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Exploring Factors Associated with Non-Urgent Emergency Department Visits and Hospital Admissions for Diabetes Related Problems in Three Community Based Hospitals in Southwestern Ontario

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EXPLORING FACTORS ASSOCIATED WITH NON-URGENT EMERGENCY DEPARTMENT VISITS AND HOSPITAL ADMISSIONS FOR DIABETES RELATED PROBLEMS IN THREE COMMUNITY BASED HOSPITALS IN SOUTHWESTERN ONTARIO

by
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AUTHOR'S DECLARATION OF ORIGINALITY

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ABSTRACT

The purposes of this study were to explore the independent predictors of non-urgent ED visits for diabetes related problems and to compare the rates of hospitalization between urgent and non-urgent ED visits for diabetes related problems. This study was completed within the context of a secondary data analysis on a subset of population based data pertaining to ED visits and hospital admissions made between 2009 and 2011 in the Windsor-Essex region of Ontario, Canada. A sample of 1913 patient observations was analyzed using multivariate logistic regression using generalized estimating equations modeling. The findings suggested that age, type of diabetes, main problem/complaint, hospital type, ambulatory type, and proximity to ED were independent predictors of non-urgent ED visits for diabetes related problems. This study also found that those who were triaged as urgent were more likely to be admitted for their diabetes related problems compared to individuals who were triaged as non-urgent.

DEDICATION

I am indebted to my wonderful family and fiancé for their unconditional love and support throughout my education. To my parents, Mark and Pauline, I would not have been able to attain this personal and professional dream without your constant belief in my abilities to succeed at anything I wish to pursue. To my fiancé, Spencer, I am eternally grateful for the support you have provided, which has never wavered. Thank you for being my shoulder to cry on, for listening to me complain, for making me laugh, and for believing in me. I am truly blessed to have you in my life.

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CHAPTER 1

Diabetes is a global epidemic that was reported to affect approximately 371 million people worldwide in 2012 (International Diabetes Federation [IDF], 2012). This number is expected to reach 438 to 439 million by 2030 (CDA, 2009; Shaw, Sicree, & Zimmet, 2010). In Canada, the prevalence of diabetes is also rising (PHAC, 2011). The number of individuals with the disease has increased largely among older age groups due to the aging baby boom cohort and the increased longevity of those living with the disease (PHAC, 2011). However, the proportion of individuals with diabetes has also increased among younger age groups; mainly due to increasing rates of modifiable risk factors such as obesity (PHAC, 2011). Nationally, more than three million Canadians live with diabetes (CDA, 2013; CDA, 2009). In 2012, Canadians 12 years and older accounted for approximately two million cases, which constitutes 6.5% of the population (Statistics Canada, 2013). Provincially, Ontario has a slightly higher percentage of diabetic residents 12 years and older compared to the national average (6.7% versus 6.5%, respectively) while the rate is even higher (10.4%) in Windsor, Ontario (Statistics Canada, 2013).

In 2012, 4.8 million people worldwide died from diabetes (IDF, 2012). Deaths are expected to rise by more than 50% in the next 10 years (World Health Organization [WHO], 2013). In Canada, diabetes was the sixth leading cause of death in 2012 (Statistics Canada, 2012) and is projected to be the seventh leading cause of death worldwide by the year 2030 (WHO, 2013). Due to the various complications associated with diabetes, premature death is more common among individuals with diabetes than those without diabetes (Canadian Diabetes Association [CDA], 2009; Public Health Agency of Canada [PHAC], 2011; WHO, 2013). For instance, patients with diabetes aged

20 to 39 years have an all-cause mortality rate 4.2 to 5.8 times higher than people without diabetes, while those aged 40 to 74 years have a mortality rate two to three times higher (PHAC, 2011). Since the complications associated with diabetes can cause premature death, diabetes may not be listed as the primary cause of death, potentially leading to underestimation of the true mortality rate associated with the disease (PHAC, 2011). Higher mortality rates are also associated with deceased life expectancy (CDA, 2009; PHAC, 2011). Compared to those without diabetes, children aged 1 to 19 years have a life expectancy 10 to 11 years less, while those aged 20 to 64 years have a life expectancy 5 to 10 years less (PHAC, 2011).

Diabetes is a chronic disease characterized by the presence of hyperglycemia that is caused by the body's inability to either sufficiently produce or properly use insulin (CDA, 2013; PHAC, 2011), a hormone produced by the beta cells of the pancreas that enables cells to absorb glucose from the blood (CDA, 2013; PHAC, 2011). The most common types of diabetes are classified as type 1, type 2, and gestational (CDA, 2013; PHAC, 2011; WHO, 2013):

Type 1 diabetes, also known as "insulin-dependent diabetes mellitus," occurs when insulin is not produced by the pancreas, thus making the individual reliant on an external source of insulin for life (CDA, 2013; PHAC, 2011; WHO, 2013). It accounts for 10% of all diabetes cases worldwide and within Canada (CDA, 2013; PHAC, 2011; WHO, 2013). Even though type 1 diabetes may develop in individuals 40 years and younger, it is most commonly diagnosed during childhood and adolescence (CDA, 2013; PHAC, 2011). Currently, there is no known way to prevent type 1 diabetes (CDA, 2013; PHAC, 2011; WHO, 2013).

Type 2 diabetes, the most common type of diabetes, accounts for approximately 90% of all cases worldwide and within Canada (CDA, 2013; PHAC, 2011; WHO, 2013). Often called "non-insulin-dependent diabetes mellitus," it usually develops in adulthood when the pancreas does not produce enough insulin or when the body does not effectively use the insulin that is produced (CDA, 2013; PHAC, 2011; WHO, 2013). Type 2 diabetes can be prevented or delayed through the reduction of modifiable risk factors such as smoking and obesity (CDA, 2013; PHAC, 2011; WHO, 2013).

Gestational diabetes is a temporary form of diabetes characterized by hyperglycemia that begins in approximately 2% to 5% of all pregnancies (CDA, 2013; PHAC, 2011; WHO, 2013). Although hyperglycemia usually returns to normal following delivery, both mother and child are at an increased risk of developing diabetes in the future (CDA, 2013; PHAC, 2011).

If diabetes is left untreated or uncontrolled, hyperglycemia can eventually damage blood vessels, nerves, and organs; causing serious complications (CDA, 2013; CDA, 2012; IDF, 2012; PHAC, 2012; PHAC, 2011). Hypertension and hyperlipidemia, conditions that often accompany diabetes, can accelerate the damage to blood vessels (IDF, 2012; PHAC, 2011). As a result, diabetes places a significant burden on the individual, both physically and psychologically. According to PHAC (2012), almost two-thirds (61%) of Canadians with diabetes have been diagnosed with at least one complication. The most common physiological complications associated with diabetes include cardiovascular disease, renal disease, eye disease, nerve disease, and problems with pregnancy (CDA, 2013; CDA, 2012; IDF, 2012; PHAC, 2011). The most common psychological complication is depression (CDA, 2012; PHAC, 2011). Even though the

rates of complications among those with diabetes have plateaued or declined in recent years, the increased prevalence of the disease has led to a continued rise in the number of people affected by its complications (PHAC, 2011).

In addition to the physical and psychological burden that diabetes places on the individual, it can also be an enormous financial burden on individuals and families living with the disease. Medical costs are two to four times higher for those with diabetes than those without this disease (PHAC, 2011; CDA, 2009). This is due to the cost of medication and testing supplies that can range from $1,000 to $15,000 a year (CDA, 2009). In addition to out-of-pocket expenses, lost productivity due to illness, disability and premature death is also significant, but difficult to quantify (PHAC, 2011; CDA, 2009).

To treat and manage diabetes and its associated complications, patients require a plethora of health services including family physicians, medical specialists, nutritionists, diabetes educators, and psychologists (PHAC, 2011). Additionally, individuals with diabetes have higher rates of hospitalizations, drug therapy, physician and emergency department (ED) visits, and other out-of-hospital health services compared to those without diabetes (PHAC, 2011). As a result, diabetes and its related problems is a large driver of healthcare costs. Recent data have not been collected on the costs of diabetes. However, the most recent national estimate is $769.4 million in year 2000 Canadian dollars, for just the primary care management of diabetes (PHAC, 2011). When the cost associated with the management of complications of diabetes is included, the costs are projected to be 4.5 times higher (PHAC, 2011). Due to the increasing prevalence of diabetes, the cost of the disease is expected to continue rising (PHAC, 2011; CDA, 2009).

Problem Statement

With adequate primary healthcare, diabetes can generally be managed on an outpatient basis, and is therefore referred to as an "ambulatory care sensitive condition" (ACSC) (Bourne et al., 2012; Canadian Institute for Health information [CIHI], 2012). The vast majority (94%) of individuals with an ACSC report having a regular primary care provider (PCP) (CIHI, 2012). However, difficulty in accessing them on the same or next day was identified as a significant problem (Bourne et al., 2012). Since almost two-thirds (61%) of individuals with an ACSC report having no access to after-hours care, more than 1 in 10 (12%) visited an ED for a situation they perceived as treatable by their regular PCP (CIHI, 2012). It is therefore presumed that patients with ACSCs are using the ED for care that could be provided by their PCP (Bourne et al., 2012; Physician Hospital Care Committee, Ontario Hospital Association, Ontario Medical Association & Ontario Ministry of Health and Long-Term Care, 2006).

Utilizing the ED for care that could be provided by a PCP adds further pressure on an already strained system, especially since patients with diabetes require complex medical assessments that use advanced diagnostic technology to determine the need for hospital admission or further therapy (Health Quality Ontario, 2011; Canadian Association of Emergency Physicians and National Emergency Nurses Affiliation, 2001). Excluding physician fees, the average cost of an ED visit for diabetes in 2009-2010 was $284, while an admission to the hospital was $4,745 (CIHI, 2012). According to CIHI (2012), timely and accessible primary healthcare can prospectively reduce ED visits and hospital admissions for ACSCs and result in significant savings to the healthcare system. Additionally, being treated in the ED may negatively affect the health of patients,

especially those with ACSCs, since the healthcare provider in the ED is unfamiliar with their complex medical history (Health Quality Ontario, 2013; Health Quality Ontario, 2011).

ED visits for diabetes related problems have not been recently explored in the literature; however, data from Ontario between 1994 and 1999 suggest that ED visits for diabetes fell by 23.9% (516,377 visits) (Booth, Hux, Fang, & Chan, 2005; Booth & Fang, 2003). This decrease may have been attributed to improved outpatient care for this population (Booth & Fang, 2003). However, considerable regional variation was seen in the rates of ED visits for diabetes across Ontario due to differences in the accessibility of hospital and community resources, with Northern communities having higher rates than southern Ontario (Booth & Fang, 2003). Yet, in the Erie St. Clair (ESC) Local Health Integration Network (LHIN) located in southern Ontario, diabetes related ED visits remain a concern with 3,584 visits (0.6% of all ED visits) made between 2009 and 2011 (El-Masri et al., 2014).

In the ED, the seriousness of a patient's condition is measured by the Canadian Emergency Department Triage and Acuity Scale (CTAS) (Bourne et al., 2012). The scale, which helps healthcare workers prioritize patient needs (Canadian Association of Emergency Physicians, n.d.), has been adopted in EDs across Canada and has been continuously revised and updated since its creation in 1999 (Bullard, Unger, Spence, & Grafstein, 2008). CTAS levels are categorized into five acuity levels (see Table 1): resuscitation, emergent, urgent, less urgent, and non-urgent (Bourne et al., 2012). For this study, high acuity classifications (resuscitation, emergent, urgent) will be referred to as

"urgent," while low acuity classifications (less urgent, non-urgent) will be referred to as "non-urgent."

Table 1

Canadian Emergency Department Triage and Acuity Scale

Level	Description
I	**Resuscitation** - Conditions that are threats to life or imminent risk of deterioration, requiring immediate aggressive interventions (e.g. cardiac arrest, major trauma or shock states).
II	**Emergent** - Conditions that are a potential threat to life or limb function requiring rapid medical intervention or delegated acts (e.g. head injury, chest pain, gastrointestinal bleeding, abdominal pain with visceral symptoms, neonates with hyperbilirubinemia).
III	**Urgent** - Conditions that could potentially progress to a serious problem requiring emergency intervention (e.g. mild moderate asthma or dyspnea, moderate trauma, vomiting and diarrhea in patients younger than age 2).
IV	**Less Urgent** - Conditions related to patient age, distress or potential for deterioration or complications that would benefit from intervention or reassurance within 1 to 2 hours (e.g. urinary symptoms, mild abdominal pain, earache).
V	**Non-Urgent** - Conditions in which investigations or interventions could be delayed or referred to other areas of the hospital or healthcare system (e.g. sore throat, menses, conditions related to chronic problems, psychiatric complaints with no suicidal ideation or attempts).

In Canada, approximately 16.2 million ED visits were made nationwide between 2011 and 2012 (CIHI, 2013). Of these visits, 45.6% were classified as non-urgent (CIHI, 2013). The ESC LHIN had a slighter lower percentage of non-urgent ED visits compared to the national average (43.6% versus 45.6%, respectively) (El-Masri et al., 2014), but higher than the provincial average (43.6% versus 41.2%, respectively) (CIHI, 2013). Throughout the literature, the prevalence of non-urgent ED use varies considerably. According to the systematic review conducted by Uscher-Pines et al. (2013), the

percentage of ED visits that were evaluated as non-urgent ranged widely (8% to 62%). Another systematic review reported similar findings with the prevalence of non-urgent ED visits varying from 10% to 90% of total ED visits (Carret et al., 2009). However, in approximately half of the studies it varied from 24% to 40% (Carret et al., 2009). In a descriptive cross-sectional study of patients presenting to the ED at a tertiary care teaching hospital, Jalili et al. (2013) found that in their sample (N = 1923) the prevalence of non-urgent ED visits was 20.8% (95% CI 18.99 - 22.61). Carret et al. (2007) found comparable results in their cross sectional study with the overall prevalence totaling 24.2% (95% CI 22.1 – 26.3). Similar results were also reported in other studies (Afilalo et al., 2004; Bianco et al., 2003; Shah et al., 1996). In the ESC LHIN, the proportion of non-urgent visits for diabetes related problems specifically was 19.7% (706 visits) (El-Masri et al., 2014). This unnecessary use of EDs to treat non-urgent medical conditions can potentially contribute to ED overcrowding.

ED overcrowding in Canada is a multifaceted dilemma that reflects system-wide problems regarding patient access to the right care at the right time in the right setting (Canadian Association of Emergency Physicians [CAEP], 2009; Hoot & Aronsky, 2008). Overcrowding can lead to inadequate patient care (CAEP, 2009), delays in treatment due to long wait times (Affleck, Parks, Drummond, Rowe, & Ovens, 2013; CAEP, 2009; Hoot & Aronsky, 2008; Olshaker & Rathlev, 2006), patient dissatisfaction (CAEP, 2009; Hoot & Aronsky, 2008), ambulance diversions (Affleck et al., 2013; Hoot & Aronsky, 2008; Olshaker & Rathlev, 2006), and adverse patient outcomes (Affleck et al., 2013; CAEP, 2009; Hoot & Aronsky, 2008; Olshaker & Rathlev, 2006). Lack of integration between community and hospital services has been identified as a major contributor to

ED overcrowding due to problems with timely and effective access to primary healthcare (Health Quality Ontario, 2013; Canadian Association of Emergency Physicians, 2009; Physician Hospital Care Committee, Ontario Hospital Association, Ontario Medical Association & Ontario Ministry of Health and Long-Term Care, 2006). According to Health Quality Ontario (2011), better access to primary care results in fewer visits to the ED. Therefore, in order to avoid unnecessary ED visits, hospital admissions, and repeat visits to the hospital; community settings need sufficient resources to manage patients, especially those with chronic diseases such as diabetes (Health Quality Ontario, 2013; Physician Hospital Care Committee, Ontario Hospital Association, Ontario Medical Association & Ontario Ministry of Health and Long-Term Care, 2006).

Even though the literature recognizes non-urgent ED visits as a reason for overcrowding, its impact on the overall problem is considered minimal (Affleck et al., 2013; Canadian Association of Emergency Physicians, 2009; Hoot & Aronsky, 2008; Physician Hospital Care Committee, Ontario Hospital Association, Ontario Medical Association & Ontario Ministry of Health and Long-Term Care, 2006; Schull, Kiss, & Szalai, 2007). However, patients with ACSCs such as diabetes should not need to utilize the ED for non-urgent reasons. The significant proportion of non-urgent ED visits for diabetes related problems in the ESC LHIN (19.7%) represents inefficient utilization of healthcare resources. Previous research has focused on ED visits for specific diabetes related problems (e.g., hyperglycemia) after the implementation of a specific intervention (e.g., disease management program). However, no known published studies have examined the factors associated with non-urgent ED visits for diabetes related problems as a whole.

Of the 16.2 million Canadians who visited the ED in 2010 – 2011, approximately one million were admitted to hospital (Bourne et al., 2012). Of those admitted, one percent had been classified as non-urgent (Bourne et al., 2012). In a study conducted by Afilalo and colleagues (2004), non-urgent patients were found to have a significantly lower admission rate compared to urgent patients (4% versus 24%, respectively; $p <$ .001). Another study reported that 10.6% (n = 3860) of non-urgent patients were admitted to hospital (El-Masri et al., 2014) while another study reported 7.3% (n = 316) (Vertesi, 2004). Even though individuals were assessed as non-urgent, a small proportion required hospital admission. Therefore, these patients may have needed to be triaged in to a more acute category upon initial assessment or re-assessment.

Purpose of Study

The general aim of this study was to explore the factors associated with non-urgent ED visits for diabetes related problems in hospitals located in Windsor-Essex County (WEC), the southwest region of Ontario. Specifically, the primary purposes of the proposed study were to: (a) explore the independent predictors of non-urgent ED visits for diabetes related problems and (b) compare the rates of hospitalization between urgent and non-urgent patients visiting the ED for diabetes related problems.

Conceptual Framework

The Behavioral Model of Health Service Use was developed in the late 1960s by the US medical sociologist and health services researcher Ronald Andersen at the University of Chicago (Andersen, 1995; Babitsch, Gohl, & von Lengerke, 2012). The model was originally developed "to assist in [the] understanding [of] why families use health services, to define and measure equitable access to health care, and to assist in developing policies to promote equitable access" (Andersen, 2008, p. 651). The model

has evolved over time with the continuously changing healthcare system, progressing through five phases (Andersen, 2008; Andersen, 1995). The revisions have not changed the model's fundamental components or its relationships, but instead have added to the original model (Andersen, 2008).

The Behavioral Model of Health Service Use is a broad model that can be adapted to help explain and predict a variety of health behaviors (Andersen & Davidson, 1997; Andersen, 1995). Although it is not specifically designed to predict non-urgent ED use for diabetes related problems, it has been used extensively in the literature (Babitsch et al., 2012), and can be readily applied to the use of the ED by individuals with diabetes related problems. For the proposed study, phase four of the model (see Figure 1), the most commonly used phase (Babitsch et al., 2012), will be utilized. This phase emphasizes the repetitive nature of health service use and its various influences (Andersen, 2008; Andersen, 1995; Babitsch et al., 2012). The model depicts that several factors influence health service use and consequently, health status. These factors include environment, population characteristics, health behavior, and outcomes (Andersen, 2008; Andersen, 1995).

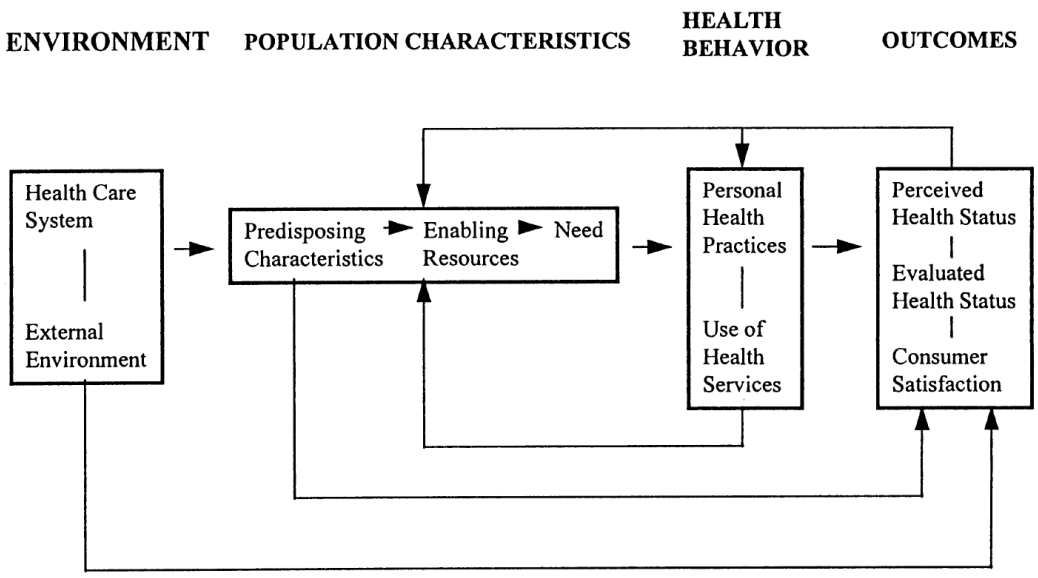

Figure 1. The Behavioral Model of Health Service Use – Phase 4

Environment

The structure of the *healthcare system* encompasses its health policies, resources, and their organization within the system. Its structure is said to influence the accessibility, acceptability, and convenience of health services (Andersen & Davidson, 1997; Andersen, 1995). In the case of an individual with diabetes, Booth and Fang (2003) found that in Ontario, ED utilization rates for diabetes related problems vary by region due to the accessibility of hospital and community resources.

The *external environment*, which consists of physical, political, and economic components, are important factors in understanding health service use (Andersen, 1995). In WEC, environmental factors potentially affecting health service use by those with diabetes include the availability of community resources for diabetes management (e.g., Diabetes Wellness) and public education campaigns raising awareness of diabetes

prevention and management (e.g., Canadian Diabetes Association's Public Awareness Campaign).

Population Characteristics

Population characteristics that influence health service use are divided into predisposing characteristics, enabling resources, and need (Andersen, 1995; Andersen & Davidson, 2007; Babitsch et al., 2012). *Predisposing characteristics* can be divided into demographic factors (age and gender), social factors (education, occupation, and ethnicity), and health beliefs (attitudes, values, and knowledge related to health and health services) (Andersen, 1995; Andersen & Davidson, 2007; Babitsch et al., 2012). Applied to the individual with diabetes, the model suggests that demographic factors influence the likelihood that the individual will use a health service before the onset of a complication, while social factors influence the individual's ability to cope with their presenting problem (e.g., hyperglycemia) and use the resources necessary to deal with that problem (e.g., insulin and supplies for injection) (Andersen, 1995). Additionally, the health beliefs of an individual with diabetes potentially influence their subsequent perceptions of need for, and use of, health services (Andersen, 1995).

In order for an individual to use a health service, both community and personal *enabling resources* must be present (Andersen, 1995; Andersen & Davidson, 2007; Babitsch et al., 2012). In addition to having community resources such as healthcare facilities and healthcare workers, individuals with diabetes must also have the resources and knowledge of how to find and use those services (Andersen, 1995; Andersen & Davidson, 2007; Babitsch et al., 2012). Examples of enabling resources include having a regular PCP; having a means of transportation; as well as travel time to, and waiting time

for, care (Andersen, 1995; Babitsch et al., 2012). Due to problems with timely and effective access to primary healthcare, individuals with ACSCs such as diabetes are using the ED for situations they perceive as treatable by their regular PCP (CIHI, 2012) because the wait time in the ED is potentially shorter than the wait time to see their PCP.

Needs can either be perceived by the individual or evaluated by a healthcare professional (Andersen, 1995; Andersen & Davidson, 2007; Babitsch et al., 2012). Perceived need is the subjective manner in which individuals experience their own general health, functional state, and illness symptoms such as pain. Evaluated need is the objective assessment by a healthcare professional of an individual's health status and their need for care (Andersen, 1995; Babitsch et al., 2012). In the case of an individual with diabetes who visits the ED, they must judge their health problem to be of sufficient importance and magnitude to seek ED services. Then, a triage nurse will evaluate the individual and determine whether their problem is urgent or non-urgent.

Health Behavior

Health behaviors such as *personal health practices* (diet, exercise, and self-care) can influence the *use of health services*. Both of these can then impact health outcomes (Andersen, 1995). For instance, if an individual with diabetes does not manage their disease appropriately, they may suffer from a greater number of diabetes related complications, thus increasing their need to use various health services.

Outcomes

Outcomes include the *perceived health status* of the individual, the *evaluated health status* from clinical assessments by healthcare professionals, and *consumer satisfaction* with the care received (Andersen, 1995; Andersen & Davidson, 2007).

Applied to a patient with diabetes, the experience of a diabetes related problem results in a change in perceived health status that triggers a visit to the ED. Upon arrival, the evaluated health status is reflected by the assigned CTAS score (i.e., urgent or non-urgent). Further assessment may lead to additional evaluation of health status, which would be reflected by the decision to either admit or discharge the patient. Consumer satisfaction of a patient with a diabetes related problem can be impacted or influenced by wait times, travel times, and the communication and care received from healthcare providers (Andersen & Davidson, 2007).

Overall, the original model (Figure 1) posits that characteristics of the environment (external environment and healthcare delivery system) in addition to population characteristics (predisposing characteristics, enabling resources, and need factors) influence health behaviors (Andersen & Davidson, 1997). These health behaviors (personal health practices and use of health services) then influence outcomes (perceived and evaluated health status and patient satisfaction) (Andersen & Davidson, 1997). The feedback loops in the model show that outcomes can affect subsequent predisposing characteristics, perceived need for health services, and health behavior (Andersen, 2008; Andersen, 1995; Andersen & Davidson, 1997). The feedback loops also demonstrate that the constructs of environment and population characteristics influence outcomes (Andersen, 2008; Andersen, 1995).

Modified Model

Since the current study is a secondary analysis, there are limited variables available for study. Therefore, the proposed study does not literally adapt the Behavioral Model of Health Service Use. The model guides the logic that informs the study,

whereby, the primary outcome (non-urgent ED use for a diabetes related problem) is assumed to be a function of a variety of population characteristics. These characteristics will be relabeled and organized into one of three categories under the study's available independent predictors: patient related factors, system related factors, or circumstantial factors. Patient related factors are variables that cannot be changed, such as age. System related factors include variables that are outside an individual's control, while circumstantial factors are variables that may indirectly influence the outcome. The specific variables that were used to explain non-urgent ED use for diabetes related problems are depicted in Figure 2. The secondary outcome reflects the disposition status of the individuals from the primary outcome, specifically their hospital admission status (i.e., admitted or not admitted), which was compared between urgent and non-urgent patients visiting the ED for diabetes related problems.

To clarify, the proposed study assessed variables that acted as antecedents to non-urgent ED visits for diabetes related problems. Factors within the ED that could have influenced this outcome, such as ED wait times, were not explored as potential independent predictors in this study.

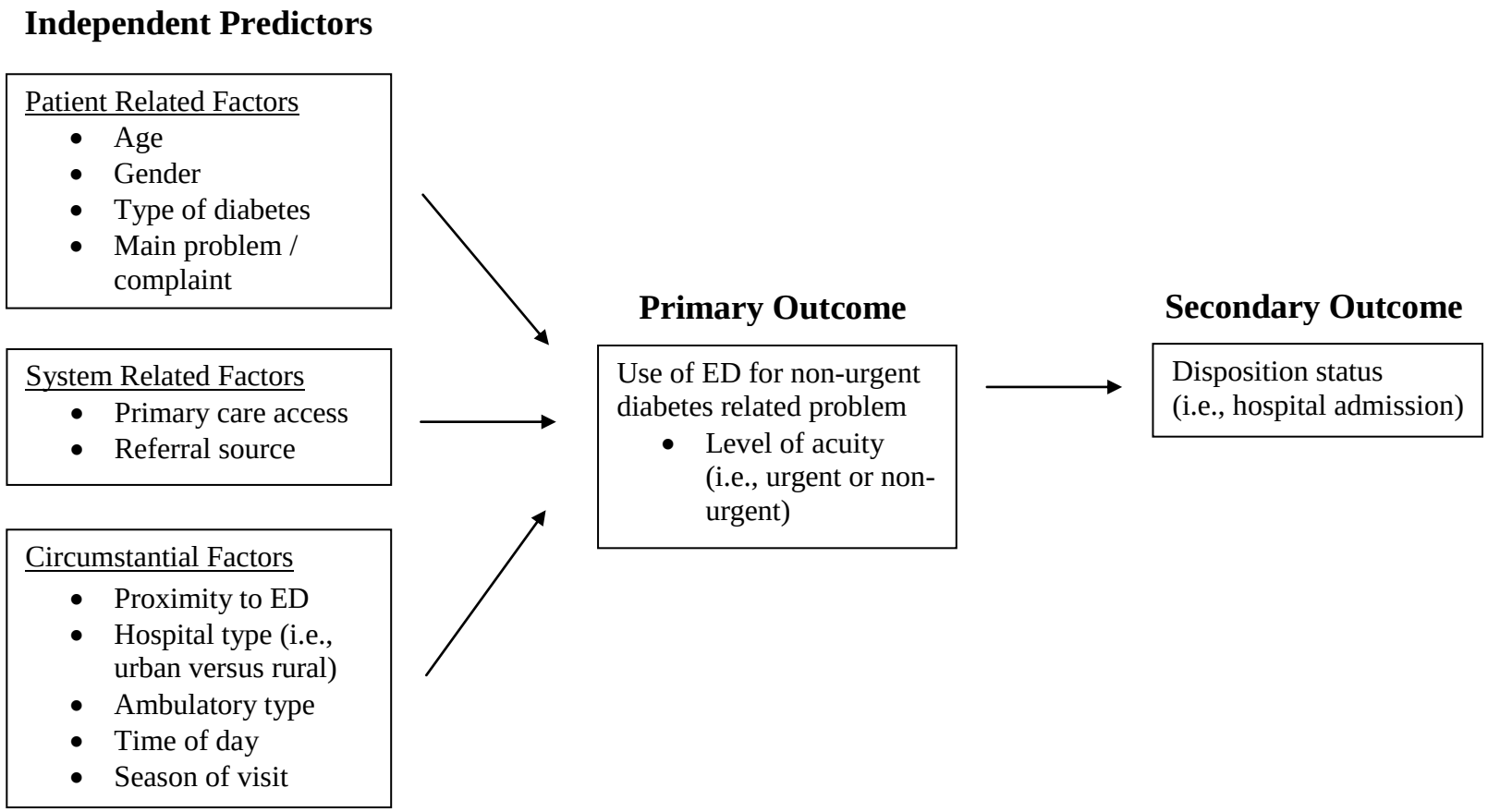

Figure 2. Modified version of the Behavioral Model of Health Service Use – adapted for non-urgent ED use for diabetes related problems

Research Questions

1. What are the independent predictors of non-urgent ED visits for diabetes related problems in WEC?

2. Is there a difference in the hospitalization rate of urgent and non-urgent patients visiting the ED for diabetes related problems in WEC?

Significance of Study

The independent predictors associated with non-urgent ED visits for diabetes related problems have not yet been studied. Therefore, new knowledge may provide significant implications for decision makers and nursing research. By understanding the patient related, system related, and circumstantial factors of non-urgent ED users for diabetes related problems, decision makers such as the LHIN can begin to support and develop policies and implement interventions to decrease their use of the ED for non-urgent problems. Furthermore, the findings of this study can also be utilized to conduct future research studies in this population.

CHAPTER 2

Literature Review

For the current study, the health behavior under investigation is the non-urgent use of the ED for diabetes related problems. Patient related, system related, and circumstantial factors act as antecedents to this health behavior. As a result, a variety of factors are likely to play a role in influencing an individual's decision to seek non-urgent care in the ED. According to Guttman and colleagues (2003), four groups of individuals use the ED for non-urgent reasons: (a) those who have no PCP, and therefore have "no alternative" but to utilize the ED for various conditions, regardless of urgency; (b) those who "prefer the ED" and perceive it as convenient for all types of care; (c) those who "would rather go elsewhere" such as their PCP but the option is unavailable to them for one of many reasons (e.g., after hours); and (d) those who think the "ED is the best option for an emergency" since they perceive themselves as needing urgent care but are evaluated as non-urgent by healthcare professionals.

Factors associated with non-urgent ED visits for diabetes related problems have not been explored in the literature. Thus, the review of the literature explores the predictors of non-urgent ED visits in general. Since the proposed study is a secondary data analysis, the proposed research is limited to variables that were collected in the original study. Therefore, the literature review is restricted to variables that were available in the original data set. Limitations of existing literature are discussed.

Search Strategy

Research findings presented in this literature review were obtained through a systematic review of the following nursing electronic databases: Cumulative Index of Nursing and Allied Health (CINAHL), Proquest, Medline via OVID, PubMed, and the

Cochrane Database of Systematic Reviews. The search was limited to peer-reviewed, English literature with no restrictions on publication date due to the limited quantity of recent literature. Ancestry searching was also used to locate relevant sources. The following keywords were used singly or in combination in either full or truncated forms during searches: non-urgent, inappropriate use, emergency department, emergency room, emergency service utilization, predictors, and factors.

Independent Predictors

Patient Related Factors

Age. Uscher-Pines and colleagues (2013) conducted a systematic review of studies published after 1990 to assess the factors associated with non-urgent ED use by adults in the United States. In the majority of studies, age was found to be significantly associated with non-urgent ED use whereby younger adults were more likely than older adults to visit the ED for non-urgent problems (Uscher-Pines et al., 2013). In another systematic review that included studies from around the world, an inverse relationship between age and non-urgent ED use was also reported (Carret et al., 2009). Similar findings were reported by El-Masri and colleagues (2014) in a study of 293,457 patient visits in the Windsor Essex region of the ESC LHIN. Their findings suggested that older people were less likely to visit the ED with non-urgent health problems (*OR* = 0.993; 95% CI .993 – .994). Younger adults were more likely to utilize the ED for non-urgent reasons in other studies as well (Afilalo et al., 2004; Bianco, Pileggi, & Angelillo, 2003; Carret, Fassa, & Kawachi, 2007; Shah, Shah, & Behbehani, 1996).

A small number of single studies (Jalili, Shirani, Hosseininejad, & Asl-E-Soleimani, 2013; Northington et al., 2005) and articles in each systematic review (Carret

et al., 2009; Uscher-Pines et al., 2013) found no association between non-urgent ED use and age. However, the majority of these studies only performed unadjusted analyses. When determining the relationship between two factors it is important to adjust for other factors (confounding variables) that may affect the outcome. If this is not conducted, the validity of the findings is limited.

Gender. Inconsistencies exist in the literature as to whether gender is associated with non-urgent ED utilization. There is a large body of literature that suggests that women are significantly more likely to utilize the ED for non-urgent care compared to men (Bianco et al., 2003; Carret et al., 2009; Uscher-Pines et al., 2013). Conversely, a small proportion of studies have found that men are more likely than women to visit the ED for a non-urgent concern (El-Masri et al., 2014; Uscher-Pines et al., 2013). A number of studies also found no association (Afilalo et al., 2004; Carret et al., 2009; Jalili et al., 2013; Northington et al., 2005; Shah, Shah, & Behbehani, 1996; Uscher-Pines et al., 2013). Of the literature that found women to be more likely to use the ED non-urgently, all but one study came to the conclusion with adjusted analyses. The vast majority of studies that found no association or concluded the opposite made their conclusion from unadjusted analyses.

Type of diabetes. The patient's type of diabetes is an additional variable that may influence non-urgent ED visits, and will therefore be included in the current study, even though it has not been explored in the literature.

Main problem / complaint. Individuals use the ED for a variety of problems / complaints. A patient's perceived urgency of their specific problem / complaint has been found to be associated with increased ED utilization in a plethora of studies. In one study,

the vast majority of participants (92%; *n* = 213) felt that their problem could not wait to be evaluated and therefore went to the ED (Redstone et al., 2008). Similar results were also found in other studies (Afilalo et al., 2004; Bianco et al., 2003; Carret et al., 2007; Field & Lantz, 2006; McGuigan & Watson, 2010; Northington et al., 2005; Steele et al., 2008; Uscher-Pines et al., 2013).

Although an individual may judge their health problem to be of sufficient importance and magnitude to seek ED services, their perceived level of urgency may differ significantly from that of a healthcare provider's assessment. In a study by Rassin et al. (2006), the majority of patients (77.1%) perceived their condition as urgent (*M* = 8.51; *SD* ± 1.51), while a large proportion of nurses (78.6%) assessed their condition as non-urgent (*M* = 3.09, *SD* ± 2.03) (*p* <.001). Similarly, another study reported that 61% (*n* = 1,226) of participants were evaluated and deemed non-urgent by an ED doctor while only 23% (*n* = 462) of patients perceived their visit to be non-urgent (Shah et al., 1996).

System Related Factors

Primary care access. Not having a PCP influences the utilization of ED services by patients with non-urgent health problems since they have "nowhere else to go" (Koziol-McLain et al., 2000, p. 559). According to Shah et al. (1996), patients with no PCP were 1.39 times more likely to visit the ED for a non-urgent reason compared to those who had a PCP (*OR* = 1.39; *p* = .012). In another study, patients without a PCP were 1.39 (95% CI 1.35 – 1.43) times more likely to use the ED for non-urgent care than those with a PCP (El-Masri et al., 2014). The systematic review conducted by Uscher-Pines and colleagues (2013) also found this association. Even though not having a PCP

predicts non-urgent ED visits, only a small percentage of individuals (3% to 8.2%) have this problem (El-Masri et al., 2014; Field & Lantz, 2006; Steele, Anstett, & Milne, 2008).

Having a PCP does not guarantee that patients will use the ED appropriately, as many use the ED as an alternative to their PCP for non-urgent concerns. Howard et al. (2005) conducted a qualitative study to obtain a better understanding of why individuals (N = 31) choose to visit the ED instead of their PCP for a non-urgent complaint. Study results suggested that difficulty accessing their PCP (i.e., obtaining a timely appointment) was a prevailing theme. For instance, one participant stated "It is weeks before [I] can get an appointment" (Howard et al., 2005, p. 432). In another study by El-Masri et al. (2014), a participant identified that "I waited months to get an appointment" (p. 248) while another reported "It might take two or three days to get an appointment" (p. 247). Other studies concurred with this finding as well (Carret et al., 2009; Guttman, Zimmerman, & Nelson, 2003; Steele et al., 2008). The concept of time was a significant factor as many believed their condition could not wait to be assessed. In a cross sectional survey, the vast majority of participants (92%; *n* = 213) believed that their problem could not wait one to two days to be evaluated (Redstone et al., 2008). Similar findings were reported by Steele et al. (2008). This led participants in both studies to use the ED for care. In light of previous experiences with getting timely appointments, some participants identified that they had stopped attempting to contact their PCP before using the ED. One participant explained "You can call, but it is usually not worth the time…all they are going to tell me is he [the PCP] can't see me today…" (Howard et al., 2005, p. 432). Interestingly, Redstone et al. (2008) found that 67.9% (*n* = 163) of participants would have been willing to see their PCP for their condition, yet only 35.4% (*n* = 85) contacted their PCP

before visiting the ED. Similar results were reported by Afilalo et al. (2004), who found that only 22% of patients tried to contact their PCP before presenting to the ED.

Limited access to PCPs after hours and during weekends is another potential cause of non-urgent ED use. One participant stated that her PCP "isn't in on weekends, and his office isn't open after 5 o'clock" (El-Masri et al., 2014, p. 248), while others stated that "nothing else is open" (Guttman et al., 2003, p. 1102). In one study, significantly higher proportions of patients used the ED for non-urgent visits during night shifts (between 6 pm and 6 am) compared with day shifts (between 6 am and 6 pm) (p <.001) (Jalili et al., 2013). Conversely, a systematic review found that the majority of non-urgent ED visits took place during the morning and afternoon shifts (Carret et al., 2009). El-Masri et al. (2014) reported similar findings in the Windsor Essex region of the ESC LHIN. Compared to patients presenting during the day shift, non-urgent patients were 16% and 10% less likely to present to the ED during the evening and night shifts, respectively. Another study also found that non-urgent patients were less likely to present between 4 pm and 8 am compared to urgent patients (42% and 52%, respectively; p = .033) (Afilalo et al., 2004).

Even though limited access to primary care influences non-urgent ED use, its impact may be minimal due to other factors such as convenience, efficiency, and quality of service. In a study by Redstone et al. (2008), 60% (n = 142) of participants felt that the ED was more convenient than their PCP because they did not have to wait for an appointment or worry about presenting during normal business hours. In a cross sectional survey of self-referred non-urgent patients in a university ED, more than half (56%; n = 157) identified having a PCP; yet 47% (n = 73) felt the ED was better for obtaining

unscheduled care (Northington et al., 2005). Even though wait times in the ED may be long, they may represent a shorter overall waiting period for care. For instance, one participant stated that "I might have to wait here [in the ED] 2-3 hours, but it's still better than waiting a week [for a PCP appointment]" (El-Masri et al., 2014, p. 248). The convenience of the ED was reported to impact non-urgent use in other studies as well (Afilalo et al., 2004; Carret et al., 2009; Koziol-McLain et al., 2000; Uscher-Pines et al., 2013). In addition to convenience, the efficiency of the ED has also been found to impact non-urgent use. Patients "want to get looked at right away" (El-Masri et al., 2014, p. 249) and "The ED is the quickest way to get checked out" (Howard et al., 2005, p. 433). In one study, 76.5% (n = 306) of participants identified using the ED to obtain rapid treatment (Jalili et al., 2013). Interestingly, El-Masri et al. (2014) found that even though several participants knew when to appropriately use the ED, many still utilized its service for non-urgent care. One participant stated,

> "as much as I didn't want to come in today, I like how, at least they dealt with the problem, instead of having to you know, book an appointment and having to come back, like in 3 or 4 days, they try to do it that day and get it over with, so you don't have to keep coming back, so I was happy with it" [care received at ED visit today] (El-Masri et al., 2014, p. 248).

In a cross-sectional patient survey, almost half of participants (49%; n = 115) identified using the ED because they were in need of a specific service such as an x-ray that was not available at their PCPs office (Field & Lantz, 2006). This was also identified as a factor by other investigators (El-Masri et al., 2014; Steele et al., 2008). As one participant stated "I just killed two birds with one stone by coming to the emerg…I would have had to go back and forth, back and forth" because her family doctor "normally sends you out to get those things done" (El-Masri et al., 2014, p. 248).

The quality of service received in the ED is another factor impacting non-urgent use. Northington et al. (2005) found that 76.1% (n = 213) of participants chose the ED for non-urgent care because they felt they would receive better care. This higher quality of service was an important reason reported in other studies as well (Rassin et al., 2006; Shah et al., 1996).

Referral source. The source of referral to the ED has been identified as another factor that influences a patients' decision to attend the ED non-urgently. Referral sources may include self, family, friends, or various healthcare professionals such as PCPs, walk-in clinics, and specialists. Interestingly, a large proportion of non-urgent patients are referred to the ED by healthcare professionals. In a descriptive qualitative study, one of the main themes identified was that participants were told by staff in their primary care office to use the ED (Howard et al., 2005). Referral by a healthcare professional was also a main theme found by Koziol-McLain et al. (2000) in their descriptive narrative study in which 13 patients (43%) called ahead to their care provider for an appointment, only to be referred to the ED. In another study, 42 patients (30.7%) stated that they were referred to the ED and of these, 76.2% were referred by healthcare professionals (Steele et al., 2008). Similar findings were also reported in other studies (Afilalo et al., 2004; Carret, Fassa, & Kawachi, 2007; Field & Lantz, 2006; Uscher-Pines et al., 2013).

In 2014, El-Masri and colleagues conducted a mixed methods study to explore the issues of non-urgent ED visits in the ESC LHIN region. In the Windsor-Essex region specifically, non-urgent patients were 2.49 (95% CI 2.43 – 2.54) times more likely to use the ED based on a referral from a healthcare provider as opposed to deciding to use the ED on their own or due to a family member or caretaker's advice. In the qualitative

section of the study, approximately one-third of participants (34.4%; *n* = 11) were referred to the ED by a healthcare professional (El-Masri et al., 2014). Conversely, Bianco et al. (2003) found that the odds of being non-urgent were higher in patients who were self or relative referred to the ED, as compared to those referred by a healthcare professional (*OR* = 2.42; 95% CI = 1.13 – 5.16). These findings are further validated in the systematic review conducted by Carret et al. (2009). Compared to those referred by a healthcare professional, individuals who were self-referred had a 1.39 to 2.42 times greater odds of using the ED for a non-urgent reason.

Circumstantial Factors

Proximity to ED. An individual's proximity to a health service potentially influences their decision to access that service. For instance, of the 400 individuals who used the ED non-urgently, 52.8% (*n* = 211) identified proximity as one of the main reasons for choosing the ED (Jalili et al., 2013). In another study, 25% (*n* = 60) of patients with a PCP chose the ED over their PCP due to proximity (Redstone et al., 2008). Several authors also reported similar findings (McGuigan & Watson, 2010; Rassin, Nasie, Bechor, Weiss, & Silner, 2006; Shah et al., 1996). However, the systematic review conducted by Carret et al. (2009) found that a large proportion of studies did not report a significant association between proximity and non-urgent ED use.

Hospital type. Hospital type refers to whether a hospital is located in an urban city centre or rurally. A moderate proportion of literature differentiates between what type of hospital was used in their research (Uscher-Pines et al., 2013; Backman et al., 2008; Steele et al., 2008; Howard et al., 2005; Afilalo et al., 2004; Vertesi, 2004; Koziol-McLain et al., 2000); however, only one study explored the relationship this variable had

with the outcome. According to Afilalo and colleagues (2004), non-urgent ED use is more likely in hospitals located in non-urban / sub-urban areas compared to urban areas.

Ambulatory type. Individuals either present to the ED by ambulance or on foot (i.e., walking). Non-urgent patients who arrived by ambulance were excluded by a large proportion of studies (McGuigan & Watson, 2010; Backman, Blomqvist, Lagerlund, Carlsson-Holm & Adami, 2008; Field & Lantz, 2006; Rassin et al., 2006; Coleman et al., 2002; Shesser, Kirsch, Smith & Hirsch, 1991). However, in a study conducted by Afilalo et al. (2004), non-urgent patients were significantly less likely to present by ambulance compared to urgent patients (5% versus 22%; $p = 0.0026$). Similar findings were also found by El-Masri et al. (2014).

Time of day. As mentioned previously in *primary care access*, one study reported that significantly higher proportions of patients used the ED for non-urgent visits during night shifts (between 6 pm and 6 am) compared with day shifts (between 6 am and 6 pm) ($p <.001$) (Jalili et al., 2013). Conversely, a systematic review found that the majority of non-urgent ED visits took place during the morning and afternoon shifts (Carret et al., 2009). El-Masri et al. (2014) reported similar findings in the Windsor Essex region of the ESC LHIN. Compared to patients presenting during the day shift, non-urgent patients were 16% and 10% less likely to present to the ED during the evening and night shifts, respectively. Another study also found that non-urgent patients were less likely to present between 4 pm and 8 am compared to urgent patients (42% and 52%, respectively; $p = .033$) (Afilalo et al., 2004).

Season of visit. According to El-Masri et al. (2014), non-urgent visits during the winter, spring, and fall were 15%, 4%, and 10% less than during the summer, suggesting

that non urgent visits were more likely to occur during the summer. To the authors knowledge, the season in which a non-urgent visit occurs has not been explored further in the literature.

Summary of the Literature

Unnecessary ED use for non-urgent health concerns is not limited to Canada. It is a global issue that has been explored nationally and internationally. This review of the literature emphasized that there is a limited understanding of the predictors of non-urgent ED use. Therefore, it is challenging to summarize the factors associated with this outcome. Even though the relationship these variables had with the outcome varied, the literature suggests there are a plethora of reasons why patients seek non-urgent care in the ED. These include age, gender, type of diabetes, and main problem / complaint (patient related factors), access to primary care and referral source to the ED (system related factors) as well as proximity to the ED, hospital type, ambulatory type, time of day, and season of visit (circumstantial factors). According to Uscher-Pines et al. (2013), this weak evidence base points to a need for further investigation of all potential predictors.

Limitations of Existing Literature

A major limitation identified throughout the literature is the various use of definitions for the term *non-urgent* (Carret et al., 2009; Bianco et al., 2003; Richardson & Hwang, 2001; Uscher-Pines et al., 2013). Articles either judged patients to be non-urgent prospectively at triage or retrospectively following ED evaluation. This variation in definitions limits the comparability of findings and may explain the heterogeneity of results across studies. Consequently, since no standard criteria for defining *non-urgent* ED visits exist, a consistent definition is needed.

Even though non-urgent ED use is a global concern, there is limited research exploring the predictors of non-urgent visits in Canada. The majority of studies described in this review were conducted in the United States. This limits the generalizability of the findings due to the unique features of each healthcare system (e.g., fee for service versus universal healthcare). As a result, this issue needs to be researched further in a Canadian context.

Another limitation in the literature relates to data analysis. Multivariate analyses were performed in only a small number of studies (El-Masri et al., 2014; Uscher-Pines et al., 2013; Carret et al., 2009; Afilalo et al., 2004; Bianco et al., 2003; Shah et al., 1996). This limits the validity of findings because the majority of factors found to be associated with non-urgent ED use were not adjusted for other factors (i.e., confounding variables) during analysis, which may have affected the outcome.

According to Uscher-Pines et al. (2013), non-urgent ED users are likely to be a diverse group. Therefore, it may be beneficial to divide this population into different groups. Throughout the literature, non-urgent ED populations have varied, with some investigators assessing non-urgent ED users as a whole, while others assessed non-urgent ED users with a PCP. The literature however, has not stratified this issue by illness (e.g., diabetes, respiratory illnesses, and mental health). To better understand what drives non-urgent utilization of the ED, research needs to focus on specific sub-groups of the non-urgent population, such as those with diabetes. Previous research has focused on non-urgent ED visits for diabetes related problems (e.g. hyperglycemia) after the implementation of a specific intervention (e.g., disease management program). However, there are no known published studies that have examined the factors associated with non-

urgent ED visits for diabetes related problems as a whole. Therefore, future research is needed in this area to add to this body of literature.

CHAPTER 3

Methodology

Research Design

This study is a secondary analysis of existing retrospective population based data that were obtained from the ESC LHIN. Information on all ED visits and hospital admissions that occurred from the seven community based hospitals located in the region between April 1, 2009 and March 31, 2011 were included (El-Masri et al., 2014). However, for the purposes of this study, only a sub-group of this database was analyzed, specifically, those visiting the ED for diabetes related problems in WEC hospitals.

Sample and Setting

The original ESC data set had an initial sample of 639,279 patient visits (*M* = 79,910 per quarter). Cases were deleted if triage data were not available or if a patient was treated outside the ESC region, resulting in a final sample of 597,373 patient visits (El-Masri et al., 2014). The ESC LHIN is divided into three regions: Windsor-Essex (*n* = 293457), Chatham-Kent (*n* = 124881), and Lambton (*n* = 166372) (El-Masri et al., 2014). The subset of cases from the Windsor-Essex region was used for this study. Hospitals in the Windsor-Essex region included Windsor Regional Hospital (WRH) – Metropolitan and Ouellette campus (Ouellette campus was formally known as Hôtel-Dieu Grace Hospital) and Leamington District Memorial Hospital (LDMH). Both campuses of WRH are located in an urban city centre while LDMH is located in a rural county area.

If the patient had a concurrent diagnosis of diabetes and presented to the ED of one of the three identified hospitals for a diabetes related problem (e.g., ketoacidosis, renal complications, eye complications, neuropathy, peripheral / circulatory complications, skin complications, hypoglycemia, foot ulcer, or “other” complications),

the visit was included in the study. In the Windsor-Essex region, a total of 1929 patient visits were made to WRH and LDMH for diabetes related problems (El-Masri et al., 2014). Patients were excluded if they utilized the ED for a diabetes related problem outside WEC hospitals (i.e., WRH and LDMH) or if they visited one of the three identified hospitals for a diabetes related problem but were not from the Windsor-Essex region.

G*power 3.1.9.2 was used to estimate the statistical power of the study. The estimated required sample size for the study was 721 patient visits to achieve a study power of .80, a two-tailed alpha of .05 and an effect size of .20 (Faul, Erdfelder, Buchner, & Lang, 2009). However, given the available sample of 1929 ED visits, the statistical power of the study was .99 with a two-tailed alpha of .05 and a small effect size of .20. A small effect size was used due to the exploratory nature of the proposed study.

Protection of Human Subjects

Prior to secondary data analysis, an application to the Research Ethics Board (REB) at the University of Windsor for a waiver of consent was sought. Patient confidentiality was maintained using an encrypted hospital number for each patient ID. Data files were also kept in password protected hard drives and computers at the University of Windsor in a locked area accessible only to the researcher.

Variable Definitions

The conceptual and operational definitions of the study variables are presented in sections that correspond with the modified model presented in the first chapter.

Independent predicators.

Patient related factors.

Age. Age was defined as the patient's age in years at the time of triage. It was measured as a categorical variable with the following levels: 40 years and younger and 41 years and older.

Gender. Gender was defined as the patient's sex (i.e., male or female) recorded at the time of triage and was measured as a binary variable.

Type of diabetes. Type of diabetes refers to the form of diabetes an individual had at the time of triage. This was measured as a categorical variable with the following levels: type 1 diabetes, type 2 diabetes, or unspecified. Unspecified was used when the type of diabetes was unknown.

Main problem/complaint. Main problem/complaint was defined as the main reason why the patient presented to the ED, as determined by a healthcare professional. It was operationalized as a categorical variable with the following levels: ketoacidosis, renal complications, eye complications, neuropathy, peripheral/circulatory complications, skin complications, hypoglycemia, foot ulcer, and other.

System related factors.

Primary care access. Primary care access refers to whether a patient has access to a PCP. This was measured as a categorical variable with the following levels: family physician; other (e.g., NP); and none.

Referral source. Referral source was defined as the individual who referred a patient to the ED for their diabetes related problem and included self, family, caretaker,

or healthcare provider. Patient referral source was operationalized as a dichotomous variable with the following levels: self/family/caretaker and healthcare provider.

Circumstantial factors.

Proximity to ED. Proximity to the ED was defined as the distance from the patient's home to the ED. Because the actual distance was not available, the town in which the patient lived was used as a proxy, and was measured as a categorical variable with the following levels: Windsor, Leamington, and other.

Hospital type. Hospital type was determined by where the hospital it located. It was measured as a binary variable with the following levels: urban hospital and rural hospital.

Ambulatory type. Ambulatory type was defined as the manner in which the patient accessed the ED. This was measured as a binary variable with the following levels: arrived by ambulance and did not arrive by ambulance (e.g., arrived walking).

Time of day. This variable was defined as the time of day in which an individual utilized the ED. It was divided into 8 hour periods and was operationalized as a categorical variable with the following levels: day (07:00-15:00); evening (15:00-23:00); and night (23:00-07:00).

Season of visit. Season of admission was defined as the season in which the patient presented at the ED. It was operationalized as a categorical variable with the following levels: winter; spring; summer; and fall.

Primary outcome.

Level of acuity. Level of acuity was defined as the level of severity of a diabetes related problem. It was measured using the CTAS, which is mandated for use in all

Canadian EDs. The five levels of the CTAS in decreasing order of acuity are listed in Table 1 (Bourne et al., 2012). In this study, CTAS score was measured as a binary variable with the following levels: urgent (resuscitation, emergent, urgent) and non-urgent (less urgent, non-urgent).

Secondary outcome.

Disposition status. Disposition status was defined as the nature of the departure of a patient from the ED. It was operationalized as a categorical variable with the following levels: discharged home; admitted to hospital; left before seen; left before treatment; discharged to another institution; transfer to another facility; intra-facility transfer; and death.

Hospital admission was defined as the admission of a patient to a hospital floor/unit for a diabetes related problem for at least 24 hours (El-Masri et al., 2014). Hospital admission was operationalized as a dichotomous variable (i.e., admitted/not admitted).

Data Collection Procedures

Data were collected from hospital based records regarding ED visits and hospital admissions that occurred between April 1, 2009 and March 31, 2011 by the ESC LHIN. Once the waiver of consent was obtained from the REB, patient observations for diabetes related problems in WEC hospitals were extracted from the original database. Data selection included the following steps: (a) select the Windsor-Essex region from the overall ESC data, (b) select the diagnosis of diabetes, (c) exclude patients/observations that utilized the ED for diabetes related problems but were not from the Windsor-Essex region, and (d) exclude patients/observations that utilized the ED for diabetes related problems outside WEC hospitals (i.e., WRH and LDMH).

Data Analysis

The SPSS statistical software package (Version 21.0) was used to analyze the data. Prior to data analysis, the database was screened for violations of bivariate and multivariate assumptions. A 95% confidence interval (95% CI) and/or a two-tailed alpha of .05 were used as the criteria for establishing statistical significance in the study. Data analysis procedures for each research question consisted of the following:

1. What are the independent predictors of non-urgent ED visits for diabetes related problems in WEC?

Patients with urgent and non-urgent ED visits for diabetes related problems were compared with respect to their patient related, system related, and circumstantial factors using univariate analyses such as basic descriptive statistics (i.e., general frequencies) and bivariate analyses (i.e., chi square). Variables with a p value of $\leq .25$ were entered into the adjusted analysis (Hosmer & Lemeshow, 1989). Since many patients contributed more than one ED visit, multivariate binary logistic regression techniques using generalized estimating equations (GEE) modeling was used.

2. Is there a difference in the hospitalization rate of urgent and non-urgent patients visiting the ED for diabetes related problems in WEC?

The hospitalization rate of urgent and non-urgent ED visits for diabetes related problems was compared using bivariate analyses (i.e., chi square).

Anticipated Limitations

For the proposed study, the researcher acknowledged three main inherent problems. First, there are biases related to the secondary nature of the analysis. The Behavioral Model of Health Service Use posits that a variety of variables predict an individual's use of health services. However, the researcher only had access to the

variables that were collected by the ESC LHIN. For example, the Behavioral Model of Health Service Use posits that social determinants such as education may influence health service use. However, this information was not collected by the ESC LHIN and therefore, the researcher could not explore if it influenced non-urgent ED use for diabetes related problems. The researcher also had a lack of control over data quality as one cannot ascertain the accuracy of the data collected. In addition, because the study is observational, no causality can be inferred.

CHAPTER 4

Findings

This chapter presents the results of the statistical analyses. Data screening and preparation is described, followed by a summary of sample and visit characteristics. The analyses associated with each research question are also presented.

Data Screening and Preparation

When the data were screened for missingness, no missing data were found. Screening for univariate outliers and normality was not required given that the current study had no continuous variables. Data were also screened for violations of bivariate and multivariate assumptions. Binary logistic regression was the only multivariate analysis conducted in the current study, and all assumptions for the test were met. The outcome variable was dichotomous (i.e., urgent or non-urgent), all independent variables were dichotomous or made dichotomous by dummy coding the variable, and the ratio of cases from the dependent variable was greater than 9 to 1 (Tabachnick & Fidell, 2007). The data on all independent variables were also screened for multivariate outliers and multicollinearity. Mahalanobis distance was used to determine whether multivariate outliers existed; however, to determine whether or not a multivariate outlier case was an influential data point or not, Cook's distance was utilized (Tabachnick & Fidell, 2007). No multivariate outliers were found to be influential. Multicollinearity occurs when there is a high correlation between two or more independent variables (Tabachnick & Fidell, 2007). This is problematic as it may lead to redundancy. Collinearity diagnostics were performed and multicollinearity was not found to be an issue.

Additional preparation was also conducted before analyses were performed. Exclusion criteria were implemented and resulted in the deletion of 16 patient observations. Necessary variables were also created (i.e., type of diabetes, hospital type, proximity to ED, within subjects) or converted from string to numeric format (i.e., main problem / complaint). *Day of week of visit* was excluded from the current study since only a portion of the date was provided in the string format. Therefore, it could not be converted to numeric format and used in analysis.

Sample and Visit Characteristics

Sample characteristics were conducted on primary cases only (n = 1328), not the total number of observations (N = 1913) since a patient could have contributed more than one data point. Specifically, the data show that 76.2% (n = 1013) of patients visited the ED once, 22.0% (n = 293) visited two to five times, while 1.8% (n = 22) visited six to 15 times. The data further suggested that the majority of participants were 41 years or older (83.5%; n = 1109). Over half the sample was comprised of males (57.2%; n = 760) and of those with type 2 diabetes (53.7%; n = 713). Type 1 diabetes accounted for 19.4% (n = 258) of the sample while 26.9% (n = 357) were classified as *unspecified*. The vast majority of participants had access to a family physician or other type of healthcare professional (95.0%; n = 1262), whereas, 5% (n = 66) had no access to primary care. Those who lived in Windsor, an urban city, visited the ED less frequently for non-urgent diabetes related problems as compared to those living in Leamington, a rural county area (11.7% versus 29.8%, respectively). A summary of the sample characteristics for primary cases is presented in Table 2.

Table 2

Comparison of sample characteristics between urgent and non-urgent visits (primary cases only)

Variable	Groups		Total (N=1328)	χ^2	*P*
	Urgent (n=1142)	Non-Urgent (n=186)			
Age [n (%)]				12.62	<.001
40 years and younger	205 (93.6)	14 (6.4)	219 (16.5)		
41 years and older	937 (84.5)	172 (15.5)	1109 (83.5)		
Gender [n (%)]				5.41	.02
Male	639 (84.1)	121 (15.9)	760 (57.2)		
Female	503 (88.6)	65 (11.4)	568 (42.8)		
Type of Diabetes [n (%)]				16.45	<.001
Type 1 diabetes	242 (93.8)	16 (6.2)	258 (19.4)		
Type 2 diabetes	597 (83.7)	116 (16.3)	713 (53.7)		
Unspecified	303 (84.9)	54 (15.1)	357 (26.9)		
Primary Care Access [n (%)]				.99	.61
Family physician	1076 (86.1)	173 (13.9)	1249 (94.0)		
Other	10 (76.9)	3 (23.1)	13 (1.0)		
None	56 (84.8)	10 (15.2)	66 (5.0)		
Proximity to ED [n (%)]				28.49	<.001
Windsor	744 (88.3)	99 (11.7)	843 (63.5)		
Leamington	85 (70.2)	36 (29.8)	121 (9.1)		
Other	313 (86.0)	51 (14.0)	364 (27.4)		

Visit characteristics were conducted on the total number of patient observations (*N* = 1913). The results of this study demonstrated that from the total number of visits made to the ED, 17.1% (*n* = 327) were for non-urgent diabetes related problems. Furthermore, although 84.4% (*n* = 1614) of all patient visits to the ED were made to urban hospitals (i.e., WRH), the data suggested that urban hospitals received fewer patient visits for non-urgent diabetes related problems compared to rural hospitals (i.e., LDMH) (15.2% versus 27.4%, respectively). Specifically, 6.2% (*n* = 36) of non-urgent

visits were made to WRH – Metropolitan campus and 20.3% (*n* = 584) were made to WRH - Ouellette campus as compared to 27.4% (*n* = 82) at LDMH. A large proportion of individuals (78.2%; *n* = 1496) went to the ED on their own or were referred by a family member or caretaker. Additionally, of those triaged as non-urgent, 27.6% (*n* = 115) were referred to the ED by a health care provider. Over half of participants came to the ED without an ambulance (59.2%; *n* = 1132), during day time hours (55.9%; *n* = 1069), and waited 6 or less hours in the ED for care (57.8%; *n* = 1106), while patient visits made in each season was approximately the same. The data further suggest that individuals with diabetes came to the ED for a variety of reasons, including: ketoacidosis (9.7%; *n* = 186), renal complications (6.0%; *n* = 115), eye complications (0.5%; *n* = 9), neuropathy (2.8%; *n* = 53), peripheral or circulatory complications (11.4%; *n* = 218), skin complications (0.7%; *n* = 14), hypoglycemia (19.8%; *n* = 378), foot ulcers (16.1%; *n* = 308), or other problems / complications (33.0%; *n* = 632). When in the ED, individuals were mainly seen by a family practitioner (49.7%; *n* = 953) or emergency medicine (38.2%; *n* = 730). Almost half of visits were discharged home (49.7%; *n* = 953), while 28.5% (*n* = 545) were admitted to hospital. A summary of visit characteristics for all patient observations is presented in Table 3.

Table 3

Comparison of visit characteristics between urgent and non-urgent visits (all observations included)

Variable	Groups		Total (N=1913)	χ^2	*P*
	Urgent (n=1586)	Non-Urgent (n=327)			
Hospital Type [n (%)]				26.69	<.001
Urban	1369 (84.8)	245 (15.2)	1614 (84.4)		
Rural	217 (72.6)	82 (27.4)	299 (15.6)		
Hospital Name [n (%)]				79.17	<.001
Windsor Regional Hospital – Metropolitan campus	548 (93.8)	36 (6.2)	584 (30.5)		
Windsor Regional Hospital – Ouellette campus	821 (79.7)	209 (20.3)	1030 (53.8)		
Leamington District Memorial Hospital	217 (72.6)	82 (27.4)	299 (15.7)		
Referral Source [n (%)]				41.36	<.001
Self/family/caretaker	1284 (85.8)	212 (14.2)	1496 (78.2)		
Other health care providers	302 (72.4)	115 (27.6)	417 (21.8)		
Ambulatory Type [n (%)]				91.71	<.001
Arrived by ambulance	725 (92.8)	56 (7.2)	781 (40.8)		
No ambulance / arrived walking	861 (76.1)	271 (23.9)	1132 (59.2)		
Time of Day [n (%)]				22.93	<.001
Day	848 (79.3)	221 (20.7)	1069 (55.9)		
Evening	494 (88.4)	65 (11.6)	559 (29.2)		
Overnight	244 (85.6)	41 (14.4)	285 (14.9)		
Season of Visit [n (%)]				12.78	.005
Spring	413 (83.3)	83 (16.7)	496 (25.9)		
Summer	375 (78.5)	103 (21.5)	478 (25.0)		
Fall	391 (87.3)	57 (12.7)	448 (23.4)		
Winter	407 (82.9)	84 (17.1)	491 (25.7)		
ED Wait Time [n (%)]				150.73	<.001
0 – 4 hours	485 (69.9)	209 (30.1)	694 (36.3)		
4.1 – 6 hours	346 (84.0)	66 (16.0)	412 (21.5)		
6.1 – 8 hours	234 (90.3)	25 (9.7)	259 (13.6)		
8.1 hours or more	521 (95.1)	27 (4.9)	548 (28.6)		

Table 3 continued

Variable	Groups		Total (N=1913)	χ^2	*P*
	Urgent (n=1586)	Non-Urgent (n=327)			
Main Problem / Complaint [n (%)]				331.38	<.001
Ketoacidosis	184 (98.9)	2 (1.1)	186 (9.7)		
Renal	109 (94.8)	6 (5.2)	115 (6.0)		
Eye	8 (88.9)	1 (11.1)	9 (0.5)		
Neuropathy	35 (66.0)	18 (34.0)	53 (2.8)		
Peripheral / Circulatory	177 (81.2)	41 (18.8)	218 (11.4)		
Skin	7 (50.0)	7 (50.0)	14 (0.7)		
Hypoglycemia	347 (91.8)	31 (8.2)	378 (19.8)		
Foot ulcer	156 (50.6)	152 (49.4)	308 (16.1)		
Other	563 (89.1)	69 (10.9)	632 (33.0)		
Main Provider in ED [n (%)]				210.11	<.001
Family practitioner	864 (90.7)	89 (9.3)	953 (49.7)		
Emergency medicine	602 (82.5)	128 (17.5)	730 (38.2)		
Nurse (RN or NP)	85 (47.0)	96 (53.0)	181 (9.5)		
Other	35 (71.4)	14 (28.6)	49 (2.6)		
Disposition Status [n (%)]				132.23	<.001
Discharged home	779 (81.7)	174 (18.3)	953 (49.7)		
Left before treatment	51 (89.5)	6 (10.5)	57 (3.0)		
Inpatient admission	515 (94.5)	30 (5.5)	545 (28.5)		
Transferred to another facility	24 (96.0)	1 (4.0)	25 (1.3)		
Death	1 (100.00)	0 (0.0)	1 (0.1)		
Intra-facility transfer	3 (60.0)	2 (40.0)	5 (0.3)		
Discharged to institution	213 (65.1)	114 (34.9)	327 (17.1)		

Research Question 1

The data in Table 2 and 3 display the unadjusted comparisons of sample and visit characteristics between urgent and non-urgent ED visits. The data show that the two groups were statistically different in all characteristics at a p value <.05, except for primary care access. Due to this variables uneven split (95% versus 5%, respectively); the decision was made to exclude this variable from analysis. This study assessed variables

that acted as antecedents to non-urgent ED visits for diabetes related problems. Factors within the ED that could have influenced this outcome, such as ED wait time, were not explored as potential independent predictors in this study but were used as descriptors under visit characteristics. Only variables established as potential independent predictors in the modified model that had a *p* value of ≤ .25 were entered into the adjusted analysis (Hosmer & Lemeshow, 1989). As a result, a total of 10 variables were used in the multivariate analysis. Since many patients contributed more than one ED visit, multivariate binary logistic regression techniques using GEE modeling was used. A total of 1913 patient observations were included in analysis for 1328 patients. Each patient within the database visited the ED anywhere from 1 to 15 times during the two year data collection period. Table 4 displays the results of the regression model.

Table 4

Binary logistic regression using generalized estimating equations (GEE)

Variables	β	*SE*	*P*	OR	95% CI
Age					
41 years or older	.608	.280	.03	1.84	1.06 – 3.18
40 years or younger (reference group)	------	------	------	------	----------
Gender					
Female	-.096	.15	.52	.908	.677 – 1.22
Male (reference group)	------	------	------	------	----------
Type of Diabetes					
Type 2 diabetes	.646	.25	.01	1.91	1.16 – 3.13
Unspecified	1.02	.26	<.001	2.76	1.65 – 4.63
Type 1 diabetes (reference group)	------	------	------	------	----------
Referral Source					
Other health care providers	.202	.16	.22	1.22	.888 – 1.69
Self/family/caretaker (reference group)	-----	-----	-----	-----	----------

Table 4 Continued

Variables	β	*SE*	*P*	OR	95% CI
Hospital Type					
Urban	-1.34	.29	<.001	.262	.148 – .464
Rural (reference group)	-----	-----	-----	-----	----------
Ambulatory Type					
No ambulance/arrived walking	.987	.19	<.001	2.68	1.84 – 3.92
Arrived by ambulance (reference group)	-----	-----	-----	-----	----------
Time of Day					
Evening	-.316	.17	.07	.729	.519 – 1.02
Overnight	.229	.22	.29	1.26	.820 – 1.93
Day (reference group)	------	------	------	------	----------
Season of Visit					
Winter	-.152	.19	.43	.859	.588 – 1.26
Spring	-.160	.19	.39	.853	.591 – 1.23
Fall	-.425	.22	.06	.654	.423– 1.01
Summer (reference group)	------	------	------	------	----------
Proximity to ED					
Leamington	-.192	.33	.56	.825	.434 – 1.57
Other	-.470	.21	.02	.625	.416 – .940
Windsor (reference group)	------	------	------	------	----------
Main Problem / Complaint					
Ketoacidosis	-1.83	.76	.02	.160	.036 – .711
Renal	-.687	.47	.14	.503	.202 – 1.25
Eye	-.440	1.21	.72	.644	.060 – 6.93
Neuropathy	1.11	.47	.02	3.02	1.21 – 7.56
Peripheral / circulatory	.556	.28	.049	1.74	1.003 – 3.03
Skin	1.73	.60	.004	5.64	1.74 – 18.32
Foot ulcer	1.67	.27	<.001	5.31	3.14 – 8.98
Other	-.060	.26	.82	.942	.571 – 1.55
Hypoglycemia (reference group)	------	------	------	------	----------

Note. Urgent is the reference group. CI = confidence interval.

Six variables were found to be independent predictors of non-urgent ED visits for diabetes related problems. The data suggest that age was a significant predictor of non-urgent ED use for diabetes related problems, whereby those 41 years and older were 1.84

(95% CI 1.06 – 3.18) times more likely to use the ED for non-urgent diabetes related problems compared to those 40 years and younger. Type of diabetes was also an independent predictor of non-urgent ED use. Specifically, those with type 2 diabetes were 1.91 (95% CI 1.16 – 3.13) times more likely to use the ED for non-urgent problems compared to those with type 1 diabetes, while those with an unspecified type of diabetes were 2.76 (95% CI 1.65 – 4.63) times more likely. The data also showed that non-urgent ED visits for diabetes related problems were 73.8% (*OR* = .262; 95% CI .148 - .464) less likely to occur at urban hospitals compared to rural hospitals. The data further suggests that visits that did not utilize EMS services (i.e., arrived walking) were 2.68 (95% CI 1.84 – 3.92) times more likely to be non-urgent compared to those who did use EMS services. Proximity to the ED was also found as an independent predictor of non-urgent ED visits for diabetes related problems. Specifically, patient visits from individuals who lived in other townships in Windsor-Essex County were 37.5% (*OR* = .625; 95% CI .416 - .940) less likely to use the ED for a non-urgent visit compared to those who lived in Windsor, where two urban hospitals are located (i.e., WRH). Table 4 further demonstrates that main problem / complaint was also a significant predictor of non-urgent ED visits for diabetes related problems. The results specifically showed that, compared to visits for patients presenting with hypoglycemia, the odds of non-urgent ED visits were higher among patients presenting with neuropathy (*OR* = 3.02; 95% CI 1.21 – 7.56), peripheral / circulatory complications (*OR* = 1.74; 95% CI 1.003 – 3.03), skin complications (*OR* = 5.64; 95% CI 1.74 – 18.32), and foot ulcers (*OR* = 5.31; 95% CI 3.14 – 8.98), while patients presenting with ketoacidosis were 84.0% (*OR* = .160; 95% CI .036 - .711) less likely to be non-urgent.

Research Question 2

The analysis for the hospitalization rate of urgent and non-urgent ED visits for various diabetes related problems can be found in Table 5. Of the 1913 patient visits made to the ED, 545 (28.5%) resulted in hospital admission. The data show that those triaged with urgent visits (n = 515; 32.5%) were significantly more likely to be admitted for their diabetes related problems compared to those triaged as non-urgent (n = 30; 9.2%; p <.001).

Table 5

Hospitalization rate of urgent and non-urgent ED visits for various diabetes related problems

Variable	Groups		Total (N=1913)	χ^2	*P*
	Urgent (n=1586)	Non-Urgent (n=327)			
Hospital Admission [n (%)]				72.23	<.001
Not admitted	1071 (67.5)	297 (90.8)	1368 (71.5)		
Admitted	515 (32.5)	30 (9.2)	545 (28.5)		

Summary

After data screening and preparation were performed, unadjusted comparisons of sample and visit characteristics between urgent and non-urgent ED visits were made. Ten variables qualified to be used in the multivariate analysis; however, only the following six were found to be independent predictors of non-urgent ED visits for diabetes related problems: age, type of diabetes, hospital type, ambulatory type, proximity to ED, and main problem / complaint. Furthermore, the findings demonstrated that individuals with urgent diabetes related problems were significantly more likely to be admitted to hospital compared to individuals with non-urgent diabetes related problems.

CHAPTER 5

Discussion

The following is a discussion of the study results. Discussion of each research question is presented separately and contextually compared to other findings in the literature whenever relevant, as there is currently no published literature on non-urgent ED visits for diabetes related problems. Implications and recommendations for nursing research, practice and policy are provided, followed by an acknowledgement of the study's limitations, and a summary of the discussion.

Research Question 1

The first research question explored the independent predictors of non-urgent ED visits for diabetes related problems in three community based hospitals located in WEC. The conceptual model that informed this study was a modified version of the Behavioral Model of Health Service Use. This modified model suggested that a variety of patient related, system related, and circumstantial factors were independent predictors of non-urgent ED visits for diabetes related problems. Overall, the findings of this study partially supported the model since some, but not all, patient related and circumstantial factors were found to be independent predictors of non-urgent ED visits for diabetes related problems. Specifically, the findings suggested that age, type of diabetes, main problem / complaint, hospital type, ambulatory type, and proximity to ED are independent predictors of non-urgent ED visits for diabetes related problems. Each of these findings is discussed below.

Sample Characteristics

The current study found that the two groups (i.e., urgent and non-urgent) were statistically different in all sample characteristics except for primary care access (refer to

Table 2). Given the relationship between age and type of diabetes, both variables are discussed together. In the current study, 53.7% of participants had type 2 diabetes. This is lower than Canada's national prevalence which is approximately 90% (CDA, 2013; PHAC, 2011; WHO, 2013). However, this finding may be logically explained. The data for this study unfortunately did not clearly differentiate between type 1 and type 2 diabetes; therefore, unknown cases were classified as *unspecified*. Since type 2 diabetes accounts for the vast majority of all cases of diabetes in Canada (CDA, 2013; PHAC, 2011; WHO, 2013), the majority of the *unspecified* cases are likely to be type 2 diabetes. When these two categories of type of diabetes are collapsed together in the current study, the result more closely approximates the national average for type 2 diabetes (80.6% versus 90%, respectively). In addition, this finding is also supported by the variable age. In the current study, age was divided into age groups that corresponded with type of diabetes. Given that type 1 diabetes can develop in individuals younger than 40 years of age (CDA, 2013; PHAC, 2011), age was divided into two levels: individuals 40 years and younger and those 41 years and older. The data suggest that 83.5% of individuals in this study were 41 years or older. This is a logical finding since type 2 diabetes, which accounts for the vast majority (90%) of all diabetes cases in Canada, is more common in adulthood (CDA, 2013; PHAC, 2011; WHO, 2013). This percentage is also comparable to the finding of type of diabetes if the categories *type 2 diabetes* and *unspecified* were collapsed together (83.5% versus 80.6%, respectively).

Furthermore, the study findings suggest that age and type of diabetes were both significant predictors of non-urgent ED use for diabetes related problems. Specifically, the findings demonstrated that those 41 years and older were more likely to use the ED

for non-urgent diabetes related problems than those 40 years and younger. The study findings also suggested that patients with type 2 diabetes and those with an *unspecified* type of diabetes, were more likely to use the ED for non-urgent problems than patients with type 1 diabetes. These interrelated findings can reasonably be explained. As previously stated, type 1 diabetes can develop in those 40 years and younger; however, it is most commonly diagnosed during childhood and adolescence (CDA, 2013; PHAC, 2011). Poor glycemic control is common in adolescents due to the rapid and drastic physiological and behavioral changes that occur during puberty (CDA, n.d.; Tfayli & Arslanian, 2007). These changes put adolescents at a greater risk of hypo and hyperglycemic events, which are more urgent conditions than other diabetic complications, such as a foot ulcer, which may explain why those 41 years and older (i.e., those with type 2 diabetes) were more likely to use the ED for non-urgent diabetes related problems than those 40 years and younger (i.e., those with type 1 diabetes).

It is difficult to ascertain whether or not the type of diabetes moderated the relationship age had with the outcome. Therefore, an exploratory post hoc analysis was conducted to explore the interaction effect between these variables. Type of diabetes was transformed into a dichotomous variable (i.e., type 1 diabetes and type 2 diabetes/unspecified) to assess for this interaction, which was found to be significant. Specifically, the findings showed that those who were 41 year and older and had type 2 diabetes were 3.90 (95% CI 1.52 - 10.05) times more likely to use the ED for a non-urgent diabetes related problem compared to those who were 40 years and younger and with type 1 diabetes. Even though a significant interaction was found in the current study, future research is needed to further explore the moderating effect that type of diabetes

may have on this relationship. Individuals of all ages were included in the current study's analysis since diabetes is a chronic disease that is prevalent across the lifespan, with complications effecting both the young and old. However, given that type 1 diabetes is specifically prevalent among young individuals (CDA, 2013; PHAC, 2011) and type 2 diabetes is more common in adulthood (CDA, 2013; PHAC, 2011; WHO, 2013), it is also important that future research explore each type of diabetes separately.

Inconsistencies exist in the literature as to whether non-urgent ED utilization is associated with gender. For instance, while some authors suggest that women are more likely to utilize the ED for non-urgent health complaints than men (Bianco et al., 2003; Carret et al., 2009; Uscher-Pines et al., 2013), others have shown men to be more likely to make non-urgent visits to the ED than women (El-Masri et al., 2014; Uscher-Pines et al., 2013), while others have reported no association at all (Afilalo et al., 2004; Carret et al., 2009; Jalili et al., 2013; Northington et al., 2005; Shah et al., 1996; Uscher-Pines et al., 2013). In the current study, no association was found between gender and the type of ED visit. This is an interesting finding that is hard to put into context. Even though the prevalence of diabetes among males and females 12 years and older are comparable in Ontario (6.8% versus 6.6%, respectively) (Statistics Canada, 2013), data from the current study suggest that males utilized the ED more often than females (57.2% versus 42.8%, respectively). This contradicts the findings of Bertakis, Azari, Helms, Callahan, and Robbins (2000), who found females more likely than men to use various health services due to higher morbidity rates in women than in men and health perception differences. Nevertheless, further investigation is needed to explore the role gender has with this outcome.

The two groups were not statistically different in regards to their primary care access status, which may have been due to the variables uneven split. The data from this study demonstrated that a small percentage of the sample (n = 66; 5.0%) had no access to primary care. This finding is comparable to CIHI (2012), who found that 6% of individuals with ACSCs, such as diabetes, had no access to a regular PCP. When examined more specifically, it was found that 15.2% of non-urgent visits occurred among those with no primary care access. This finding is similar to those of general non-urgent ED studies (El-Masri et al., 2014; Field & Lantz, 2006; Steele et al., 2008) which reported that only 3% to 8.2% of all non-urgent ED visits occurred among patients who had no primary care access. In general, the ED is an inappropriate setting for non-urgent patients with diabetes related problems as it does not allow for continuity of care. Those with diabetes need to be cared for by a consistent healthcare provider who knows their complex medical history, has rapport with the patient, and can provide follow-up and preventive care as needed (Davis et al., 2010). Even though only a small percentage of non-urgent patients had no access to primary care, efforts need to be made by the ESC LHIN to ensure all individuals with diabetes in WEC have access to a PCP.

Although the current study only found a small proportion of participants with no primary care access, the literature identifies that simply having access to a PCP does not guarantee that the ED will be utilized appropriately for care. For instance, even though the majority of individuals with an ACSC reported having a regular PCP (CIHI, 2012), difficulty accessing PCP services on the same or next day was reported to be a major issue for patients (Bourne et al., 2012). Given that almost two-thirds (61%) of those with an ACSC reported no access to after-hours care, more than 1 in 10 (12%) visited an ED

for a concern they perceived as treatable by their PCP (CIHI, 2012). Similar findings were also found in the literature on non-urgent ED visits in general. Various authors reported that difficulty accessing a PCP (i.e., obtaining a timely appointment) (Carret et al., 2009; El-Masri et al., 2014; Guttman et al., 2003; Howard et al., 2005; Redstone et al., 2008; Steele et al., 2008) and having limited access to PCPs after hours and on weekends (El-Masri et al., 2014; Guttman et al., 2003) were main reasons individuals used the ED for a non-urgent concern. The convenience (Afilalo et al., 2004; Carret et al., 2009; El-Masri et al., 2014; Koziol-McLain et al., 2000; Northington et al., 2005; Redstone et al., 2008; Uscher-Pines et al., 2013), efficiency (El-Masri et al., 2014; Howard et al., 2005; Jalili et al., 2013; Steele et al., 2008), and quality of service (Northington et al., 2005; Rassin et al., 2006; Shah et al., 1996) received in the ED were found to influence non-urgent use as well. To further understand why those with a PCP use the ED as an alternative for their non-urgent diabetes related problems, qualitative research needs to be conducted to explore the motives behind this behavior. Interventions to reduce this problem can then be tailored to this specific population.

The findings suggest that an individual's proximity to the ED was a predictor of non-urgent ED use for diabetes related problems. Specifically, those who lived in other townships in WEC were 37.5% less likely to use the ED for a non-urgent visit compared to those who lived in Windsor, where two urban hospitals are located. The three hospitals in the study (i.e., both campuses of WRH and LDMH) serve their local patients and cross visits were not anticipated to be a problem. This finding was anticipated given the convenience of using a health service that is closer to ones residence (e.g., less time travelling). This is congruent with the findings of others (Jalili et al., 2013; McGuigan &

Watson, 2010; Rassin et al., 2006; Redstone et al., 2008; Shah et al., 1996) who identified proximity as one of the main reasons individuals decided to visit the ED for a non-urgent concern. Even though this was an expected finding, future research, particularly qualitative research, is needed to explore this variable further so that researchers can gain a more comprehensive understanding of this finding.

Visit Characteristics

The results of this study show a significant prevalence of inappropriate ED use for diabetes related problems in WEC. From the total number of visits made to the ED, approximately one in every five visits (17.1%; $n = 327$) were for non-urgent diabetes related problems. The prevalence of non-urgent ED visits in general varies considerably throughout the literature. One systematic review found that non-urgent ED use ranged from 8% to 62%, while another systematic review reported a range of 10% to 90% (Carret et al., 2009). However, Carret et al. (2009) found that in approximately half of the studies it varied from 24% to 40%. This inconsistency may be due to the large number of diverse groups that make up this non-urgent population or because of the variation in definitions of the term *non-urgent* used throughout the literature. Since the current study stratified this population by illness (i.e., diabetes), the finding of this study is more meaningful and specific; however, replication is needed to validate this finding. Additionally, future research on this topic in Canada needs to ensure that the non-urgent population is defined in the same way to allow for comparability.

The findings demonstrated that non-urgent ED visits for diabetes related problems were 73.8% less likely to occur at urban hospitals (i.e., WRH) compared to rural hospitals (i.e., LDMH). In WEC, Hay Group (2013) found that ED patients from the rural areas of Leamington and Kingsville were less likely to have regular access to a PCP compared to

residents of other Windsor-Essex communities. This resulted in these residents having the highest rate of hospital service use for primary care purposes in WEC (Hay Group, 2013). Contrary to Hay Group (2013), the vast majority of patients in the current study had a PCP (95.0%). Therefore, this is an interesting finding that is difficult to explain. It may be possible that the 5% of individuals in the current study with no access to a PCP may be localized to the Kingsville and Leamington area. If primary care access is limited in these areas, EDs may be seen as the only viable option for care. Therefore, enhanced access to primary care for those with diabetes living in rural areas, such as Leamington, may be needed to reduce the rate of reliance on hospital services for care. However, the literature shows that having access to a PCP does not guarantee that the ED will not be used inappropriately for care. Therefore, further investigation is needed to explore the reasoning for this finding in more detail.

Referral source was not found to be an independent predictor of non-urgent ED use for diabetes related problems. The exact reason for this finding is unclear; however, this finding may suggest that individuals with diabetes are knowledgeable on the subject of their chronic condition and when they need to seek treatment. It is interesting to note that 27.6% (n = 115) of those who were triaged as non-urgent were referred to the ED by a healthcare professional. A variety of studies conducted on the larger non-urgent population found a large proportion of non-urgent patients were referred to the ED by a healthcare professional as well (Afilalo et al., 2004; Carret et al., 2007; El-Masri et al., 2014; Field & Lantz, 2006; Howard et al., 2005; Koziol-McLain et al., 2000; Steele et al., 2008; Uscher-Pines et al., 2013). Future research should continue to explore whether a relationship between referral source and non-urgent ED use for diabetes related problems

exist. In addition, it would be interesting for future research to investigate why healthcare professionals are referring their patients to the ED for non-urgent diabetes related problems.

Ambulatory type was found to be an independent predictor of non-urgent ED use for diabetes related problems. Specifically, the finding suggests that non-urgent visits were more likely to arrive to the ED without an ambulance compared to urgent visits, a logical finding. If an individual is able to drive or find transportation to the ED, their diabetes related problem was most likely non-urgent. In the larger non-urgent population, a large proportion of studies excluded non-urgent patients who arrived by ambulance (McGuigan & Watson, 2010; Backman, Blomqvist, Lagerlund, Carlsson-Holm & Adami, 2008; Field & Lantz, 2006; Rassin et al., 2006; Coleman et al., 2002; Shesser, Kirsch, Smith & Hirsch, 1991); however, a small amount of studies found similar results to the current study (Afilalo et al., 2004; El-Masri et al., 2014). Future research needs to explore why non-urgent patients are using EMS services to come to the ED.

The findings demonstrate the time of day was not predictive of non-urgent ED use for diabetes related problems. In the unadjusted analysis, non-urgent visits for diabetes related problems were significantly less likely to occur during day, evening, and overnight hours compared to urgent visits. Since a small proportion of visits still occurred during these different times of day, this may suggest that non-urgent patients who utilized the ED during evening (11.6%) and overnight (14.4%) hours may have perceived themselves as needing urgent care but were only triaged as non-urgent upon arrival. This finding may also suggest that the ED was the only viable option for care since the majority of clinics and PCP offices are also closed during evening and overnight hours.

The small amount of visits that occurred during the day may be explained by an individual's difficulty in accessing primary care. However, to truly understand why individuals with non-urgent diabetes related problems are using the ED during certain times of the day, qualitative research is needed to explore this issue further.

Season of visit was not found to be a predictor in the current study. Visits made to the ED for diabetes related problems, regardless of urgency, were similar across all seasons. This suggests that weather may not influence the various complications of diabetes. The season in which a non-urgent ED visit occurred has only been researched by El-Masri et al. (2014) in the larger non-urgent population. This variable may not be as useful to predict non-urgent ED use for diabetes related problems as it may be for other illnesses affected by weather such as upper and lower respiratory illnesses; however, future research still needs to investigate this variable further in this population.

The data further demonstrated that main problem / complaint was another significant predictor of non-urgent ED use for diabetes related problems. Specifically, compared to visits for patients presenting with hypoglycemia, non-urgent ED visits occurred more often among patients presenting with neuropathy, peripheral / circulatory complications, skin complications, and foot ulcers, while patients presenting with ketoacidosis were less likely to be non-urgent than those presenting with hypoglycemia. Hypoglycemia and ketoacidosis are serious diabetes complications that require urgent care; for that reason, the study results are logical. In future research, it would be interesting to explore this variable across each type of diabetes separately to examine whether significant differences are seen between the two groups.

Research Question 2

The second research question in this study examined the difference in the hospitalization rate of urgent and non-urgent patients visiting the ED for various diabetes related problems in WEC. As expected, the study findings demonstrated that individuals triaged as urgent were significantly more likely to be admitted for their diabetes related problems compared to those triaged as non-urgent. This finding is similar to the literature on the larger non-urgent population. Afilalo and colleagues (2004) found that non-urgent patients had significantly lower admission rates compared to urgent patients (4% versus 24%, respectively; $p < .001$). The percentage of non-urgent patients admitted to hospital in the current study (9.2%) was similar to other studies as well. Vertesi (2004) reported 7.3% of non-urgent patients were admitted to hospital while El-Masri et al. (2014) reported 10.6%. Overall, even though individuals were assessed as non-urgent, a small proportion required hospital admission. Therefore, this finding suggests that these patients may have needed to be triaged in to a more acute category upon initial assessment or re-assessment. In Canada, a triage nurse determines the seriousness of a patient's condition using CTAS (Bourne et al., 2012) upon arrival to the ED. Although trained to use this scale, triage nurses have been found to misclassify patients into the wrong category (Carret et al., 2007; Lin & Worster, 2013). This is why efforts to divert non-urgent patients away from the ED are considered unsafe as it can potentially lead to refusal of care to a small percentage of patients that actually require hospital treatment (Vertesi, 2004).

Implications and Recommendations for Nursing Research

Since this appears to be the first study to stratify the greater non-urgent population by illness, further research is needed to validate the findings of the current study. The current study obtained retrospective data collected by the ESC LHIN. Even though this was an effective way to obtain a large amount of analyzable data, important information was missed because it simply was not collected. As a result, prospective research that explores interactions is recommended for future studies. Furthermore, future research should also use a mixed methods approach to allow for a more complete and comprehensive understanding of patient behavior than either approach could provide alone. This approach would help validate quantitative findings and allow for a greater depth of understanding of expected and unexpected findings.

Future research also needs to consider including a number of social determinants of health as potential independent predictors (e.g., education and income) to help gain a better understanding of the factors that bring individuals into the ED non-urgently for diabetes related problems. Since the current study was a secondary analysis, limited variables were available for study which is why a modified version of the Behavioral Model of Health Service Use was used to guide the current study. The Behavioral Model of Health Service Use is a broad model that can be adapted to help explain and predict a variety of health behaviors (Andersen & Davidson, 1997; Andersen, 1995). Although it is not specifically designed to predict non-urgent ED use for diabetes related problems, it has been used extensively in the literature (Babitsch et al., 2012), and can be readily applied to the use of the ED by individuals with diabetes related problems. The model depicts that several factors, including social determinants, influence health service use;

therefore, it would be beneficial to use this model as a conceptual framework to guide future research on this topic.

It would also be important to study this topic for type 1 and type 2 diabetes separately to see if the predictors are similar or different than for the disease as a whole. Dividing diabetes into its different types would also allow researchers to explore differences across different age groups, since type 1 diabetes is more common among children and adolescents (CDA, 2013; PHAC, 2011) and type 2 diabetes is more common among adults (CDA, 2013; PHAC, 2011; WHO, 2013). Furthermore, since non-urgent ED users are likely to be a diverse group (Uscher-Pines et al., 2013) other sub-groups of the non-urgent population, such as those with other illnesses (e.g., respiratory illnesses) need to be examined as well.

Even though non-urgent ED use is a global concern, there is limited research exploring the predictors of non-urgent visits in Canada, and no published research on non-urgent ED use for diabetes related problems. This issue needs to be researched further in a Canadian context. Future researchers also need to ensure they use the same definition for the term *non-urgent* to allow for greater generalizability of findings.

Implications and Recommendations for Nursing Practice and Policy

To potentially decrease the rate of non-urgent ED visits for diabetes related problems, patients using the ED for this reason need to be educated on when to appropriately use the ED. Triage nurses could be the health care professional responsible for this task since they have a unique opportunity with these patients. While being triaged, the nurse is alone with the patient for a small period of time, allowing for an ideal opportunity to ask the patient if they sought other services before coming to the ED (e.g.,

clinic or PCP) and educate on proper use if needed. If lack of knowledge of other resources in the community is identified, triage nurses could also educate on community resources better suited to their non-urgent needs. Unfortunately, Steele et al. (2008) states that there is limited evidence on the effectiveness of reducing non-urgent patients by educating patients on alternative sources of care. Education efforts may also prove ineffective if reasons for seeking treatment are dependent on factors outside the user's control (e.g., hours of operation of their PCP), or are based on individual perceptions that are difficult to change (e.g., the ED is more convenient than their PCP).

The significant proportion of non-urgent ED visits for diabetes related problems in the current study (17.1%) represents inefficient utilization of healthcare resources. Patients with diabetes should not need to utilize the ED for non-urgent reasons since with adequate primary health care; the disease can generally be managed on an outpatient basis (Bourne et al., 2012; CIHI, 2012). If these individuals use the ED for care that could be provided by a PCP, further pressure is added to an already strained system. Additionally, being treated in the ED may negatively affect the health of patients, especially those with diabetes, since the healthcare provider in the ED is unfamiliar with their complex medical history (Health Quality Ontario, 2013; Health Quality Ontario, 2011). Therefore, this is an issue worth the time and investment of the LHIN.

Despite the policy interest in deterring non-urgent ED use, this is the first study to explore the predictors of non-urgent ED visits for diabetes related problems; therefore, there is limited understanding of what drives this behavior. Future research is needed to further explore the reasons behind non-urgent ED use for diabetes related problems. By understanding the patient related, system related, and circumstantial factors that drive this

behavior, decision makers such as the LHIN can begin to develop policies and implement interventions to decrease the use of the ED for non-urgent diabetes related problems. However, the LHIN needs to focus their efforts to factors that they can potentially influence. Even though a variety of factors were found to predict non-urgent ED use for diabetes related problems, some factors cannot be changed such as age and type of diabetes. As a result, the findings of this study that may be of the most interest to the LHIN would be primary care access and hospital type. Once potential strategies have been established to reduce the problem, intervention studies need to be conducted to determine the effectiveness of proposed strategies.

Limitations

The researcher acknowledges that the potential of bias could not be eliminated given the secondary nature of the study. Further, the study is limited to the variables collected by the ESC LHIN; therefore, other potential variables that may have influenced the outcome (e.g., education and income) could not be explored, limiting the generalizability of the study findings. As in all secondary data analysis studies, the quality and accuracy of the analyzed data could not be ascertained. Additionally, the database categorized type of diabetes as type 1, type 2, or *unspecified*. As a result, the researcher could not determine the true frequency of patients with type 1 and type 2 diabetes in the study. The definition of diabetes related problems was also restricted due to the secondary nature of the data. Individuals that already had a diagnosis of diabetes and came to the ED for a specific diabetes related complication (i.e., renal complications) were included in the study. However, this could have potentially excluded a number of

participants if they did not have a diagnosis of diabetes but were using the ED for a problem that was related to their undiagnosed diabetes (e.g., renal complications).

Another limitation is the generalizability of the study findings. Generalizability of the results is limited to the Windsor-Essex region and cannot be generalized to the overall ESC LHIN or Ontario as a province. Generalizability is also limited to non-urgent ED users for diabetes related problems. Furthermore, given that the current study was observational, no causality can be inferred. Regardless of these limitations, the findings of this study begin to shed light on an issue that has never been explored in the literature.

Conclusion

The purposes of this study were to explore the independent predictors of non-urgent ED visits for diabetes related problems and to compare the rates of hospitalization between urgent and non-urgent ED visits for diabetes related problems. The results showed that a significant proportion of non-urgent visits were made in WEC for diabetes related problems. The findings also suggest that certain patient related factors (i.e., age, type of diabetes and main problem / complaint) and circumstantial factors (i.e., hospital type, ambulatory type, and proximity to ED) were independent predictors of non-urgent ED visits for diabetes related problems. Gender, referral source, time of day, and season of visit had no association with non-urgent presentation for diabetes related problems. The study also found that those who were triaged as urgent were more likely to be admitted for their diabetes related problems compared to individuals who were triaged as non-urgent. The discussion provided plausible explanations for all results, whether significant or insignificant. Implications and recommendations to research, nursing practice and policy were also made. With consideration of the study's limitations, further

research is needed with additional variables to validate the findings of the current study and to help build the body of knowledge on this specific topic that has not been explored in the literature to date.

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