FAMILY PHYSICIAN CONTINUITY OF CARE IN END-OF-LIFE HOMECARE CANCER PATIENTS AND ITS ASSOCIATION WITH ACUTE CARE SERVICES USE

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Abstract

Background and Objectives: Previous research has examined the effect of family physician continuity of care within end-of-life care cancer patients and its association with reduced use of acute care services. However, such research has not been examined in the end of life homecare cancer population. **Objectives:** To investigate the association of family physician continuity with location of death, hospital and emergency room (ER) visits in the last 2 weeks of life in end of life homecare cancer patients. **Research Design:** Retrospective study involving secondary data analysis of 7 linked databases**. Subjects:** All those who died of cancer between January 1, 2006 to December 31, 2006 in Ontario who had at least 1 visit to a family physician and enrolled in homecare for at least 2 weeks. **Methods:** The relationship of family physician continuity of care and location of death, and hospital and ER visits in the last 2 weeks of life was examined using logistic regression. **Results:** The Usual Provider of Care (UPC) measure demonstrated a dose response relationship with increasing continuity resulting in decreased odds of dying in the hospital and visiting the hospital and ER in the last 2 weeks of life. The Family Physician visits per week measure demonstrated a threshold effect relationship with location of death and hospital visits and dose response relationship with ER visits in the last 2 weeks of life. **Conclusions:** These results demonstrate an association between family physician continuity of care and location of death and visits to the hospital and ER in the last 2 weeks of life. This indicates the need for more involvement of family physicians in end of life cancer care.

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1 Introduction

According to the World Health Organization (WHO) palliative care is an approach that aims to improve the quality of life for individuals and their families who are facing a life-threatening illness such as cancer (Sepulveda, Marlin, Yoshida & Ullrich, 2002). End-of-life care is a component of palliative care. End-of-life care can be delivered within a variety of settings ranging from the hospital to the home.

In Ontario palliative care services are considered to be fragmented and poorly coordinated as a comprehensive palliative care program currently does not exist (Cancer Care Ontario, 2006). Home care access rates are approximately 70% in 2005 for people who are within six months of death (Canadian Cancer Statistics, 2010). Recognizing the need for a more integrated and coordinated home care for end-of-life patients, the Ontario government developed an End-of-Life Care Strategy aimed to improve and integrate end-of-life homecare services (Seow et al., 2010).

The main objectives of the strategy include the need to reduce the demand on the acute care system by improving home care and to improve the access, coordination and consistency of home care. Home care in Ontario is organized by local community care access centers (CCAC) which coordinate a variety of services, with nursing and personal support worker (PSW) services as

one of them (Seow et al., 2010). The role of the family physician can play a substantial role in meeting the objectives of the strategy. The family physician speciality could provide continuity of care among home care patients which may result in physicians making better informed decision of whether the patient can be managed at home, better able to recognize problems, and high patient satisfaction which may result in greater trust in the physician and greater willingness to manage serious medical problems at home (Starfield 1992; Becker et al., 1974; Wasson et al., 1984). This in turn could lead to decreasing the use of hospital resources and increasing patient satisfaction with care during end-of-life.

Continuity of care pertaining to the family physician specialty is defined as uninterrupted or unceasing succession of care by an individual physician, not limited by the nature of the patient's illness, and facilitated by prior knowledge of the patient (Wall 1981). The role of the family physician in cancer care has been greatly undervalued as the speciality is not frequently associated with cancer care. An analysis of Ministry of Health and Long Term Care Ontario Health Insurance Plan (MOHLTC-OHIP) data from 1993 to 2005, highlighted the continuous involvement of family physicians in the care of cancer patients, from the diagnostic, therapeutic, follow-up and palliative phases of the illness. The analysis found a notable increase in family physician visits during the last three months of life illustrating the importance of the specialty within the cancer realm especially during end-of-life (Giudice et al., 2006).

Prior research in physician continuity of care among cancer patients focused on examining cohorts of deceased cancer patients relating to the outcomes of location of death and emergency department use. The research found the odds of death outside of the hospital and emergency department use decreased with increased family physician continuity of care (Burge et al. 2003). Research on end of life homecare patients and acute care services found using more end-of-life homecare services is associated with using fewer acute care services (Seow et al., 2010). The Seow et al. (2010) study found a dose response relationship, as the average amount of nursing hours increased the odds of having a hospitalization, ER visit or death in the hospital significantly decreased. The Burge et al. (2003) studies did not control for nursing hours in the studies examining family physician continuity and outcomes of location of death and ER utilization. Since many patients may transition some of their care from family physician to home care nursing, the true effect of family physician continuity of care on end-of -life homecare patient's outcomes is still elusive.

This research will examine family physician continuity of care among end-of-life homecare cancer patients. The association between family physician continuity of care and the association between having a death outside of the hospital, and acute care service utilization will be explored. Family physicians continuity of care will be measured by the Usual Provider of Care Index and Family physician visits per week variable, creating two models of continuity. The UPC index is a density measure and is the most commonly applied index in

measuring continuity (Jee & Cabana 2006). The FP visits per week measure is a unique measure that was created particularly for this study. The FP visit per week measure creates a model that measures the frequency of visits on a weekly basis to a family physician. It was necessary to use to measures because one measure was not sufficient by itself to illustrate continuity of care. Controlling for nursing hours will also be an important distinction in the planned research which has previously not been done with family physician continuity of care research.

2 Literature Review

This section contains a review of the current literature on patient preferences in end-of-life care, trends in place of death and acute care utilization during end of life. Continuity of care and its association with place of death and acute care utilization is also reviewed when applicable.

2.1 Dignity and Quality in End of Life Care

It is important to examine the wishes and preferences of terminal cancer patients. Research suggests that one of the most important tenets underlying end-of-life care is rooted in the acknowledgement of the inherent dignity of

individuals and directed toward the goal of helping patients die with dignity. According to Latimer (1991), palliative care must be philosophically rooted in an acknowledgement of the inherent dignity of individuals (Latimer 1991). Dignity is also listed as one of the 5 basic tenants that must be satisfied in caring for dying patients (Geyman 1983). The term dignity is often used in arguments for and against a patient's self-governance in matters pertaining to death (Chochinov 2002). Although dignity for palliative cancer patients inherently relates to the patients sense of control and autonomy in decision making during end of life, little research has been done to understand the definition of dignity from the patient's perspective. Chochinov et al. provides one of the models that describes dignity from the patient's perceptive. Fifty patients with advanced stage of terminal cancer were interviewed to develop the dignity model by Chochinov et. al. The dignity conserving model of care includes 3 areas of influence on an individual's perception of dignity: *illness-related concerns*, those things that directly result from the illness, the *dignity conserving repertoire,* those influences related to the patient's psychological and spiritual resources or make-up; and the *social dignity inventory*, those environmental influences that can affect dignity (Chochinov 2002).

Dignity is an important component of assuring quality of death and dying for patients as illustrated by the Wallston et al. (1998) suggestion that the degree to which terminally ill patients can regain or maintain a sense of control by obtaining desired characteristics of their own deaths can enhance the quality of

life and quality of dying at end of life (Wallston et al., 1998). Patrick et al (2001) defines quality of death and dying as the “degree to which a person’s preferences for dying and the moment of death agree with how the person actually died correlates with the construct of dignity for dying patients” (Patrick et al. 2001).

2.2 Location of Death

Patrick et al. (2001) model of quality of death and dying includes 6 domains: symptoms and personal care; preparation for death; moment of death; family; treatment preferences; and whole person concern. The domain of moment of death includes the items: dying in the place of one’s choice; dying in the state of one’s choice and having the desired people present at the time of one’s death.

Literature suggests there is a growing discrepancy between what patients report as their preferred place of death which is often at home and the actual place of death (Beccaro et al. 2006; Bruera et al. 2003; Burge et al. 2003; Foreman et al. 2006; Gilbar and Steiner 1996; Karlsen and Addington-Hall 1998; McWhinney et al. 1995; Heyland et al. 2000; Pritchard et al. 1998). For most patients, the home represents a familiar environment with the presence of family and loved ones – hence more than half of people with terminal illness prefer to die at home (Gomes 2004). In the United States, Europe and Australia, hospital deaths range from 30-50% (Bruera et al., 2002; Gallo et al., 2001; Higginson et al, 1999; Costantini et al., 1993).

In Canada, data suggests that 55% of deaths occur in a hospital (CIHI 2007; Barbera et al., 2010; Burge et al., 2003a; Burge et al., 2003b).The Burge et al (2003b) study also demonstrated an increasing trend towards death outside of hospital from 19.8% in 1992 to 30.2% in 1997 (Burge et al., 2003b). A significant proportion of the hospital deaths occur in special hospital units such as medical, surgical, transitional, or intensive care units instead of palliative care beds (Heyland et al., 2000). The higher proportion of hospital deaths in Canada compared to other countries may be a result of better developed systems of institutional and home based palliative care (Barbera et al., 2010). Also, according to studies in the United Kingdom and Australia hospitalizations prior to death may be linked to some particular cancer types such as prostate, breast, and haematological cancer which have higher in hospital death rates (Higginson et al., 1999; Hunt & McCaul, 1996). Global initiatives are developing to reform home care services for palliative care patients which would facilitate death at home rather than the hospital or other institutions as studies have shown the link between homecare services and death outside of the hospital (Seow et al., 2010).

In a qualitative study examining terminally ill cancer patients in Taiwan, 87.2% patients preferred to die at home while 4.4% chose the hospital, 6.7% chose an inpatient hospice and the nursing home was chosen by 1.7% of patients as the preferred place of death (Tang 2003). The study examined the patients reasoning for choosing a preferred place of death through qualitative

interviews. The multiple considerations in choosing the preferred place of death include: quality of life, availability and ability of family caregivers, concerns of being a burden to others, long standing relationships with healthcare providers, and quality of health care (Tang 2003).

According to Tang's study quality of life considerations were the motivating factors in patients choosing the home as the preferred place of death. Being with their families, enjoying a more "normal" life, having greater autonomy, and being surrounded by familiar and comfortable home as the principal reasons why they preferred the home environment (Tang 2003). Tang's findings correlate with the Townsend et al. study confirming the overwhelming majority of palliative cancer patient's preference of dying at home. In the sample examined by Townsend et al. 58% of palliative cancer patients preferred to die at home, however, 63% of those patients who preferred to die at home died in the hospital (Townsend et al. 1990).

Although dying at home is deemed the "gold standard" for most patients, for some patients dying at home may not be the ideal situation. For the patients who prefer to die in the hospital, inpatient hospice, or nursing home several reasons for the preference include: availability and ability of family caregivers, burden to others, and long standing relationship with healthcare providers and quality of health care (Tang 2003). Martineu et al. (2003) found the presence or absence of pain as one of the deciding factors in choosing between dying at home or at an institution (Martineu et al. 2003). When faced with pain, 67.2% of

patients expressed an intention to die in the hospital, while when not faced with pain 33.8% preferred the home and 38% preferred the hospital (Martineu et al. 2003). Martineue et al. hypothesized that when faced with pain patients prefer the hospital rather than the home out of concern for not imposing a burden on their families which may also explain why certain respondents still preferred dying in the hospital when faced with no pain.

Of those end of life cancer patients who die at home there are several factors that influence such a circumstance. In a systematic review, 17 factors were found to be associated with place of death for cancer patients (Gomes and Higginson 2006). Of the 17 factors, 6 factors were strongly associated with home death: low functional status, an expressed preference for home death, home care and its intensity, living with relatives, and being able to count on extended family support.

The Burge et al. (2003a) study illustrated the association between family physician continuity of care within end-of-life cancer patients and location of death. The results indicated as family physician continuity of care increased the likelihood dying in the hospital significantly decreased (Burge et al., 2003a)

2.3 Acute Care Services at End of Life

Hospitalization and emergency room visits in the last 2 weeks of life are also considered as poor quality indicators of end-of-life cancer care (Earle et al., 2003). Although, it is recognized that some of these services may be appropriately needed, ideally aggressive treatment should stop during the end-of-life phase, and supportive services should take over (Barbera et al., 2006). Hospitalizations and emergency department use could indicate that there is lack of attention to symptomatic issues. In the early course of treatment, patients are willing to cope with hospitalizations especially if they have a chance of prolonging survival, but once a survival benefit is deemed less likely many patients would rather avoid hospitalization and other acute care service use (Gill et al., 1997).

In a US study examining the aggressiveness of care among cancer patients near the end-of-life, there was a reported increase in the use of chemotherapy treatment and an increased proportion of patients had more than one emergency department visit in the last 2 weeks of life from 1993 to 1996 (Barbera et al., 2006). Another recent study in the US, found that approximately 8% of individuals visited the emergency in the last month of life (Earle et al. 2004). In Quebec, 41.8% of breast cancer patients had an ER visit in the last weeks of life (Gagnon et al., 2004). In a population based study of measuring the proportion of cancer patients in Ontario with emergency room visits in the last 2 weeks of life found that 27% of the cohort had at least one ER visit (Barbera et al., 2006).

2.4 Continuity of Care

Various studies have examined the effect of physician continuity of care on the general population regardless of disease. In a systematic review analyzing the association between continuity of care and outcomes, eight of nine high quality studies found a significant association between increased continuity and decreased health utilization including hospitalizations and emergency visits (van Walraven et al., 2010). The specialties most examined in continuity of care studies have been pediatrics and family medicine. In a study examining a cohort of end of life US Medicare recipients found that primary care visits in the preceding year was associated with fewer hospital utilization (Gill et al., 1998). Similar results were also found among the Medicare population in terms of emergency department visits; higher provider continuity is associated with lower ER use (Gill et al., 2000). Examining the role of family physician continuity among end of life cancer patients in Nova Scotia, the study found that higher continuity among end of life cancer patients decreased the likelihood of visiting the ED (Burge et al., 2003).

In an editorial examining doctor-patient relationships in terminally ill patients, Weatherall (1994) states that “those with distressing chronic or terminal illnesses need above all else, is continuity of care – that is attention and friendship of one doctor whom they can come to trust and with whom they can share their hopes and fears” (Weatherall 1994). Higher continuity among healthcare providers has shown to have a beneficial effect on patients and

healthcare utilization (Gill et al, 1997; Gill et al., 2000; Burge et al., 2003). Continuity of care ensures patient coordination, and various studies have examined the negative influence of dis-coordinated care on patient outcomes. Patients also directly benefit from high provider continuity as studies have shown that patients are more likely to be satisfied with their care, take medications correctly and more likely to have problems identified with their physicians (Starfield 1992; Becker et al., 1974; Wasson et al., 1984). Among cancer patients, continuity has been found to be a desirable attribute. A qualitative study, found that family physician continuity of care had a positive influence on the quality of experiences for end of life cancer patients. Regular visitations from a family physician who had personal knowledge of the patient, was found to be an influencing factor in a patients quality of experience during end of life (Smith et al., 1999).

The literature review reveals that evidence exists with regards to patient's preferences for dying in the home and spending less time in acute care service facilities during end-of-life. Several studies have shown the link between continuity of care decreasing the likelihood of patients dying in the hospital and visiting the hospital and ER in the last 2 weeks of life across different kinds of patient populations. But no studies examining family physician continuity of care have been conducted in the end-of-life homecare cancer population.

3 Methods

3.1 Objectives:

To examine the association between family physician continuity of care with location of death, emergency room and hospital visits in the last 2 weeks of life.

3.2 Question

In a cohort of cancer patients who were admitted to end-of-life homecare and who died between January 1, 2006 and December 31, 2006 in Ontario, what is the association between family physician continuity of care with location of death, hospitalizations and emergency department use during the last 2 weeks of life?

3.3 Study Methods and Sample

The study involves the secondary data analysis of retrospective population based information obtained through the linkage of individual data contained in administrative health databases: (1) Registered Persons Database (RPDB); (2) Ontario Health Insurance Plan (OHIP) database; (3) Discharge Abstract

Database (DAD); (4) National Ambulatory Care Reporting System (NACRS); (5) Home Care Database (HCD); (6) 2001 Census; (7) Ontario Cancer Registry (OCRIS). The use of multiple linked databases allows for controlling a variety of demographics and health services related variables.

Cancer patients who died between April 1, 2008 to March 31, 2009 were included; those without a confirmed cancer diagnosis or a valid Ontario Health Insurance Plan (OHIP) number were excluded. The cohort was identified by using the Registered Persons Database (RPDB), which records date of death. Date of death was assigned at time zero, and then counted backwards in weeks from death to homecare admission, which ensured patients were compared equally across time.

The initial cohort included 34,625 cancer patients with a valid Ontario Health Insurance Plan (OHIP) plan number and a confirmed cancer diagnosis who died between January 1, 2006 to December 31, 2006. The year 2006 represented the most recent cancer registry data available at the time of analysis. The cohort was reduced to 9716 patients who had an end of life care designation of code 95 from the HCD with duration of at least 2 weeks in homecare. Entrance in to homecare was designated with receiving of nursing services. Of those patients, 249 were excluded because they were in the hospital for the entire duration of the exposure period defined from the onset of homecare admission to the last two weeks before death. A total of 9,467 patients remained, and 1,300

were excluded, as they did not have any visits to a family physician during the exposure period, resulting in a final cohort of 8,083 patients.

There are several reasons for the exclusion of patients with no family physician contact during the exposure period. Those excluded had similar demographic and utilization characteristics to those included, except for duration in homecare. Of the patients who had at least 1 family physician visit, only 10% of patients were in homecare for 3 to 4 weeks while compared to 56% of patients with no visits to a family physician. Patients with no family physician visits were in homecare for a shorter duration as illustrated in Table 1 resulting in less of an exposure period. Also, the patients with no family physician visits may be fully engaging with oncologists or may not have a designated family physician; such patients are referred to as being “orphaned”. A diagram illustrating the process of reaching the final sample sized is illustrated in Figure 1. Ultimately, as this study is aimed at understanding the association between family physician visits and acute care service use at end-of-life, our inclusion criteria required having at least 1 visit with a family physician during the exposure period.

Figure 3.1: Flow chart of patient inclusion and exclusion

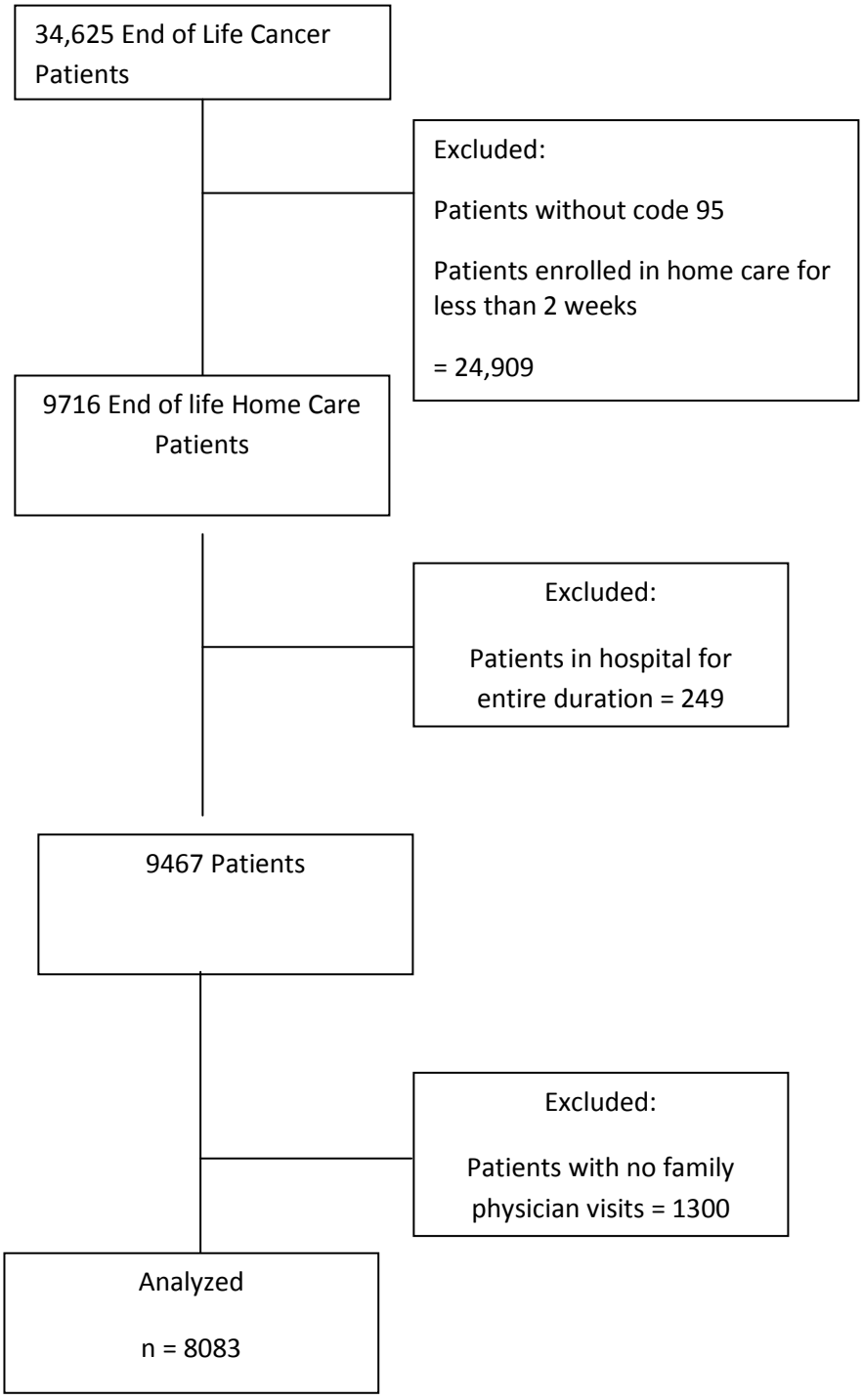


Table 1: Comparing Duration in Home Care %

Duration	At least 1 FP Visit	0 FP Visits
3 – 4 wks	789 (9.8%)	780 (56.4%)
5 – 12 wks	2969 (36.7%)	483 (34.9%)
13 – 23 wks	1873 (23.2%)	94 (6.8%)
> 24 wks	2452 (30.3%)	27 (2.0%)

3.4 Variables

A Independent Variables

The main variables of interest in this study were the Usual Provider of Care continuity score and family physicians visits per week variable. Both these measures provide a means of quantifying the patient's contact with a family physician. Other important variables of interest also include nursing hours that end of life patients received in homecare. Factors that may affect utilization were also included that were available in the various linked databases such as age, gender, geographic location, co-morbidities, income grouping, cancer diagnosis, and duration in homecare.

<u>Usual Provider of Care</u>

Usual provider of care is defined as fraction of visits made to the usual provider. In this study, UPC was calculated by taking a fraction of total family physician visits made during the exposure period over the total number of visits made to family physicians plus oncology. The UPC measure takes into account the involvement of family physicians in a patient's continuum of care when compared to the involvement of oncologists. UPC is a known as a type of density measure of continuity of care. In a systematic review of continuity measures, density measures were the most common with UPC being the most commonly applied in 13 of 44 articles (Jee & Cabana 2006). UPC measures are commonly used because they are easy to calculate.

$$UPC = \frac{\text{Family Physician Visits}}{\text{Family Physician Visits} + \text{Oncology Visits}}$$

Information on visits made to specialists was retrieved from the OHIP database. In the OHIP database family physician visits were coded as 13, and visit was defined by the entry of physician coding. If a patient had more than one entry on the same day to the family physician in the database, that was counted as 1 visit for the day. The UPC measure yielded scores ranging from 0.01 to 1, with the lowest indicating low continuity within the family physician specialty.

Family Physician Visits Per Week

To complement the UPC continuity measure, another variable measuring a patient's contact with a family physician was created. The variable measures family physician visits per week (i.e. # of family physician visits during study period / ((day 14 prior to death – date of entry into study +1) /7)) from admission into homecare to the last 2 weeks of life excluding the days patients spent in hospital. The UPC and family physician visit per week measures were analyzed separately creating two different models for comparison.

Nursing Hours

In a study examining end of life homecare services and its association with acute care service use, a dose response relationship emerged as nursing hours per week increased the odds of having a hospitalization, ER visit, or death in the hospital significantly decreased (Seow et al., 2010). The results of the study indicate the important contribution of nursing services in the homecare arena. Although the study included all disease sites of end of life patients, 84% of the patients had a cancer diagnosis. This study indicates the significance of controlling for the variable of nursing hours within the end of life home care population, which was not controlled for in Burge's research examining family physician continuity of care with in end-of-life cancer patients. Nursing hours

were derived from the HCD, which contained the type of nursing service used and dates of services.

Gender

Cancer is more common among males than females in those 19 and younger and 60 and older, however the trend reverses with a higher incidence in females between ages 20 and 59. Cancer incidence among males over age 69 is on the decline because of reduced rates of lung cancer from decreased tobacco use (Health Canada 2009).

Most studies in the health sciences adjust for gender in their analyses, which is consistent with evidence suggesting gender differences in health services utilization. Illness behavior and symptoms perception are the most commonly attributed differences between men and women (Bertakis et al., 2000; Redondo-Sendino et al., 2006). Women are generally more users of healthcare resources even when differences in morbidity are taken into account (Kjerulff et al., 2005). In a study examining factors associated with end of life cancer patients health service use, found that women were less likely to die in hospital and more likely to receive homecare (Barbera at al., 2010). Gender was extracted from the RPDB.

Age

Age was extracted from the RPDB and OHIP which provided age in 5 year groupings and was defined as age at death. Increasing age was found to lessen the likelihood of dying in hospital, receiving home care and physician house calls in the last 2 weeks of life (Barbera et al., 2010).

Geographic Location

A report from the Government of Canada on Rural Canada Access to healthcare, uncovered substantial problems in the distribution of family physician in rural areas. The report found that as of 1996, only 9.8% of family physicians practice in rural Canada, while 22.8% of Canada's population lived in rural areas. A health Canada report of homecare in Canada found that most of the problems in the delivery and coordination of homecare are even more pronounced in rural regions (Laurent, 2002).

Geographic location was categorized as either urban or rural place of residence. Postal codes were extracted from the RPDB to categorize patients. Canada Post assigns postal codes based on population and geographic data from Statistics Canada, which uses the 10,000 population threshold to designate an area as urban (Canada Post 2009; Statistics Canada, 2009).

Income

Evidence suggests that those who have higher income levels live longer and are in better health than poorer individuals. Many reasons have been attributed to such a phenomena from the fact that those with higher incomes have higher educational achievement to having better access to services because of less financial barriers (Lynch et al. 2000; Alder et al. 1999). In a universal health care system such as Canada, health utilization should not be constrained by income levels. However, in a study examining family physician home visits in end of life cancer patients in Nova Scotia, found the odds of receiving at least one home visit was significantly greater among subjects who reside in middle to high income neighborhoods (Burge et al., 2005). Examining hospital stay among end-of-life cancer patients in Ontario, also found that patients from poorer communities spent longer periods in hospital than those from wealthier communities (Huang et al., 2002).

Income quintiles were derived from linking data from the 2001 Census with postal codes from RPDB. Income quintiles were categorized into 5 distinct categories in the database ranging Low to High, with Middle Low, Middle, and Middle High falling in between.

Cancer Type

In men and women combined, lung cancer is the second most common cancer (14%) and colorectal is the third most common cancer (12%) (Canadian

Cancer Society 2011). In men, prostate cancer remains the most common cancer diagnosed, with 25,500 cases expected in 2011. In women, breast cancer still remains the most frequently diagnosed cancer in women, with over 23,400 new cases expected in 2011. Of all the cancers, breast, lung, colorectal and prostate account for 54% of all cancer diagnosis in Canada (Canadian Cancer Society 2011).

Cancer cause of death was derived from the OCR by ICD 9 group codes: breast: 174; lung: 162; prostate: 185; colorectal: 153, 154; all other codes were classified under other cancer types.

Co-morbidities

The DAD contained the Charlson co-morbidity index, a measure that uses medical record review to predict risk of mortality (Perkins et al., 2004). Scores ranged from 0 to 16 based on the risk of mortality, with a score of 0 to 6 categorized as low and a score of higher than 6 categorized as high.

Duration in Homecare

Seow et al. (2010) research illustrated a dose response relationship with duration in homecare and its association with visiting the hospital or ER in the last 2 weeks of life and location of death. As the duration in homecare increased, the

likelihood of visiting the ER or hospital in the last 2 weeks of life, and dying in the hospital decreased (Seow et al., 2010)

Duration in home care was derived from the HCD, which included the number of days patients spent into homecare. For this study, entrance into homecare was defined as the first date patients received nursing services.

B Outcome Variables

Hospital Visits in the Last 2 Weeks of Life

In the database hospital visits in the last 2 weeks of life were categorized as either '1' or '0'. A coding of '1' would indicate at least 1 visit to the hospital in the last 2 weeks of life, with a coding of '0' indicating patient did not visit the hospital. This information was extracted from the DAD, which contained hospital visits the patients made up to their date of death.

ER Visits in the Last 2 Weeks of Life

In the database ER visits in the last 2 weeks of life were categorized as either '1' or '0'. A coding of '1' would indicate at least 1 visit to the ER in the last 2 weeks of life, with a coding of '0' indicating no visits to the ER. This information

was extracted from the NACRS, which contained ER visits the patients made up to their date of death.

Location of Death

Location of death took on 2 values in the database. A coding of '1' indicated a patient died in the hospital with a coding of '0' indicating patient death outside of the hospital. This information was extracted from the DAD.

Table 2: Variables and Data Sources

Outcomes	**Data Source**
Hospital Visits	DAD
Emergency Department visit	NACRS
Location of Death	DAD
Covariates	
UPC – continuity score	OHIP
Family Physician visits per week	OHIP
Nursing Hours	HCD
Gender	RPDB
Age at death	DAD
Cancer type	OCRIS
Co-morbidities	DAD
Income quintile	Census
Duration	RPDB
Rurality	Census

* DAD – Discharge Abstract Database, NACRS – National Ambulatory Care Reporting System, OHIP – Ontario Health Insurance Plan, HCD – Home-Care Database, RPDB – Registered Persons Database, OCRIS – Ontario Cancer Register Information System

3.5 Statistical Analysis

Patient characteristics were summarized using descriptive statistics, such as the proportion and frequency. The primary statistical analysis was based on logistic regression analyses, as the outcome variables were dichotomized. All analyses were conducted using SPSS (Version 19).

Logistic regression analysis is an extension of linear regression, which is used when the dependent variable is dichotomous. Logistic regression estimates fit the probability associated with each observed value by use of a logistic function. Several assumptions have to be fulfilled before logistic regression can be applied: having a large enough sample, independence of observations and a lack of correlation among the independent variables with each other. Additional outliers should be checked and verified or discarded to prevent the possibility that one or two results will substantially affect study results. All these assumptions were checked before the analysis was performed.

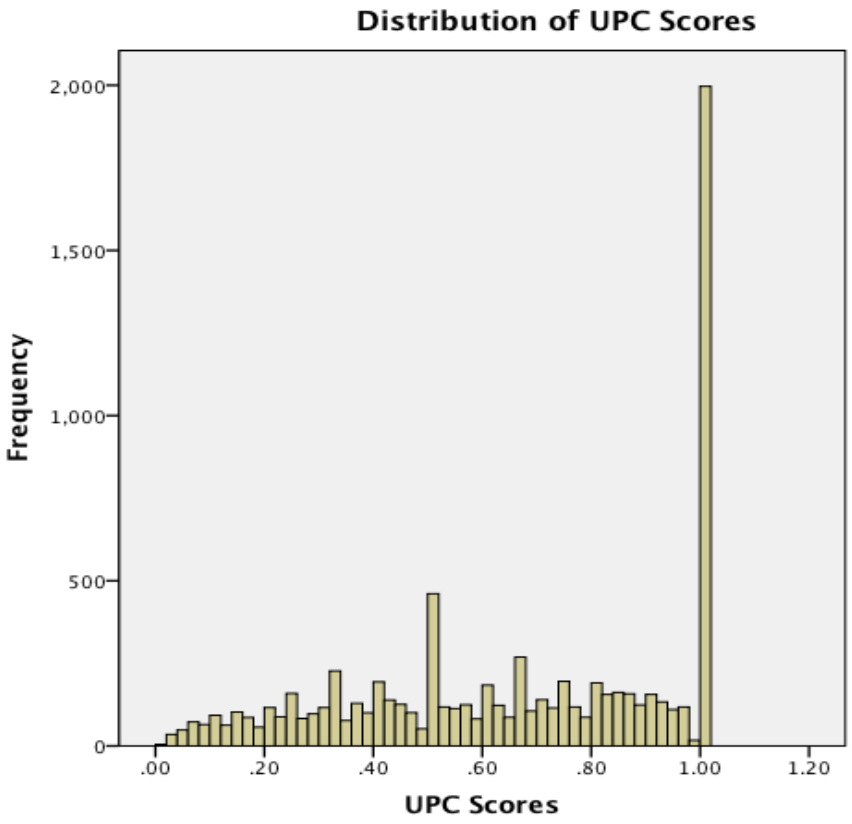
Initially univariate analysis was performed with each of the independent variables analyzed separately with each of the different outcomes. Although some variables were not statistically significant all of the variables were retained for the multivariate model. Statistical significance was defined as a p-value of 0.05 or less, and all tests were two sided.

A Exploratory Data

This section explores the data used for the study. FP visits per week, UPC scores, nursing hours, duration in home care, and co morbidities were initially provided as continuous variables, which were later converted to categorical variables. Age was provided in increments of 5 years, which was reduced to 10-year increments. Cancer type was categorized into the most common cancers, lung, breast, prostate, and colorectal, with all other cancers falling with in the “all others” categorization. Age, co-morbidities, nursing hours, duration in homecare, followed Seow et al. (2010) and Burge et al. (2003) categorization patterns in their studies which makes for ease in comparison of results.

Distribution of UPC Scores

Figure 3.2: Distribution of UPC Scores



UPC scores ranged from .01 to 1. Figure 2.1 illustrates the distribution of continuous UPC scores before the scores were categorized. From the continuous distribution, most of the scores were distributed evenly, except for scores with the value of 1, which had the highest frequency. The scores were later categorized into Low (0.01 – 0.49), Medium (0.50 – 0.79), and High (0.80 – 1). The categorization of the UPC scores presented in Figure 2.2, followed a similar categorization pattern to Burge et. al (2003) categories of Modified Modified

Continuity Index (MMCI) scores which measures provider visit concentration and ranged from 0.02 – 1.

Figure 3.3: Distribution of UPC Scores

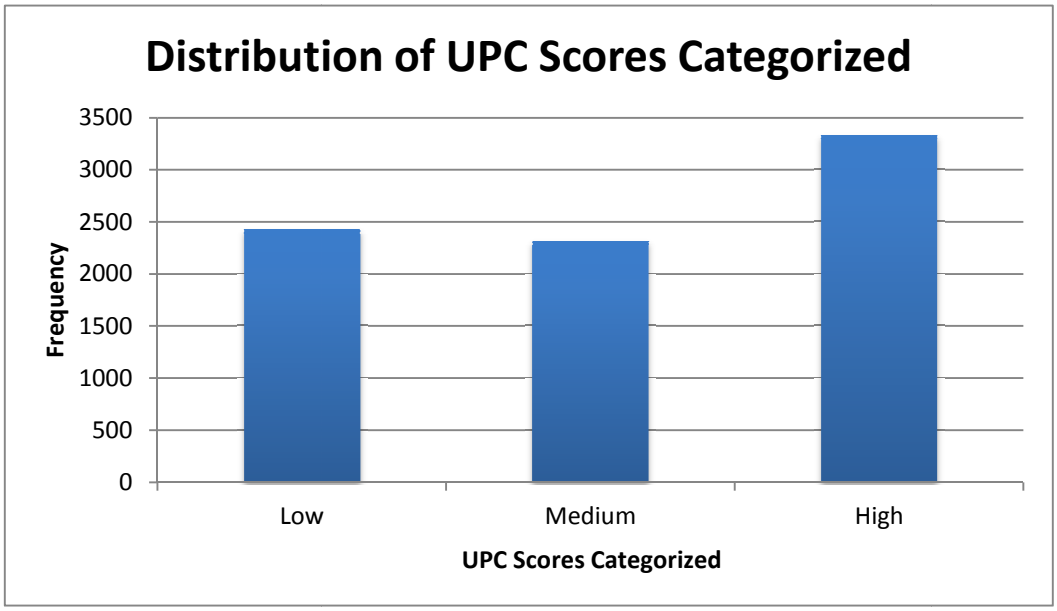
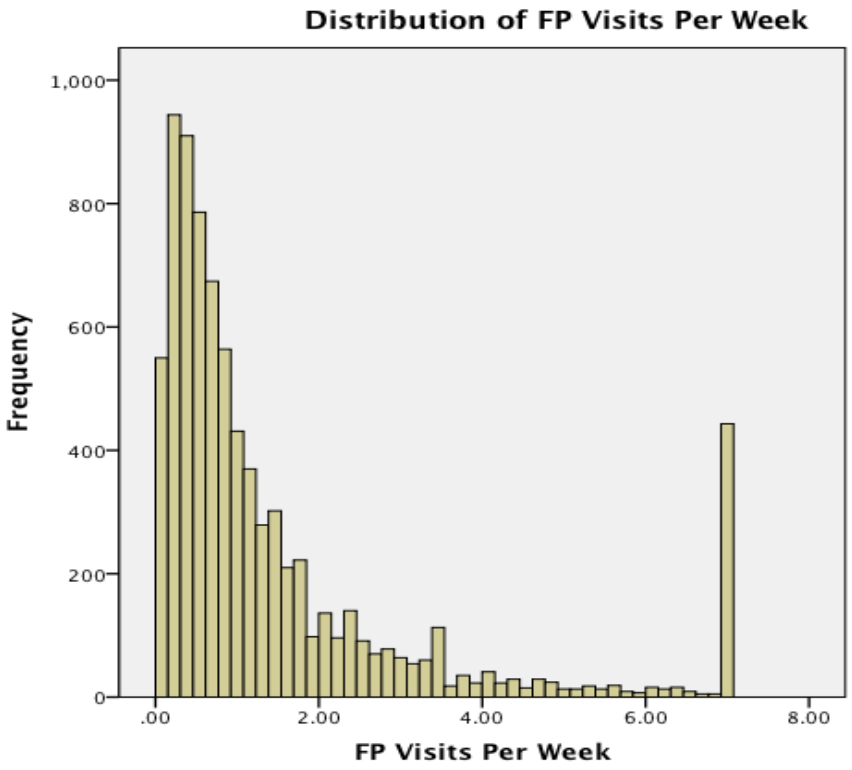


Figure 3.4: Distribution of FP Visits Per Week

Distribution of FP Visits Per Week



The number of FP visits per week ranged between 0.01 to 2 visits per week, and with 7 visits per week also having a high frequency as illustrated in figure 3.1. With categorization, FP visits per week variable was reduced to 5 categories ranging from 0.25 to >4 visits per week. The 0.25 categorization represented less than 1 visit per month, followed by the 0.5 categorization, which represented 1 visit every week. The categorizations took into account the distribution of the continuous visits, presented in Figure 3.2. This makes the distribution more normally distributed.

Figure 3.5: Distribution of FP Visits Per Week Categorized

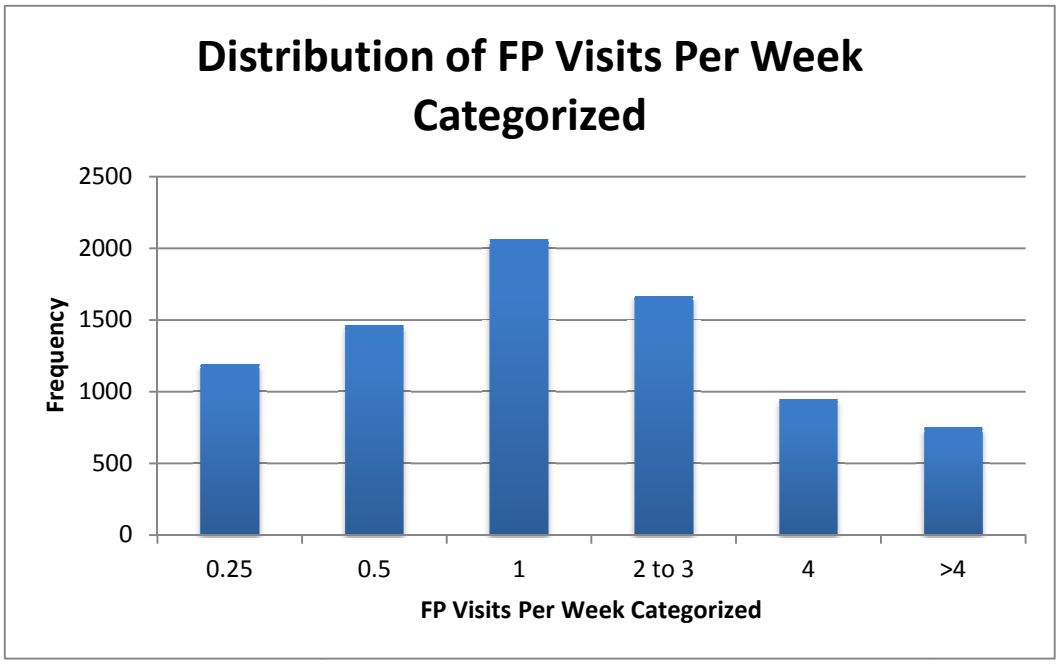
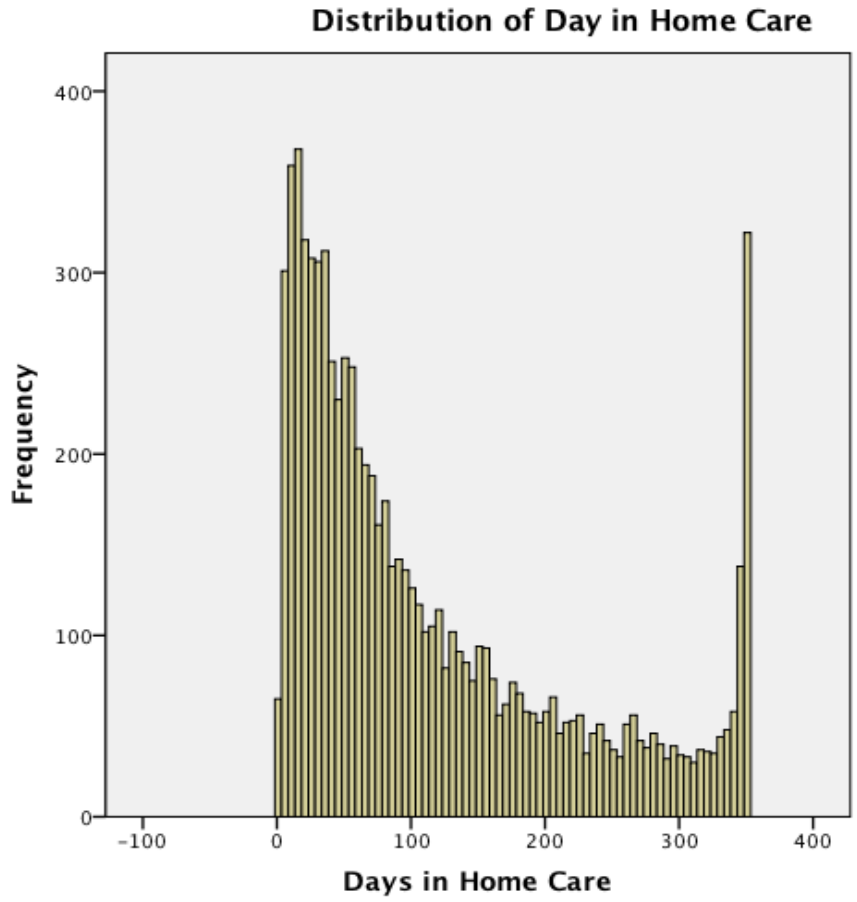


Figure 3.6: Distribution of Days in Home Care

Distribution of Days in Home Care



Patients who were admitted 2 weeks or less before death were excluded from the analysis. Figure 4.1 illustrates the distribution of days in homecare, the 0 point on the continuous distribution diagram indicates the starting point of day 13 in home care. The categorization of homecare days followed a similar pattern to Seow et al. (2010) study. Days in homecare was categorized into categories of 3

to 4 weeks, 5 to 12 weeks, 13 to 23 weeks, and greater than or equal to 24 weeks as presented in Figure 4.2. Keeping the categorizations similar with Seow et. al (2010) research enables a comparison of results.

Figure 3.7: Distribution of Home Care Duration Categorized

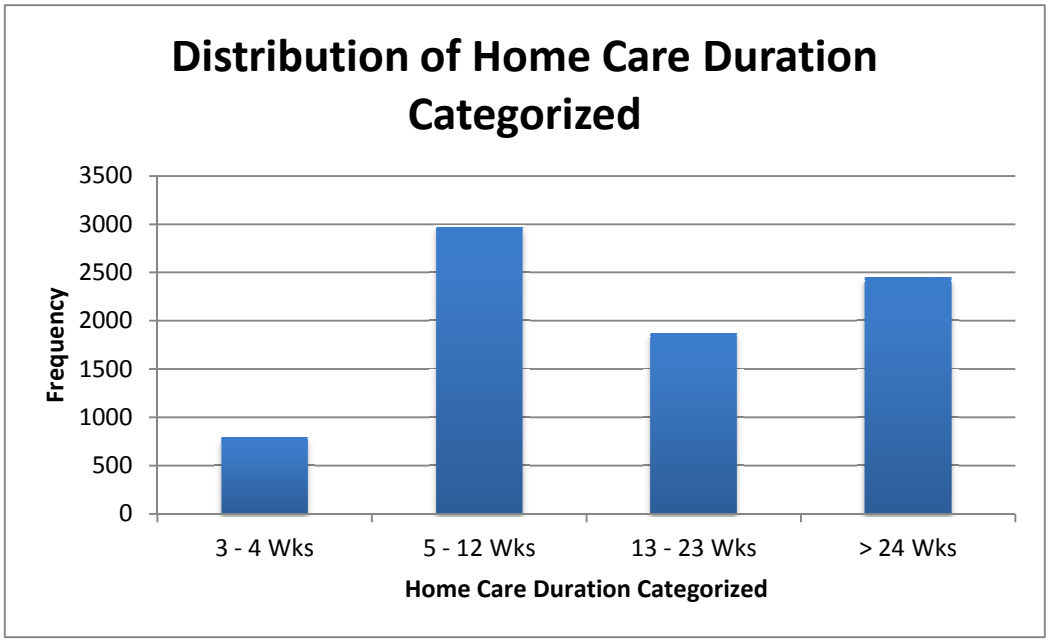


Table 3: Univariate analysis for hospital visits, death in hospital, and ER visits

	Hospital Visits		Death in Hospital		ER Visits	
Variable	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
UPC						
Low (reference)						
Medium	**0.756**	**0.674-0.847**	**0.813**	**0.725-0.912**	**0.887**	**0.780-1.009**
High	**0.531**	**0.478-0.590**	**0.624**	**0.561-0.694**	**0.680**	**0.624-0.796**
FP Visits per wk						
0.25 (reference)						
0.50	0.896	0.768-1.044	**0.887**	**0.770-1.289**	**0.800**	**0.679-0.942**
1	0.972	0.842-1.121	**0.858**	**0.894-1.127**	**0.704**	**0.604-0.821**
2 to 3	0.955	0.822-1.108	**0.859**	**0.832-1.108**	**0.503**	**0.425-0.595**
4	1.038	0.875-1.231	**0.822**	**0.862-1.181**	**0.296**	**0.237-0.368**
>4	**2.259**	**1.867-2.733**	**1.672**	**0.651-0.903**	**0.182**	**0.138-0.241**
Nursing Hours						
1 (reference)						
0	1.105	0.858-1.423	0.996	0.770-1.289	0.956	0.715-1.277
2 to 3	1.037	0.925-1.162	1.004	0.894-1.127	1.033	0.908-1.175
4 to 5	0.972	0.844-1.119	0.960	0.832-1.108	0.873	0.741-1.028
6 to 7	0.953	0.816-1.113	1.009	0.862-1.181	**0.766**	**0.637-0.922**
>7	**0.702**	**0.599-0.823**	**0.767**	**0.651-0.903**	**0.514**	**0.418-0.632**
Gender						
Females (ref)						
Males	1.086	0.995-1.185	1.009	0.924-1.103	1.283	1.159-1.421
Income Quintile						
Low						
Middle Low	0.922	0.805-1.055	1.002	0.874-1.149	0.976	0.838-1.149
Middle	0.902	0.785-1.036	0.936	0.813-1.078	1.003	0.861-1.192
Middle High	**0.840**	**0.730-0.966**	0.953	0.827-1.098	0.929	0.798-1.108
High	**0.752**	**0.654-0.865**	**0.825**	**0.715-0.951**	**0.848**	**0.749-1.045**
Age Group						
>80 (reference)						
18-49	**1.513**	**1.261-1.815**	**1.724**	**1.434-2.073**	1.202	0.972-1.485
50-59	**1.442**	**1.247-1.667**	**1.516**	**1.306-1.760**	**1.311**	**1.108-1.552**
60-69	**1.454**	**1.276-1.656**	**1.538**	**1.345-1.758**	**1.249**	**1.073-1.455**
70-79	**1.259**	**1.115-1.421**	**1.337**	**1.179-1.516**	**1.136**	**0.983-1.312**
Location						
Urban (ref)						
Rural	**1.740**	**1.531-1.978**	**1.819**	**1.604-2.063**	**1.536**	**1.340-1.761**
Charlson						
0-6 (reference)						
>6	**1.150**	**1.053-1.255**	**1.131**	**1.035-1.237**	0.985	0.890-1.091

Death Cause						
Lung Cancer(ref)						
Breast Cancer	0.971	0.817-1.155	0.897	0.751-1.070	**0.667**	**0.541-0.821**
Colorectal	0.919	0.789-1.071	**0.832**	0.712-0.974	**0.660**	**0.550-0.793**
Prostate	0.966	0.784-1.190	0.842	0.679-1.044	**0.672**	**0.521-0.865**
All Others	1.009	0.907-1.122	0.957	0.859-1.067	**0.838**	**0.743-0.945**
Duration						
3 to 4 wks (ref)						
5 to 12 wks	1.043	0.891-1.220	1.071	0.912-1.256	**0.830**	**0.696-0.990**
13 to 23 wks	0.892	0.755-1.054	0.950	0.801-1.126	**0.709**	**0.586-0.858**
>24 wks	0.881	0.751-1.035	0.986	0.837-1.162	0.856	0.715-1.024

* Significant results highlighted in bold

Univariate Analysis

Univariate analysis was performed as part of the exploratory data phase to determine the individual significance of variables with each outcome. The UPC variable was significant across all outcomes unlike FP Visits per week, which was significant for the outcome location of death, and visits to the ER in the last 2 weeks of life. Age was significant with visits to the hospital in the last 2 weeks of life and location of death. Geographic location was significant across all outcomes, unlike the results of gender, which were not significant for any outcomes. Although some of the variables did not attain significance in the univariate analysis model, all of the variables were retained to be included in the final model, because previous research has indicated the association of the variables with the outcomes (Burge et al., 2003; Seow et al., 2010)

4 Results

4.1 Participant Characteristics

Of the 8078 end of life cancer patients, males constituted 50.7% and females 49.3%. The 70 – 79 age group bracket made up 31.3% in contrast to 6.3% in the lowest age group 18 to 49. Of all 5 cancer categories, 25.3% of patients died of lung cancer, compared to 8.5% and 12% for breast and colorectal cancer, respectively. An overwhelming majority of patients, 85.9% resided in urban areas compared to 14.1% for rural areas. The Hamilton Niagara Haldimand Brant Local Health Integration Network (LHIN) constituted the highest distribution of patients with 14.3%.

Thirty six percent of patients were in homecare for 5 to 12 weeks, with only 9.8% in home care for duration of 3 to 4 weeks. Only patients who had duration of at least 2 weeks were included in the analysis. The mean nursing hours per week in homecare received was 2.85 (SD=2.72).

Table 4: Patient Characteristics

Variable	n=8078 %
UPC	
Low	2431 (30.1)
Medium	2316 (28.7)
High	3331 (41.2)
FP Visits Per Week	
0.25	1189(14)
0.5	1465 (18.1)

1	2059 (25.5)
2	1665 (20.6)
4	949 (11.7)
>4	751 (9.3)
Nursing Hours	
0	271 (3.4)
1	2100 (26.0)
2 to 3	2681 (33.2)
4 to 5	1228 (15.2)
6 to 7	916 (11.3)
>7	882 (10.9)
Gender	
Females	3982 (49.3)
Males	4096 (50.7)
Income Quintile	
Low	1612 (20.0)
Middle Low	1771 (21.9)
Middle	1569 (19.4)
Middle High	1550 (19.2)
High	1564 (19.4)
Age Group	
18-49	631 (7.8)
50-59	1239 (15.3)
60-69	1862 (23.1)
70-79	2530 (31.3)
>80	1816 (22.5)
Location	
Urban	6935 (85.9)
Rural	1139 (14.1)
Co-morbidities	
0-6	4305 (53.3)
>6	3773 (46.7)
Death Cause	
Lung Cancer	2043 (25.3)
Breast Cancer	685 (8.5)
Colorectal	974 (12.0)
Prostate	425 (5.3)
All Others	3951 (48.9)
Duration	
3 to 4 wks	789 (9.8)
5 to 12 wks	2969 (36.8)
13 to 23 wks	1873 (23.2)
>24 wks	2447 (30.3)

LHIN	
Erie St. Clair	507 (6.3)
South West	678 (8.4)
Waterloo Wellington	491 (6.1)
Hamilton Niagara Haldimand Brant	1152 (14.3)
Central West	251 (3.1)
Missassauga Halton	446 (5.5)
Toronto Central	534 (6.6)
Central	721 (8.9)
Central East	1013 (12.5)
South East	359 (4.4)
Champlain	961 (11.9)
North Simcoe Muskoka	381 (4.7)
North East	463 (5.7)
North West	117 (1.4)

4.2 Exposure and Outcome

Usual Provider of Care (Exposure)

The mean UPC score was 0.66 (SD = .294): about 41% had a high UPC continuity score and 30% had a low score on the continuity scale. Both genders had similar UPC scores with a mean of .67 (SD .29) for females and a mean of 0.65 (SD =.29) for males.

Family Physician Visits per Week (Exposure)

The family physician visit per week was 1.48 (SD = 1.76): about 25% had an average of 1 visit per week with 9% having more than 4 visits per week.

Acute Care Services Use (Outcomes)

In the 2 weeks before death, about half (49%) had a hospitalization and 24% had an ER visit. During the exposure period, 59% of patients had at least 1 hospitalization and 59% had at least 1 ER visit. About 40% died in a hospital.

A Hospital Visits in the Last 2 Weeks of Life

UPC

Results of the univariate and multivariate analysis examining the association of UPC continuity score and other variables with hospital visits in the last 2 weeks of life are presented in Table 4.2. Odds ratios, 95% confidence intervals, and associated p-values are presented for both the univariate and multivariate logistic regression models.

Table 5.1: Univariate and multivariate UPC odds ratio for hospital visits

	Univariate			Multivariate		
Variable	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
UPC						
Low (reference)						
Medium	**0.756**	**0.674-0.847**	**p=<0.0001**	**0.714**	**0.635-0.802**	**p=<0.0001**
High	**0.531**	**0.478-0.590**	**p=<0.0001**	**0.474**	**0.423-0.532**	**p=<0.0001**
Nursing Hours						
1 (reference)						
0	1.105	0.858-1.423	p=0.440	1.100	0.845-1.433	p=0.479
2 to 3	1.037	0.925-1.162	p=0.538	0.992	0.882-1.117	p=0.897
4 to 5	0.972	0.844-1.119	p=0.689	0.913	0.788-1.057	p=0.222
6 to 7	0.953	0.816-1.113	p=0.539	0.868	0.737-1.022	p=0.090
>7	**0.702**	**0.599-0.823**	**p=<0.0001**	**0.660**	**0.557-0.781**	**p=<0.0001**
Gender						
Females (ref)						
Males	1.086	0.995-1.185	p=0.065	1.039	0.943-1.144	p=0.440
Income Quintile						
Low						
Middle Low	0.922	0.805-1.055	p=0.237	0.916	0.798-1.052	p=0.215
Middle	0.902	0.785-1.036	p=0.145	0.889	0.771-1.026	p=0.107
Middle High	**0.840**	**0.730-0.966**	**p=0.014**	**0.835**	**0.724-0.963**	**p=0.013**
High	**0.752**	**0.654-0.865**	**p=<0.0001**	**0.759**	**0.658-0.876**	**p=<0.0001**
Age Group						
>80 (reference)						
18-49	**1.513**	**1.261-1.815**	**p=<0.0001**	**1.344**	**1.110-1.628**	**p=0.002**
50-59	**1.442**	**1.247-1.667**	**p=<0.0001**	**1.267**	**1.087-1.477**	**p=0.002**
60-69	**1.454**	**1.276-1.656**	**p=<0.0001**	**1.276**	**1.113-1.463**	**p=<0.0001**
70-79	**1.259**	**1.115-1.421**	**p=<0.0001**	**1.174**	**1.036-1.331**	**p=0.012**

Location Urban (ref) Rural	**1.740**	**1.531-1.978**	**p=<0.0001**	**1.977**	**1.731-2.257**	**p=<0.0001**
Charlson 0-6 (reference) >6	**1.150**	**1.053-1.255**	**p=0.002**	**1.125**	**1.026-1.233**	**p=0.013**
Death Cause Lung Cancer(ref) Breast Cancer Colorectal Prostate All Others	 0.971 0.919 0.966 1.009	 0.817-1.155 0.789-1.071 0.784-1.190 0.907-1.122	 p=0.742 p=0.278 p=0.745 p=0.907	 1.017 1.002 1.080 1.081	 0.845-1.225 0.855-1.173 0.866-1.347 0.968-1.208	 p=0.856 p=0.983 p=0.492 p=0.167
Duration 3 to 4 wks (ref) 5 to 12 wks 13 to 23 wks >24 wks	 1.043 0.892 0.881	 0.891-1.220 0.755-1.054 0.751-1.035	 p=0.601 p=0.179 p=0.123	 0.903 **0.698** **0.627**	 0.767-1.064 **0.584-0.833** **0.526-0.833**	 p=0.223 **p=<0.0001** **p=<0.0001**

* Significant results in bolds

The results of the multivariate analysis indicate that individuals with high and medium UPC continuity scores are less likely to visit the hospital during the last 2 weeks of life after adjusting for nursing hours, gender, income quintile, age, geographic location, co morbidities, death cause, and duration. Patients with medium UPC continuity scores were 0.714 (95% CI: 0.635-0.802, $P < 0.0001$) times as likely to visit the hospital in the last 2 weeks of life, while those with high UPC continuity scores were 0.474 (95% CI: 0.423-0.532, $P < 0.0001$) as likely.

The more nursing hours patients received the less likely they were to visit the hospital during the last 2 weeks of life, but significance was only attained for nursing hours greater than 7. Males were 1.039 (95% CI: 0.943-1.144, $P = 0.440$) times as likely to visit the hospital than females while increasing income also lessened the likelihood of attaining the outcome but significance was reached

only for categories Middle High and High income. A dose response relationship occurs with age, increasing age decreases the likelihood of having the outcome. The odds for rural residents were 1.997 (95% CI: 1.731-2.257, $P < 0.0001$) times greater compared to urban residents. Higher co-morbidities was also associated with a greater likelihood of visiting the hospital in the last 2 weeks of life, patients with a Charlson comorbidity score of 6 or higher were 1.125 (95% CI: 1.026-1.233, $P = 0.013$) more likely to have the outcome. All the cancer categories were more likely to have the outcome when compared to lung cancer, although no significance was attained for any of the different categories. Patients who were enrolled in homecare for 13 or more weeks, were less likely to visit the hospital with the results being highly significant.

FP Visits Per Week

Results of the univariate and multivariate analysis examining the association of FP visits per week and other variables with hospital visits in the last 2 weeks of life are presented in Table 4.3. Odds ratios, 95% confidence intervals, and associated p-values are presented for both the univariate and multivariate logistic regression analysis.

Table 5.2: Univariate and multivariate FP visits per week odds ratios for hospital visits

	Univariate			Multivariate		
Variable	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
FP Visits per wk						
0.25 (reference)						
0.50	0.896	0.768-1.044	p=0.160	0.881	0.754-1.029	p=.111
1	0.972	0.842-1.121	p=0.696	0.960	0.829-1.113	p=.591
2 to 3	0.955	0.822-1.108	p=0.542	0.954	0.817-1.114	p=.551
4	1.038	0.875-1.231	p=0.667	1.050	0.878-1.255	p=.594
>4	**2.259**	**1.867-2.733**	**p=<0.0001**	**2.276**	**1.858-2.788**	**p=<0.0001**
Nursing Hours						
1 (reference)						
0	1.105	0.858-1.423	p=0.440	0.866	0.662-1.131	p=0.291
2 to 3	1.037	0.925-1.162	p=0.538	0.990	0.880-1.114	p=0.869
4 to 5	0.972	0.844-1.119	p=0.689	0.865	0.747-1.001	p=0.052
6 to 7	0.953	0.816-1.113	p=0.539	**0.800**	**0.679-0.942**	**p=0.008**
>7	**0.702**	**0.599-0.823**	**p=<0.0001**	**0.561**	**0.473-0.665**	**p=<0.0001**
Gender						
Females (ref)						
Males	1.086	0.995-1.185	p=0.065	1.095	0.995-1.206	p=0.064
Income Quintile						
Low						
Middle Low	0.922	0.805-1.055	p=0.237	0.934	0.814-1.072	p=0.330
Middle	0.902	0.785-1.036	p=0.145	0.915	0.794-1.054	p=0.218
Middle High	**0.840**	**0.730-0.966**	**p=0.014**	**0.856**	**0.742-0.987**	**p=0.032**
High	**0.752**	**0.654-0.865**	**p=<0.0001**	**0.772**	**0.669-0.890**	**p=<0.0001**
Age Group	**1.513**					
>80 (reference)	**1.442**					
18-49	**1.454**	**1.261-1.815**	**p=<0.0001**	**1.598**	**1.323-1.931**	**p=<0.0001**
50-59	**1.259**	**1.247-1.667**	**p=<0.0001**	**1.480**	**1.273-1.722**	**p=<0.0001**
60-69		**1.276-1.656**	**p=<0.0001**	**1.453**	**1.269-1.662**	**p=<0.0001**
70-79		**1.115-1.421**	**p=<0.0001**	**1.253**	**1.107-1.419**	**p=<0.0001**
Location						
Urban (ref)						
Rural	**1.740**	**1.531-1.978**	**p=<0.0001**	**1.672**	**1.467-1.905**	**p=<0.0001**
Charlson						
0-6 (reference)						
>6	**1.150**	**1.053-1.255**	**p=0.002**	**1.126**	**1.027-1.234**	**p=0.012**
Death Cause						
Lung Cancer(ref)						
Breast Cancer	0.971	0.817-1.155	p=0.742	1.038	0.863-1.249	p=0.690
Colorectal	0.919	0.789-1.071	p=0.278	0.982	0.839-1.149	p=0.818
Prostate	0.966	0.784-1.190	p=0.745	1.039	0.833-1.295	p=0.737
All Others	1.009	0.907-1.122	p=0.907	1.078	0.965-1.204	p=0.183

Duration 3 to 4 wks (ref) 5 to 12 wks 13 to 23 wks >24 wks	 1.043 0.892 0.881	 0.891-1.220 0.755-1.054 0.751-1.035	 p=0.601 p=0.179 p=0.123	 1.004 0.868 0.879	 0.852-1.183 0.728-1.036 0.737-1.049	 p=0.963 p=0.116 p=0.153

* Significant Results in bold

Results of the multivariate analysis indicate that significance was attained only for more than 4 visits. Two or less FP visits per week resulted in less of a likelihood of visiting the hospital (insignificant), but 4 or more visits resulted in more of a likelihood of visiting the hospital. The odds of reporting hospital use in the last 2 weeks of life are at least 1.05 (95% CI: 0.878-1.255, $P < 0.0001$) times more likely for 4 visits or more.

Nursing hours were only significant for 6 or more hours, resulting in less of a likelihood of visiting the hospital during the last 2 weeks of life. Males were 1.095 (95% CI: 0.995-1.206, $P = 0.064$) times more likely to visit the hospital but significance was not attained. The categories ‘middle high’ and ‘high’ for income were significant indicating that the higher the income the less likely to attain the outcome. The age group variable was highly significant indicating that all the age categories were more likely to visit the hospital in the last 2 weeks of life when compared to the 80 or older age group. Geographic location also was highly significant, as rural residents were 1.672 (95% CI: 1.467-1.905, $P < 0.0001$) more likely to attain the outcome. Cause of death and home care duration were not significant. Although duration in home care was not significant, increasing duration resulted in less of a likelihood of attaining the outcome.

B Death in Hospital

UPC

Results of the univariate and multivariate analysis examining the association of UPC continuity score and other variables with death in hospital are presented in Table 4.4. Odds ratios, 95% confidence intervals, and associated p-values are presented for both the univariate and multivariate logistic regression analysis.

Table 6.1.: Univariate and multivariate UPC odds ratios for death in hospital

	Univariate			Multivariate		
Variable	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
UPC						
Low (reference)						
Medium	**0.813**	**0.725-0.912**	**p=<0.0001**	**0.778**	**0.692-0.875**	**p=<0.0001**
High	**0.624**	**0.561-0.694**	**p=<0.0001**	**0.583**	**0.519-0.655**	**p=<0.0001**
Nursing Hours						
1 (reference)						
0	0.996	0.770-1.289	p=0.978	1.020	0.781-1.332	p=0.883
2 to 3	1.004	0.894-1.127	p=0.948	0.974	0.864-1.098	p=0.667
4 to 5	0.960	0.832-1.108	p=0.578	0.918	0.791-1.065	p=0.260
6 to 7	1.009	0.862-1.181	p=0.911	0.945	0.801-1.115	p=0.505
>7	**0.767**	**0.651-0.903**	**p=<0.001**	**0.732**	**0.616-0.870**	**p=<0.0001**
Gender						
Females (ref)						
Males	1.009	0.924-1.103	p=0.837	0.969	0.879-1.068	p=0.526

Income Quintile						
Low						
Middle Low	1.002	0.874-1.149	p=0.981	1.002	0.872-1.152	p=0.977
Middle	0.936	0.813-1.078	p=0.359	0.927	0.803-1.071	p=0.305
Middle High	0.953	0.827-1.098	p=0.503	0.954	0.826-1.102	p=0.524
High	**0.825**	**0.715-0.951**	**p=<0.008**	**0.839**	**0.725-0.970**	**p=0.018**
Age Group						
>80 (reference)						
18-49	**1.724**	**1.434-2.073**	**p=<0.0001**	**1.568**	**1.293-1.901**	**p=<0.0001**
50-59	**1.516**	**1.306-1.760**	**p=<0.0001**	**1.357**	**1.161-1.587**	**p=<0.0001**
60-69	**1.538**	**1.345-1.758**	**p=<0.0001**	**1.370**	**1.192-1.576**	**p=<0.0001**
70-79	**1.337**	**1.179-1.516**	**p=<0.0001**	**1.255**	**1.103-1.428**	**p=0.001**
Location						
Urban (ref)						
Rural	**1.819**	**1.604-2.063**	**p=<0.0001**	**1.990**	**1.747-2.266**	**p=<0.0001**
Charlson						
0-6 (reference)						
>6	**1.131**	**1.035-1.237**	**p=0.007**	**1.101**	**1.003-1.209**	**p=0.043**
Death Cause						
Lung Cancer(ref)						
Breast Cancer	0.897	0.751-1.070	p=0.226	0.887	0.735-1.071	p=0.213
Colorectal	**0.832**	**0.712-0.974**	**p=0.022**	0.888	0.756-1.043	p=0.148
Prostate	0.842	0.679-1.044	p=0.118	0.963	0.768-1.207	p=0.742
All Others	0.957	0.859-1.067	p=0.432	1.014	0.907-1.133	p=0.812
Duration						
3 to 4 wks (ref)						
5 to 12 wks	1.071	0.912-1.256	p=0.404	0.964	0.817-1.138	p=0.667
13 to 23 wks	0.950	0.801-1.126	p=0.551	**0.800**	**0.668-0.957**	**p=0.015**
>24 wks	0.986	0.837-1.162	p=0.870	**0.774**	**0.648-0.925**	**p=0.005**

* Significant Results in bold

The results of the multivariate analysis indicate that individuals with high and medium UPC continuity scores are less likely to die in the hospital adjusting for nursing hours, gender, income quintile, age, geographic location, co morbidities, death cause, and duration. Patients with medium continuity UPC scores were 0.778 (95% CI: 0.692-0.875, $P < 0.0001$) times as likely to die in the

hospital while those with high continuity were 0.583 (95% CI: 0.519-0.655, $P < 0.0001$) times as likely to die in the hospital.

Nursing hours was only significant for greater than 7 nursing hours per week. Males are 0.969 (95% CI: 0.879-1.068, $P = 0.526$) times as likely to die in the hospital compared to women but the results were not significant. The 'high' income quintile group was the only category that attained significance for the income quintile variable. A dose response relationship occurs with age, as increasing age decreases the likelihood of having the outcome. The odds for rural residents were almost 1.990 times greater compared to urban residents. Patients with higher co-morbidities were 1.101 (95% CI: 1.003-1.209, $P = 0.043$) times more likely to die in the hospital. The variable cancer type did not attain significance. Patients who were enrolled in home care for 13 or more weeks were less likely to experience a death in the hospital.

FP Visits Per Week

Results of the univariate and multivariate analysis examining the association of FP visits per week and other variables with location of death are presented in Table 4.5. Odds ratios, 95% confidence intervals, and associated p-values are presented for both the univariate and multivariate logistic regression models.

Table 6.2: Univariate and multivariate FP visits per week odds ratios for death in hospital

	Univariate			Multivariate		
Variable	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
FP Visits per wk						
0.25 (reference)						
0.50						
1	**0.887**	**0.716-0.978**	**p=0.025**	**0.825**	**0.704-0.967**	**p=0.017**
2 to 3	**0.858**	**0.742-0.993**	**p=0.040**	**0.844**	**0.726-0.980**	**p=0.026**
4	**0.859**	**0.738-1.000**	**p=0.050**	**0.854**	**0.729-1.000**	**p=0.050**
>4	**0.822**	**0.690-0.979**	**p=0.028**	**0.819**	**0.683-0.984**	**p=0.033**
	1.672	**1.391-2.011**	**p=<0.0001**	**1.660**	**1.364-2.021**	**p=<0.0001**
Nursing Hours						
1 (reference)						
0	0.996	0.770-1.289	p=0.978	1.020	0.781-1.332	p=0.883
2 to 3	1.004	0.894-1.127	p=0.948	0.974	0.864-1.098	p=0.667
4 to 5	0.960	0.832-1.108	p=0.578	0.918	0.791-1.065	p=0.260
6 to 7	1.009	0.862-1.181	p=0.911	0.945	0.801-1.115	p=0.505
>7	**0.767**	**0.651-0.903**	**p=<0.001**	**0.732**	**0.616-0.870**	**p=<0.0001**
Gender						
Females (ref)						
Males	1.009	0.924-1.103	p=0.837	0.969	0.879-1.068	p=0.526
Income Quintile						
Low						
Middle Low	1.002	0.874-1.149	p=0.981	1.002	0.872-1.152	p=0.977
Middle	0.936	0.813-1.078	p=0.359	0.927	0.803-1.071	p=0.305
Middle High	0.953	0.827-1.098	p=0.503	0.954	0.826-1.102	p=0.524
High	**0.825**	**0.715-0.951**	**p=<0.008**	**0.839**	**0.725-0.970**	**p=0.018**
Age Group						
>80 (reference)						
18-49	**1.724**	**1.434-2.073**	**p=<0.0001**	**1.568**	**1.293-1.901**	**p=<0.0001**
50-59	**1.516**	**1.306-1.760**	**p=<0.0001**	**1.357**	**1.161-1.587**	**p=<0.0001**
60-69	**1.538**	**1.345-1.758**	**p=<0.0001**	**1.370**	**1.192-1.576**	**p=<0.0001**
70-79	**1.337**	**1.179-1.516**	**p=<0.0001**	**1.255**	**1.103-1.428**	**p=0.001**
Location						
Urban (ref)						
Rural	**1.819**	**1.604-2.063**	**p=<0.0001**	**1.990**	**1.747-2.266**	**p=<0.0001**
Charlson						
0-6 (reference)						
>6	**1.131**	**1.035-1.237**	**p=0.007**	**1.101**	**1.003-1.209**	**p=0.043**
Death Cause						
Lung Cancer(ref)						
Breast Cancer	0.897	0.751-1.070	p=0.226	0.887	0.735-1.071	p=0.213
Colorectal	0.832	0.712-0.974	p=0.022	0.888	0.756-1.043	p=0.148
Prostate	0.842	0.679-1.044	p=0.118	0.963	0.768-1.207	p=0.742
All Others	0.957	0.859-1.067	p=0.432	1.014	0.907-1.133	p=0.812

Duration 3 to 4 wks (ref) 5 to 12 wks 13 to 23 wks >24 wks	 1.071 0.950 0.986	 0.912-1.256 0.801-1.126 0.837-1.162	 p=0.404 p=0.551 p=0.870	 0.964 **0.800** **0.774**	 0.817-1.138 **0.668-0.957** **0.648-0.925**	 p=0.667 **p=0.015** **p=0.005**

* Significant Results in bold

The results of the multivariate analysis indicate that patients having 4 or less FP visits per week resulted in less of a likelihood of dying in the hospital, but patients with more than 4 visits resulted in more of a likelihood of visiting the hospital while controlling for other factors in the model.

Increasing nursing hours per week resulted in less of a likelihood of dying in the hospital, although the results were only significant for more than 7 hours per week. Males were 0.969 (95% CI: 0.879-1.068, $P = 0.526$) times as

likely than women to have a death in the hospital but the results were not significant. Increasing income resulted in less of a likelihood of attaining the outcome but significant results were obtained only for the 'high' income group. Results for the age category were all significant with all age categories resulting in less of likelihood of attaining the outcome when compared to the 80 and older age group category. Rural residents were 1.990 (95% CI: 1.747-2.266, P < 0.0001) times more likely to die in the hospital when compared to urban residents. The variable cause of death was not significant. Duration in home care was significant for patients that spent 13 or more weeks in home care, which resulted in less of a likelihood of dying in the hospital.

C ER Visits in the Last 2 Weeks of Life

UPC

Results of the univariate and multivariate analysis examining the association of UPC continuity score and other variables with visit to the ER in the last 2 weeks of life are presented in Table 4.6. Odds ratios, 95% confidence intervals, and associated p-values are presented for both the univariate and multivariate logistic regression analysis.

Table 7.1: Univariate and multivariate UPC odds ratios for ER visits

	Univariate	Multivariate

Variable	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
UPC						
Low (reference)						
Medium	0.887	0.780-1.009	p=0.069	**0.863**	**0.756-0.984**	**p=0.028**
High	**0.705**	**0.624-0.796**	**p=<0.0001**	**0.680**	**0.596-0.775**	**p=<0.0001**
Nursing Hours						
1 (reference)						
0	0.956	0.715-1.277	p=0.759	0.899	0.666-1.214	p=0.488
2 to 3	1.033	0.908-1.175	p=0.623	1.014	0.888-1.157	p=0.840
4 to 5	0.873	0.741-1.028	p=0.102	**0.842**	**0.711-0.996**	**p=0.045**
6 to 7	**0.766**	**0.637-0.922**	**p=0.005**	**0.709**	**0.584-0.860**	**p=<0.0001**
>7	**0.514**	**0.418-0.632**	**p=<0.0001**	**0.497**	**0.401-0.617**	**p=<0.0001**
Gender						
Females (ref)						
Males	**1.283**	**1.159-1.421**	**p=<0.0001**	**1.267**	**1.134-1.416**	**p=<0.0001**
Income Quintile						
Low						
Middle Low	0.976	0.835-1.140	p=0.755	0.982	0.838-1.149	p=0.817
Middle	01.003	0.855-1.177	p=0.971	1.013	0.861-1.192	p=0.875
Middle High	0.929	0.790-1.092	p=0.370	0.940	0.798-1.108	p=0.463
High	**0.848**	**0.720-0.998**	**p=0.048**	0.885	0.749-1.045	p=0.150
Age Group						
>80 (reference)						
18-49	1.202	0.972-1.485	p=0.089	1.220	0.978-1.522	p=0.078
50-59	**1.311**	**1.108-1.552**	**p=0.002**	**1.267**	**1.062-1.512**	**p=0.009**
60-69	**1.249**	**1.073-1.455**	**p=0.004**	1.150	0.981-1.348	p=0.085
70-79	1.136	0.983-1.312	p=0.084	1.069	0.922-1.240	p=0.375
Location						
Urban (ref)						
Rural	**1.536**	**1.340-1.761**	**p=<0.0001**	**1.608**	**1.396-1.851**	**p=<0.0001**
Charlson						
0-6 (reference)						
>6	0.985	0.890-1.091	p=0.771	1.002	0.901-1.114	p=0.971
Death Cause						
Lung Cancer (ref)						
Breast Cancer	**0.667**	**0.541-0.821**	**p=<0.0001**	0.764	0.612-0.953	p=0.213
Colorectal	**0.660**	**0.550-0.793**	**p=<0.0001**	**0.702**	**0.582-0.847**	**p=<0.0001**
Prostate	**0.672**	**0.521-0.865**	**p=0.002**	**0.648**	**0.497-0.843**	**p=0.001**
All Others	**0.838**	**0.743-0.945**	**p=0.004**	**0.883**	**0.780-0.999**	**p=0.049**
Duration						
3 to 4 wks (ref)						
5 to 12 wks	0.830	0.696-0.990	p=0.038	**0.728**	**0.606-0.874**	**p=0.001**
13 to 23 wks	**0.709**	**0.586-0.858**	**p=<0.0001**	**0.574**	**0.469-0.702**	**p=<0.0001**
>24 wks						

	0.856	0.715-1.024	p=0.089	**0.653**	**0.537-0.795**	**p=<0.0001**

* Significant results in bold

The results of the multivariate analysis indicate that individuals with high and medium UPC continuity scores are less likely to visit the ER during the last 2 weeks of life after adjusting for nursing hours, gender, income quintile, age, geographic location, co morbidities, cancer type, and duration in homecare. Patients with medium UPC continuity scores were 0.863 (95% CI: 0.756-0.984, *P* = 0.028) times as likely to visit the ER in the last 2 weeks of life, while those with high UPC continuity scores were 0.680 (95% CI: 0.596-0.775, *P* < 0.0001) as likely.

Nursing hours were significant for 4 or more hours per week. Males were 1.267 (95% CI: 1.134-1.416, *P* <0.0001) times as likely to attain the outcome when compared to women. None of the income quintile groups attained significance. Although increasing age resulted in less of likelihood of having the outcome none of the categories were significant. Rural residents were 1.608 (95% CI: 1.396-1.851, *P* = 0.009) times as likely to visit the ER in the last 2 weeks of life with results being highly significant. Results for co-morbidities did not attain significance. All of the categories for cancer type attained significance except for the breast cancer category, with all of the other cancer types resulting in less of likelihood of attaining the outcome when compared to lung cancer. There was a dose response relationship for duration in homecare, as homecare

increased the likelihood of patients visiting the ER in the last two weeks of life decreased.

FP Visits Per Week

Results of the univariate and multivariate analysis examining the association of FP visits per week and other variables with ER visits in the last 2 weeks of life are presented in Table 4.7. Odds ratios, 95% confidence intervals, and associated p-values are presented for both the univariate and multivariate logistic regression models.

Table 7.2: Univariate and multivariate FP visits per week odds ratios for ER visits

	Univariate			Multivariate		
Variable	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
FP Visits per wk						
0.25 (reference)						
0.50	**0.800**	**0.679-0.942**	**p=0.007**	**0.753**	**0.637-0.890**	**p=0.001**
1	**0.704**	**0.604-0.821**	**p=<0.0001**	**0.622**	**0.530-0.730**	**p=<0.0001**
2 to 3	**0.503**	**0.425-0.595**	**p=<0.0001**	**0.431**	**0.361-0.514**	**p=<0.0001**
4	**0.296**	**0.237-0.368**	**p=<0.0001**	**0.247**	**0.196-0.311**	**p=<0.0001**
>4	**0.182**	**0.138-0.241**	**p=<0.0001**	**0.141**	**0.105-0.189**	**p=<0.0001**
Nursing Hours						
1 (reference)						
0	0.956	0.715-1.277	p=0.759	1.214	0.891-1.655	p=0.291
2 to 3	1.033	0.908-1.175	p=0.623	1.013	0.885-1.160	p=0.850
4 to 5	0.873	0.741-1.028	p=0.102	0.904	0.761-1.073	p=0.248
6 to 7	**0.766**	**0.637-0.922**	**p=0.005**	**0.762**	**0.626-0.927**	**p=0.007**
>7	**0.514**	**0.418-0.632**	**p=<0.0001**	**0.593**	**0.476-0.738**	**p=<0.0001**
Gender						
Females (ref)						
Males	**1.283**	**1.159-1.421**	**p=<0.0001**	**1.275**	**1.139-1.427**	**p=<0.0001**
Income Quintile						
Low						
Middle Low	0.976	0.835-1.140	p=0.755	0.958	0.816-1.125	p=0.601
Middle	01.003	0.855-1.177	p=0.971	0.993	0.841-1.171	p=0.930

Middle High High	0.929 0.848	0.790-1.092 0.720-0.998	p=0.370 p=0.048	0.904 0.849	0.765-1.069 0.717-1.006	p=0.238 p=0.058
Age Group >80 (reference) 18-49 50-59 60-69 70-79	 1.202 **1.311** **1.249** 1.136	 0.972-1.485 **1.108-1.552** **1.073-1.455** 0.983-1.312	 p=0.089 **p=0.002** **p=0.004** p=0.084	 **1.336** **1.374** **1.231** 1.140	 **1.093-1.707** **1.151-1.641** **1.049-1.445** 1.049-1.445	 **p=0.006** **p=<0.0001** **p=0.011** p=0.087
Location Urban (ref) Rural	 **1.536**	 **1.340-1.761**	 **p=<0.0001**	 **1.694**	 **1.468-1.955**	 **p=<0.0001**
Charlson 0-6 (reference) >6	 0.985	 0.890-1.091	 p=0.771	 1.052	 0.944-1.172	 p=0.361
Death Cause Lung Cancer (ref) Breast Cancer Colorectal Prostate All Others	**0.667** **0.660** **0.672** **0.838**	 **0.541-0.821** **0.550-0.793** **0.521-0.865** **0.743-0.945**	 **p=<0.0001** **p=<0.0001** **p=0.002** **p=0.004**	 **0.774** **0.680** **0.692** 0.897	 **0.618-0.969** **0.563-0.823** **0.530-0.905** 0.791-1.018	 **p=0.025** **p=<0.0001** **p=0.007** p=0.092
Duration 3 to 4 wks (ref) 5 to 12 wks 13 to 23 wks >24 wks	 **0.830** **0.709** 0.856	 **0.696-0.990** **0.586-0.858** 0.715-1.024	 **p=0.038** **p=<0.0001** p=0.089	 **0.650** **0.470** **0.475**	 **0.538-0.785** **0.383-0.578** **0.388-0.582**	 **p=<0.0001** **p=<0.0001** **p=<0.0001**

Dose response results were attained for the multivariate analysis. Patients who had more than 4 FP visits per week were 0.141 (95% CI: 0.105-0.189, $P < 0.0001$) times as likely to visit the ER in the last two weeks of life, while those who had 1 visit every 2 weeks were 0.753 (95% CI: 0.637-0.890, $P = 0.001$) times as likely.

Nursing hours was significant for 6 or more nursing hours per week, with more nursing hours resulting in less of a likelihood of having an ER visit in the last 2 weeks of life. Males were 1.275 (95% CI: 1.139-1.427, $P <0.0001$) times

more likely to attain the outcome than females. The Income quintile variable did not attain significance. The age group category attained significance except for the category 70-79 age group, with increasing age there was less of likelihood of visiting the ER in the last 2 weeks of life. Rural residents were 1.694 (95% CI: 1.468-1.955, $P < 0.0001$) times more likely to attain the outcome than urban residents. All of the cancer type categories were less likely to attain the outcome when compared to lung cancer. There was a dose response relationship for homecare duration, an increase in homecare duration resulted in less of a likelihood of visiting the ER.

5 Discussion

5.1 Interpretation

This study shows a significant association between family physician continuity of care for patients dying of cancer enrolled in home care, with dying outside of hospital and hospital and emergency department use. With the UPC continuity scores, there is a dose response relationship – as continuity declines, hospital and ER use increases, and the likelihood of dying in the hospital increases. The association continues even after controlling for nursing hours,

age, sex, income, duration in home care, geographic location, co-morbidities, and cancer type.

Examining the family physician visits per week variable, a similar dose response relationship emerged for ER visits in the last 2 weeks of life. For the outcome hospital visits in the last 2 weeks of life and location of death, up to a certain number of family physician visits resulted in the patient being less likely to attain the outcome. A threshold effect seems to occur as patients are less likely to visit the hospital in the last 2 weeks of life when they have 2 or less visits per week to the family physician, while those who have more than 2 visits per week were more likely to have the outcome. A similar threshold effect also occurred with location of death, as patients are less likely to die in the hospital for those who have 4 or less visits to the FP per week, while those who have more than 4 visits per week are more likely to have the outcome.

These results, in particular the UPC continuity model, correspond with others that have found that patients who have a regular source of care are less likely to die in the hospital and to utilize acute care services. The results confirm Burge et al. (2003) findings of increasing family physician continuity of care resulting in a reduction of ER and hospital visits in the last 2 weeks of life and a higher likelihood of dying at home for end of life cancer patients. However, this study controlled for nursing hours and included end of life cancer patients who were admitted to homecare. This study also used a novel approach from Burge's study of measuring continuity by relying on two measures rather than one, family

physician visits per week and UPC measures. Seow et al (2010) demonstrated a dose response relationship with nursing hours per week and duration in home care. As nursing hours and duration in home care increased the less likely end of life home care patients were to die in the hospital or have a hospital or ER visit in the last 2 weeks of life with all variables attaining significance. This study did not replicate such results, although the dose response pattern was present for both variables, not all of the categories in the variables attained significance. Burge's and Seow's research also demonstrated that females were less likely than males to attain all of the outcomes and rural residents were more likely to experience the outcomes, which was congruent with the findings in this research.

Using the two different measures allowed for a broader picture to be presented when examining FP continuity in end of life cancer patients. With the UPC scores, a dose relationship occurred for all of the outcomes but with the FP visits per week measure such a relationship occurred for only ER visits in the last 2 weeks of life. Why is there a dose response relationship for the association between FP visits per week and ER visits but a threshold effect occurred for hospital visits and location of death? Patients who frequently visited the family physician may be due to the fact that the patients were very ill compared to other patients, so the need to visit the hospital in the last 2 weeks of life may have been necessary. As logic follows those patients who were more likely to visit the hospital in the last 2 weeks of life were also more likely to die in the hospital. But for ER visits, the FP per week variable indicated more visits to the FP resulted in

less of a likelihood to visits the ER. From the patient's perspective trips to the ER occur because of medical emergencies, inadequate symptom control, caregiver fatigue or stress in having the dying person at home (Burge et al., 2003). Therefore, more visits to the FP indicate that the physician is probably able to remedy an emergency over the phone, by a brief home visit, or may have anticipated the problem and made arrangements for such situations in advance resulting in avoidance of visits to the ER (Burge et al., 2003). For severe emergencies an admission to the hospital may be necessary.

Both the UPC and FP visits per week models demonstrates the significance of family physician involvement to reduce the odds of dying in the hospital, and visiting the hospital and ER in the last 2 weeks of life. They build a case for having more involvement from the family physician for end-of-life homecare cancer patients. Important consideration should be made for the family physician role in providing continuity of care when developing policy and designing strategies for home care structure. For the patient, family physician continuity may indicate trust in the provider of care, greater satisfaction with care, and avoidance of unnecessary hospital and ER visits which may result in more quality time spent with family. Family physician continuity of care may also have cost-savings implications especially in

5.2 Limitations

There are a number of limitations in the study that are worth noting. Those individuals who did not receive at least one family physician visit were excluded from the analysis. Although this may result in systematic bias, when examining the differences between those included in the study and those excluded, it was found that both groups were very similar in characteristic and utilization except for a major difference in the duration of homecare. Those excluded had a shorter stay in home care than those included, however duration in homecare was adjusted for in the multivariate regression models.

There may also be legitimate reason for patients to visit the hospital or ER in the last two weeks of life, but extracting information from databases do not allow us to determine the reasons for visits to acute care facilities. There may be reasons that patients visited the hospital or ER because issues could not be dealt with adequately by a family physician or homecare visit.

Extracting visits from databases does not take into account the skills and training of the family physicians in palliative care. Family physicians who are well versed in palliative care are presumed to be better able to provide end-of-life care for patients. It may also be that family physicians with palliative care training will request more or less frequent patient visits for palliative cases. Also other important variables may contribute to the patient's care seeking behaviour pattern that was not captured by the database. For instance some patients may have a solid family support system aiding in providing care or there may be personal

reasons for not seeking care at end of life attributed to religious or cultural traditions. Thus, ideally, these factors should be accounted for in analyses.

Last, assumptions are being made about patient preferences based on previous research, but it is not entirely certain that these particular patients analyzed would prefer to die at home and not visit the hospital or ER in the last 2 weeks of life. Some patients may deem it necessary to fight the disease up to the last minute to increase their chance of survival.

5.3 Conclusion

In this study the UPC continuity score model, demonstrated a dose response relationship with increasing continuity the likelihood of visiting the hospital and ER in the last 2 weeks of life, and dying outside of the hospital decreased. The FP visits per week variable model complemented the UPC model but it also illustrated further how patients who had more visits than normal were more likely to experience the outcomes of visiting the hospital and dying in the hospital. This study should encourage policy makers to include family physicians in providing care during the end of life care period. More research, however, is needed in better understanding patient characteristics that lead to continuity seeking behaviour.

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7 APPENDIX

7.1 Outcome Tables

A. UPC Outcomes

	Hospital Visits		Death in Hospital		ER Visits	
Variable	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI

UPC						
Low (reference)						
Medium	**0.714**	**0.635-0.802**	**0.778**	**0.692-0.875**	**0.863**	**0.756-0.984**
High	**0.474**	**0.423-0.532**	**0.583**	**0.519-0.655**	**0.680**	**0.596-0.775**
Nursing Hours						
1 (reference)						
0	1.100	0.845-1.433	1.020	0.781-1.332	0.899	0.666-1.214
2 to 3	0.992	0.882-1.117	0.974	0.864-1.098	1.014	0.888-1.157
4 to 5	0.913	0.788-1.057	0.918	0.791-1.065	0.842	0.711-0.996
6 to 7	0.868	0.737-1.022	0.945	0.801-1.115	**0.709**	**0.584-0.860**
>7	**0.660**	**0.557-0.781**	**0.732**	**0.616-0.870**	**0.497**	**0.401-0.617**
Gender						
Females (ref)						
Males	1.039	0.943-1.144	0.969	0.879-1.068	**1.267**	**1.134-1.416**
Income Quintile						
Low						
Middle Low	0.916	0.798-1.052	1.002	0.872-1.152	0.982	0.838-1.149
Middle	0.889	0.771-1.026	0.927	0.803-1.071	1.013	0.861-1.192
Middle High	**0.835**	**0.724-0.963**	0.954	0.826-1.102	0.940	0.798-1.108
High	**0.759**	**0.658-0.876**	**0.839**	**0.725-0.970**	0.885	0.749-1.045
Age Group						
>80 (reference)						
18-49	**1.344**	**1.110-1.628**	**1.568**	**1.293-1.901**	1.220	0.978-1.522
50-59	**1.267**	**1.087-1.477**	**1.357**	**1.161-1.587**	**1.267**	**1.062-1.512**
60-69	**1.276**	**1.113-1.463**	**1.370**	**1.192-1.576**	1.150	0.981-1.348
70-79	**1.174**	**1.036-1.331**	**1.255**	**1.103-1.428**	1.069	0.922-1.240
Location						
Urban (ref)						
Rural	**1.977**	**1.731-2.257**	**1.990**	**1.747-2.266**	**1.608**	**1.396-1.851**
Charlson						
0-6 (reference)						
>6	**1.125**	**1.026-1.233**	**1.101**	**1.003-1.209**	1.002	0.901-1.114
Death Cause						
Lung Cancer(ref)						
Breast Cancer	1.017	0.845-1.225	0.887	0.735-1.071	0.764	0.612-0.953
Colorectal	1.002	0.855-1.173	**0.888**	0.756-1.043	**0.702**	**0.582-0.847**
Prostate	1.080	0.866-1.347	0.963	0.768-1.207	**0.648**	**0.497-0.843**
All Others	1.081	0.968-1.208	1.014	0.907-1.133	**0.883**	**0.780-0.999**
Duration						
3 to 4 wks (ref)						
5 to 12 wks	0.903	0.767-1.064	0.964	0.817-1.138	0.728	**0.606-0.874**
13 to 23 wks	**0.698**	**0.584-0.833**	**0.800**	**0.668-0.957**	0.574	**0.469-0.702**
>24 wks	**0.627**	**0.526-0.833**	**0.774**	**0.648-0.925**	0.653	**0.537-0.795**

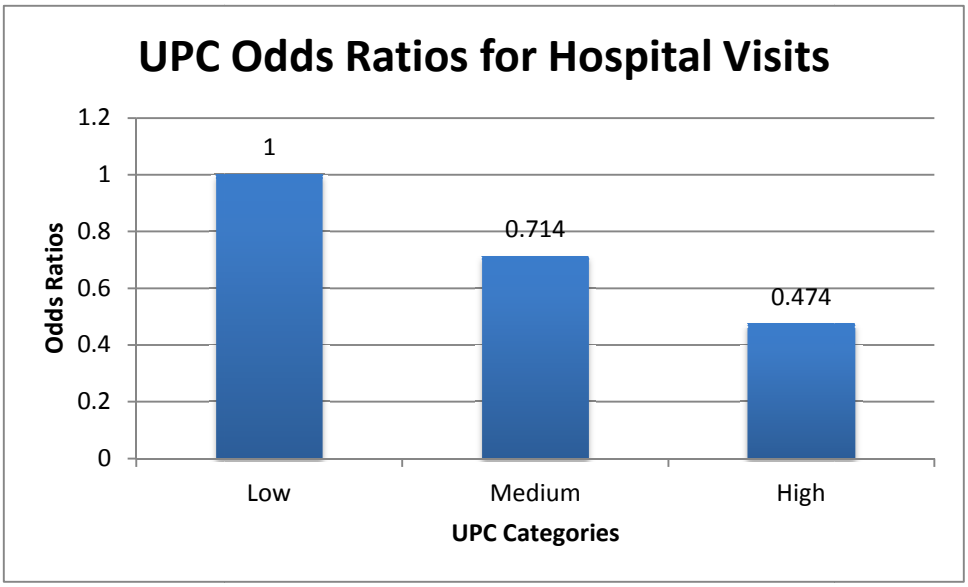
B. FP Visits Per Week Outcomes

	Hospital Visits	Death in Hospital	ER Visits

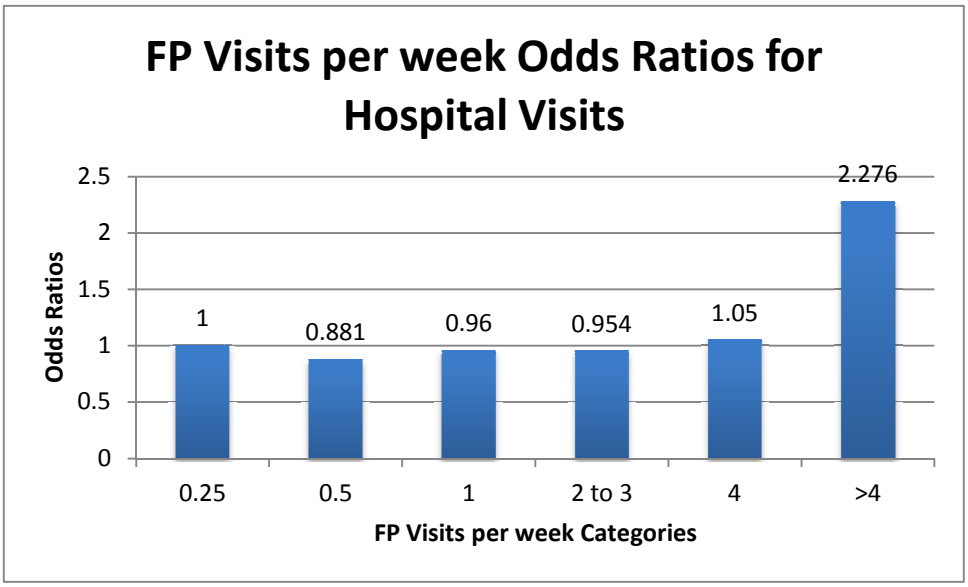
Variable	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
FP Visits per wk						
0.25 (reference)						
0.50	0.881	0.754-1.029	**0.825**	**0.704-0.967**	**0.753**	**0.637-0.890**
1	0.960	0.829-1.113	**0.844**	**0.726-0.980**	**0.622**	**0.530-0.730**
2	0.954	0.817-1.114	**0.854**	**0.729-1.000**	**0.431**	**0.361-0.514**
4	1.050	0.878-1.255	**0.819**	**0.683-0.984**	**0.247**	**0.196-0.311**
>4	**2.276**	**1.858-2.788**	**1.660**	**1.364-2.021**	**0.141**	**0.105-0.189**
Nursing Hours						
1 (reference)						
0	0.866	0.662-1.131	1.020	0.781-1.332	1.214	0.891-1.655
2 to 3	0.990	0.880-1.114	0.974	0.864-1.098	1.013	0.885-1.160
4 to 5	0.865	0.747-1.001	0.918	0.791-1.065	0.904	0.761-1.073
6 to 7	**0.800**	**0.679-0.942**	0.945	0.801-1.115	**0.762**	**0.626-0.927**
>7	**0.561**	**0.473-0.665**	**0.732**	**0.616-0.870**	**0.593**	**0.476-0.738**
Gender						
Females (ref)						
Males	1.095	0.995-1.206	0.969	0.879-1.068	1.275	1.139-1.427
Income Quintile						
Low						
Middle Low	0.934	0.814-1.072	1.002	0.872-1.152	0.958	0.816-1.125
Middle	0.915	0.794-1.054	0.927	0.803-1.071	0.993	0.841-1.171
Middle High	**0.856**	**0.742-0.987**	0.954	0.826-1.102	0.904	0.765-1.069
High	**0.772**	**0.669-0.890**	**0.839**	**0.725-0.970**	0.849	0.717-1.006
Age Group						
>80 (reference)						
18-49	**1.598**	**1.323-1.931**	**1.568**	**1.293-1.901**	1.336	1.093-1.707
50-59	**1.480**	**1.273-1.722**	**1.357**	**1.161-1.587**	**1.374**	**1.151-1.641**
60-69	**1.453**	**1.269-1.662**	**1.370**	**1.192-1.576**	**1.231**	**1.049-1.445**
70-79	**1.253**	**1.107-1.419**	**1.255**	**1.103-1.428**	**1.140**	**1.049-1.445**
Location						
Urban (ref)						
Rural	**1.672**	**1.467-1.905**	**1.990**	**1.747-2.266**	**1.536**	**1.340-1.761**
Charlson						
0-6 (reference)						
>6	**1.126**	**1.027-1.234**	**1.101**	**1.003-1.209**	1.052	0.944-1.172
Death Cause						
Lung Cancer(ref)						
Breast Cancer	1.038	0.863-1.249	0.887	0.735-1.071	**0.774**	**0.618-0.969**
Colorectal	0.982	0.839-1.149	0.888	0.756-1.043	**0.680**	**0.563-0.823**
Prostate	1.039	0.833-1.295	0.963	0.768-1.207	**0.692**	**0.530-0.905**
All Others	1.078	0.965-1.204	1.014	0.907-1.133	**0.897**	**0.791-1.018**
Duration						
3 to 4 wks (ref)						
5 to 12 wks	1.004	0.852-1.183	0.964	0.817-1.138	**0.650**	**0.538-0.785**
13 to 23 wks	0.868	0.728-1.036	**0.800**	**0.668-0.957**	**0.470**	**0.383-0.578**
>24 wks	0.879	0.737-1.049	**0.774**	**0.648-0.925**	**0.475**	**0.388-0.582**

7.2 Illustrated Comparison of Odds Ratios

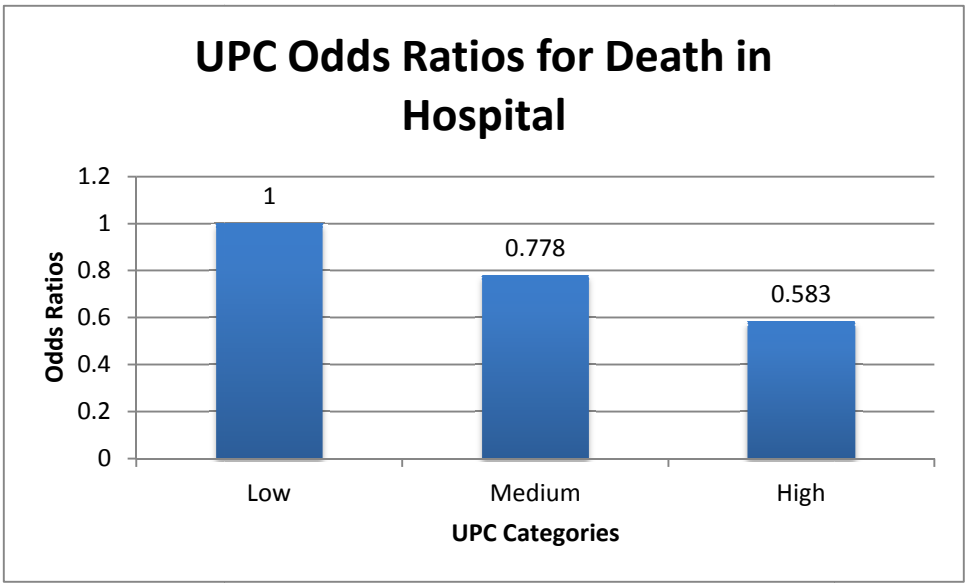
A. UPC Odds Ratios for Hospital Visits



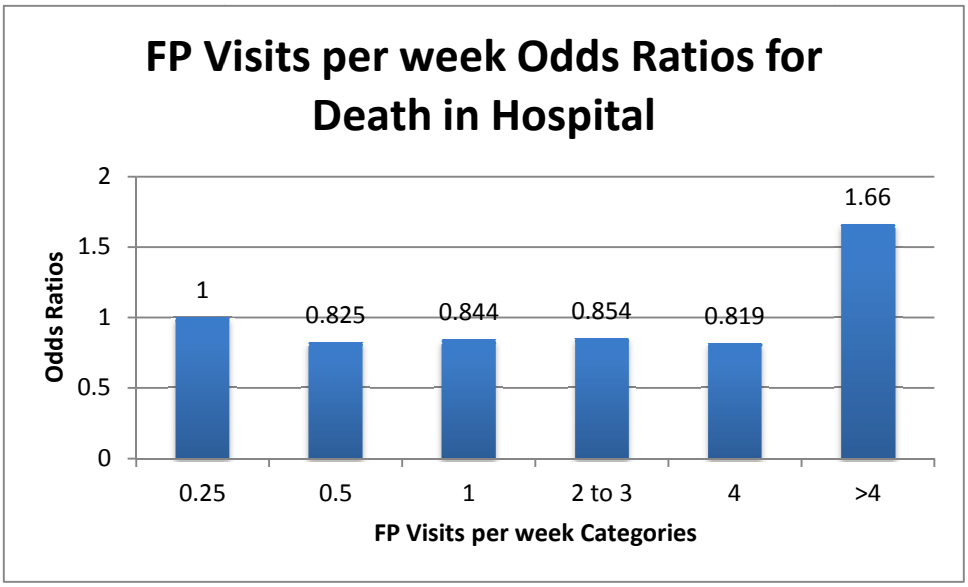
B. FP Visits Per Week Odds Ratios



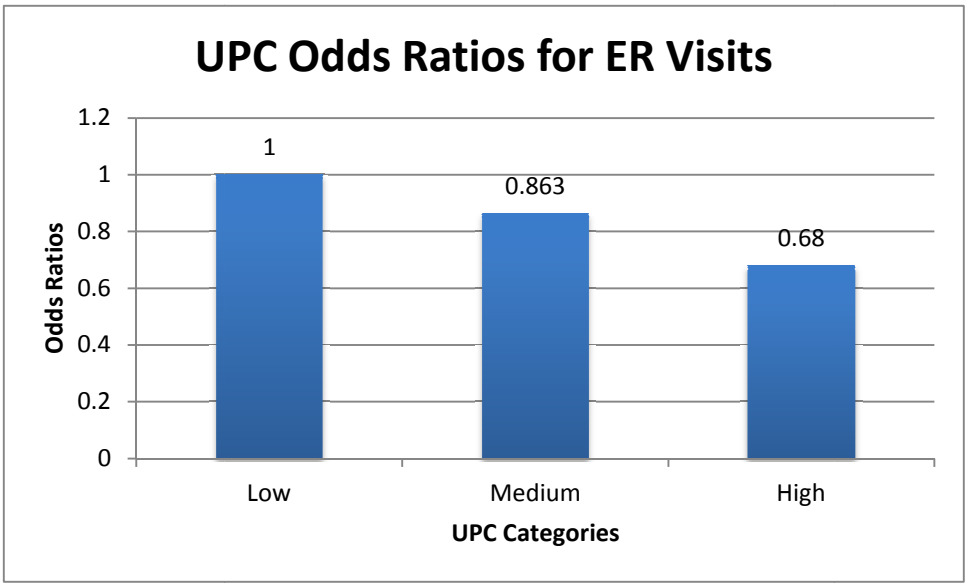
C. UPC Odds Ratios for Death in Hospital



D. FP Visits Per Week Odds Ratios for Death in Hospital



E. UPC Odds Ratios for ER Visits



F. FP Visits Per Week Odds Ratios for ER Visits