relation to gender of residents and preceptors, training locations, and billing structures.

### CONCLUSIONS

The scientific literature is lacking on the adequacy of experience or clinical training in managing diabetes related issues within Canadian Family Medicine Residency programs and abroad. With the exception of procedural and emergency medicine skills, all current literature focuses on the general concept of training rather than specifics of certain conditions or skill sets (43, 44, 25). The majority of published studies are based on single programs or schools, and are typically descriptive in nature (28). This study provides valuable perspective on the current gaps in diabetes specific clinical experience within Canadian Family Medicine residency programs.

From a global learner's perspective, there were very few diabetes topics that residents identified as being adequately trained within. Diagnosis of diabetes was clearly identified as the most adequately trained area. However, almost all topics related to management of diabetes once diagnosis has occurred were consistently rated as inadequately trained. In particular, the main gaps in training that were identified by the learners (in order of inadequacy) were related to diabetes in Aboriginal people, insulin therapy, foot assessment and acute complications of diabetes. Canadian Family Medicine residency programs need to evaluate their present training systems and attempt to identify

opportunities to enhance clinical experience and learning opportunities for residents in these areas.

The positive finding of this study was related to survey methodology within the medical resident population. There has been very little research that has explored differing methodologies that may improve response rates within this population. Results of this study clearly show that response rates can be significantly increased by use of a combined electronic and paper distribution format. These findings will be of interest to researchers within the medical education field who are further exploring issues related to medical education.

Overall, this study provides an initial glimpse at the adequacy of training in diabetes from the learner's perspective. Results from this study will assist Family Medicine residency programs in Canada in identifying the gaps in diabetes training within the present system. This will allow for targeted modifications to the training system to ensure that the key diabetes features of learning are obtained, as identified by The College of Family Physicians of Canada within their evaluation objectives document (50). This in turn will help ensure that family medicine residents are provided the opportunities to integrate adequate experience into appropriate independent clinical competence in managing diabetes issues.

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**Appendix 1: Research Ethics Board Approval Form – University of Manitoba**



UNIVERSITY  
OF MANITOBA

BANNATYNE CAMPUS  
Research Ethics Boards

P126-770 Bannatyne Avenue  
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APPROVAL FORM

**Principal Investigator:** Mr. Kevin Thiele  
**Supervisor:** Dr. Verena Menec

**Protocol Reference Number:** H2005:017  
**Date of REB Meeting:** January 24, 2005  
**Date of Approval:** February 24, 2005  
**Date of Expiry:** January 24, 2006

**Protocol Title:** "Canadian Family Medicine Residents' Clinical Training in Diabetes Mellitus"

The following is/are approved for use:

- Revised Protocol (submitted February 23, 2005)
- Research Participant Information and Consent Form: Focus Group (version date 21/02/05)
- Research Participant Information and Consent Form: Questionnaire (version dated 21/02/05)

The above was approved by Dr. Ken Brown, Chair, Health Research Ethics Board, Bannatyne Campus, University of Manitoba on behalf of the committee per your letter dated February 21, 2005. The Research Ethics Board is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement, and the applicable laws and regulations of Manitoba. The membership of this Research Ethics Board complies with the membership requirements for Research Ethics Boards defined in Division 5 of the *Food and Drug Regulations*.

**This approval is valid for one year from the date of the REB meeting at which the study was reviewed.** A study status report must be submitted annually and must accompany your request for re-approval. Any significant changes of the protocol and informed consent form should be reported to the Chair for consideration in advance of implementation of such changes. The REB must be notified regarding discontinuation or study closure.

This approval is for the ethics of human use only. For the logistics of performing the study, approval should be sought from the relevant institution, if required.

Sincerely yours,

Ken Brown, MD, MBA  
Chair,  
Health Research Ethics Board  
Bannatyne Campus

Please quote the above protocol reference number on all correspondence.  
Inquiries should be directed to the REB Secretary Telephone: (204) 789-3255 / Fax: (204) 789-3414

## **Appendix #2: Survey Instrument**

# Canadian Family Medicine Residents' Clinical Training in Diabetes Mellitus

## Survey Instructions

Thank you for taking the time to complete this important survey.

Below are statements regarding the experience that you have obtained in managing diabetes while in your Family Medicine Residency training. Please provide, to the best of your recollection, the level of experience you have obtained in various areas.

### Diagnosis of Diabetes

1. In the last two years of residency training, how many times did you diagnose the following types of diabetes?

	Never	1-2 times	3-5 times	6-10 times	Over 10 times
a. Type 1 Diabetes	<input type="checkbox"/>				
b. Type 2 Diabetes	<input type="checkbox"/>				
c. Gestational Diabetes	<input type="checkbox"/>				
d. Pre-Diabetes	<input type="checkbox"/>				

### Experience in Insulin Therapy

2. In the last two years of residency training, how many times did you start an insulin routine primarily on your own?

- |  |                   |
|--|-------------------|
| <input type="checkbox"/> Never         | <b>SKIP TO Q4</b> |
| <input type="checkbox"/> 1-2 times     | CONTINUE          |
| <input type="checkbox"/> 3-5 times     | CONTINUE          |
| <input type="checkbox"/> 6-10 times    | CONTINUE          |
| <input type="checkbox"/> Over 10 times | CONTINUE          |

3. If you started an insulin routine at least once, please indicate the general type of insulin routine(s) that you used. **Please check all that apply.**

	Yes	No
a. Multiple Daily Injections (3-4 injections per day)	<input type="checkbox"/>	<input type="checkbox"/>
b. Two (2) Injections per day (BID routine)	<input type="checkbox"/>	<input type="checkbox"/>
c. One (1) Injection per day (NpH as 100% basal insulin at bedtime)	<input type="checkbox"/>	<input type="checkbox"/>
d. Sliding scale	<input type="checkbox"/>	<input type="checkbox"/>
e. Insulin Sage / Infusion	<input type="checkbox"/>	<input type="checkbox"/>

4. In the last two years of residency training, how many times did you adjust an existing insulin routine based on home blood glucose monitoring results or elevated Hemoglobin A1C values?

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

**Experience in Oral Antihyperglycemic Agents**

5. In the last two years of residency training, how many times did you start an oral antihyperglycemic agent on a person with diabetes?

- |  |                   |
|--|-------------------|
| <input type="checkbox"/> Never         | <b>SKIP TO Q7</b> |
| <input type="checkbox"/> 1-2 times     | CONTINUE          |
| <input type="checkbox"/> 3-5 times     | CONTINUE          |
| <input type="checkbox"/> 6-10 times    | CONTINUE          |
| <input type="checkbox"/> Over 10 times | CONTINUE          |

6. If you started an oral antihyperglycemic agent at least once in residency training, please indicate the agent(s) that you had experience initiating. **Please check all that apply.**

	Yes	No
a. Acarbose (Prandase)	<input type="checkbox"/>	<input type="checkbox"/>
b. Metformin (Glucophage)	<input type="checkbox"/>	<input type="checkbox"/>
c. Glyburide (Diabeta)	<input type="checkbox"/>	<input type="checkbox"/>
d. Gliclazide (Diamicron)	<input type="checkbox"/>	<input type="checkbox"/>
e. Repaglinide (Gluconorm)	<input type="checkbox"/>	<input type="checkbox"/>
f. Pioglitzone (Actos)	<input type="checkbox"/>	<input type="checkbox"/>
g. Rosiglitzone (Avandia)	<input type="checkbox"/>	<input type="checkbox"/>

**Foot Assessment and Care**

7. In the last two years of residency training, how many times did you conduct a foot assessment on a person with diabetes?

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

8. In the last two years of residency training, how many times did you test for peripheral neuropathy using a 10 gram monofilament?

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

9. In the last two years of residency training, how many times did you treat a diabetic foot ulcer?

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

**Managing Acute Diabetes Complications**

10. In the last two years of residency training, how many times did you manage an acute hypoglycemic reaction?

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

11. In the last two years of residency training, how many times did you manage the following acute hyperglycemic issues?

	Never	1-2 times	3-5 times	6-10 times	Over 10 times
a. Diabetic Ketoacidosis (DKA)	<input type="checkbox"/>				
b. Hyperglycemic Hyperosmolar Non-Ketotic Syndrome (HHNS)	<input type="checkbox"/>				

**Chronic Complications of Diabetes**

12. Did your Family Medicine clinic time provide experience using a structured diabetes checklist / flow-sheet to help track risk factors for diabetes complications?

- Yes
- No

**Type 2 Diabetes in Aboriginal People**

13. In your residency training, did you have an opportunity to work within an Aboriginal community to understand health issues such as poverty, housing, and access restrictions to health care and nutritious foods that face the marginalized portion of the Aboriginal population?

- Yes
- No

14. How would you rate your understanding of how Aboriginal individuals think or feel about having and living with Diabetes?

- No understanding
- Some understanding
- Good understanding
- Excellent understanding

## Obesity and Diabetes

15. In the last two years of residency training, how many times did you counsel **non-diabetic** patients on lifestyle principles for weight loss for the **primary prevention** of Type 2 Diabetes?

- Never
- 1-2 times
- 3-5 times
- 6-10 times
- Over 10 times

16. In the last two years of residency training, how many times did you counsel and treat obese diabetic individuals using the following strategies?

	Never	1-2 times	3-5 times	6-10 times	Over 10 times
a. Lifestyle Intervention	<input type="checkbox"/>				
b. Antiobesity Agents (e.g. Xenical or Meridia)	<input type="checkbox"/>				

## Clinical Practice Guidelines

17. To what extent have you read the 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada?

- Have not read (**skip to Q19**)
- Skimmed over
- Read important sections only
- Read extensively

18. Has reading and becoming knowledgeable on the guidelines changed your practice patterns in managing diabetes?

- No
- A little
- A lot

## The Cost of Diabetes

19. To what extent do you feel your training has prepared you to manage the health care costs of diabetes on the Canadian Health Care System? (e.g. drug costs, control on lab tests, outpatient management versus inpatient care, etc). Do you feel...

- Not at all prepared
- Somewhat prepared
- Well prepared

20. To what extent do you feel your training has prepared you to **support your clients** with diabetes in controlling the daily costs of living with diabetes? (e.g. minimizing supply costs, generic versus name brand medications, minimizing travel costs for appointments or loss of productivity costs). Do you feel...

- Not at all prepared
- Somewhat prepared
- Well prepared

**Academic / Classroom Training in Diabetes**

21. How would you describe the *amount* of academic / classroom training that you received in the following areas?

	No Training	A Little Training	A lot of Training	Enough Training
a. Diagnosis of Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Insulin Therapy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Oral Antihyperglycemic agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Foot assessment and care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Managing acute complications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Managing chronic complications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Aboriginal cross cultural training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Obesity and Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Confidence in Managing Diabetes**

22. How difficult are the following conditions to treat / manage successfully? Please use a scale of 1 to 7 where 1 is "not at all difficult" and 7 is "extremely difficult".

	Not at all difficult (1)				Extremely difficult (7)			
a. Type 1 Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Type 2 Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Congestive Heart Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Arthritis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Angina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Hiatus Hernia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Hypertension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Hyperlipidemia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. How confident do you feel in managing the following conditions? Please use a scale of 1 to 7 where 1 is "not at all confident" and 7 is "extremely confident".

	Not at all confident (1)					Extremely Confident (7)	
a. Type 1 Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Type 2 Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Congestive Heart Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Arthritis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Angina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Hiatus Hernia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Hypertension	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Hyperlipidemia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Gaps in Diabetes Training in Residency**

24. In your opinion, how important is it for a resident to receive training in the following areas? Please use a scale of 1 to 7, where 1 is "not at all important", and 7 is "extremely important".

	Not at all important (1)					Extremely Important (7)	
a. Diagnosis of Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Insulin therapy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Oral antihyperglycemic agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Foot assessment and care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Managing acute complications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Managing chronic complications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Diabetes in Aboriginal People / Cross Cultural Training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Obesity and Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. Thinking about your residency training, how would you rate the overall adequacy of your training (clinical and classroom combined) in these areas? Please use a scale of 1 to 7, where 1 is "not at all adequate, and 7 is "completely adequate".

	Not at all adequate (1)					Completely adequate (7)	
a. Diagnosis of Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Insulin therapy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Oral antihyperglycemic agents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Foot assessment and care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Managing acute complications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Managing chronic complications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Aboriginal Cross-cultural training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Obesity and Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### Background Information

Finally, we would like to ask you a few questions about yourself and the residency program that you currently train within. None of these answers are examined individually, they are grouped together and all answers are confidential.

1. Gender

- Male  
 Female

2. Through which program are you currently taking your Family Medicine training?

- University of British Columbia  
 University of Alberta  
 University of Calgary  
 University of Saskatchewan  
 University of Manitoba  
 University of Western Ontario  
 McMaster University  
 University of Toronto  
 Queen's University  
 University of Ottawa  
 Dalhousie University  
 Memorial University  
 Other (Please specify) \_\_\_\_\_

3. Are you training in an urban or rural based program?

- Urban
- Rural
- Both

4. Please indicate the type of hospital setting in which the majority of your training occurred within...

- Teaching Hospital
- Community based Hospital

5. Did you have an endocrinology elective during your Family Medicine residency training?

- Yes
- No

6. Did you use an electronic medical record (EMR) in the Family Medicine clinic in which you spent the majority of your block time?

- Yes
- No

7. In your residency training, did you use a clinical logbook to record clinical experiences?

- Yes, all the time
- Yes, some of the time
- No

#### **Your Preceptors Practice**

8. Please indicate the billing structure of your primary preceptor

- Fee for Service
- Salaried Academic Physician
- Salaried Community Based Physician

9. What is the gender of your preceptor?

- Male
- Female

10. How many years has your primary preceptor been working as a family physician?

\_\_\_\_\_

11. How many years has your primary preceptor been training Family Medicine residents?

\_\_\_\_\_

**THANK YOU!!**

**Appendix #3: Letter to Post Graduate Directors for Permission to Survey Residents**



UNIVERSITY  
OF MANITOBA

Faculty of Medicine  
Department of Family Medicine

Parkland Residency  
Dauphin Regional Health Centre  
625 Third Street S.W.  
Dauphin MB R7N 1R7  
Telephone (204) 638-2163  
Fax (204) 638-0669

Office of Professor & Head  
St. Boniface General Hospital  
E6003 – 409 Taché Avenue  
Winnipeg MB R2H 2A6  
Telephone (204) 235-3655  
Fax (204) 231-0302

Bannatyne Campus  
T158 – 770 Bannatyne Avenue  
Winnipeg MB R3E 0W3  
Telephone (204) 789-3314/3390 -  
789-3801  
Fax (204) 789-3917

Family Medical Centre  
St. Boniface General Hospital  
500 – 400 Taché Avenue  
Winnipeg MB R2H 3E1  
Telephone (204) 237-2863  
Fax (204) 231-2648

Financial Administration Office  
2PC07 – 2300 McPhillips Street  
Winnipeg MB R2V 3M3  
Telephone (204) 632-3561  
Fax (204) 694-7639

Kildonan Medical Centre  
Seven Oaks General Hospital  
2300 McPhillips Street  
Winnipeg MB R2V 3M3  
Telephone (204) 632-3203  
Fax (204) 694-5697



Hôpital général St-Boniface Hôpital général

 SEVEN OAKS  
General Hospital

OFFICE RÉGIONAL DE LA SANTÉ  
DES PARCS



 Winnipeg Regional  
Health Authority Office régional de la  
santé de Winnipeg

March 21, 2005

Dear Dr. :

I am writing to you to request your help in conducting a national study entitled Canadian Family Medicine Residents' Clinical Training in Diabetes.

Diabetes mellitus is a condition that continues to increase in prevalence in Canada and worldwide, and costs the Canadian health care system an estimated \$13.2 billion per year. This condition places a significant workload burden on family physicians. Visits to Family Physicians by persons with diabetes account for approximately 80% of all office visits for diabetes in our health care system.

Clinical management is therefore squarely on the Family Physician, as well as wise use of our scarce health care resources. Although diabetes is one of the more common conditions seen by family physicians, we know very little as to whether the training provided in Canada is adequately preparing residents for professional practice.

I am formally writing to ask for your permission and co-operation in conducting this study. This project is my masters thesis in Community Health Sciences at the University of Manitoba. Beyond its academic purpose, this is a significant endeavor for several reasons. Results will help to identify any potential gaps in diabetes training in Canadian Family Medicine residency programs, and will serve to strengthen future training. As well, this is the first time that a formal assessment has been undertaken to voice the adequacy of residency training in Canada on a specific clinical issue like diabetes.

**What am I specifically requesting?** I will require written approval from your department to allow this research to be conducted on your graduating residents, beginning after the upcoming CCFP examination. In addition, I would require a contact person(s) within your department who would be delegated responsibility to distribute this survey electronically to your residents.

Please find attached a copy of the ethics approval for this project through the Health Research Ethics Board at the University of Manitoba. Please feel free to contact the Principle Investigator Kevin Thiele at \_\_\_\_\_ or at \_\_\_\_\_ should you have any questions or comments. Thank you for your time and interest in this initiative.

Sincerely,

Mr. Kevin Thiele  
Principle Investigator

**Appendix #4: Research Ethics Board Approval Form – University of Alberta**

# Health Research Ethics Board

213 Heritage Medical Research Centre  
University of Alberta, Edmonton, Alberta T6C 2S2  
p.780.492.9724 (Biomedical Panel)  
p.780.492.0302 (Health Panel)  
p.780.492.0459  
p.780.492.0839  
f.780.492.7808

## HEALTH RESEARCH ETHICS APPROVAL FORM

**Date:** April 2005

**Name of Applicant:** Olga Szafran

**Organization:** University of Alberta

**Department:** Family Medicine

**Project Title:** Canadian Family Medicine residents' clinical training in diabetes mellitus

The Health Research Ethics Board (HREB) has reviewed the protocol for this project and found it to be acceptable within the limitations of human experimentation. The HREB has also reviewed and approved the subject information letter and consent form

**Special Comments:**

APR 27 2005

Dr. Glenn Griener, PhD  
Chair of the Health Research Ethics Board  
(B: Health Research)

Date of Approval Release

File Number: B-250405



**Appendix #5: Email Sent to Residents**

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**Sent:** Friday, February 02, 2007 12:14 PM  
**Attach:** Consent Form - Mail Survey-post ethics.doc  
**Subject:** FAMILY MEDICINE DIABETES STUDY

## **FAMILY MEDICINE DIABETES SURVEY**

**Dear Graduating Family Medicine Resident:**

Are you aware that, as a future Family Physician, you will be expected to manage more than 90% of presenting diabetes related problems without referral elsewhere, and 100% of continuous care for your diabetes patients? Diabetes management is presently the 7<sup>th</sup> most frequent reason for visits to a family physician. **Have you wondered if your residency training has provided enough experience to prepare you adequately to manage this clinical burden?**

You have been approached to participate in a study conducted through the Department of Family Medicine at the University of Manitoba. This project is taking a Family Medicine Residents' view on the adequacy of experiences provided in residency training on managing diabetes mellitus. This is the first time that a formal assessment has been undertaken to voice the adequacy of training experience for Family Medicine Residents in a specific clinical issue. Participating in this survey will help to identify any potential gaps in diabetes training in Canadian Family Medicine Residency programs.

**I encourage you to access the following link <http://www.surveymonkey.com/s.asp?u=54865801210> to complete this important survey.** It will take only 10-15 minutes of your time. Further information on this study is attached to this email for your reference. If you have already completed the survey, please disregard this notice, and accept our thanks for participating.

Please feel free to contact the Principle Investigator, Kevin Thiele, at [redacted] ext. [redacted] at [redacted] should you have any questions or comments. Thank you for your time and interest in this initiative.



UNIVERSITY  
OF MANITOBA

Faculty of Medicine  
Department of Family Medicine

## RESEARCH PARTICIPANT INFORMATION AND CONSENT FORM

**Title of Study: "Canadian Family Medicine Residents' Clinical Training in Diabetes Mellitus".**

**Principal Investigator: Kevin Thiele, RD CDE  
Education Dietitian  
University of Manitoba - Department of Family  
Medicine  
Parkland Family Medicine Residency Unit**

F  
Ph: ( )

**Sponsor: Manitoba Medical Services Foundation Grant**

**You are being asked to participate in a research study. This research study is being conducted to assess graduating Canadian Family Medicine residents' level of experience obtained in residency training and confidence levels in managing diabetes specific clinical issues. This is an important opportunity to express your views in confidence regarding the training provided by your residency program in managing this commonly seen condition.**

**A total of 476 participants will participate in this study, which will represent all graduating Family Medicine residents in Canada (excluding French programs).**

### **Study Procedures**

**If you take part in this study, you will complete a brief questionnaire that focuses on the approximate level of experience that you received in various clinical areas of diabetes management. Questions are based around common diabetes clinical issues as well as sections of the 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada.**

Participation in the study is completely voluntary, and will be for the duration of time necessary to complete the survey. This should take approximately 10-15 minutes of your time.

You can stop participating at any time. However, if you decide to stop participating in the study, we encourage you to talk to the study staff first.

### Risks and Discomforts

Questions regarding training can often be very sensitive issues due to anxiety related to concern of identification of individual respondents. Your participation in this survey will in no way affect your current residency training. There will be no names or obvious identifiable characteristics collected. Comparisons will only be made globally between different Departments of Family Medicine. Be reassured that results from independent residency units within Departments of Family Medicines will not be reported, in efforts to protect against recognition of results and concerns over how responses may reflect on yourself, your primary preceptor or program. This is of particular concern with the rural residency units, where numbers of residents are small compared to urban based programs.

### Benefits

There is no direct benefit to you from participating in this study. We hope the information learned from this study will benefit Family Medicine residency training in the future.

### Confidentiality

All surveys will bear only an assigned study number, which will be discarded once your response has been received. Response rates are based on percentage of return within the known number of graduating residents in each Family Medicine residency program. No personal information such as name or health numbers will be gathered. Information gathered in this research study may be published or presented in public forums, however your name and other identifying information will not be collected, used or revealed. Despite efforts to keep your personal information confidential, absolute confidentiality cannot be guaranteed. Your personal information may be disclosed if required by law.

The University of Manitoba Health Research Ethics Board may review records related to the study for quality assurance purposes.

All records will be kept in a locked secure area and only the principal investigator will have access to these records.

### Voluntary Participation/Withdrawal from the Study

Your decision to take part in this study is voluntary. You may refuse to participate or you may withdraw from the study at any time. Your decision not to participate or to withdraw from the study will not affect your residency training or evaluations.

### Questions

You are free to ask any questions that you may have about your rights as a research participant. If any questions come up during or after the study, contact the principle investigator: *Kevin Thiele* at \_\_\_\_\_ or email at \_\_\_\_\_.

For questions about your rights as a research participant, you may contact The University of Manitoba, Bannatyne Campus Research Ethics Board Office at (204) 789-3389