6-23-2017 12:00 AM

Perceived patient-pharmacist communication and diabetes management: Assessing medication adherence among older patients

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A thesis submitted in partial fulfillment of the requirements for the degree in Master of Science

Abstract

With 50% of patients in North America not taking their medications as they should (Brown & Bussell, 2011), a better understanding of medication adherence among older patients could be helpful to health professionals and service providers. The purpose of this study was to examine whether the perceived pharmacist-patient quality of communication is associated with diabetes medication adherence. Eighty-four adults (>60 years old) from the Primary Care Diabetes Support Program were recruited. Diabetes medication adherence and pharmacist-patient quality of communication were measured using self-report questionnaires. No significant correlation was found between medication adherence and perceived pharmacist-patient quality of communication. Results indicated a significant correlation between medication adherence and the number of years the patient had been diagnosed with diabetes (r=-0.233), as well as the number of medications the patient took (r=-0.284). Patients diagnosed with diabetes for a longer time and patients taking both injections and pills reported to be less adherent.

Keywords

Medication Adherence, Pharmacist-Patient Communication, Diabetes in seniors, Diabetes Medication.

Acknowledgments

I would like to thank my supervisor Professor Alan Salmoni for all his patience, advice and support from the very first day. Professor, I am eternally grateful for your guidance when I was feeling lost and scared, I cannot thank you enough for taking me as your student and helping me become a better graduate student and researcher. Also, my gratitude to my advisory committee: Professor J.B Orange and Professor Rob Petrella. I appreciate your time and generous advice.

I would like to acknowledge the St. Joseph's Family Medical and Dental Centre doctors and staff for their continuous support and welcoming attitude. I would like to thank sincerely Doctor Sonja Reichert for her time and kind support; also, I appreciate the time and help that Tylene Fisher, Jessica Smith and Sara Somers provided during data collection, it was my pleasure to work with you all. I would like to express my gratitude to the University of Western Ontario and the Health and Rehabilitation Sciences Program. To Janet Holmes, Nancy Inchley and Barb Nikolakakos, thank you for pointing me in the right direction always. Thank you for your warm smiles and useful advice.

I acknowledge the National Council of Science and Technology (CONACYT) in Mexico and the San Luis Potosi Council of Science and Technology (COPOCYT) for the funding for my second Master's degree year (September 2016-August 2017).

I appreciate all the help that my friends offered me during my program. Thank you for your advice, love and care.

Finally, I acknowledge the kindness of all seniors who participated in my study. Your smiles meant the world to me.

Dedication

To my parents, who always believed in me when nobody else would, who supported me to accomplish the impossible, I love you very much and I hope you are proud of me.

To my sister, because we smiled, laughed and cried together. I thank God everyday, knowing that He sent you to be my best friend in life.

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Chapter 1

1 Introduction

In recent years, the older adult population in North America has grown quickly. "Population aging in Canada would accelerate between 2010 and 2031, a period during which all baby boomers would reach age 65" (Statistics Canada, 2010, p.16). Long life spans and improving medical care means aging is becoming a priority among health care researchers (Jeannotte & Moore, 2007) and practitioners. As a result of these demographic changes, it is estimated that by 2036 the number of older adults in Canada will range between 9.9 and 10.9 million (Statistics Canada, 2010). As the population of older adults in Canada grows, the number of prescriptions for health conditions and chronic disease also will increase. Medication misuse, poor adherence and risk of overdose are just some of the issues that health professionals can expect when providing care to older patients (The Gerontological Society of America, 2013).

Haskard-Zolnierek and DiMatteo (2009) defined patient adherence to medical advice as follows: "the degree to which patients follow the recommendations of their health professionals" (p. 827). The term "compliance" has been replaced by "adherence" in recent literature (Brincat, 2012). Terms like "unfaithful" and "unreliable" can be found in the medical literature from the first half of the twentieth century, however, they implied that the physician had absolute power over the patient, instead of portraying the process as a shared decision between physician and patient (Steiner & Earnest, 2000). Although both terms "adherence" and "compliance" can be found in the literature "adherence presumes the patient's agreement with the recommendations, whereas compliance implies patient passivity" (Brown & Bussell, 2011, p. 305). The term "compliance" was proposed by a group of health professionals in United Kingdom and it also refers to the medical consultation as a dialogue between the physician and patient (Bissell, May, & Noyce, 2004).

Non-adherence happens when patients do not take their medications as prescribed (e.g. the patient stops taking the medication or the treatment is never started). "Poor

adherence to medical treatment severely compromises patient outcomes and increases patient mortality" (Brown & Bussell, 2011, p. 306). According to Brincat (2012), non-adherence can be intentional or unintentional, depending on the type of barrier. For instance, unintentional non-adherence is related to financial causes, memory issues and difficulties to understand the instructions (Brincat, 2012).

Improving medication adherence among older patients is essential in order to achieve positive healthcare outcomes; such as reducing hospitalization rates, reducing further disease complications (Starr & Sacks, 2010) and minimizing the cost of long-term care for patients (Krueger, Berger, & Felkey, 2005). According to the World Health Organization (2003): "Poor adherence to treatment of chronic diseases is a worldwide problem of striking magnitude. Adherence to long-term therapy for chronic illnesses in developed countries averages 50%. In developing countries, the rates are even lower."(p. 13).

There are numerous reasons for medication non-adherence that range from age-related problems like memory declines and sensory loss to social and financial issues (Murray et al., 2004), as well as the patient's decision to stop taking the medication. According to the National Council on Patient Information and Education (2007), the dimensions that affect medication adherence can be: "social and economic factors, health system and health care team-related factors, therapy-related factors, condition-related factors and patient-related factors" (p. 9). Effective patient-provider communication is one of the fundamental aspects for medical care delivery; and it has been proven important for the optimization of medication adherence among older patients (Heisler, Cole, Weir, Kerr, & Hayward, 2007; Wilson et al., 2007).

Diabetes type 2 is one of the more common chronic conditions among older adults with a prevalence of approximately 13% in individuals 65 years and over (Misiaszek, 2008). Older patients with diabetes are unable to produce enough insulin or their bodies are unable to use it correctly. Diabetes patients are often prescribed oral agents, however, as the disease progresses, insulin might be required. Diabetes mellitus increases the risk for cardiovascular disease and is a predictor for kidney damage, blindness and non-

traumatic amputations. It is also associated with depression (Canadian Diabetes Association, 2015). Even when this disease requires lifestyle changes and prescribed medication for adult patients, they tend to take fewer doses than prescribed (Cramer, 2004). Since poor adherence can impact future diabetes management (Aikens & Piette, 2013), measuring medication adherence among older patients with diabetes can inform health professionals about diabetes management and clinical outcomes.

Adherence to diabetes treatment can be affected by diverse factors, however patients who report satisfaction with their patient-provider relationship adhere better to their treatment (Heisler, Bouknight, Hayward, Smith, & Kerr, 2002; Rubin, 2005). Although most of the literature focuses on physician-patient relationship, this study examined the relationship with the pharmacist as an important factor for medication adherence, specifically for diabetes medication. Recent studies report that the pharmacist is deemed as a more accessible health professional than physicians for older patients with diabetes, allowing for long-term relationships, trust and better communication. This accessibility is directly associated with better medication adherence (Rickles et al., 2015; Worley, 2006). Given the interaction among the multiple factors that affect diabetes treatment adherence and patient-pharmacist communication, determining the association between them could be beneficial in order to inform health professionals and enhance older adults' quality of life.

1.1 The research problem

With 50% of patients in North America not taking their medications as they should (Brown & Bussell, 2011), a better understanding of medication adherence among older patients could be helpful to health professionals and to service providers. In addition, since the relationship between pharmacist and patient has an important role for the patient's behavior and adherence to treatment (Donohue, Huskamp, Wilson, & Weissman, 2009), measuring these two variables would be significant for gaining an insight into the interaction between patient-provider communication and medication adherence. For this reason, this study investigated whether perceived patient-pharmacist quality of communication is associated with type II diabetes medication adherence (insulin and oral medications).

1.2 Purpose of the study

The purpose of this study was to assess older patients' perceived quality of communication with their pharmacists and to investigate whether their perception correlates with diabetes medication adherence. Knowing more about this relationship has the potential to improve diabetes care among older adults. The hypothesis of this research was that older adults who report a better quality relationship with their pharmacists would report better adherence to diabetes medication.

Chapter 2

2 Literature Review

2.1 Medication Adherence

Medication adherence is considered a major problem worldwide, especially for older adults (65 and over) who take numerous medications (National Council on Patient Information and Education, 2007). In Canada, the proportion of older adults is increasing; this tendency is expected to continue in subsequent years. According to the demographic projections for the country: "the proportion of persons aged 65 years or over would range between 23% and 25% in 2036 and between 24% and 28% in 2061" (Statistics Canada, 2010, p. 50). With a high prevalence of multimorbidity among older adults, the number of medication prescriptions is rising, as is the burden for the health care system. Multimorbidity is defined as the coexistence of two or more chronic conditions (Salive, 2013). The use of numerous medications is known as polypharmacy. It is a serious issue for the health care system since it encompasses negative side effects, drug-drug interactions and incongruous dosing (Bushardt, Massey, Simpson, Ariail, & Simpson, 2008). According to the Canadian Institute for Health Information, "Seniors who reported three or more chronic conditions were taking an average of six prescription medications on a routine or ongoing basis, twice as many medications as seniors with only one chronic condition." (Canadian Institute for Health Information, 2011, p. 2).

According to the World Health Organization (2003), medication adherence can be defined as: "the extent to which the patient follows medical instructions" (p. 3). However, the term is not limited to drug prescription, but to specific behaviors as well, for instance, special diet, physical activity and minimizing negative habits such as smoking or drinking (World Health Organization, 2003). The term "adherence" has been used in recent literature to replace the term "compliance", given that the first term implies that the patient is an active participant in the treatment process (Brown & Bussell, 2011). . The term compliance is related to a negative assumption towards the patients behavior, while the term adherence implies active decision-making and collaboration between the

patient and the provider (Delamater, 2006) When the patient continues the treatment over a period of time without exceeding the acceptable pauses established by the physician, the term “persistence” is used (Cramer et al., 2008).

Optimum adherence to medical treatment is fundamental for chronic disease management among older patients. The more adherent the patient is, the lower the rate of hospitalization and mortality (Starr & Sacks, 2010). Inappropriate support for older adults with a long-term prescribed drug therapy often leads to medication non-adherence (Murray et al., 2004). From the provider’s perspective, some signs of medication non-adherence include the following: “the patient does not get a new prescription, does not refill a long-term medication as frequently as expected, stops refilling medications used for long-term therapy, or fails to finish an entire course of an acute medication (e.g. an antibiotic)” (Krueger, Berger, & Felkey, 2005, p. 329). The literature reports different classifications of medication non-adherence. Jimmy and Jose (2011) suggested three types: Primary non-adherence, non-persistence and non-conforming. In the first example, the patient does not fill the prescription after it is received, so the treatment is never initiated. Non-persistence refers to stopping the medication after the treatment has started. This can be caused by individual limitations, personal beliefs and different expectations that promote the lack of adherence. Therefore, this type of non-adherence can be either “unintentional” (e.g. health status, cognitive decline) or “intentional” (e.g. skipping doses) (Brincat, 2012). The third type, non-conforming, encompasses different behaviors towards the medication that affect adherence. These include, for instance, taking a higher or lower dosage than prescribed, skipping dosages or changing doses (Jimmy & Jose, 2011).

Medication non-adherence in older patients can be influenced by a myriad of factors, ranging from health literacy (Lee, Yu, You, & Son, 2015) to poor knowledge of the medication (Barat, Andreasen, & Damsgaard, 2001), to age-related factors such as cognitive impairment (Campbell et al., 2016) and difficulties opening medication containers (Atkin, Finnegan, Ogle, & Shenfield, 1994). Recently, several authors (Krueger et al., 2005; Murray et al., 2004; Yap, Thirumoorthy, & Kwan, 2015) outlined the factors that influence medication adherence among older adults. For instance, Yap

and her colleagues (2015) reported five main categories, namely: (1) medication-related factors, (2) system-based factors, (3) patient factors, (4) physician factors and (5) other factors, such as lack of a caregiver. This last category encompasses factors that do not appear very often in the literature. According to Yap and her colleagues, medication factors are related to the type of medication, dosing regimen, and drug interactions, among others. System-based factors refer to patient education, quality of the follow-up, lack of medication schedule, as well as availability of nursing care. Patient factors include mental and physical health, medical history, patient's demographics and beliefs regarding medical treatment. With regard to physician factors, the authors located the following issues: lack of trust and satisfaction with medical visits, lack of involvement from the patient and poor physician-patient communication (Yap et al., 2015).

Another factor that affects adherence is polypharmacy, defined as the use of multiple medications. Duplicated drugs (Golchin, Isham, Meropol, Vince, & Frank, 2015), adverse side effects, drug interactions and inappropriate dosing are some of the negative outcomes of polypharmacy (Bushardt et al., 2008). The number of seniors who are taking multiple medications is increasing in Canada, and the number of medications is related to age, specially for patients 65 years and over (Rotermann, Sanmartin, Hennessy, & Arthur, 2014). Reason and colleagues (2012) analyzed data from the Canadian Survey of Experiences with Primary Health Care (2008) and found that 27% of older patients were taking five or more medications. Also, older adults who were taking numerous medications were more likely to receive a wrong dose or a wrong prescription from their provider (Reason, Terner, Moses McKeag, Tipper, & Webster, 2012).

Assessing medication adherence among seniors is a concern for health professionals, since physical and cognitive changes, such as memory loss, might impact their ability to take prescribed drugs (Kessels, 2003; Raehl, Bond, Woods, Patry, & Sleeper, 2002). According to Salthouse (2009), even when some cognitive abilities start to decline slightly before the age of 30, the decline in some domains such as memory is significantly more evident after 60 (Salthouse, 2009).

There is no standard assessment for medication adherence. However, measurements can be categorized according to the type of data that reflect adherence (quantitative or qualitative). Farmer (1999) reported different methods to measure medication adherence. For instance, the method of drug level in biologic fluids helps to determine if the patient has received the required dose of medication more accurately. However, it is difficult to assess the degree of compliance from one patient to another because two patients can have the same level of the target drug but they could have consumed the medication in a different way. Other methods to assess medication adherence include: biologic markers (similar to biologic fluids), direct patient observation (monitored clinical trials) and patient self-report (e.g., diaries, interviews and validated questionnaires), pill count (simply counting the number of dosage units like tablets or capsules), prescription refill records, use of electronic devices, and Meds Check program[1] (Ontario Pharmacists Association).

Self-report is the most common assessment in clinical care (Stirratt et al., 2015), questionnaires related to medication adherence have numerous advantages. For instance, they can be used in different settings and patients can complete them easily. However, the accuracy of the results depends on the instrument, on how patients might interpret the questions differently or on how they might attempt to conceal their behaviour (Farmer, 1999). Self-report measures were selected for this research because they are the most convenient and flexible method for assessing medication adherence in the health care context (Stirratt et al., 2015).

2.2 Patient-provider communication

One of the most essential physician-related factors that affects medication adherence is "poor communication" (Yap et al., 2015). The physician-patient relationship influences patient outcomes such as patient satisfaction (Linn, van Weert, van Dijk, Horne, & Smit, 2014), adherence to treatment, recall and understanding of medical information, health

[1] Annual consultation with the patient in which the pharmacists make sure that all the medication is taken properly (Ontario, Ministry of Health and Long-term Care).

[2] "Electronic monitoring generates data on the date and time of each opening of the bottle. Such data can be repeated and compared over time" (Lehmann et al., 2014, p.60).

status and even quality of life (Ong, de Haes, Hoos, & Lammes, 1995). Physician quality of communication is an important aspect of medical education. However, the active participation of the patient during the consultation also is fundamental for a better understanding of the treatment information and health outcomes (Ha, Anat, & Longnecker, 2010; Harrington, Noble, & Newman, 2004).

Effective communication between patient and provider is expected to result in appropriate delivery of medical care. Nevertheless, different communication barriers in clinical settings have been identified including patients leaving with unanswered questions after a medical visit (Zullig et al., 2015). Bartlett and colleagues (2008) found that adverse events in hospital could be preventable by overcoming communication barriers (e.g., optimizing information sharing and special attention to patients with disabilities). Moreover, Park and Song (2005) reported significant differences between older patients and nurses perceived communication barriers. The authors found that older patients considered: “using medical terminology”, “working without a sincere attitude”, “authoritative attitude”, “sudden change of subject” and “being unfriendly” as the more important nurse-related barriers (p. 161).

The complex interaction between physician-patient communication and medication adherence has been examined for the last four decades. Hulka and colleagues (1976) investigated inappropriate drug use and how it was related to physician and patient communication. The authors found that appropriate physician-patient communication was associated with better adherence to the treatment among patients with heart failure and diabetes. They also found that communication influenced patient behavior during health care delivery, especially for receiving and understanding instructions (Hulka, Cassel, Kupper, & Burdette, 1976).

Numerous authors have shown that a relationship exists between the quality of patient-provider communication and medication adherence (Brown & Bussell, 2011; Haskard-Zolnierek & DiMatteo, 2009; Jolles, Clark, & Braam, 2012; Martin et al., 2010; Ratanawongsa, Karter, Parker, Lyles, Heisler, et al., 2013; Schoenthaler et al., 2009; Stavropoulou, 2011; Swain, Hariharan, Rana, Chivukula, & Thomas, 2015; Zullig et al.,

2015). Communication rated as collaborative was associated with better adherence to long-term treatment. Collaborative communication refers to a shared-decision making process between the physician and the patient, rather than unitary (Naik, Kallen, Walder, & Street, 2008).

Trust is another relevant factor for the patient-provider relationship. Donohue and her colleagues (2009) conducted a survey among American older adult patients to investigate the level of trust that the patients had for their provider, and how it was related with prescription medications. The result from their survey showed that the respondents trusted physicians and pharmacists as the most reliable source of information about drug effectiveness and about the prices of medication (Donohue et al., 2009). The authors suggested that the patients' trust in their providers has a significant impact on medication adherence. Moreover, the pharmacists seem to have a special position to support and to educate the patient about medication use (Urru, Pasina, Minghetti, & Giua, 2015).

Among health professionals, pharmacists have a considerable influence for medication adherence. Ranelli and Coward (1996) investigated the differences between rural and urban pharmacists concerning the interaction with older patients. They found that patients from rural areas communicated more often with their pharmacists than their urban counterparts and that they established significant relationships with their providers. This interaction facilitated the communication about medication issues and was thought to prevent and to help decrease drug management issues (Ranelli & Coward, 1996). In a subsequent study (1997), the authors examined patients' expectations regarding their pharmacist. Older patients with higher expectations were more likely to request health care counseling, highlighting the significant role of communication for health outcomes (Ranelli & Coward, 1997).

Effective patient-pharmacist communication has a significant role in health care. In this regard, Hargie and his colleagues (2000) analyzed 30-videotaped interactions between pharmacists and patients with the aim of identifying effective communication features. Pharmacists were instructed to watch the interactions and to rank the

communication skills based on level of importance from their perspective. The effective communication skills were placed in eleven categories (according to the ranking): building rapport (e.g. being helpful, showing concern), explaining, questioning, listening, non-verbal communication (e.g. eye-contact, tone of voice), suggesting/advising, opening (e.g. identifying patient by name), closing (e.g. being polite), assertiveness (e.g. enhancing credibility) to mention a few. The findings suggested that pharmacists who showed a higher number of these communication skills were deemed better practitioners (Hargie, Morrow, & Woodman, 2000).

Several scales for assessing patient-provider communication exist. Ramsey's (2000) General Practice Assessment Survey (GPAS) is used for communication and other dimensions of medical care like satisfaction and patient's knowledge (Ramsay, Campbell, Schroter, Green, & Roland, 2000). Lerman's (1990) Perceived Involvement in Care Scale (PICS) addresses the decision-making process between patient and doctor. Little's (2001) questionnaire permits the researcher to explore communication, illness experience, patient-provider relationship, beliefs and expectations, among other factors (Little et al., 2001). As for pharmacist-specific communication, Worley (2006) used a questionnaire to test the pharmacist-patient relationship quality in a random sample of 600 older adults in the United States. This complete tool includes numerous questions related to participative behavior, interpersonal communication and relationship commitment (Worley, 2006).

2.3 Diabetes medication adherence and pharmacist communication

"Diabetes is currently among the top five causes of death in most high-income countries and resulted in 4.6 million deaths globally in 2011" (García-Pérez, Alvarez, Dilla, Gil-Guillén, & Orozco-Beltrán, 2013, p. 176). Canada has a high rate of diabetes in comparison with other nations causing a significant financial burden to the Canadian health system (Canadian Diabetes Association & Diabetes Québec, 2010). In fact, The Canadian Diabetes Association (2015) estimated that the direct cost due to diabetes was approximately $3 billion for 2015: $1.8 billion in medication, $721 million in hospital care and $717 million in physician consultations. According to the Canadian Diabetes Association (2015): "There are three types of diabetes: type 1 diabetes, which generally

develops in childhood or adolescence, and occurs when the body does not produce insulin (or produces very little); type 2 diabetes occurs when the body does not make enough insulin or cannot properly use the insulin it produces; gestational diabetes is a temporary condition that develops during pregnancy and leads to increased risk of developing type 2 diabetes for both mother and child." (p. 11).

Optimal glycemic control is fundamental to manage diabetes properly. In this regard, patients can be prescribed non-insulin antihyperglycemic agents and/or insulin therapy. The non-insulin antihyperglycemic agents include: DPP-4 Inhibitors (oral drugs that improve glucose control like linagliptin, saxagliptin, sitagliptin), GLP-1 Receptor Agonists (injectable drugs that stimulate insulin secretion like liraglutide), Sulfonylureas (drugs that stimulate the beta cells to secrete insulin, like gliclazide, glyburide), Meglitinides (drugs that stimulate insulin secretion with an immediate effect like repaglinide), Metformin (enhances insulin sensitivity), SGLT2 Inhibitors (drugs that enhance urinary glucose excretion like canagliflozin) and Combination formulations (e.g. linagliptin with metformin). Insulin therapies include: Basal insulin (e.g. determir, glargine), Prandial insulin (e.g. aspart, lispro), and Premixed insulin (e.g. biphasic aspart (Canadian Diabetes Association, 2015). Although Type 2 diabetes requires a delicate balance of prescribed medication and lifestyle changes, adherence to oral drugs or insulin is often poor and affects the management of the condition (Aikens & Piette, 2013). As a matter of fact, "recommended glycemic goals are achieved by less than 50% of patients, which may be associated with reduced adherence to therapies, and may lead to complications of diabetes over time" (García-Pérez et al., 2013, p.189).

Regimen complexity is a significant factor that influences medication adherence in patients with diabetes. Patients who take numerous prescribed medications report low levels of adherence (Pasina et al., 2014). In this regard, taking both pills and injections increases the treatment level of complexity. Adherence can also be affected by the type of drugs. For instance, injectable medication is often related with lower adherence (Balkrishnan et al., 2003). Concerning oral hypoglycemic drugs, the number of tablets that the patient must take per day heavily influences adherence. Patients taking one tablet

per day (e.g. metformin) show better adherence than those who take two or more (Donnan, MacDonald, & Morris, 2002; Morningstar, Sketris, Kephart, & Sclar, 2002).

Diabetes medication adherence continues to be a problem for patients and the health care system, especially for seniors. In Canada, the diabetes prevalence is higher among older adults. According to the 2015 Report on Diabetes, by 2010, 49% of patients were 65 years of age and older, and among the newly diagnosed group 39% of new cases were reported for individuals 50 to 64 years old (Canadian Diabetes Association, 2015). A high levels of medication adherence offers numerous benefits for older adults such as better glycaemic control over time, lower medication costs and fewer diabetes complications and hospital visits (Capoccia, Odegard, & Letassy, 2015).

Older patients with diabetes require pharmacotherapy to achieve glycaemic control. Therefore, adherence to the treatment is fundamental in order to manage their disease successfully and improve the patients' quality of life (Krass, Schieback, & Dhippayom, 2014). Older patients face numerous barriers to diabetes management such as comorbidities, lack of knowledge of the disease, age-related changes, financial problems, lack of social support, adherence to medications and inadequate communication with health professionals (Hammouda, 2011). Moreover, older patients are more likely to develop diabetes complications and to suffer depressive symptoms, which can significantly affect medication adherence (Kim et al., 2015).

Type 2 diabetes medication adherence can be greatly affected by the perceived patient-provider quality of communication (Heisler et al., 2002). Regrettably, approximately 63% of healthy Canadians have never talked about diabetes with their physician (Canadian Diabetes Association, 2015a). Furthermore, poor communication with providers is associated with low adherence to oral hypoglycemics, to refilling prescriptions and to monitoring glucose levels (Ciechanowski, Katon, Russo, & Walker, 2001; Ratanawongsa, Karter, Parker, Lyles, Heisler, et al., 2013).

Older patients with diabetes establish significant long-term relationships with different providers like physicians and nurses, also pharmacists are often more accessible to address medication related problems (Worley, 2006). There is a significant association

between the pharmacist-patient relationship and glycaemic control (Collins, Limone, Scholle, & Coleman, 2011). Pharmacists are able to reduce adverse drug effects, increase knowledge about diabetes and improve medication adherence in older patients (Alhabib, Aldraimly, & Alfarhan, 2014; Butt, Mhd Ali, Bakry, & Mustafa, 2016; Grossman, 2011; Hassali, Nazir, Saleem, & Masood, 2015; Omran, Guirguis, & Simpson, 2012). The influence of pharmacist-patient communication has been shown to be a crucial factor concerning diabetes medication adherence among older patients. Hence, ineffective communication can lead to medication non-adherence, which can cause negative health outcomes in older adults with diabetes (Rickles et al., 2015).

Additional research regarding adherence to diabetes medication and patient-pharmacist communication would be useful to inform health professionals about older adults' medication behaviour. Moreover, since "more than 10% of emergency department visits in Canada result from drug-related problems" (Tannenbaum & Tsuyuki, 2013, p.1229), exploring medication adherence among seniors might be helpful to providers, specially pharmacists, considering that older patients tend to have a continuous interaction with their pharmacists and this connection improves with age (Dragic et al., 2015).

Chapter 3

3 Methodology

3.1 Participants and design

The present study is quantitative and uses a cross-sectional design. A convenience sample was used. The sample consisted of 84 patients from the Primary Care Diabetes Support Program at the St. Joseph's Family Medical and Dental Centre, in London Ontario, Canada. This clinic offers a multidisciplinary team of health professionals who provide support for individual with diabetes. Patients attending this clinic have access to specialized nurse practitioners, physicians and dieticians. A sample of 84 participants was sufficient to detect a correlation of 0.30 with a power of 80 percent (Cohen, 1988). The inclusion criteria for the participants were: ≥60 years, diagnosed with type 2 diabetes, taking at least one long-term medication for this condition, English-speaking, no visual or hearing problems, as well as no diagnosis of dementia. All the participants had had at least one previous appointment at the clinic.

According to a Report of Diabetes in Canada: "The sharpest increase in the prevalence of diabetes occurs after the age of 40" (Public Health Agency of Canada, 2011). Also, from 1988 to 2010 the prevalence of diabetes significantly increased in the age group ≥65 years old (Cheng et al., 2013). Considering this information, a minimal age of 60 was set as the criteria for recruitment for patients with diabetes. Regarding medication, it is estimated that from 2008 to 2010 85.1% of adults with diabetes were taking at least one oral medication, insulin injections or both (Public Health Agency of Canada, 2011). For this study, patients were required to be taking at least one diabetes-related medication. This study was approved by Western Ethics Board and the Clinical Research Impact Committee and Lawson Administration (Please refer to Appendix A).

3.2 Instruments

For this research, the following assessment tools were used:

a) The Morisky's Medication Adherence Scale (MMAS 8) (Morisky DE, Green LW, 1986). This medication adherence instrument was developed by Morisky and

colleagues on 2008 to assess patients with hypertension. This tool has a sensitivity of 93% and specificity of 53%, with alpha reliability of 0.83 (Morisky, Ang, Krousel-Wood, & Ward, 2008). This questionnaire assesses the level of medication adherence for each participant. Eight questions are each answered "yes" or "no", with "yes" scored as 1 and "no" as zero; except for item number 5, in which "yes" scores zero and "no" scores 1. The adherence level can be determined based on a score from 0 to 8. A score under 6 represents low adherence, scores from 6 to 7 represent medium adherence and a score of 8 represents high adherence. This adherence scale is used commonly in clinical settings for different diseases (Tan, Patel, & Chang, 2014) It was chosen to offer participants a short questionnaire that they could fill quickly. (Please refer to Appendix B for a copy of the questionnaire)

b) The Pharmacist-Patient Relationship Quality Model Questionnaire (Worley, 2006) consists of 43 items, with alpha reliability of 0.76. Each question is answered on a Likert Scale in order to test the quality of the relationship between the patient and the pharmacist from the patient's perspective. The tool incorporates five constructs:

- Pharmacist participative behavior (reliability $\alpha = 0.95$)
- Patient participative behavior ($\alpha = 0.91$)
- Pharmacist-patient interpersonal communication ($\alpha = 0.90$)
- Relationship quality ($\alpha = 0.93$)
- Relationship commitment ($\alpha = 0.76$)

Participants are asked questions about their relationship with their pharmacist. They are required to answer on a scale from 1 (strongly disagree) to 5 (strongly agree). A 9 is included as a "does not apply" option. If the data contains 20% or more missing items and "does not apply" items in the questionnaire, these data were removed from the scoring in accordance with the scoring protocol of the scale. For each question scores range from 1 to 5 with a higher score representing a stronger relationship between the pharmacist and the patient. The final score was obtained adding all the participant's answers and dividing them by the number of items in the questionnaire (43), with the maximum final score being 5. This scale

was chosen because it was developed to assess older adults with diabetes. Further, the scale contains questions worded in such manner that optimizes comprehension. Moreover the response is not complicated (Please refer to Appendix C for a copy of the questionnaire).

c) A demographic questionnaire was administered to collect the following information from participants: year of birth, gender, level of education, time diagnosed with diabetes, type of medication currently taking (pills, injections or both), and time filling the prescription with the same pharmacist. The participant could also indicate if a different pharmacist assisted them each time the prescription was filled (Please refer to Appendix D for a copy of the demographic questionnaire).

3.3 Procedure

Morisky's Medication Adherence Scale (MMAS 8) (Morisky DE, Green LW, 1986), and the Pharmacist-Patient Relationship Quality Questionnaire (Worley, 2006) were used to test 84 participants at a single point in time. The procedure follows:

1) The patient arrived to the clinic and proceeded to the front desk.
2) The clinic receptionist determined if the patient was a potential participant based on the eligibility criteria (age, diabetes medication, etc.).
3) The patient was given a clinic consent form regarding research and clinical trials. On the form they were asked to indicate whether he or she would agree to be contacted about research.
4) After checking in for their appointment and signing the clinic consent form, the participant was asked by the receptionist if he or she would have some time to participate in a research study conducted by a Western student.
5) If the participants agreed, they were given a letter of information and consent form (Please see Appendix E), the demographic information form and the two self-administered questionnaires.
6) The participant filled out the demographic information and completed the questionnaires during their waiting time. Although waiting times were often long, the participant could decide to drop out of the study by the time of the appointment,

without finishing it. The participant could also complete the questionnaires after the appointment. In order to ensure an anonymous process while collecting the data, a drop box was placed in the waiting room. Participants were informed about the drop box and the importance of anonymity, however, some participants felt uncomfortable with this instruction and asked the student if she could receive the questionnaire personally. The student received the questionnaires from the participants who felt uncomfortable using the drop box. The student was always present in the waiting room during the data collection process, in order to answer all the participants' questions about the study.

7) After each day of data collection, the student reviewed the information and separated incomplete or empty questionnaires from the complete ones. A total of 96 patients volunteered to participate in the study and filled out the questionnaires. However, during the data collection process, 12 questionnaires were considered unusable and were removed. See the next paragraph in which the reasons for removing these files were outlined. For anonymity purposes, all removed data was place in a confidential waste container according to the requirements of the clinic.
8) After the number of participants was achieved, the student proceeded to read the last set of questionnaires and forms to keep identifying missing data or blank questionnaires. Following the removal of 12 questionnaires, the student returned to the clinic to get 12 new participants and achieve the required number based on the calculations for the required sample size.

From all data collected, 12 questionnaires were removed because of the following reasons:

a) Missing data or empty questionnaires. 20% or more of missing items and "does not apply" items in the Pharmacist-Patient Relationship Quality Model Questionnaire.
b) A patient had a diagnosis of dementia. This information was given to the student by the patient's relative after the person finished the questionnaire. The clinic staff also confirmed this information so the participant's data were removed.
c) A patient had a diagnosis of schizophrenia. In this case the patient agreed to participate and completed the questionnaire before the appointment. However, later

that day, the nurse in charge of the patient informed the student about the schizophrenia diagnosis and the data were removed.

d) A patient refused to continue the questionnaire after completing half of it and declared that the questions were too difficult. The participant gave the questionnaire to the student before her appointment and the data were removed.

3.4 Data Analyses

Data analyses were carried out using the Statistical Package for the Social Sciences (SPSS) software version 2.0. Pearson correlations were calculated to measure the association between the medication adherence overall score and the quality of pharmacist-patient relationship overall score. In addition, the questionnaires' scores were correlated with: (1) Age, (2) Years of formal education, (3) Years diagnosed with diabetes, (4) Number of Medications, (5) Time filling the prescription with the same pharmacist measured in years, (6) Gender, (7) Medication Type (pills, injections or both).

Chapter 4

4 Results

The participant's mean age was 68.3 years, ranging from 60 to 89 years. Men constituted 60% of the sample while women represented 40% of the sample. Regarding education, 52% of the participants completed college/university studies, 30% completed high school, 9% had a Master's or PhD degree, 5% attended middle school only and 4% reported completing elementary school as their highest level of education. Participants reported an average of 16.0 years since being diagnosed with diabetes, ranging from 1 year to 52 years. The average time with their pharmacist was 9.67 years. Some participants reported that they had been filling their prescriptions with the same pharmacist even before they were diagnosed with diabetes. However, for the purpose of this study, only time filling diabetes medication prescriptions was considered. Concerning diabetes-.related medication, 43% of the patients reported taking both pills and injections, 38% reported only using pills, while 19% stated taking injections only. All participants used pens instead of syringes for diabetes medication injections. For the present research no medication brands were considered, as most patients just answered "pills" or "injections" in their demographic questionnaires. The study sample corresponded to a specific population of older adults who have access to diabetes care program. The descriptive data are summarized in Table 1 below. Please see Appendix F for a complete summary of the data collected.

Table 1 Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	St. Deviation
Age	84	60	89	68.31	6.569

Years of Formal Education	84	5	18	14.23	3.079
Years diagnosed with diabetes	84	1.0	52.0	16.042	9.1941
Number of Medications	84	1	2	1.42	.496
Time with the Pharmacist	84	2	25	9.67	5.972
Pharmacist-Patient Relationship Score	84	2.12	5.00	4.1751	.67986
Medication Adherence Score	84	2.00	8.00	6.7649	1.35012
Valid N (listwise)	84				

The statistical analyses indicated that there was a positive correlation of r=0.162, p>.05 between the medication adherence score and the quality of pharmacist-patient relationship score. Contrary to expectations, the variables were not significantly correlated. The Medication Adherence score was not significantly correlated with age (r= 0.15, p> .05) or with the time with the pharmacist (r= -0.045, p>.05). However, a significant negative correlation was found between medication adherence and years diagnosed with diabetes (r= -0.233 p<. 05). This finding suggests that a patient who had been taking diabetes medication for a longer period of time reported to be less adherent to their treatment in comparison with someone who was more recently diagnosed.

The quality of the pharmacist-patient relationship was not significantly correlated with the time with the pharmacist (r= 0.024, p>.05), the years diagnosed with diabetes (r= 0.012, p>.05), or with the age of the participant (r= -0.118, p>.05). Also, the number of years of education was not significantly correlated with medication adherence (r=-0.074, p>.05) or with the quality of the pharmacist-patient relationship (r= -0.194, p>.05).

After the first statistical analysis, the medication adherence scores were divided in two categories: high adherence (8 points) and low adherence (less than 8 points). A significant correlation was found between the medication adherence score and the number of medications the patient is taking (r= -0.284, p=0.01). This result shows that patients who were taking just one medication (pills only or injections only) reported better adherence than participants who were taking both pills and injections as part of their diabetes treatment. A Chi Square (please see Table 2) was conducted to examine the relation between low or high adherence and the number of medications taken by the participant (1 medication represents pills or injections only, while 2 medications represents for both pills and injections). As shown in table 2, the level of adherence is associated with the number of medication types that the patient is taking. That is, participants taking two types of diabetes medications are less adherent than those who take only one type.

Table 2 Chi Square Test

*Adherence (High or Low) * Diabetes Medication Crosstabulation*

Count

		Diabetes Medication		
		One Medication	Two Medications	Total
Adherence (High or Low)	High	25	8	33
	Low	24	27	51
Total		49	35	84

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.789[a]	1	.009		
Continuity Correction[b]	5.660	1	.017		
Likelihood Ratio	7.025	1	.008		
Fisher's Exact Test				.013	.008
N of Valid Cases	84				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.75.

b. Computed only for a 2x2 table

A t-Test (see Table 3) was performed to compare sex differences for medication adherence and pharmacist-patient quality of relationship. Even though, women (M=6.9118, SD=1.14297) were slightly more adherent than men (M=6.6650, SD=1.47739), no significant difference was found, t (82)= -0.821, p > 0.5. In general, 26.2% of participants reported low adherence, 34.54% reported medium adherence and 39.3% reported high adherence. Concerning the pharmacist-patient quality of relationship score male participants reported a slightly better, but not statistically different t (82)= 0.320, p > 0.5 quality of relationship with their pharmacists (M=4.1948, SD= 0.71988), than female participants (M=4.1462, SD= 0.62578).

Table 3 T-Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Pharmacist-Patient Relationship Score	Equal variances assumed	.887	.349	.320	82	.750	.04862	.15195	-.25365	.35090
	Equal variances not assumed			.329	77.079	.743	.04862	.14793	-.24593	.34318
Medication Adherence Score	Equal variances assumed	1.728	.192	-.821	82	.414	-.24676	.30071	-.84497	.35144
	Equal variances not assumed			-.861	80.554	.392	-.24676	.28649	-.81684	.32331

Chapter 5

5 Discussion

Results from the present study show that the medication adherence score was not significantly correlated with the pharmacist-patient quality of relationship score. This finding is not consistent with the existing literature, which shows the existence of an association between communication and adherence. Previous studies considered that the quality of patient-provider communication is a relevant factor for medication adherence in general (Haskard-Zolnierek & DiMatteo, 2009; Martin et al., 2010; Schoenthaler et al., 2009; Stavropoulou, 2011; Swain et al., 2015; Zullig et al., 2015) and for diabetes-specific medication adherence (Ciechanowski et al., 2001; Ratanawongsa, Karter, Parker, Lyles, Warton, et al., 2013).

The fact that no statistically significant association was found between the medication adherence score and the pharmacist-patient quality of relationship score could be related to the setting in which the data were collected. A study by White and colleagues (2012) found that patients from diabetes primary care showed high adherence to hypoglycemic medication, indicating that diabetes specialized clinics contribute to a significant improvement in diabetes medication adherence (White et al., 2012). The present research was conducted using patients who visited the Primary Care Diabetes Support Program, which offers multidisciplinary teams of health professionals who focus on helping patients manage their diabetes. This innovative primary health care model offers access to two full-time nurse practitioners, two part-time nurses, three physicians, two dietitians and one social worker; patients with no family physician receive assistance to find a family doctor (Reichert, Harris, & Harvey, 2014). On this matter, the diabetes management support received by the patients who attend this clinic might influence adherence. That is, since the clinic works alongside the pharmacists to make sure prescriptions are filled in time, the quality of the relationship with the provider may be influenced by this continuous interaction.

No statistically significant associations were found between the medication adherence score or the pharmacist-patient quality of relationship score vs. age, time with

the pharmacist, and level of education. Concerning education level and medication adherence, these findings differ from other studies. For instance, Bakar and colleagues (2016) found that participants with high levels of education were more adherent than those with primary school or no formal education at all (Bakar, Fahrni, & Khan, 2016). The participants in this study were highly educated (i.e., 9% had a Master's or PhD degree, while 50% of the sample had completed university studies) whereas 55.2% of participants in Bakar's study had secondary education, and 12.1% had completed college or university. The literature shows that patients with higher levels of education are more inclined to be adherent to their diabetes treatment; also, patients who had completed graduate school were 41% more likely to be adherent (Kirkman et al., 2015). Since 61% of the participants in the present study reported college-level education or higher, a highly educated sample may have affected the correlation between education and medication adherence. Given that patients with a higher level of education were more inclined to participate in the study, in comparison with patients with a lower level of education, it should be noted that these highly educated participants might not represent the total patient population of the clinic.

Concerning the sex differences, the present research found no significant difference between women and men with respect to the medication adherence score and the pharmacist-patient quality of relationship score. This result is congruent with some of the existing literature (Donnan et al., 2002; Osborn & Gonzalez, 2016; Sirey, Greenfield, Weinberger, & Bruce, 2013). Geisel-Marbaise and Stummer (2009) suggested that, since adherence can be influenced by numerous factors there is no gender patter for diabetes medication adherence; according to the authors: "A patient's decision for or against adherence seems to be influenced by so many individual factors that it implies profound multidimensionality"(Geisel-Marbaise & Stummer, 2009, p.225). The present study results differ from other findings that suggest men report better adherence than women (Curkendall, Thomas, Bell, Juneau, & Weiss, 2013; Kirkman et al., 2015; Rolnick, Pawloski, Hedblom, Asche, & Bruzek, 2013; Vietri et al., 2016). Also, male participants represented 60% of the sample and the results may have been affected by the lack of female participants. Regarding the discrepant findings in the literature, Curkendall and colleagues (2013) considered that differences between women and men could be

explained by the different types of diabetes medications that each study examined as well as sex differences in medication interactions and side effects (Curkendall et al., 2013).

A significant negative correlation was found between the medication adherence score and the years that the patient had been diagnosed with diabetes. This association is not congruent with previous research. For example, Kirkman and colleagues (2015) indicated that patients who were new to diabetes treatment were less adherent to the treatment. Additionally, some older adults may present diabetes progression and complications, which eventually can result and more prescriptions and affect medication adherence (Jarab et al., 2014). Another factor that could have influenced the negative correlation between the medication adherence score and years diagnosed with diabetes is the intense diabetes monitoring that the patients receive at the clinic when they are newly diagnosed. If the patient achieves the optimal glycemic control, the appointments with the physician will be less frequent. Recently diagnosed patients are followed-up more intensively and they can be seen at the clinic once a week until the diabetes education is covered. In the present study as the patient improves, appointments occur every six months. In this way, less frequent visits may affect diabetes medication adherence.

In the present study no association between medication adherence score and age was found. Other studies suggest that older individuals report higher adherence. For instance, Kirkman and her colleagues indicated that the age group of 45-64 years was more adherent than the group 20 to 44 years old (Kirkman et al., 2015). Regarding age, Curkendall and colleagues found that adults 65 and over are more adherent than their younger counterparts (Curkendall et al., 2013). In a review by Jin and colleagues (2008), the authors indicated that numerous studies found that older patients have higher rates of adherence than younger groups. The authors suggested that although older patients might face more barriers for adherence (e.g. vision or hearing difficulties, difficulties to open bottles or swallow pills), if they get support from caregivers and health providers, they are more likely to be highly adherent (Jin, Sklar, Min Sen Oh, & Chuen Li, 2008).

The time that the participants had been filling their prescription with the same pharmacist was expected to have a significant correlation with the medication adherence

score and the pharmacist-patient quality of relationship score. Even though the average time that the participants reported with their pharmacist was very high, no correlation was found between this variable and the medication adherence score and the pharmacist-patient quality of relationship score. The clinical setting of the study could have influenced the high pharmacist-patient quality of relationship scores reported by the participants. Keshishian and her colleagues found that community-dwelling older adults who attend metropolitan pharmacies reported to be less satisfied with the quality of the relationship with their pharmacists (Keshishian, Colodny, & Boone, 2008). In contrast, older adults who receive care at the diabetes clinic might benefit from the continuous communication between the clinic and the pharmacy.

The present study found a significant negative correlation between the medication adherence score and the number of medications that the patient was taking. Patients who reported to be taking both insulin and pills as part of their treatment had a lower medication adherence score than the patients who were taking one type of medication only (pills or injections). This association has been found in previous studies. For instance, Barat and colleagues (2001) found that the number of medications could be deemed as a predictor for medication non-adherence (Barat et al., 2001). Pasina and colleagues (2014) tested medication adherence in a sample of older adults who had been discharged from internal medicine and after a follow up, the authors found an association between a high number of medications and a lower adherence (Pasina et al., 2014). In this regard, findings from the present research suggest that the combination of pills and injections for diabetes treatment could be detrimental for adherence.

Introducing new medications during the course of a treatment might also impact the patterns of adherence (Curkendall, Thomas, Bell, Juneau, & Weiss, 2013b). The more complex the treatment, the lower will be the level of adherence (Shah, Desai, Gajjar, & Shah, 2013; Vries et al., 2014). The medication adherence score in this research could be related to pharmacologic management of diabetes, in which the introduction of new medications is required until the patient achieves the optimal glycemic control. The participants from this study who had more years diagnosed with diabetes, could have

been experiencing diabetes progression and receiving more prescriptions, which eventually could influence overall adherence.

According to the Prevention and Management of type 2 Diabetes in Adults (2015) adapted from the Canadian Diabetes Association (2013), at diagnosis of diabetes type 2, the patient must start with a lifestyle intervention (including physical activity and nutritional changes) as well as pills (e.g. metformin). The amount of pills that the patient is required to take will change according to the glycemic target. If glycemic control is not achieved in two or three months, the dose can be increased. The patient characteristics determine what type of medication will be added next (for instance, degree of hypoglycemia, overweight patient, renal problems); subsequently, if the glycemic target is still not achieved, the guidelines suggest adding insulin injections to oral agents or intensify the pills regimen (Canadian Diabetes Association, 2015). As these guidelines suggest, the diabetes treatment can become more complex while achieving glycemic control. In this regard, taking only oral agents or only injections as treatment could be easier to maintain in comparison with patients who must take multiple injections a day, along with the oral agents.

The results of this study correspond to a sample of participants who are receiving diabetes care in a specialized clinic and findings might differ if the same method was applied to a sample of older adults from a rural community (Martin et al., 2010), a hospital (Swain et al., 2015), or a sample obtained from survey data (Ratanawongsa, Karter, Parker, Lyles, Heisler, et al., 2013; Stavropoulou, 2011). The follow-up that the diabetes clinic offers in order to monitor patients' progress is a valuable service that could influence the participants' perceptions regarding diabetes medication and communication with pharmacists, as well as improving treatment adherence. The study participants receive care from physicians, nurse practitioners and dieticians specialized in diabetes. For this reason, the lack of variability in the scores (See Figure 1 and Figure 2) and the presence of high adherence could be related to the integral service that is provided in this clinic. This study shows the relevance of diabetes specialized clinics and the importance of intense patient follow-up and monitoring as a valuable way to improve medication adherence among older patients diagnosed with diabetes.

Figure 1

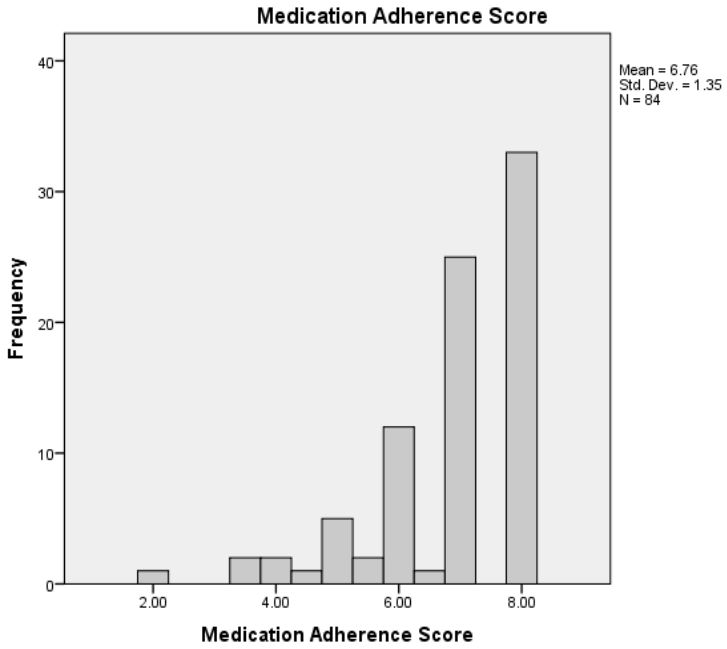
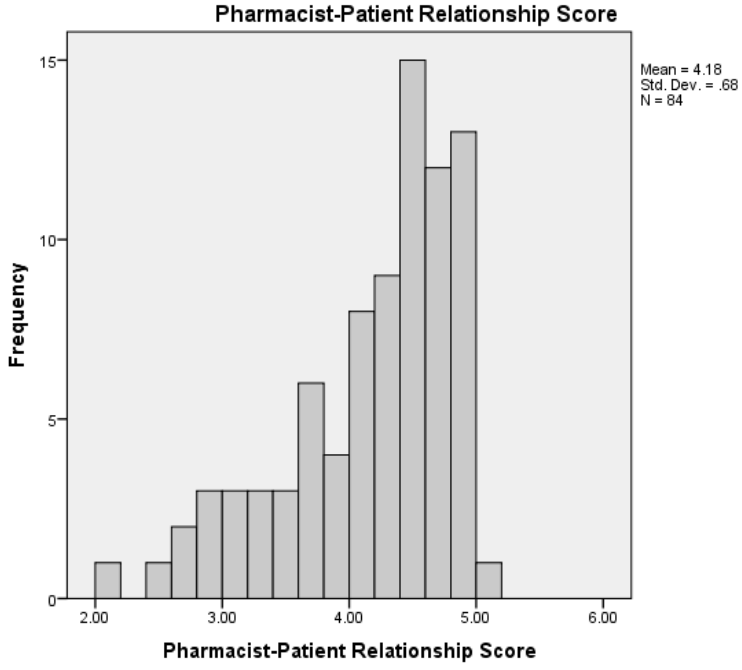


Figure 2



5.1 Limitations

The present study had several limitations. As a cross-sectional study, the findings are limited to a specific moment in time. All the participants were part of the Primary Care Diabetes Support Program, consequently, the results might not be generalizable to other health care settings or populations with no access to a clinic specialized in diabetes.

Several factors were not included in the present study:

a) Comorbidities. For the present study, only diabetes was included, however, it should be pointed out that adherence might be different in seniors who have diabetes only in comparison with seniors who also have hypertension, dyslipidemia, etc.
b) Acute management vs. chronic management of diabetes.
c) The exact daily dosing (both for pills and injections) of every patient and the specific brands that they were using.
d) Patients' strategies to adhere to their treatments
e) Individual domains in the Pharmacist-Patient Quality of Relationship Questionnaire.
f) Over the counter (OTC) medications and non-prescribed supplements.
g) The presence of depression was not tested. Depression may affect self-care among diabetes patients (Park, Katon, & Wolf, 2013).
h) Marital status of the participants, economic status and disease-specific social support. Higher levels of social support and good relationships with family members can impact positively adherence to treatment (Delamater, 2006).
i) The participants' health literacy, which has been associated with adherence in general and poor glycemic control (Geboers et al., 2015; Jones, Treiber, & Jones, 2014; Kirk et al., 2011; Souza et al., 2014).

Another limitation is the medication adherence and provider communication assessment through self-reported questionnaires. Even though self-reported measures are

less time consuming and less complex for older patients, the information may not be completely accurate as patients might overestimate their own adherence and try to conceal any negative behaviors. Moreover, the patient could misinterpret the questions or present difficulty to recall medication specific details. In this regard, the study results correspond only to what the participants reported and the additional information provided by the clinic. It is acknowledged that self-reported measurements may not be as accurate as other types of assessments such as electronic measures[2], pharmacy refills and prescription claims databases (Lehmann et al., 2014).

5.2 Future Research

Future research should recruit participants from different settings in order to compare patients from a specialized clinic to those who have no access to diabetes care, as well as patients who manage their diabetes under the supervision of their family physician. In this study, more than half of the patients reported high adherence to their diabetes treatment and it would have been informative to compare adherence among clinic patients and seniors with no access to this type of clinic.

Approximately 80% of people with diabetes take natural products along with their prescribed medications (Canadian Diabetes Association, 2015). In future studies, it would be relevant to consider other prescribed medications that the patient might be taking, as well as natural products, supplements and medications over the counter.

The specific tools used to assess medication adherence and pharmacist-patient communication heavily influenced the results. Some participants said that the Pharmacist-patient Quality of Relationship questionnaire was too long. Future research should consider different assessment tools to more comprehensively study the relationship between medication adherence and pharmacist-patient communication.

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[2] "Electronic monitoring generates data on the date and time of each opening of the bottle. Such data can be repeated and compared over time" (Lehmann et al., 2014, p.60).

Given that patients in urban areas are likely to interact with different pharmacists when filling a prescription, future studies should consider assessing the pharmacist-patient relationship in terms of satisfaction with the pharmacy in general, as well as consider the pharmacists' viewpoint in order to identify how the pharmacist and the patient work as a team to manage diabetes.

5.3 Conclusions

This research explored the correlation between medication adherence and pharmacist-provider quality of communication in a sample of 84 older adults at the Primary Care Diabetes Support Program at the St. Joseph's Family Medical and Dental Centre. This study did not find a correlation between the medication adherence score and the pharmacist-patient relationship quality score. This result corresponds to a population who have access to a clinic specialized in diabetes. Most participants reported high adherence and good quality of communication with their pharmacists, which could be related to the intensive diabetes monitoring they receive at the clinic. Results showed that patients who take both insulin and pills tend to report lower adherence to treatment. On this matter, health professionals should pay special attention to patients taking both medications to try to decrease the potential burden for the individual. Patients who have been diagnosed with diabetes for a long time also reported lower levels of adherence in comparison with the more recently diagnosed. Therefore, more attention should be given to these patients to prevent poor adherence.

Despite several limitations, the present study emphasizes the importance of long-term diabetes follow-up even when the patient has been diagnosed for many years. This research also highlights the importance of intense monitoring for patients who take both pills and insulin in order to identify non-adherence. Furthermore, the study suggests that pharmacists may play an important position into improving senior's diabetes management.

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7

APPENDIX A

Western Research

Research Ethics

Western University Health Science Research Ethics Board
HSREB Delegated Initial Approval Notice

Principal Investigator: Dr. Alan Salmoni
Department & Institution: Health Sciences\Kinesiology, Western University

Review Type: Delegated
HSREB File Number: 108032
Study Title: Perceived patient-pharmacist communication and diabetes management: assessing medication adherence among older patients.

HSREB Initial Approval Date: June 20, 2016
HSREB Expiry Date: June 20, 2017

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Instruments	Medication Adherence Questionnaire	2016/04/29
Instruments	Questionnaire Pharmacist Communication	2016/05/31
Instruments	Demographic Information Form	2016/05/31
Western University Protocol	Received June 14, 2016	
Letter of Information & Consent		2016/06/14

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above named study, as of the HSREB Initial Approval Date noted above.

HSREB approval for this study remains valid until the HSREB Expiry Date noted above, conditional to timely submission and acceptance of HSREB Continuing Ethics Review.

The Western University HSREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use Guideline for Good Clinical Practice Practices (ICH E6 R1), the Ontario Personal Health Information Protection Act (PHIPA, 2004), Part 4 of the Natural Health Product Regulations, Health Canada Medical Device Regulations and Part C, Division 5, of the Food and Drug Regulations of Health Canada.

Members of the HSREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

LAWSON
HEALTH RESEARCH INSTITUTE

LAWSON FINAL APPROVAL NOTICE

LAWSON APPROVAL NUMBER: R-16-439

PROJECT TITLE: Perceived patient-pharmacist communication and diabetes management: assessing medication adherence among older patients.

PRINCIPAL INVESTIGATOR: Dr. Alan Salmoni

LAWSON APPROVAL DATE: October 24, 2016

Health Sciences REB#: 108032

Please be advised that the above project was reviewed by the Clinical Research Impact Committee and Lawson Administration and the project:

Was Approved

Please provide your Lawson Approval Number (R#) to the appropriate contact(s) in supporting departments (eg. Lab Services, Diagnostic Imaging, etc.) to inform them that your study is starting. The Lawson Approval Number must be provided each time services are requested.

Dr. David Hill
V.P. Research
Lawson Health Research Institute

APPENDIX B

Morisky Medication Adherence Scale:

Please answer the following questions thinking ONLY about your diabetes medication

MMAS-8

Instructions: Please answer **YES** or **NO** to the following questions

1) Do you sometimes forget to take your medication? **YES** □ **NO** □

2) People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine? **YES** □ **NO** □

3) Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it? **YES** □ **NO** □

4) When you travel or leave home, do you sometimes forget to bring along your medicines? **YES** □ **NO** □
5) Did you take all your medicine yesterday? **YES** □ **NO** □

6) When you feel like your symptoms are under control, do you sometimes stop taking your medicine? **YES** □ **NO** □

7) Taking medicine everyday is a real inconvenience for some people? Do you ever feel hassled about sticking to your treatment plan? **YES** □ **NO** □

8) How often do you have difficulty remembering to take all your medicine?
___**A.** Never / Rarely
___**B.** Once in a while
___**C.** Sometimes
___**D.** Usually
___**E.** All the time

APPENDIX C

Please answer the following questions thinking ONLY about your diabetes medication:

My pharmacist:	**Never** **1**	**Rarely** **2**	**Every once in a while** **3**	**Sometimes** **4**	**Always** **5**	**Does not apply** **9**
Advises me about how to monitor myself for medication side effects	1	2	3	4	5	9
Advises me about my medication(s) even if I do not have medication questions	1	2	3	4	5	9
Advises me about whether or not is okay for me to take my medication(s) with over-the-counter products	1	2	3	4	5	9
Expresses interest to work with me to meet my health care needs	1	2	3	4	5	9
Expresses a desire to help me manage my medication	1	2	3	4	5	9
Questions me to be sure I understand how to properly use my medication(s) before I leave the pharmacy	1	2	3	4	5	9
Expresses a desire to help me deal with my medication concerns	1	2	3	4	5	9
Shows concern about my medication needs	1	2	3	4	5	9

Listens to me when I have a medication question (s)	1	2	3	4	5	9
Asks me my opinion about how I think my medication regimen is working for me	1	2	3	4	5	9
Is easily approachable to discuss my medication (s)	1	2	3	4	5	9
Is attentive to my medication needs	1	2	3	4	5	9
Me as a patient:	**Definitely would not** **1**	**Not really** **2**	**Undecided** **3**	**Somewhat** **Would** **4**	**Definitely would** **5**	**Does not apply** **9**
I would like to discuss medication problems I am having with my pharmacist	1	2	3	4	5	9
I keep my pharmacist up to date regarding any changes in my health condition (s)	1	2	3	4	5	9
I would tell my pharmacist about herbal medications I am taking with my prescription medication (s)	1	2	3	4	5	9
I would tell my pharmacist about over-the-counter medications I am taking with my prescription medication (s)	1	2	3	4	5	9
I would tell my pharmacist if I	1	2	3	4	5	9

experienced side effects to any of my medication (s)						
I would inform my pharmacist of any drug allergies I have	1	2	3	4	5	9
I would inform my pharmacist if I were getting prescription medications form another pharmacy	1	2	3	4	5	9
Me as a patient:	**Never** **1**	**Rarely** **2**	**Every once in a while** **3**	**Sometimes** **4**	**Always** **5**	Does not apply 9
I work with my pharmacist to manage my medication(s)	1	2	3	4	5	9
I get all of my prescription refills on time	1	2	3	4	5	9
I express a desire to my pharmacist that I would like him or her to help me deal with health care needs	1	2	3	4	5	9
If I do not understand something about my medication therapy, I ask my pharmacist to address my concerns	1	2	3	4	5	9
If the pharmacist who usually helps me with my medication is busy, I will wait until he or she is available to discuss my medication concerns	1	2	3	4	5	9

If I have a medication question, I will call my pharmacist to discuss it with him or her	1	2	3	4	5	9
My pharmacist:	**Never** **1**	**Rarely** **2**	**Every once in a while** **3**	**Sometimes** **4**	**Always** **5**	**Does not apply** 9
Greets me at the prescription counter and takes my prescription information from me	1	2	3	4	5	9
Says “hello” to me when I visit the pharmacy	1	2	3	4	5	9
Hands me my prescription when it is ready	1	2	3	4	5	9
I initiate a conversation with my pharmacist when I am at the pharmacy	1	2	3	4	5	9
I say “hello” to my pharmacist when I visit the pharmacy	1	2	3	4	5	9
In general:	**Strongly disagree** **1**	**Somewhat disagree** **2**	**Undecided** **3**	**Somewhat agree** **4**	**Strongly agree** **5**	Does not apply 9
My pharmacist is trustworthy	1	2	3	4	5	9
I trust that my pharmacist will alert my physician of any problems with the	1	2	3	4	5	9

combination of drugs that I am taking						
There are times when my pharmacist seems insincere	1	2	3	4	5	9
My pharmacist always puts my best interests first	1	2	3	4	5	9
I am satisfied with my pharmacist	1	2	3	4	5	9
I receive useful information about my medication(s) from my pharmacist	1	2	3	4	5	9
I value the services that my pharmacist provides to me	1	2	3	4	5	9
I am grateful for the individualized attention I receive from my pharmacist	1	2	3	4	5	9
It is important to me to take my prescription to the same pharmacist or group of pharmacist whenever I get a prescription filled	1	2	3	4	5	9
If I had a general health related question that did not require me to obtain a prescription, I would rely on my pharmacist for advice related to these matters	1	2	3	4	5	9
If a less expensive pharmacy opened near my present pharmacy, I would change	1	2	3	4	5	9

pharmacies						
I plan to use my current pharmacist to meet my prescription	1	2	3	4	5	9
If a more convenient pharmacy location opened I would start going to that pharmacy.	1	2	3	4	5	9

APPENDIX D

Demographic Information Form

1. Year of birth: _____

2. Gender: Female □ Male □

3. Level of education:

Elementary School □

Middle School □

High School □

College □

Master/PhD □

4. How long have you been diagnosed with diabetes?

_____

_____

5. What type of medication do you take for diabetes?

_____

6. How long have you been filling your prescription with the same pharmacist?

_____

APPENDIX E

Western

LETTER OF INFORMATION

Perceived patient-pharmacist communication and diabetes management: assessing medication adherence among older patients

PRINCIPAL INVESTIGATOR:

Dr. Alan Salmoni

MASTER'S STUDENT:

Cecilia Flores-Sandoval

COMMITTEE MEMBERS:

Dr. Joseph B. Orange

Dr. Rob Petrella

You are being invited to participate in this research study about pharmacist communication and diabetes medication adherence because you are an older adult with diabetes. Improving medication adherence among older patients can lead to positive health outcomes, reducing complications and hospitalization rates. Numerous barriers affect medication adherence, including patient and pharmacist communication. The literature has shown that effective communication with the pharmacist has a positive impact on the patient treatment adherence. In the case of diabetes, patients who report a good communication with their pharmacist often show a better adherence to their medications.

Your participation in this study is voluntary. You may decide not to be in this study, or to be in the study now and then change your mind later. You may leave the study at any time

without affecting your care. You may refuse to answer any question you do not want to answer. This study is completely independent from health care in this clinic, doctors, nurses and clinic staff. All data collected during this study will be confidential, participation is completely anonymous and the personal data will not be linked to the questionnaire answers. If you get called before you finish your participation you may withdraw from the study and your data will be discarded, this will not affect your health care.

Data will be kept in an encrypted portable device and only the research team members will have access to it. All data (electronic and paper) will be kept for 15 years in accordance with Lawson Policy.

This study is about how seniors with diabetes perceive their communication with their pharmacist and whether this affects adherence to diabetes medication. This study will help to understand the importance of pharmacist's communication to ensure that patients with diabetes are able to take their diabetes medications correctly.

Your participation in the study is required only on this one occasion.

If you decide to participate, you will be asked to complete a demographic data form and two brief questionnaires. Filling out the questionnaires will take you no longer than 30 minutes. You may refuse to answer any question you do not want to answer.

You will be asked to fill the following:

1. Demographic Information Form (year of birth, gender, level of education, how long have you been taking medication for diabetes and what type of medication, time you have been filling your prescription with in the same pharmacist).

2. Medication Adherence Scale (12 Yes/No Questions about your diabetes medication habits) Please fill this questionnaire keeping in mind ONLY your diabetes medication.

3. Pharmacist-Patient Relationship Questionnaire (you will rate how do you perceive your relationship and communication with your pharmacist in a scale from 1 to 5) Please fill this questionnaire keeping in mind ONLY your diabetes medication.

There are no known risks for participating in this study. There are no known benefits to

you associated with your participation in this research study, although we hope the recommendations we make may help future pharmacist-older adult communication in general. There are no costs for participating. If you decide to participate, you are free to withdraw your consent at any moment and ask as many questions as you like.

Completing the questionnaire and placing it in the drop box located in the waiting room implies consent to participate in this study.

Representatives of The University of Western Ontario's Health Sciences Research Ethics Board may require access to your study-related records to monitor the conduct of the research. You do not waive any legal rights by participating in this study.

Representatives of Lawson Quality Assurance Education Program may require access to your study-related documents to ensure that proper laws and guidelines are being followed.

Participation in this study is anonymous. All data collected will be kept confidential and access will be restricted to the researchers named above. If you have any questions about the study or if you wish to receive the results via e-mail please feel free to contact us.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact Dr. David Hill, Scientific Director, Lawson Health Research Institute.

APPENDIX F

Table 4

Correlations

		Adherence (High or Low)	Number of Medication Types
Adherence (High or Low)	Pearson Correlation	1	-.284**
	Sig. (2-tailed)		.009
	N	84	84
Number of Medication Types	Pearson Correlation	-.284**	1
	Sig. (2-tailed)	.009	
	N	84	84

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5

Correlations

		Medication Adherence Score	Years diagnosed with diabetes
Medication Adherence Score	Pearson Correlation	1	-.233*
	Sig. (2-tailed)		.033
	N	84	84
Years diagnosed with diabetes	Pearson Correlation	-.233*	1
	Sig. (2-tailed)	.033	
	N	84	84

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6

Gender		Adherence_ Medication	Pharmacist_ Patient Relationship
Female	Mean	2.6215	2.0291
	N	34	34
	Std. Deviation	.22879	.16204
Male	Mean	2.5646	2.0400
	N	50	50
	Std. Deviation	.31645	.18585
Total	Mean	2.5876	2.0356
	N	84	84
	Std. Deviation	.28411	.17567

Table 7

Descriptives

			Statistic	Std. Error
Age	Mean		68.31	.717
	95% Confidence Interval for Mean	Lower Bound	66.88	
		Upper Bound	69.74	
	5% Trimmed Mean		67.86	
	Median		67.00	
	Variance		43.156	
	Std. Deviation		6.569	
	Minimum		60	
	Maximum		89	

	Range		29	
	Interquartile Range		9	
	Skewness		.864	.263
	Kurtosis		.467	.520
Years of Formal Education	Mean		14.23	.336
	95% Confidence Interval for Mean	Lower Bound	13.56	
		Upper Bound	14.89	
	5% Trimmed Mean		14.48	
	Median		16.00	
	Variance		9.478	
	Std. Deviation		3.079	
	Minimum		5	
	Maximum		18	
	Range		13	
	Interquartile Range		4	
	Skewness		-1.236	.263
	Kurtosis		1.274	.520
Years diagnosed with diabetes	Mean		16.042	1.0032
	95% Confidence Interval for Mean	Lower Bound	14.046	
		Upper Bound	18.037	

	5% Trimmed Mean		15.492	
	Median		15.000	
	Variance		84.531	
	Std. Deviation		9.1941	
	Minimum		1.0	
	Maximum		52.0	
	Range		51.0	
	Interquartile Range		10.0	
	Skewness		1.077	.263
	Kurtosis		2.023	.520
Number of Medication Types	Mean		1.42	.054
	95% Confidence Interval for Mean	Lower Bound	1.31	
		Upper Bound	1.52	
	5% Trimmed Mean		1.41	
	Median		1.00	
	Variance		.246	
	Std. Deviation		.496	
	Minimum		1	
	Maximum		2	
	Range		1	

	Interquartile Range		1	
	Skewness		.344	.263
	Kurtosis		-1.928	.520
Time_Pharmacist	Mean		9.67	.652
	95% Confidence Interval for Mean	Lower Bound	8.37	
		Upper Bound	10.96	
	5% Trimmed Mean		9.21	
	Median		9.00	
	Variance		35.671	
	Std. Deviation		5.972	
	Minimum		2	
	Maximum		25	
	Range		23	
	Interquartile Range		11	
	Skewness		.920	.263
	Kurtosis		-.034	.520
Pharmacist-Patient Relationship Score	Mean		4.1751	.07418
	95% Confidence Interval for Mean	Lower Bound	4.0276	
		Upper Bound	4.3227	
	5% Trimmed Mean		4.2248	

	Median		4.3600	
	Variance		.462	
	Std. Deviation		.67986	
	Minimum		2.12	
	Maximum		5.00	
	Range		2.88	
	Interquartile Range		.95	
	Skewness		-1.037	.263
	Kurtosis		.393	.520
Medication Adherence Score	Mean		6.7649	.14731
	95% Confidence Interval for Mean	Lower Bound	6.4719	
		Upper Bound	7.0579	
	5% Trimmed Mean		6.8935	
	Median		7.0000	
	Variance		1.823	
	Std. Deviation		1.35012	
	Minimum		2.00	
	Maximum		8.00	
	Range		6.00	

	Interquartile Range	2.25	
	Skewness	-1.165	.263
	Kurtosis	1.160	.520

Curriculum Vitae

Name:	Cecilia Flores Sandoval
Post-secondary Education and Degrees:	Universidad Autónoma de San Luis Potosí México (2010-2014) B.A.
	The University of Western Ontario London, Ontario, Canada (2015-2017) MSc.
Honours and Awards:	National Council of Science and Technology Scholarship **(**CONACYT)
	Distinguished Student Best Academic Record Social Sciences And Humanities (Universidad Autónoma de San Luis Potosí) (2010 – 2014)
Related Work Experience	Teaching Assistant The University of Western Ontario 2016