University of Alberta

The Relationship Between the Referral Palliative Performance Scale Score and Length of Survival in Palliative Cancer Patients Referred to a Hospice Palliative Care Unit from an Acute Tertiary Care Hospital Setting

by

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Dedication

This work is dedicated to all the palliative patients and their families that have shared a part of their lives with me and have inspired me to continue to learn.

Abstract

Palliative care consultants in an acute tertiary care centre, the Royal Alexandra Hospital (RAH) in Edmonton, Alberta, are faced with the responsibility of assessing palliative patients for appropriate placement for discharge. One tool used to determine eligibility for placement in a hospice palliative care unit is the Palliative Performance Scale (PPS). The PPS is a tool used to measure the physical status of patients in the following five domains: Ambulation, activity and evidence of disease, self-care, intake, and level of consciousness. This study found a significant relationship between the referral PPS scores of palliative cancer patients who were referred to a hospice palliative care unit in Edmonton and who lived less than 60 days and those who lived 60 days or greater. Older aged individuals lived longer when examining the impact of age, gender, cancer diagnosis, and palliative status at the time of consult on length of survival.

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Chapter 1: Statement of the Problem

Organization of the Regional Palliative Care Program (RPCP)

The Royal Alexandra Hospital (RAH) is one of two acute tertiary level hospitals in Edmonton, Alberta, Canada that has a palliative care consultant referral program. The RAH Palliative Care Program is one component of the Capital Health Regional Palliative Care Program (RPCP) which also includes: 20 inpatient beds within a tertiary acute palliative care unit in the Grey Nuns Hospital for complex palliative care needs; a community consultation service; a palliative consultation referral team within the local cancer institute; and 57 inpatient hospice palliative care beds. Of the 57 beds available, 56 beds are divided amongst three specialty units within continuing care or long term care facilities in the Capital Health Region of Edmonton and one bed is located within a nursing home in St. Alberta, Alberta.

Palliative care consultants in the RAH are faced with many responsibilities. In addition to providing symptom assessment and management, and offering psychosocial and spiritual support, the palliative care consultants must also assess for appropriate discharge options. The placement arrangements must be completed in a timely manner as the mean length of stay from the time of hospital admission to discharge is only 18.5 days (RAH, 2005).

Accurate assessment of physical status has important implications for palliative patients, their families, and the health care system. For example, if a person's physical status suggested a length of survival (LOS) of significantly more than two months, but they were unable to return home, extended care may be recommended instead of hospice. In this case, the palliative patient would be subjected to the stress of the transfer, would not receive ongoing expert palliative care, and would be required to assume some financial costs that would have been covered within hospice palliative care. On the other hand, with a median length of stay of 19.0 days and a mean of 36.3 days in an Edmonton hospice palliative care unit (RPCP, 2006); it can be very distressing for palliative patients and their families to be prematurely admitted to an environment where death occurs frequently.

Individuals referred to hospice commonly meet the following criteria: Reduced mobility, extensive disease, limited self care ability, reduced nutritional intake, variable levels of consciousness, unable to be managed at home, do not require acute or tertiary care in a hospital setting, and have an expected LOS of two months or less (RPCP, 2003). Most significantly, the first five parameters above are reflected within the Palliative Performance Scale (PPS). For this reason, palliative care consultants within the RPCP use the PPS as the primary tool for assessing placement. The RAH has utilized the PPS since its introduction in 1996 by Anderson, Downing, Hill, Casorso, and Lerch. While the relationship between the PPS score and LOS has been assumed, it has never been studied in palliative patients referred from an acute care hospital to a hospice palliative care unit.

Purpose of the Study

The purpose of this study was to examine the relationship between the PPS score at the time of referral to a hospice palliative care unit and LOS. This purpose was accomplished by comparing referral PPS scores of palliative cancer patients who lived less than 60 days and those who lived 60 days or greater. The population of interest is palliative cancer patients referred to a RPCP hospice palliative care unit in Edmonton by the RAH palliative care consultants.

Research Question

The research question for this study was, “What is the relationship between the referral palliative performance scale score and length of survival in palliative cancer patients referred to a hospice palliative care unit from an acute tertiary care hospital in Edmonton?”

Definition of Terms

For the purposes of this study, the following definitions were used:

1. Palliative cancer patient: An individual with a progressive incurable cancer diagnosis for whom the focus of care is comfort, not cure.
2. A hospice palliative care unit: A RPCP in-patient palliative care unit for palliative patients who cannot be managed at home and who do not require tertiary acute care within a hospital setting.
3. Length of survival (LOS): Days from the date of referral to a hospice palliative care unit to the date of death.
4. Age: Length of life in years from date of birth.
5. Gender: Male or female.
6. Cancer diagnosis: The type of cancer for which the person is being treated. The RPCP cancer diagnoses categories are as follows: Bone and connective tissue; breast; endocrine; eye, brain, and other central nervous system (CNS);

female genital; gastrointestinal; head and neck; hematology; male genital; melanoma; non-melanoma; respiratory; retroperitoneal, urinary tract; and cancer of unknown origin.

7. Palliative status: Those who were known to be palliative at the time of consult to the RAH Palliative Care Program will be labeled "yes" and all others will be labeled "no".

Organization of the Proposal

Chapter Two provides a discussion of the literature pertaining to prognostication in the context of palliative cancer patients and the PPS. Chapter Three outlines the methods used in this study. Study results are presented in Chapter Four with discussion of results in comparison with other study findings and study limitations discussed in Chapter Five. Implications for research, policy, and clinical practice are highlighted in Chapter Six.

Chapter 2: Literature Review

Palliative Performance Score and Survival of Palliative Cancer Patients

A comprehensive search of literature indexed in PubMed, MEDLINE (Ovid), CINAHL (Ovid), EMBASE (Ovid), and SCOPUS between the years of 1996, the year the PPS tool was first published, to 2007 was performed. The following search terms were used: Palliative Performance Scale, PPS, Karnofsky Performance Scale, KPS, performance status, functional status, palliative care, hospice care, prognosis, mortality, survival analysis, and length of survival. Additionally, references cited in relevant manuscripts were searched by hand. Studies were included if they discussed PPS scores in relation to survival of cancer patients or a combination of cancer and non-cancer patients. Studies regarding other prognostic indicators were excluded. Only 12 studies met the inclusion criteria. A brief overview of the 12 studies is shown in Table 1. All researchers listed in Table 1 reported a strong association between the PPS score and LOS. Lower PPS scores were associated with shorter survival and higher PPS scores were associated with longer LOS, but only five research groups specifically evaluated the prognostic value of the PPS as a predictor of mortality (Downing et al., 2006; Head, Ritchie, & Smoot, 2005; Harrold et al., 2005; Lau, Downing, Lesperance, Shaw, & Kuziemsky, 2006; and Olajide et al., 2007). Of the five research groups, one study by Downing et al. (2006) is a meta-analysis of the four other studies (Head et al., 2005; Harrold et al., 2005; Lau et al., 2006; & Olajide et al., 2007). An asterisk (*) in Table 1 indicates the studies analyzed by Downing et al. (2006).

Table 1

Studies Using the Palliative Performance Scale (PPS)

Study	Diagnosis	Setting	*N*
Anderson	Unknown	Canadian Acute Palliative Unit	213
Connor	Heterogeneous	American database of 13 hospice sites	1,306
Downing	Heterogeneous	Meta-analysis	1,808
*Harrold	Heterogeneous	American Multi-site	466
*Head	Heterogeneous	American Multi-site	396
*Lau	Heterogeneous	Canadian Acute/Residential Palliative Unit	733
Morita	Cancer	Japanese Palliative Unit	245
*Olajide	Heterogeneous	American Hospital Palliative Consult Team	261
Sanchez	Cancer	Spanish Home Care	98
Virik	Heterogeneous	Australian Specialist Palliative Unit	153[a]
Younis	Cancer	Cancer Centre and others to hospice	670
Younis	Cancer	From Cancer Centre to hospice program	180

Note. *Indicates studies included in Downing et al.'s (2006) meta-analysis.
[a] Indicates number of assessments on 139 subjects.

Through conducting their meta-analysis, Downing et al. (2006) found that each PPS level was associated with a distinct survival curve and that the lower the PPS score, the shorter the length of survival (see Table 2). Downing et al.'s (2006) findings differed from three other studies (Harrold et al., 2005; Head et al., 2005; & Morita, Tsunoda, Inoue, & Chihara, 1999) that categorized PPS scores into groups, likely due to small sizes. A cancer diagnosis and age did not have a significant effect on LOS (Downing et al, 2006). However, when cancer and gender were analyzed together, males had a shorter length of survival.

Table 2

Admission PPS Scores and Length of Survival (Downing et al., 2006)

PPS score category	Mean days	Median days
10%	8	2
20%	15	4
30%	39	13
40%	52	24
50%	72	37
60%	93	48
70%	134	78

Only four studies focused exclusively on cancer palliative patients (Morita et al., 1999; Sanchez et al., 2006; Younis et al., 2003; Younis et al., 2004). Seven studies focused on a heterogeneous population of cancer and/or non-cancer patients (Connor, Horn, Smout, & Gassaway, 2005; Downing et al., 2006; Harrold et al., 2005; Head et al., 2005; Lau et al., 2006; Olajide, 2007; & Virik & Glare, 2002). The diagnoses of patients within the study by Anderson et al. (1996) were not stated. The study conducted by Anderson and colleagues (1996) is included since it introduced the PPS as a tool for use in the context of palliative care and presented its role in prognosticating LOS.

There were a number of factors that made the studies noted in Table 1 not as useful as they might otherwise have been. The first factor was related to the PPS score used. All research groups, listed in Table 1, examined the relationship between length of survival and the admission PPS score, rather than the PPS score at the time of referral to a hospice palliative care unit. Admission PPS scores were variable, ranging from 10% in all 12 studies to the maximum of 100% in Sanchez et al.'s (2006) study. Although all 12 studies concluded that lower PPS scores were associated with decreased length of survival, median lengths of survival were variable. For example, the developers of the PPS tool, Anderson et al. (1996), found that a palliative patient dying on the acute palliative unit with an admitting PPS score of 10% lived an average of 1.88 days; whereas patients with an admitting PPS score of 50% lived a mean of 13.87 days. However, two patients admitted with the highest scores of 60% lived only an average of four days. Conversely, of the seven patients who had admission PPS scores of 70% and were discharged alive from the palliative care unit, the mean length of survival was 8.29 days, compared to the one patient with an admission PPS score of 20% who lived 26 days following discharge from the palliative care unit. No other predictor variables were explored in Anderson et al.'s (1996) study.

The second factor was related to the sample. While Head et al. (2005) recognized the importance of a change in the PPS score from admission to discharge as being significant, their sample included both cancer and non-cancer patients. Within their mixed sample, Head and colleagues found that stable PPS scores were more indicative of a longer prognosis, indicating that these patients may possibly be eligible for discharge from hospice care. Age, gender, and co-morbidities were not significant influences on length of survival, but it is important to note that 21% of patients were eliminated from Head et al.'s (2005) study because they had survived five days or less.

Lau et al. (2006) also studied a heterogeneous population (N=733). The applicability of the findings to my research question was further complicated by several factors. First, participants were admitted to an inpatient palliative care unit that included both tertiary and residential extended levels of care in British Columbia, Canada. Second, since multiple admissions were possible, LOS was calculated from the first admission date to the date of death. Age, gender, and diagnosis were included as predictors for survival. If the admission PPS score was lower, older age, and male gender were significant predictors of LOS. Diagnosis was not a predictor of LOS even when separated into non-cancer or cancer, likely because 88.3% of the total cohort had a cancer diagnosis. Within 60 days, 89% of the total cohort had deceased. Sixteen patients who lived greater than 365 days were excluded from the study. There were no patients with a PPS score greater than 60%.

While Olajide et al. (2007) also studied a heterogeneous sample, their setting was the most comparable to the RAH. Their study was conducted by a pain and symptom consultation team within an acute tertiary care hospital setting. The objective of the study conducted by Olajide et al. was to examine relationships between the PPS score, symptoms associated with distress, and length of survival. Patients were followed in hospital by the palliative team for a median of nine days, and then followed after discharge until the date of death or the end of the study. Initially, 310 patients were eligible for the study; however, only 277 consented to have their data evaluated. Because 22 patients were still living at the end of the 911 days of follow up, and some cases were missing data, the final analysis was conducted on a sample of 261 cases. Sixty percent of all study subjects had a non-specified cancer diagnosis. There was no discussion related to age, gender, and the type of cancer to length of survival. The median LOS was nine days with a range of zero days to 30 months and 83% of patients died by 90 days. Ninety two percent of PPS scores at the time of admission were between 10% and 40% with a range of scores from 10% to 80%. The admission PPS score category and four symptoms: Dyspnea, pain, fatigue, and agitated delirium were the independent variables. Only dyspnea had an independent effect on survival when the analysis was adjusted for the PPS score. In discussing the results of their study, Olajide et al. (2007) stated that a PPS score obtained at admission was an adequate predictor of length of survival. They stated that using a single PPS score was particularly important in an acute hospital setting where the environment is very busy and there is often a lack of time and/or the resources to evaluate repeat PPS measurements.

The third factor was related to the location of the palliative unit; Morita et al. (1999) conducted a prospective study on their Japanese palliative care unit, but it was unclear if this was a tertiary or hospice palliative unit. The studies by both Morita et al. (1999) and Virik and Glare (2002) were presented as letters in a peer-reviewed journal, rather than as a peer-reviewed manuscript, and thus the setting was not well described. The study population in Virik and Glare's (2002) study was the (153) PPS assessments completed on 139 patients. Some patients had repeat admissions. Both studies by Younis et al. (2003, 2004) were only available as abstracts. The setting and population were American cancer center patients being referred to hospice care as compared to cancer patients referred from other unspecified settings. Younis et al. (2004) reported that being male and having a low admission PPS score were associated with a short length of survival. The study by Connor et al. (2005) used the PPS score in describing the functional status of patients receiving hospice care at 13 different hospice sites throughout the United States; however, the settings were not described.

The fourth factor was related to the timing of the study. All of the 98 patients studied by Sanchez et al. (2006) were receiving home care in Spain. Two hundred and fifty evaluations were completed to determine which characteristics, signs, and symptoms classifying functional status could predict mortality. Functional status was defined using the PPS. A multivariate analysis revealed that an admission PPS score of 50% or less, a heart rate of 100 beats per minute or greater, and a respiratory rate of 24 per minute or greater were strongly associated with a short LOS. The type of cancer diagnosis or location of metastases were not significant. The influence of age and gender on length of survival was not discussed.

Summary of Literature Review

A review of the above studies shows some inconsistency between the findings. The difference in length of survival with individual PPS scores and associated predictor variables cannot be extrapolated to this study's population due to the factors identified above; the use of the admission rather than the referral PPS score, heterogeneous samples studied the location of palliative care, and the timing of the study. Olajide et al.'s (2007) referred to Morita et al.'s (1999) study inferring a single PPS assessment, collected at the time of admission, was sufficient as a predictor of survival. It is important to note, the median number of assessments done in Morita et al.'s (1999) study was two. Additionally, Head et al. (2005) showed that a change in PPS score between admission and discharge was also a significant predictor of survival. As well, Downing et al. (2006) recognized admission PPS scores as a limitation within their own study analysis; admission PPS scores may not recognize where patients are in their survival trajectory. This study attempts to address these issues. Since the Palliative Care Program at the RAH routinely reassesses the PPS from the time of the initial consultation and makes referrals on the basis of the most recent PPS score, rather than the admission PPS score, the analysis in this study is based on the referral PPS scores. Comparisons of the mean age, gender, cancer diagnosis, and palliative status on hospital admission between the two groups (those who survive less than 60 days and those who survive 60 days or greater) will assist in determining whether the addition of these data to prognostication equations could increase their accuracy.

Chapter 3: Methods

Research Design

A Level II, retrospective, descriptive, approach was used to conduct an analysis of an existing dataset. This approach enabled a comparison of the referral PPS scores of palliative cancer patients living less 60 days with those living 60 days or greater; with consideration of the impact of age, gender, cancer diagnosis, and palliative status on survival.

Sample and Setting

The sample for this study was comprised of all palliative cancer patients who:

1. Were at least 18 years of age at the time of referral from the RAH Palliative Care Program to one of 57 RPCP hospice palliative care beds available in the Capital Health Region, Alberta, Canada.
2. Had a documented PPS score at the time of referral.
3. Were referred by the RAH Palliative Care Program between March 1, 2002 and September 30, 2005.
4. Had a documented cancer diagnosis.
5. Had a documented date of death.
6. Agreed to be transferred to a hospice palliative care bed at the site of their choice when one became available.

Those less than 18 years of age were referred to the Pediatric Palliative Care Program at the Stollery Children's Hospital, and thus were not be included in this study. Excluded individuals also included those who were eligible for referral, but preferred a home discharge, those whose referring physician preferred that they remain in hospital, or those who were referred to non-hospice palliative care unit settings. Referrals to non-hospice palliative care units were made at the recommendation of the RAH Palliative Care Program and/or at the request of the patient and/or family.

Data Collection

With the assistance of the data manager for the RPCP, data was retrieved from the RPCP database for all palliative cancer patients referred to hospice by the RAH Palliative Care Program from March 1, 2002, the initiation of the full RPCP database system, to September 30, 2005, the latest date for a dataset in which all dates of death were known.

A copy of the data collection form is included in Appendix A. Patient charts were reviewed for the PPS score at the time of referral to a hospice palliative care unit. Both the subject's name and Personal Health Number were retrieved in order to facilitate chart retrieval. Additional variables collected included gender, age, cancer diagnosis, palliative status at the time of admission, referral PPS score, date of referral to hospice, and date of death.

Instrumentation

The Palliative Performance Scale (PPS) (see copy in Appendix B) was developed by a palliative care team in Victoria, British Columbia, Canada to monitor the changing physical status of palliative patients (Anderson et al., 1996). Originally developed in part to profile admissions and discharges to their palliative unit, it was thought that it could also aid in prognostication (Anderson et al., 1996). The PPS is appealing because it is simple and non-invasive. Unlike other prognostication tools such as the Palliative Prognostic Score (PaP) tool, developed by Pirovano et al. (1999), the PPS does not require invasive hematological testing and thus does not add to healthcare expenses.

The PPS is a modification of the Karnofsky Performance Scale (KPS) (Anderson et al., 1996). Glare and Christakis (2004) provide a helpful table of the comparisons between the KPS and PPS. Although the KPS has been used extensively since its development in 1948; it only considers ambulation, activity and extent of disease, and ability to do self care (Anderson et al., 1996; Glare & Christakis, 2004; Karnofsky, Abelmann, Craver & Burchenal, 1948). Thus, it is less inclusive than the PPS, which also assesses the amount of nutritional intake and the level of consciousness; factors Maltoni et al. (2005) found to be significant prognostic factors in advanced cancer patients with a length of survival of 90 days or less.

The PPS assesses a palliative patient's functional status in 11 categories measured in 10% increments. A score of 0% indicates death while a person with a score of 100% is considered to be fully independent and healthy. Within the different levels, five parameters are observed: Ambulation, ability to do activities and extent of disease, ability to do self care, food and fluid intake, and level of consciousness. The parameters such as ambulation are considered stronger indicators than level of consciousness. For example, a palliative patient may be drowsy at times, but overall still independently mobile. Specific descriptions of these variables are outlined in Appendix B. Although no testing of reliability and validity was noted by the original authors, the PPS was found to be a valid and reliable tool by Morita et al. (1999), Virik and Glare (2002), and Harrold et al. (2005) reported good inter-rater reliability.

Since the development of the original PPS, The Victoria Hospice Society, the palliative care program under which the PPS was developed, has released a letter noting only the revised second version of the PPS should now be used as it has more detailed descriptors and definitions to aid in a more objective assessment (see Appendix C). The revised PPS tool is currently undergoing validity and reliability testing by Ho et al. (2005). The data used in this study were collected using the original PPS tool up until 2001; thereafter, it is not clear which version of the PPS was used.

Data Analysis

All data were analyzed using version 15.0 of the Statistical Package for the Social Sciences (2006) computer software. Data pertaining to all variables were reported descriptively (mean, median, mode, standard deviation, and range). As conducted by Downing et al. (2006), a test of association using the Chi-square statistic was performed to describe the relationship between the referral PPS score and LOS in the two groups (survival of less than 60 days versus survival of 60 days or greater). All results using Chi-square analysis were considered significant if the probability (*p*) was less than or equal to .05. To complete Chi-square analysis, five or more cases are required. Since only one patient had a PPS score of 70%, the patient's data was recoded and added to the data for patients who had a PPS score of 60%. Additionally, Spearman rank correlation coefficient (Spearman's rho) was used to assess the correlation between the referral PPS score and LOS. The length of survival for each PPS score was also analyzed descriptively (mean, median, mode, standard deviation, range, and frequency). Lastly, independent *t*-tests, not assuming equal variances, were performed on each group of PPS scores between the two survival groups less than 60 days and 60 days or greater.

Unpaired independent *t*-tests, not assuming equal variances, were used to compare means for each demographic variable (age, gender, cancer diagnosis, and palliative status) for those patients living less than 60 days and those living 60 days and greater. Chi-square analysis was also used to assess relationships between gender and survival, cancer diagnosis and survival, and palliative status and survival.

Ethical Considerations

This study was conducted under the auspices of the ethical clearance issued for the study entitled, "Use of the Palliative Performance Scale to understand survival patterns of terminally ill patients." Ethical clearance was granted by the University of Alberta Health Review Ethics Board, Panel B, at the University of Alberta to Mr. Hue Quan, the principal investigator, on December 21, 2006. An amendment requesting permission for the researcher to have access to the data required for this study was obtained. Additionally, letters of support and permission to conduct the study were obtained from RPCP and the RAH administration directors.

It is important to note no direct patient contact was made. All information was and will be treated confidentially, and will only be available to individuals directly related to the study. All data collected has been and will remain kept in a locked cabinet. Once the study is finished, the Personal Health Information numbers will be removed and the data will be made available for educational purposes to colleagues teaching within the Department of Oncology and the Faculty of Nursing at the University of Alberta.

Chapter 4: Results

General Findings

The sample in this study consisted of 406 subjects identified by the RPCP* data manager as being referred to a hospice palliative care unit in Edmonton from the RAH Palliative Care Program between March 1, 2002 and September 30, 2005; 14 subjects were missing referral PPS scores, leaving a total of 392 evaluable cases. The six variables studied were: Gender, age, cancer diagnosis, palliative status at time of hospital admission, length of survival in days from date of referral to hospice to date of death, and referral PPS score. Of these six variables received, there were no missing data. The range in referral PPS scores was 10% to 70%. One subject with a referral PPS score of 70% was recoded to 60% because of a concern of possible subjectiveness at the time of hospice assessment.

Subjects

Overall Patient Characteristics

All 392 patients captured in this study had documented dates of death. The age characteristics of all palliative cancer patients referred to hospice during the study's time frame are depicted in Table 3 and Figure 1. Of the 392 patients referred to hospice, the range of age was from 40 to 97 years of age. The mean age was 74.3 years, the median 76.0 years, the mode 72.0 years, and the standard deviation 11.7.

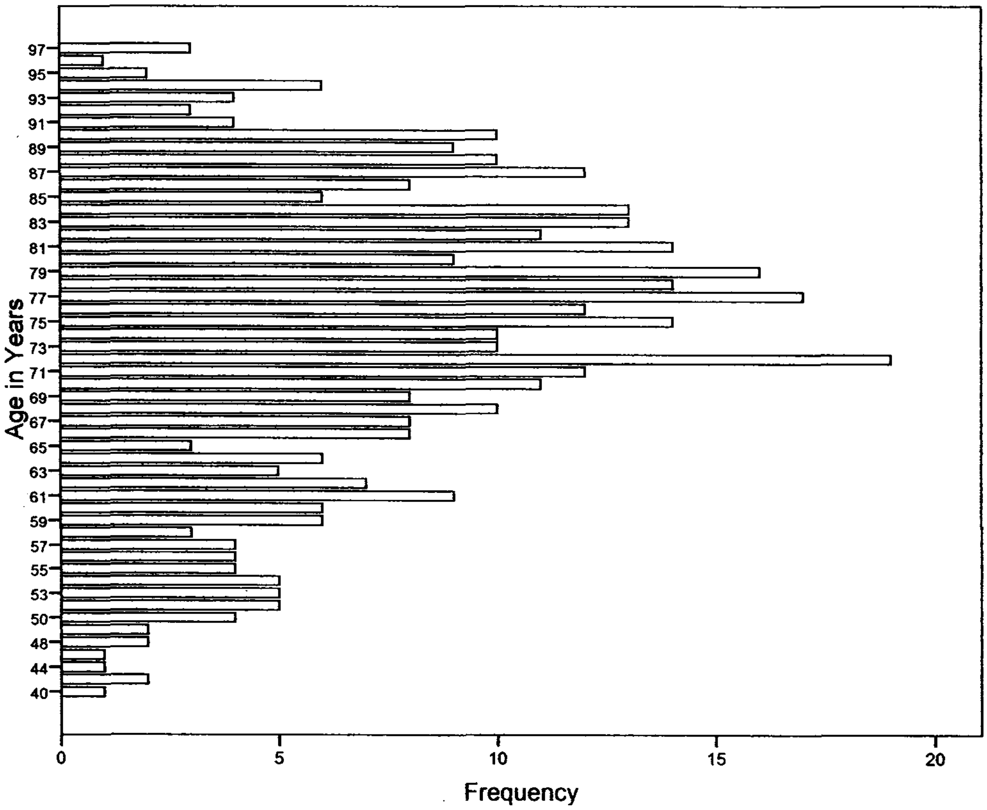
Table 3

Age of Subjects (N = 392)

	Age in Years
Mean	74.3
Median	76.0
Mode	72.0
Range	40 – 97
Standard Deviation	11.7

Figure 1

Age of Subjects (N =392)



Of the 392 subjects, 207 or 52.8% were male, while 185 or 47.2% were female (see Table 4). A total of 168 or 42.9% of the 392 subjects were not known to have been diagnosed as palliative at the time of their hospital admission. Conversely, 57.1% or 224 patients were known to be palliative (see Table 5).

Table 4

Gender of Subjects (N = 392)

	Percentage	Frequency
Male	52.8%	207
Female	47.2%	185

Table 5

Palliative Status of Subjects (N = 392)

	Percentage	Frequency
Yes	57.1%	224
No	42.9%	168

The most common cancer diagnosis was gastrointestinal at 32.1%, followed by respiratory at 26.5%, cancer of unknown origin at 10.7%, female genital at 6.6%, and male genital at 5.1%. Table 6 summarizes all cancer diagnoses by frequency of occurrence and percentage. Figure 2 depicts the frequency of various cancer diagnoses in this study's population.

Figure 2

Cancer Diagnoses of Subjects (N = 392)

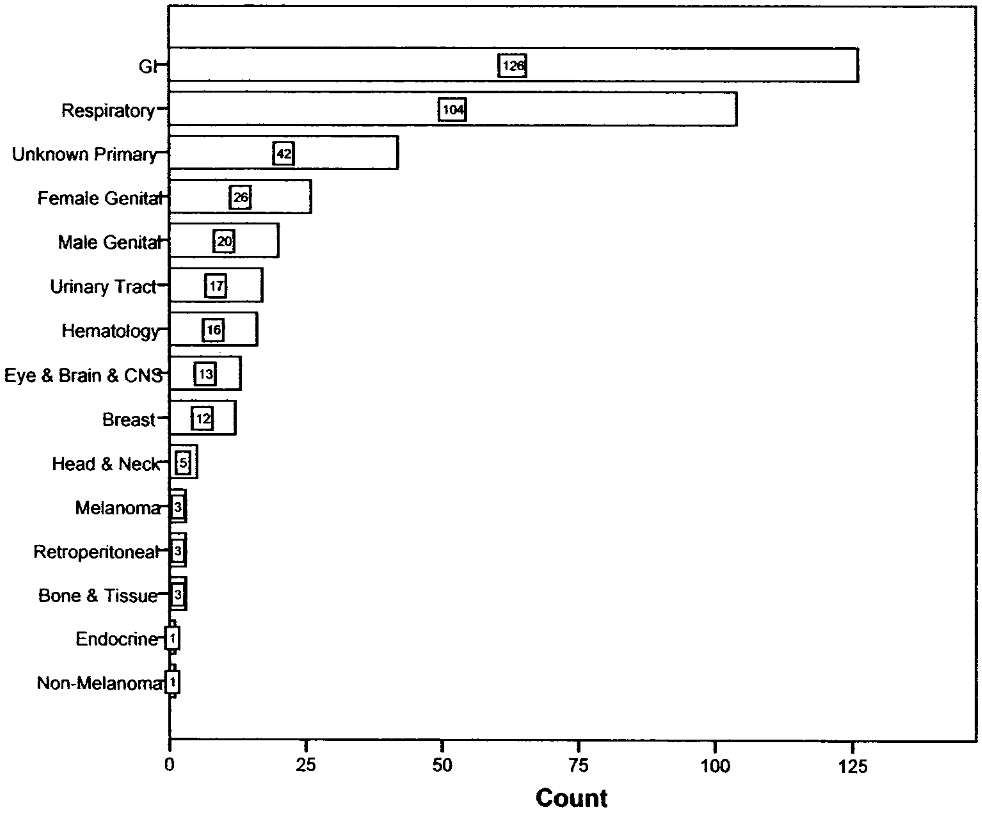


Table 6

Cancer Diagnoses of Subjects (N = 392)

Diagnosis	Percentage	Frequency
Gastrointestinal	32.1%	126
Respiratory	26.5%	104
Unknown primary	10.7%	42
Female genital	6.6%	26
Male genital	5.1%	20
Urinary tract	4.3%	17
Hematology	4.1%	16
Eye, brain and CNS	3.3%	13
Breast	3.1%	12
Head and neck	1.3%	5
Bone and tissue	0.8%	3
Melanoma	0.8%	3
Retroperitoneal	0.8%	3
Endocrine	0.3%	1
Non-melanoma	0.3%	1

With the range of referral PPS scores being 10% to 60%, the mean referral PPS score was 37.8 and median of 40. As depicted in Table 7 and Figure 3, the most common referral PPS score was 40% (n = 159 or 40.6% of subjects) followed by 30% (n = 92 or 23.5%), 50% (n = 73 or 18.6%), 20% (n = 28 or 7.1%), 60% (n = 22 or 5.6%), and 10% (n = 18 or 4.6%).

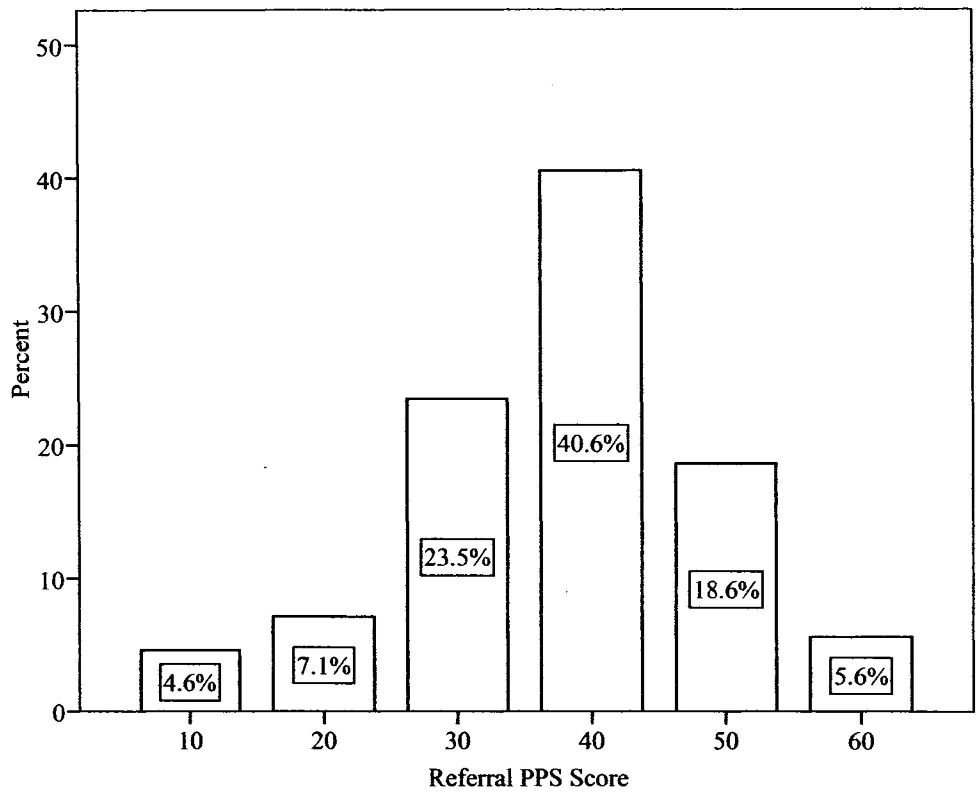
Table 7

Referral PPS Scores of Subjects (N = 392)

PPS Score	Percentage	Frequency
10	4.6%	18
20	7.1%	28
30	23.5%	92
40	40.6%	159
50	18.6%	73
60	5.6%	22

Figure 3

Referral PPS Scores (N = 392)



The mean length of survival from date of referral to date of death was 40.0 days, with a median of 19.0 days, mode of six days, and standard deviation of 70.5. As some subjects did not live a full day, the range was zero to 789 days (see Table 9 and Figure 4). Patients with a referral PPS score of 10% lived a mean of 6.5 days; a score of 20% lived 5.5 days; a score of 30% lived 11.0 days; a score of 40% lived 21.0 days; a score of 50% lived 35.0 days; and a score of 60% lived a mean of 50.5 days. Among all 392 patients, 326 or 83.2% died in less than 60 days. The remaining 66 patients or 16.8% died after 60 days (see Table 8).

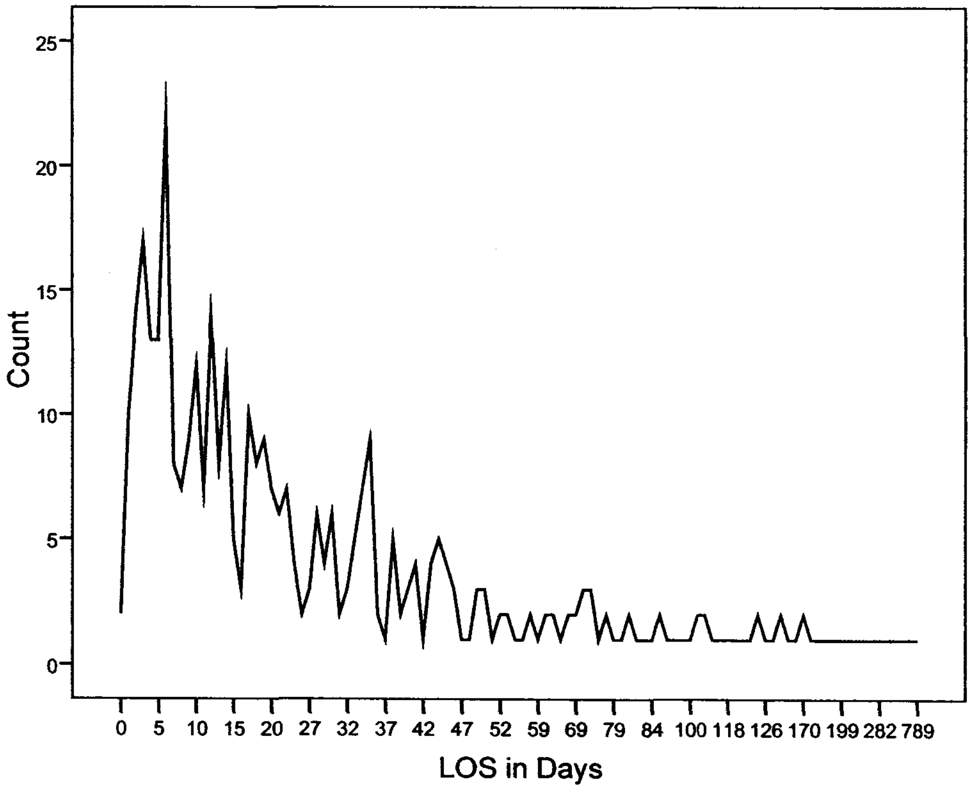
Table 8

Comparison of Subjects and Length of Survival in Days (N = 392)

	Less than 60 days	60 days or greater
Percentage	83.2%	16.6%
Frequency	326	66

Figure 4

Range in Length of Survival (N = 392)



Mean: 40 days Median: 19 days Mode: 6 days

Table 9

Length of Survival (in days)

Subjects	Mean	Median	Mode	Range	Standard deviation
Total (*N* = 392)	40.0	19.0	6.0	0 – 789	70.5
LOS < 60 days (*n* =326)	18.8	14.0	1.0 [a]	0 - 59	117.2
LOS ≥ 60 days (*n* = 66)	145.0	105.5	9.0 [a]	62 - 789	113.6

Note. a Indicates multiple modes exist. The smallest value is shown.

Research Questions

Relationship of Referral PPS Score to Length of Survival

The relationship between the referral PPS scores of palliative cancer patients referred to a hospice palliative care unit by the RAH Palliative Care Program and LOS was examined using Chi-square analysis. There was a significant difference in the proportion of those patients living less than 60 days and those patients who lived 60 days or greater, ($\chi^2(df = 1) = 24.009, p < .000$). Additionally, the correlation between the referral PPS score and LOS was significant with the Spearman rank correlation coefficient equal to .424 ($p < .000$).

Table 10 and Figure 5 depict the unusual distribution across the six referral PPS score groupings for the 83.2% or 326 of subjects living less than 60 days and the 16.8% or 66 patients that lived 60 days or greater. There were no subjects with a referral PPS score of 10% who lived 60 days or more. Only one subject from a total of 28 with a referral PPS score of 20% lived more than 60 days. Of the 92 subjects with a referral PPS score of 30%, the majority died in less than 60 days (n = 83 or 90.2%). The most frequent referral PPS score of 40% had 159 subjects with 82.4% (n = 131) living less than 60 days. Of the 73 subjects with a referral PPS score of 50%, 74.0% (n = 54) lived less than 60 days. Finally, there were 22 subjects with a 60% referral PPS score of which 59.1% (n = 13) lived greater than 60 days.

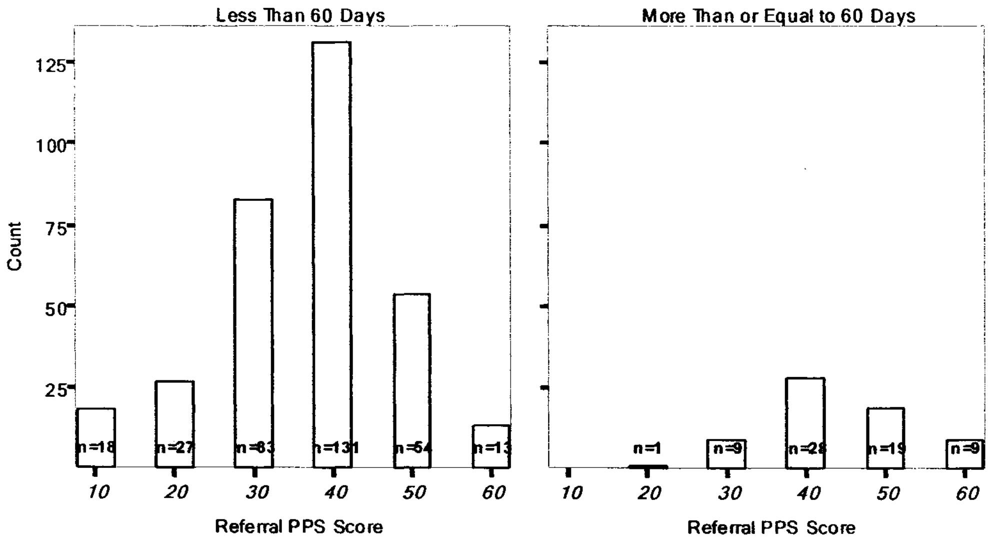
Table 10

Referral PPS Score and Length of Survival (N = 392)

Referral PPS score	Less than 60 days *n* = 326	60 days or greater *n* = 66	Independent *t* test *p* value
10%	100% (n = 18)	0% (n = 0)	
20%	96.4% (n = 27)	3.6% (n = 1)	< .000
30%	90.2% (n = 83)	9.8% (n = 9)	.006
40%	82.4% (n = 131)	17.6% (n = 28)	< .000
50%	74% (n = 54)	26.0% (n = 19)	.001
60%	59.1% (n = 13)	40.9% (n = 9)	.023

Figure 5

Referral PPS Scores and Length of Survival (N = 392)



Mean referral PPS score: 36.6

Mean referral PPS score: 43.9

For those subjects living less than 60 days the mean referral PPS score was 36.6 and the median and mode were 40.0. In comparison, although the population was smaller, the average referral PPS scores of subjects living 60 days or greater was higher at 43.9, a smaller standard deviation of 9.4, with the same median of 40.0 and mode of 40 (see Table 11).

Table 11

Descriptive Characteristics of Referral PPS Scores

Subjects	Mean	Median	Mode	Range	Standard deviation
Total (*N* = 392)	37.8	40.0	40.0	10 – 60	11.4
LOS < 60 days (*n* =326)	36.6	40.0	40.0	10 – 60	11.4
LOS ≥ 60 days (*n* = 66)	43.9	40.0	40.0	20 -60	9.4

Referral PPS Score to Length of Survival

Table 12 presents the mean LOS for all subjects, those that lived less than 60 days, and those that lived 60 days or more. A more detailed presentation of the descriptive characteristics of patients living less than 60 days to those living 60 days or greater is presented in Table 13. Independent *t*-tests were performed to test for level of significance when comparing the means of referral PPS scores between those subjects who died in less than 60 days and those who died 60 days or greater. All results were found to be highly significant, not assuming equal variances (see Table 10). When comparing the 326 patients living less than 60 days to those 66 subjects living 60 days or greater the mean was 18.8 days versus 145.0 days with a standard deviation of 15.0 days to 123.6 days, ($t(390) = -17.9$, $p <.000$). All patients with a referral PPS score of 10% died in less than 60 days ($M = 10.9$, SD = 10.6). There were 27 patients with a referral PPS score of 20%

that died in less than 60 days and one patient who died at 122.0 days. For the 27 patients dying in less than 60 days the mean LOS was 12.6 days (SD = 16.4 days), ($t(26) = -6.5, p <.000$). Eighty three patients died in less than 60 days ($M = 13.0, SD = 11.7$), with a PPS score of 30% and nine patients died greater than 60 days ($M = 170.4, SD = 128.7$), ($t(8.0) = -3.7, p = .006$). With a 40% PPS score there were 131 patients ($M = 20.6, SD = 14.4$) who died in less than 60 days compared to 28 patients ($M = 106.8, SD = 47.4$) living greater than 60 days, ($t(28.1) = -9.5, p < .000$). Fifty four patients ($M = 26.0, SD = 15.3$) with a 50% PPS score died in less than 60 days compared to 19 patients ($M = 178.1, SD = 174.4$) dying greater than 60 days, ($t(18.1) = -3.8, p = .001$). For those 13 patients who died in less than 60 days the mean LOS was 30.6 days (SD = 16.7 days) compared to the nine patients who lived 60 days or greater having a mean of 171.2 days (SD = 150.0 days), ($t(8.1) = -2.8, p = .023$). Table 13 summarizes the descriptive characteristics of referral PPS scores to the two LOS groups.

Table 12

Comparison of Referral PPS Scores and Mean Length of Survival (in days)

PPS Score	N = 392	n = 326	n = 66
		< 60 days LOS	≥ 60 days LOS
10%	6.5	10.9	
20%	5.5	12.6	122.0
30%	11.0	13.0	170.4
40%	21.0	20.6	106.8
50%	35.0	26.0	178.1
60%	50.0	30.6	171.2
Total	40.0	18.8	145.0

Table 13

Referral PPS Scores in Two Length of Survival (in days) Groups

Subjects	PPS score	*n*	Mean LOS	Median LOS	Mode LOS	Range LOS	Standard Deviation
<60 days	10%	18	10.9	6.5	14.0	0 – 38	10.6
LOS	20%	27	12.6	5.0	1.0[a]	0 – 59	16.4
	30%	83	13.0	10.0	2.0	1 – 58	11.7
	40%	131	20.6	18.0	6.0	1 – 55	14.4
	50%	54	26.0	22.0	10.0[a]	1 – 58	15.3
	60%	13	30.6	34.0	17.0[a]	3 – 54	16.7
Total		326	18.8	14.0	6.0	0 - 59	15.0
≥60 days	10%	0					
LOS	20%	1	122.0	122.0	122.0		
	30%	9	170.4	125.0	90.0[a]	68–464	128.7
	40%	28	106.8	81.5	64.0[a]	62–224	47.4
	50%	19	178.1	119.0	62.0[a]	62–789	174.4
	60%	9	171.2	146.0	68.0[a]	68–552	150.0
Total		66	145.0	105.5	73.0[a]	62-789	123.6

Note. a Indicates multiple modes exist. The smallest value is shown.

Age and Length of Survival

In the group of 326 subjects who lived less than 60 days, the mean age was 73.6 years, mode 79.0 years, median 75.0 years, standard deviation 11.7, and the range was 40 to 97 years of age. Surprisingly, the 66 subjects who lived 60 days or greater were older in age with a mean of 77.8 years, median 77.5 years, standard deviation of 11.5, range of 50 to 97 years, and a mode of 90 years. A comparison of means using an independent t-test with 95% confidence intervals confirmed this finding ($t(390) = -2.676, p = .008$ (two tailed)). Table 14 depicts a summary of these findings.

Table 14

Comparison of Age of Subjects in Two Lengths of Survival Groups (in years)

	Less than 60 days (n = 326)	60 days or greater (n = 66)
Mean	73.6	77.8
Median	75.0	77.5
Mode	79.0	90.0
Range	40 – 97	50 -97
Standard deviation	11.7	11.5

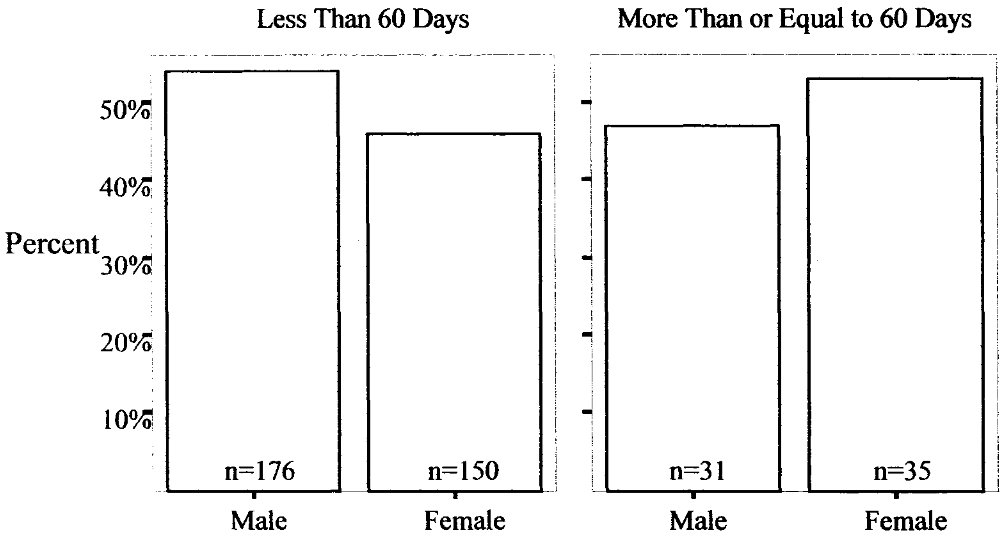
$p = .008$

Gender and Length of Survival

With 207 men and 185 women making up the total cohort of 392, 176 or 85% of men lived less than 60 days and 31 or 15.0% lived greater than 60 days. There were 150 or 81.1% of women who lived less than 60 days and 35 or 18.9% who lived 60 days or greater. The results suggest that women are more likely to live greater than 60 days; however, using Chi-square analysis, this is not statistically significant finding with $\chi^2(1, N = 392) = 1.085$, $p = .298$. Figure 6 depicts the summary of these results.

Figure 6

Comparison of Gender in Two Lengths of Survival Groups (N = 392) [$p = .298$]



Cancer Diagnosis and Length of Survival

The five most frequently occurring cancer diagnoses in the 326 patients who lived less than 60 days are as follows (percentage in parentheses): 106 with gastrointestinal (32.5%), 88 with respiratory (27.0%), 39 with an unknown primary carcinoma (12.0%), 18 with female genital (5.5%), 16 with urinary tract (4.9%) and 16 with male genital (4.9%). There were 20 of the 66 subjects who lived 60 days or greater that had gastrointestinal cancer (30.3%) followed by 16 with respiratory (24.2%), 8 with female genital (12.1%), 5 with eye, brain, or CNS (7.6%), and hematological and male genital each had 4 subjects (6.1%).

Figures 7 and 8 summarize the percentage of all cancer diagnoses within the two LOS groups. Statistically, considering the small sample size of those subjects living 60 days or greater was 66 compared to 326 subjects living less than 60 days, the cancer diagnosis was not significant to LOS, (χ^2 (14, N = 326) = 15.581, p = .340).

Figure 7

Cancer Diagnoses in Subjects Living Less than 60 Days (n = 326)

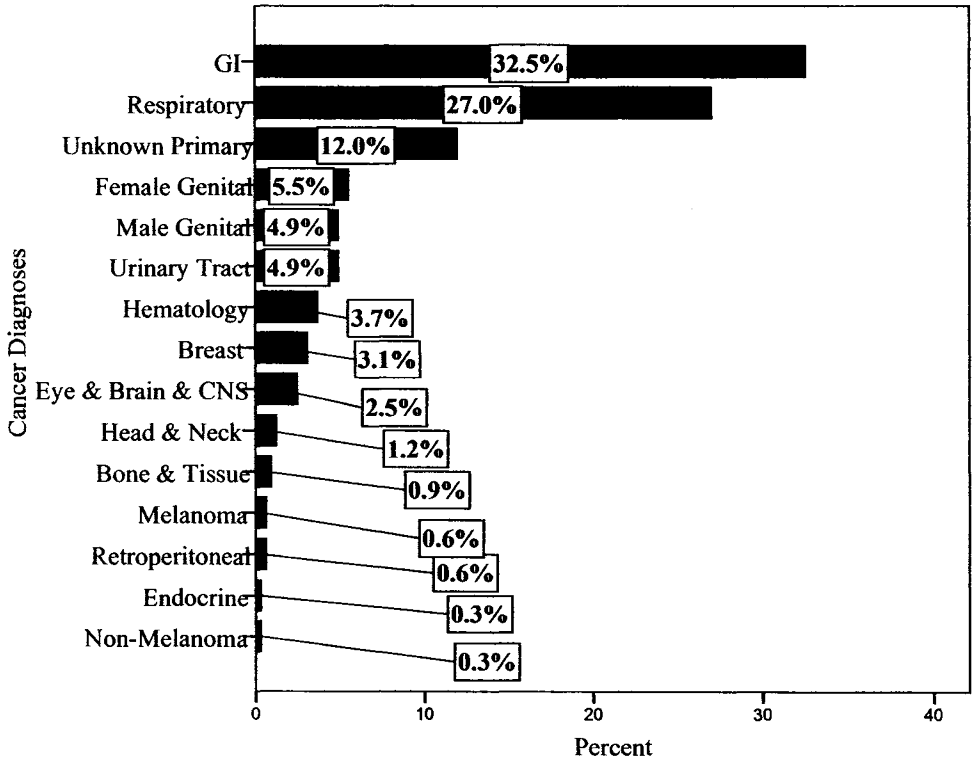
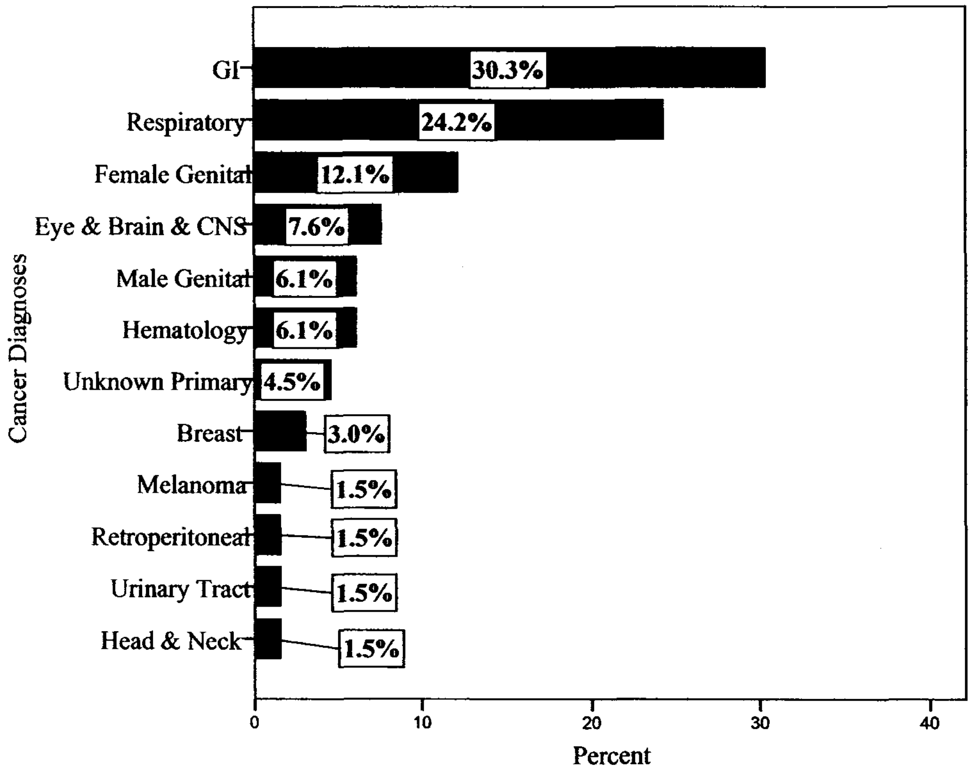


Figure 8

Cancer Diagnoses of Subjects Living 60 Days or Greater (n = 66)

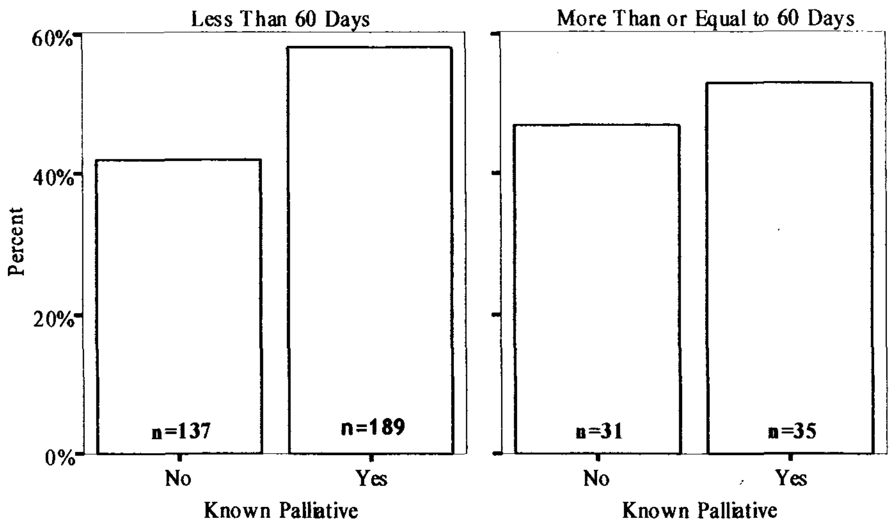


Known Palliative Status and Length of Survival

Chi-square analysis was performed to examine the relationship between palliative status and LOS. The relationship between these two variables was not significant, (χ^2 (df = 1) = .548, p = *.459).* Having been known to be palliative versus just being diagnosed as palliative prior to the RAH Palliative Care Program consultation did not statistically affect LOS. Figure 9 depicts a summary of this finding.

Figure 9

Known Palliative Status and Length of Survival (N = 392)[p = .459]



Conclusion

Between March 1, 2002 and September 30, 2005 there were 406 patients referred by the RAH Palliative Care Program to one of the RPCP hospice palliative care units. With 14 subjects missing referral PPS scores, there was a total of 392 cases with 100% complete data. A Chi-square analysis found a significant relationship between the referral PPS score and LOS, $\chi^2(5, N = 392) = 24.009$, $p < .000$, and using the Spearman rank correlation coefficient, the correlation between PPS score and LOS was positive and significant ($r_s = .424$, $p < .000$). These findings show a strong association between length of survival (less than 60 days compared to 60 days or more) and PPS score in this study population with an unusual distribution of PPS scores between 10% and 60% groupings. The correlation between the two survival groups (less than 60 days to

60 days or greater), indicates those patients with a lower PPS score are more likely to have a shorter LOS than those patients with higher PPS scores. When comparing the demographic variables (age, gender, cancer diagnosis, and palliative status) between the two survival groups, only age was found to be a significant finding. A comparison of means using an independent t-test revealed older people lived statistically longer those of younger age ($t(390) = -2.676$, $p = .008$). There were more women who lived greater than 60 days; however, using Chi-square analysis, this was not a statistically significant finding with $\chi^2(1, N = 392) = 1.085, p = .298$. In both LOS groups, gastrointestinal cancer occurred most frequently. Cancer diagnosis was not significantly associated with LOS (χ^2 (df = 14) = 15.581, $p = .340$). Of the 392 subjects, 57.1% or 224 who were known to be palliative, 84.4% or 189 died within 60 days of being referred to a hospice palliative care unit. Chi-square analysis found no statistical difference, ($\chi^2 (1, N = 392) = .548, p = .459$), when comparing the two LOS groups with known versus unknown palliative status.

Chapter 5: Discussion

This study addressed a gap in knowledge about the PPS by examining the strength of its association with LOS in palliative cancer patients referred to a hospice palliative care unit from an acute tertiary care hospital setting, the RAH. In this chapter the findings of this study are discussed in relation to existing knowledge in more detail.

General Findings

The RPCP data manager provided a list of 406 subjects who were referred by the RAH Palliative Care Program to a RPCP hospice palliative care unit between March 1, 2002 and September 30, 2005. There were 14 subjects without a documented referral PPS score leaving the study total of 392 patients having 100% complete data for all the following variables examined: Gender, age, cancer diagnosis, palliative status, a hospice palliative care unit referral date, and a documented date of death. With a complete dataset, LOS was calculated for the total population. Length of survival was then divided into those patients living less than 60 days and subjects living 60 days or greater. A comparison of the two survival groups was then performed including a comparison of referral PPS scores to LOS, age, gender, cancer diagnosis, and palliative status. There was a significant relationship between the referral PPS score and LOS as well as age in the two survival groups. However, there was no significant statistical relationship between gender, cancer diagnosis, or palliative status between the two survival groups.

Comparison of All PPS Studies Related to Survival

It is somewhat difficult to compare this study's results to those listed previously in Table 1. This is the only known Canadian study examining the relationship of the referral PPS score and LOS in palliative cancer patients referred to an inpatient hospice palliative care unit by an acute tertiary care hospital palliative consultation team. All studies listed in Table 1 used admission PPS scores when investigating the PPS tool's role in prognosticating LOS. PPS scores were variable ranging from 0% to 100%. This study used the referral PPS score with a range in scores between 10% and 60% including one subject with a PPS score of 70% reclassified as 60%. The median LOS was also variable throughout the studies, including Harrold et al.'s (2005) study not providing the median LOS to compare with. When comparing PPS scores and LOS, some studies did not analyze PPS score categories independently; categories were combined when small sample sizes existed. As noted in Table 1, study populations were variable. Finally, of those studies listed in Table 1, not all variables investigated in this study were examined

Setting Characteristics within PPS Studies

This is the only known Canadian study examining the relationship of the referral PPS score and LOS in palliative cancer patients referred to an inpatient hospice palliative care unit by an acute tertiary care hospital palliative consultation team. All the 12 studies noted in Table 1, four of which are included in the meta-analysis by Downing et al. (2006), conducted their studies in various settings. The setting of the study conducted by Olajide et al. (2007) is the most comparable setting to this study; both being located in acute tertiary care teaching hospital settings. However, there are still some variances that may explain differences in findings between this project and the study conducted by Olajide et al. First, Olajide et al.'s (2007) hospital is located in the United States with a different healthcare setting than Canada's. Second, although Olajide et al. (2007) refer to themselves as a palliative care consultative service, their program is actually a Pain and Symptom Consult Service. Thus, it is difficult to know if Olajide et al. (2007) are the referral source in their centre for access to hospice palliative care as is the RAH Palliative Care Program.

Age Characteristics within PPS Studies

Whereas this study found those subjects living 60 days or greater were significantly older than those living less than 60 days, Lau et al. (2006) found the opposite. Using the Cox Proportional Hazards Model, patients in the age category of 45 to 64 years old had significantly lower hazards than patients aged 85 or older ($p = .002$) (Lau et al., 2006). Downing et al. (2006), Sanchez et al. (2006), and Harrold et al. (2005) were the only other researchers who studied age as a predictor of mortality. All did not find age to be a significant predictor of LOS. However, Virik and Glare (2002) found that the admission PPS score was a significant predictor of mortality irrespective of other variables, but they did not specify which variables were studied. Table 15 summarizes the age findings in the PPS studies. The differences in age ranges likely reflect the study setting. For example, Harrold et al. (2005) and Connor et al. (2006) include nursing home facilities. Olajide et al.'s (2007) population was the youngest.

Their young population may be related to the need for patients or their caregiver needing to consent to participating in their detailed prospective study versus a retrospective chart review.

Table 15

Comparison of Subject Ages in PPS Studies

Study	*N*	Mean	Median	Range	Standard Deviation	*p* Value
Anderson	213					
Connor	1,303	78.7	81.0	22 - 103	13.0	
Downing	1,808					.746
Head	396	72.2			13.0	
Harrold	466	78.0				.7949
Lau	733	70.3	73.0			.002[a]
Morita	245	67.0			13.0	
Olajide	261	64.0			15.6	
Sanchez	98	72.0		35 - 94	12.1	
Sawchuk	392	74.3	76.0	40 - 97	11.7	.008[b]
Virik	139					
Younis	180 & 670					

Note. [a]Indicates younger age decreased LOS
[b]Indicates older age increased LOS

Gender Characteristics of Subjects within PPS Studies

Gender was discussed in nine studies. In keeping with Head et al. (2005) and Sanchez et al. (2006) this study did not find gender to be significantly associated with LOS. A summary of those studies is presented in Table 16. Sanchez et al.'s (2006) study had the highest proportion of males. This finding may reflect their home care study setting, with females possibly being the primary caregivers. The remaining studies were fairly equally divided between male and female. Of those researchers that investigated the influence of gender on mortality, males were found to die sooner than females by Lau et al. (2006) and Younis et al. (2004).

Table 16

Comparison of Gender in PPS Studies

Study	*N*	Male	Female	*p* Value
Connor	1,303	41.4%	58.6%	
Downing	1,808	45.4%	54.6%	
Head	396	46.0%	54.0%	.2061
Harrold	466	46.0%	54.0%	
Lau	733	45.7%	54.3%	.026
Morita	245	55.0%	45.0%	
Olajide	261	42.0%	58.0%	
Sanchez	98	61.0%	39.0%	
Sawchuk	392	52.8%	47.2%	.298
Younis	180			.01

Cancer Characteristics within PPS Studies

Although both studies by Younis et al. (2003, 2004) refer to a specific palliative cancer population, the only two studies comparable to this study were by Sanchez et al. (2006) and Morita et al. (1999). Both these studies reported similar rates of occurrence of specific cancer diagnoses to this study with gastrointestinal and lung cancer being the most frequently occurring. Sanchez et al. (2006) confirmed this study's findings cancer diagnosis was not found to be a significant influence on LOS. Sanchez et al. (2006) found the presence and location of metastases were independent of survival. Downing et al. (2006) noted that the range of diagnoses made it difficult to distinguish between cancer and non-cancer, and were only able to conclude cancer was a non-significant predictor of mortality.

Palliative Status within PPS Studies

Only this study specifically addressed palliative status at the time of assessing palliative cancer patients. The other studies (as listed in Table 1) described their patients as palliative; however, definitions of palliative were not consistently defined.

Comparison of Admission PPS Scores

Table 17 compares the admission PPS scores in those studies described in Table 1. Younis et al. (2003, 2004) were not included as data were limited in their abstract presentation. Once again, it is important to remember that the PPS scores in this study were obtained at time of referral rather than at the time of admission, and thus there is little data available to compare to this study.

Nevertheless, the PPS scores obtained in this study are similar to the scores reported on admission by others.

Table 17

Comparison of Studies' Admission PPS Scores

Study	Mean	Median	Mode	Range	Standard deviation
Anderson				10 - 70	
[a]Connor	36.1	40		10 - 90	14.9
Downing				10 - 70	
*Harrold	38.0			10 - 70	13.5
*Head	38.9			10 - 70	10.3
*Lau				10 - 60	
Morita				10 - 90	
*Olajide				10 – 80	
Sanchez				10 - 100	
Sawchuk (N = 392)	37.8	40		10 - 70	11.4
Sawchuk (n = 326) < 60 day LOS	36.6	40		10 - 70	11.4
Sawchuk (n = 66) ≥ 60 day LOS	43.9	40		20 - 60	9.4
Virik				10 - 70	

Note. *Indicates studies included in Downing et al.'s (2006) meta-analysis.
[a]Indicates a review of databases

Comparison of Studies' Subjects in each PPS Level

This study's finding regarding the most frequent PPS score (40% followed by 30%) is in keeping with the majority of the other studies (see Table 18). The findings from the study conducted by Olajide et al. (2007) were the most different. They reported that 92% of their subjects had PPS scores 10% to 40%. In comparing their study to others, Olajide et al. (2007) reported that these scores were reflective of the types of patients referred to their service, a Pain and Symptom Consult Service.

The findings from the study conducted by Head et al. (2005) were difficult to compare to this study because the standard incremental categories of the PPS were combined further, due to the small sample size. It is not surprising the majority of Sanchez et al.'s (2006) subjects had a PPS score of 50%, as they were from a community based setting.

Table 18

Number of Subjects in each PPS Level (Frequency in Percentage)

PPS score	Anderson N = 213	Head N = 396	Lau N = 733	Morita N=245*	Olajide N=261	Sanchez N = 98	Sawchuk N = 392	Virik N= 153*
10%	7.5%	7.3%[a]	9.0%	7.1%	24.0%	3.1%	4.6%	7.2%
20%	12.7%		12.2%	14.0%	29.0%	3.1%	7.1%	11.8%
30%	21.1%	27.8%	29.7%	19.0%	25.0%	6.1%	23.5%	32.0%
40%	27.7%	37.6%	30.7%	25.0%	14.0%	19.4%	40.6%	24.8%
50%	18.8%	22.7%	16.1%	16.0%	3.7%	32.7%	18.6%	15.0%
60%	4.2%	4.5%[b]	2.3%	7.8%	1.7%	18.4%	5.6%	7.2%
70%	3.3%			9.4%	1.7%	12.2%		1.3%
80%					1.0%			

Note. *Iindicates assessments not individual subjects
[a]Indicates combined PPS score groups of 10% and 20%
[b]Indicates combined PPS score groups of 60% and 70%

Comparison of Length of Survival

As observed in Table 19, the overall length of survival was variable across studies. This study found the mean length of survival to be 40.0 days, a median of 10.9 days, and a range of zero to 789 days. It is likely that Head et al.'s (2005) length of survival findings were influenced by their decision to exclude individuals living five days or less (21% of their total sample). The length of survival in the study conducted by Sanchez et al. (2006) would be expected to be longer due to their community setting. The findings by Connor et al. (2005) are in keeping with their reference to the fact that most American patients referred to a hospice have a short, 24 day, mean length of survival. This finding by Connor et al. may also reflect the American healthcare system approach regarding the attachment of cost to care with a specific prognosis. Although Lau et al.'s (2006) study is Canadian; their setting differs from the setting of this study, as it was a combined tertiary acute palliative care unit and residential care unit. With tertiary level care, the objective is for symptom management and a timely discharge.

Table 19

Comparison of Studies' Length of Survival (in days)

Study	(*N*)	Mean	Median	Range	Standard deviation
Connor	(1,303)	25.2	12.0	1 - 282	35.2
Head	(396)	54.4	28.0		71.8
Lau	(733)	27.0	10.0	0 - 348	
Olajide	(261)		9.0	0 – 911	
Sanchez	(98)	42.4	32.0	1 - 213	
Sawchuk	(392)	40.0	19.0	0 - 789	70.5
Virik	(153)		9.0	0 - 204	

This study found 83.2% of all patients referred to hospice died before 60 days had elapsed and 90.1% died by 90 days. These findings are slightly different from those of Lau et al. (2006), who found that 89% of their patients died before 60 days and 94% had died by 90 days. This difference may be reflective of the acute nature of Lau et al.'s (2006) patients on the tertiary unit. An interesting finding of comparison was that of this study to the work completed by Olajide et al. (2007). Although Olajide et al. (2007) had a shorter median LOS of 9 days compared to 19 days in this study; the range in LOS in this study was smaller than that of Olajide et al. (2007). In their study, 83% of their study population had died by 90 days. Olajide et al.'s finding may be related more to the symptom management service they provide versus the additional role of hospice referrals the RAH Palliative Care Program provides. An additional factor may be related to their mixed study population.

Comparison of PPS Score and Length of Survival

The overall median LOS was variable. In comparison to other studies, this study's findings had longer LOS for those patients with a PPS score of 10% and 60%. This may be reflective of the referral score versus admission score. Table 20 summarizes the various studies that examined the relationship between the PPS score and LOS. Table 21 presents Morita et al.'s (1999) findings as they had categorized the PPS scores. All studies found the PPS score to be a significant predictor of survival with a low PPS score predicting a short LOS. Although not noted in Table 20, given the limited study information in their abstract, Younis et al. (2003, 2004) found the PPS score to be a significant predictor of mortality in both studies (with *p* values less than .001).

Table 20

Median Days of Length of Survival and PPS Levels

PPS Score	Anderson[a]	Anderson[b]	Downing	Head	Lau	Virik	Sawchuk
10%	1		2	9[c]	1	1	6.5
20%	2	26	4		2	4	5.5
30%	5	12.5	13	20	9	8	11.0
40%	8	9.5	24	29	17	18	21.0
50%	11	7	37	43	27	30	35.0
60%	4	9	48	44[d]	40	29	50.0
70%		5	78			145	
p					<.001	<.0001	< .000

Note. [a] Indicates LOS of subjects who died in unit
[b] Indicates LOS of subjects who died after discharge from unit
[c] Indicates LOS for PPS score 10% and 20%
[d] Indicates LOS for PPS score 60% and 70%

Table 21

PPS Score Groups and Length of Survival in Days in Morita et al. (1999)

PPS score group	Mean	Median
10% to 20%	17	6
30% to 50%	70	41
$\geq$ 60%	157	108

$p < .01$

Lau et al. (2006) and Harrold et al. (2005) had similar observations to those of this study regarding the frequency distribution of PPS scores and LOS. One would not expect to find palliative patients with PPS scores of 20% to live longer than patients with higher PPS scores. In the study by Lau et al. (2006), 99% of patients with a PPS score of 20% had died by 60 days and all had died by 90 days. As depicted in Table 22, Harrold et al. (2005) found 62% of cancer patients with a score of 10% to 20% had died by 30 days and all died by 90 days. In this study, the one subject with a PPS score of 20% lived 122 days.

Table 22

Mortality of Cancer Patients by PPS Score in Harrold et al. (2005) (n=214)

PPS category	7 days	30 days	90 days	180 days
10% to 20%	50%	62%	100%	100%
30% to 40%	20%	60%	88%	95%
50% to 70%	5%	36%	75%	84%

In studying their mixed diagnosis population, Harrold et al. (2005) found the PPS most accurate within one week or less of LOS. Using Receiver Operating Curves, they found the PPS score to be only slightly better than chance at predicting LOS at 90 days. However, in using Kaplan-Meier survival curves, the PPS score was strongly predictive of LOS ($p < .001$).

The variability of this study's LOS to others is likely due to the varying settings and non-cancer specific diagnosis. For example, in Anderson et al.'s

(1996) study the diagnosis was unknown and patients were on a tertiary palliative care unit.

Summary of Studies' Results

In keeping with the results of the listed in Table 1, this study also found the relationship and correlation between the PPS score and length of survival to be significant. The majority of those palliative patients with lower PPS scores had a higher rate of mortality than those with higher PPS scores. In comparing the variables of age, gender, cancer diagnosis, and palliative status to LOS, this study found younger patients dying within 60 days. These findings were different when studying the influences of age and gender on LOS. Lau et al. (2006) found a statistically significant finding whereby patients aged 45 to 64 were likely to live longer than those aged 85 or greater. This study was different than most with more males than females comprising the total population. However, whereas this study's results did not find gender to be significant, findings by Lau et al. (2006) and Younis et al. (2004) who found women did live longer than men. Of those studies that specified a cancer diagnosis, frequency of occurrence varied as cancers had variable definitions, some by specific types and some grouped into categories. Sanchez et al. (2006) did not find cancer diagnosis and metastases to be significant survival prognostic factors in their population. Other studies had less specific definitions of palliative status to this study that did not make comparison to this study possible.

One unexplained observation within this study, in addition to Lau et al. (2006) and Harrold et al. (2005) was the lack of explanation as to why certain patients lived longer with a very low performance status, PPS score, and others died quickly having been assessed at a higher level of function. In reviewing nine subjects of interest in this study, no similarity or significant differences in age, gender, diagnosis, or palliative status could explain these findings.

Limitations of Study

There are both similar and unique limitations to this study in comparison to past studies that investigated the relationship between the PPS score and LOS. The following limitations were discovered during the course of this study.

General Observations of Study Limitations

As with all studies (see Table 1) investigating the relationship of the PPS score to LOS, sample sizes were limited. There were 326 subjects who lived less than 60 days compared to 66 subjects who lived 60 days or greater. In comparing PPS scores of those subjects who lived less than 60 days to those who lived 60 days or greater, no PPS level had equal sample sizes. For example, there were only 9 subjects who lived greater than 60 days compared to 83 who lived less than 60 days with a PPS score of 30% and of all 18 patients with a PPS score of 10%, none lived greater than 60 days. Having more equal sample sizes may have resulted in different findings. However, this would be difficult as this is a function of the sample with all patients being expected to die within approximately 60 days.

It was not possible to accurately capture co-morbidities and periods of acute exacerbations or complicating factors that could have shortened the lives of patients in this study unpredictably. Similarly, it was not possible to capture periods where disease progression or acute illnesses stabilized or resolved, both of which could lengthen life. These factors are considered when assessing patients; however, co-morbidities were not assessed as a variable within this study.

One attempt of this study was to obtain the PPS score most representative of a stable condition versus acute exacerbation. However, even with a limited mean length of stay of 18.5 days from admission to discharge in the RAH and the mean length of time followed by the RAH Palliative Care Program being 10.7 days (RAH, 2006); some patients were assessed, referred, and transferred to a hospice palliative care unit on the same day.

This study included palliative cancer patients referred to a hospice by the RAH Palliative Care Program. It did not account for all patients deemed appropriate for hospice by the RAH Palliative Care Program. For example, patients who were appropriate for hospice may have remained in an acute care setting if preferred by the attending physician, or may have been discharged home if the family wished to care for the palliative patient in that setting. Additionally, palliative patients and/or their families may have preferred a non-palliative setting, such as long-term care.

Individuals with low PPS scores for whom stabilization was expected were not included in this study. For instance, a palliative patient with prostate cancer may be restricted to bed with an impending pathological fracture, and thus may be assigned a PPS score of 30%. If stabilization were expected, however, the patient would be assumed to have a prognosis of many months to years, and would not be referred to hospice. The second group of individuals excluded from this study includes those with PPS scores of 10% who may have been thought to be too frail to transfer to a hospice palliative care unit. Both of these scenarios could also account for the smaller sample sizes in the lower and upper PPS score groups.

In reviewing patient charts to obtain the referral PPS score, 14 patients from the original dataset of 406 subjects were missing referral PPS scores for the date of referral to hospice. However, PPS scores were documented for some of these subjects within at least 24 hours of the referral date to a hospice palliative care unit. As such, it is possible those referral PPS scores recorded for the 392 subjects having 100% complete data were actually the most recent PPS score rather than the PPS score at the exact time of referral to a hospice palliative care unit.

Additionally, the setting is unique. Although there is one other acute tertiary care hospital in Edmonton with a palliative care program, the RAH is located within the inner city. Finally, it may be difficult to generalize the results as the definition of hospice and criteria for admission to hospice may vary in other jurisdictions.

Study Limitations Related to the Palliative Performance Scale

There has not been a formal evaluation of inter-rater reliability of the revised PPS tool, PPSv2, in the RAH Palliative Care Program. As well, there was no formal training in how to use either the original or revised PPS; thus, the degree of assessor subjectivity is uncertain. There was no documentation indicating if the original or revised PPS tool was used to assess patients.

The clinicians who recorded the referral score were varied. The RAH Palliative Care Program is compromised of an experienced group of palliative clinicians including a palliative care physician, a palliative care nurse practitioner, and palliative care nurse consultants. Additionally, there are numerous medical fellows, residents and other health care professionals that spend time with the RAH Palliative Care Program that also recorded some of the referral PPS scores. The final decision regarding whether to refer to hospice was based on several factors (symptoms, stage of disease, clinical signs and characteristics and quality of life) in addition to the PPS score, and these individuals may not have incorporated these factors consistently.

Study Limitations Related to Diagnosis

Another limitation of this study was not knowing the timeframe for which a palliative patient had been living with their cancer. Some cancers are more chronic in nature than others (Lamont & Christakis, 2006). A repeat analysis of this study's database regarding the specific cancer type may explain the differences in LOS for patients having cancers within a group. For example, in this study a gastrointestinal cancer would include pancreatic and colon cancer.

This study did not include the date of cancer diagnosis or the cancer stage. Lamont and Christakis (2006) provided a brief review of studies examining LOS related to patients with various advanced cancers who did not receive treatment. Their review presented wide discrepancies within different cancers. For example, a subgroup of patients with adenocarcinoma of the breast lived a median of 2.3 years compared to Stage IV colorectal adenocarcinoma patients living a median of five months, and Stage IIIb/IV non-small cell lung cancer patients living 4.1 months. The varying nature of these cancers explains why some patients had a longer LOS. As well, this study did not identify which patients had pathology confirming their cancer diagnosis.

Chapter 6: Implications for Research, Clinical Practice, and Policy

The findings of this study raise implications for research, education, practice, and policy. This study found the PPS to be a fairly effective tool in assessing palliative cancer patients for appropriateness of placement in a hospice palliative care unit. However, the PPS tool did not predict prognosis with 100% accuracy. The following considerations for future research may improve the accuracy of the PPS in relation to LOS.

Implications for Research

It may be of benefit to incorporate other factors known to affect mortality in the PPS. There has been extensive research on individual prognosticating factors that may be useful in predicting early mortality; hence, appropriateness for hospice placement. Table 23 summarizes both the individual factors that are significant in prognosticating survival in palliative cancer patients and related references of researchers involved. Maltoni et al. (2005) completed a systematic review of all electronic literature relating to prognostic factors found in advanced cancer patients with a LOS of 90 days or less. They found the following to be significant influences on mortality: Clinical prediction of survival; dyspnea; delirium; biologic factors such as leukocytosis, lymphocytopenia, and C-reactive protein; anorexia-cachexia syndrome; and performance status.

Table 23

Individual Prognosticating Factors

Factor	Reference
Clinician's estimation of survival	Glare et al., 2005; Lamont & Christakis, 2001; Morita, Tsunoda, Inoue, & Chihara, 2001; Vigano, Dorgan, Bruera, & Suarez-Alamor, 1999
Quality of life	Chang, 1998; Chang et al., 2000; Vigano et al., 2004
Anorexia and cachexia	Pirovano et al., 1999; Vigano, Dorgan, Buckingham, Bruera, & Suarez-Alamor., 2000
Dyspnea	Goodrich, Bond, Cameron, & McKean, 2005; Zambroski, Moser, Roser, Heo, & Chung, 2005
Impaired cognition	Carceni et al., 2000; Fainsinger, deMoissac, Cole, Mead-Wood, & Lee, 2000; Goodrich et al., 2005; Zambroski et al., 2005
Biological factors	Glare & Christakis, 2004; Vigano, Bruera, Jhangri, Newman, Fields, & Suarez-Alamor, 2000
Performance status	Blagden, Charman, Sharples, Magee, & Gilligan, 2003; Fainsinger et al., 2000; Glare & Christakis, 2004; Zambroski et al., 2005

Studies conducted by Anderson et al.(1996), Olajide et al. (2007), and Sanchez et al. (2006) also recognized the influence of symptoms on LOS. The RAH Palliative Care Program continues to use the Edmonton Symptom Assessment System (ESAS) and MMSE on a regular basis. A secondary analysis of this study's database looking at the relationship of the PPS score and symptoms and signs, such as dyspnea and presence of delirium, would provide more information about the influence of symptoms on LOS in this population. An exploration of this nature may provide an explanation for those subjects who could be deemed outliers in this study. For example, the individual with a PPS score who lived 122 days may not have had any of the symptoms reported by others to be associated with LOS (Olajide et al., 2007; Sanchez et al., 2006).

A secondary analysis of this study's data could also explore other factors having a possible effect on LOS. Factors of interest could include the presence of comorbidities and acute complications, previous cancer treatments and artificial means of hydration and nutrition.

At this point there is not a definitive answer regarding the usefulness of the referral PPS score versus the admission PPS score. It would be logical to repeat this study using the admission, repeat, and discharge PPS scores to assess LOS. This study should include a comparison of Receiver Operating Curves in order to determine which score would be more predictive of LOS, and thus more useful in determining whether a referral to hospice was appropriate. These findings would address the debate in the literature about whether repeat assessments of the PPS are necessary.

It would be interesting to undertake the same study at another acute tertiary care hospital that had a similar consult palliative care program, such as the University of Alberta Hospital in Edmonton. This would be a more accurate comparison to these study findings than those provided by Olajide et al. (2007).

A qualitative study investigating quality of life issues associated with varying PPS scores may provide a better understanding about the influences of hope and the will to live. For instance, Cairns, Thompson, and Wainwright (2003) have addressed the connection between the PPS and the psychosocial impact patients and families may experience at different PPS levels.

Implications for Clinical Practice

Head et al. (2005) recently stated that a rigorous training program was required for all clinicians utilizing the PPS. Although the revised PPS tool, PPSv2, is available on the RPCP website to all clinicians and includes guidelines for usage, it is evident not all clinicians are aware of the revised PPS tool. In a recent edition of a peer reviewed palliative care publication, the original PPS was presented (Wilner & Arnold, 2006). For this study, it was not clear which PPS tool was used. Once all clinicians were taught to use the revised PPSv2 tool, an evaluation to confirm inter-rater reliability should be conducted.

Implications for Policy

Nearly half (42.9%) of all patients in this study were diagnosed with a palliative cancer during their hospital admission. With the average length of hospital stay being 18.5 days and an average length of palliative team follow up in hospital of 10.7 days, patients and families are required to address issues pertaining to their impending mortality in a very short time frame. Lamont and Christakis (2006) recently showed that clinicians overestimate LOS in palliative patients. In providing an overly optimistic prognosis, the palliative patient and family may not have the opportunities or resources available to deal with a more realistic shorter LOS. Being too pessimistic, on the other hand, may affect the trusting relationship between patients, families, and healthcare professionals and cause patients and families to lose hope. This conundrum was recognized by a group of American researchers who found that the mean length of stay in hospice was three weeks and that one third of palliative patients were being admitted during the last week of their life (Kapo, Harrold, Carroll, Rickerson, & Casarett, 2005; Rickerson, Harrold, Kapo, Carroll, & Casarett, 2005). With the mean length of stay in hospice of 24 days and the median 10, interviews addressing timely access to hospice were conducted before death with patients and families and after death with families. Most patients and families believed hospice referral was timely; however, the follow up interview with families after their loved one died found families wished for earlier referrals. Timely access to hospice reinforces the need for open and honest communication.

While the availability of instruments like the PPS provide an opportunity to estimate LOS more accurately, it highlights important issues that have always been central in palliative care related to staffing. The time required to carefully guide patients and families through issues they face in relation to an unexpected palliative diagnosis is significant, but the long term consequences of not providing this help are also significant. It is critical that managers of acute care settings ensure that staff caring for individuals with an unexpected palliative diagnosis has the time to be available to this special patient population and answer their questions.

Conclusion

The purpose of this study was to examine the relationship between the referral PPS score and LOS by comparing referral PPS scores of palliative cancer patients living less than 60 days and those living 60 days or greater to determine if patients were being appropriately referred to a hospice palliative care unit from an acute tertiary care hospital setting by the RAH Palliative Care Program. The impact of age, gender, cancer diagnosis, and palliative status at the time of consult on LOS were also explored. Analysis of the data found a significant correlation between the referral PPS score and LOS such that patients with lower PPS scores were more likely to die sooner than those with higher PPS scores. Only age was found to have an additional impact on LOS. Subjects living 60 days or greater were older than subjects living less than 60 days. Overall, the PPS tool was found to be an effective tool in predicting LOS when referral PPS scores were utilized. Of the 392 patients in this study, 83.2% had died within the RPCP guidelines indicating an approximate two month prognosis. By extending the LOS to 90 days, 90.1% of all patients referred to a hospice palliative care unit were deceased and at four months only 6.9% of the 392 patients were still living. These findings mean that clinicians can use the PPS in confidence, knowing that their estimates of LOS are reasonably accurate. It is hoped that this knowledge will help clinicians become more comfortable in communicating prognosis in a manner that allows the patient and family to maintain dignity and have the best possible quality of life.

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Appendix A

Data Collection Record

Subject Name _________________

Subjects Personal Health Number _________________

1. Gender (male or female) ________

2. Age in years ________

3. Cancer diagnosis ________

4. Known palliative diagnosis on admission (yes/no) ________

5. Referral PPS score ________

6. Date of referral to hospice ________

7. Date of death ________

8. Length of survival in days ________

A Circle Of Care
Victoria Hospice
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Appendix B

Palliative Performance Scale (PPSv2)

version 2

PPS Level	Ambulation	Activity & Evidence of Disease	Self-Care	Intake	Conscious Level
100%	Full	Normal activity & work No evidence of disease	Full	Normal	Full
90%	Full	Normal activity & work Some evidence of disease	Full	Normal	Full
80%	Full	Normal activity *with* Effort Some evidence of disease	Full	Normal or reduced	Full
70%	Reduced	Unable Normal Job/Work Significant disease	Full	Normal or reduced	Full
60%	Reduced	Unable hobby/house work Significant disease	Occasional assistance necessary	Normal or reduced	Full or Confusion
50%	Mainly Sit/Lie	Unable to do any work Extensive disease	Considerable assistance required	Normal or reduced	Full or Confusion
40%	Mainly in Bed	Unable to do most activity Extensive disease	Mainly assistance	Normal or reduced	Full or Drowsy +/- Confusion
30%	Totally Bed Bound	Unable to do any activity Extensive disease	Total Care	Normal or reduced	Full or Drowsy +/- Confusion
20%	Totally Bed Bound	Unable to do any activity Extensive disease	Total Care	Minimal to sips	Full or Drowsy +/- Confusion
10%	Totally Bed Bound	Unable to do any activity Extensive disease	Total Care	Mouth care only	Drowsy or Coma +/- Confusion
0%	Death	-	-	-	-

Instructions for Use of PPS (see also definition of terms)

1. PPS scores are determined by reading horizontally at each level to find a 'best fit' for the patient which is then assigned as the PPS% score.

2. Begin at the left column and read downwards until the appropriate ambulation level is reached, then read across to the next column and downwards again until the activity/evidence of disease is located. These steps are repeated until all five columns are covered before assigning the actual PPS for that patient. In this way, 'leftward' columns (columns to the left of any specific column) are 'stronger' determinants and generally take precedence over others.

   Example 1: A patient who spends the majority of the day sitting or lying down due to fatigue from advanced disease and requires considerable assistance to walk even for short distances but who is otherwise fully conscious level with good intake would be scored at PPS 50%.

   Example 2: A patient who has become paralyzed and quadriplegic requiring total care would be PPS 30%. Although this patient may be placed in a wheelchair (and perhaps seem initially to be at 50%), the score is 30% because he or she would be otherwise totally bed bound due to the disease or complication if it were not for caregivers providing total care including lift/transfer. The patient may have normal intake and full conscious level.

   Example 3: However, if the patient in example 2 was paraplegic and bed bound but still able to do some self-care such as feed themselves, then the PPS would be higher at 40 or 50% since he or she is not 'total care.'

3. PPS scores are in 10% increments only. Sometimes, there are several columns easily placed at one level but one or two which seem better at a higher or lower level. One then needs to make a 'best fit' decision. Choosing a 'half-fit' value of PPS 45%, for example, is not correct. The combination of clinical judgment and 'leftward precedence' is used to determine whether 40% or 50% is the more accurate score for that patient.

4. PPS may be used for several purposes. First, it is an excellent communication tool for quickly describing a patient's current functional level. Second, it may have value in criteria for workload assessment or other measurements and comparisons. Finally, it appears to have prognostic value.

Definition of Terms for PPS

As noted below, some of the terms have similar meanings with the differences being more readily apparent as one reads horizontally across each row to find an overall 'best fit' using all five columns.

1. Ambulation
The items **'mainly sit/lie,' 'mainly in bed,'** and **'totally bed bound'** are clearly similar. The subtle differences are related to items in the self-care column. For example, 'totally bed 'bound' at PPS 30% is due to either profound weakness or paralysis such that the patient not only can't get out of bed but is also unable to do any self-care. The difference between 'sit/lie' and 'bed' is proportionate to the amount of time the patient is able to sit up vs need to lie down.

'Reduced ambulation' is located at the PPS 70% and PPS 60% level. By using the adjacent column, the reduction of ambulation is tied to inability to carry out their normal job, work occupation or some hobbies or housework activities. The person is still able to walk and transfer on their own but at PPS 60% needs occasional assistance.

2. Activity & Extent of disease
'Some,' 'significant,' and **'extensive'** disease refer to physical and investigative evidence which shows degrees of progression. For example in breast cancer, a local recurrence would imply 'some' disease, one or two metastases in the lung or bone would imply 'significant' disease, whereas multiple metastases in lung, bone, liver, brain, hypercalcemia or other major complications would be 'extensive' disease. The extent may also refer to progression of disease despite active treatments. Using PPS in AIDS, 'some' may mean the shift from HIV to AIDS, 'significant' implies progression in physical decline, new or difficult symptoms and laboratory findings with low counts. 'Extensive' refers to one or more serious complications with or without continuation of active antiretrovirals, antibiotics, etc.

The above extent of disease is also judged in context with the ability to maintain one's work and hobbies or activities. Decline in activity may mean the person still plays golf but reduces from playing 18 holes to 9 holes, or just a par 3, or to backyard putting. People who enjoy walking will gradually reduce the distance covered, although they may continue trying, sometimes even close to death (eg. trying to walk the halls).

3. Self-Care
'Occasional assistance' means that most of the time patients are able to transfer out of bed, walk, wash, toilet and eat by their own means, but that on occasion (perhaps once daily or a few times weekly) they require minor assistance.

'Considerable assistance' means that regularly every day the patient needs help, usually by one person, to do some of the activities noted above. For example, the person needs help to get to the bathroom but is then able to brush his or her teeth or wash at least hands and face. Food will often need to be cut into edible sizes but the patient is then able to eat of his or her own accord.

'Mainly assistance' is a further extension of 'considerable.' Using the above example, the patient now needs help getting up but also needs assistance washing his face and shaving, but can usually eat with minimal or no help. This may fluctuate according to fatigue during the day.

'Total care' means that the patient is completely unable to eat without help, toilet or do any self-care. Depending on the clinical situation, the patient may or may not be able to chew and swallow food once prepared and fed to him or her.

4. Intake
Changes in intake are quite obvious with **'normal intake'** referring to the person's usual eating habits while healthy. **'Reduced'** means any reduction from that and is highly variable according to the unique individual circumstances. **'Minimal'** refers to very small amounts, usually pureed or liquid, which are well below nutritional sustenance.

5. Conscious Level
'Full consciousness' implies full alertness and orientation with good cognitive abilities in various domains of thinking, memory, etc. **'Confusion'** is used to denote presence of either delirium or dementia and is a reduced level of consciousness. It may be mild, moderate or severe with multiple possible etiologies. **'Drowsiness'** implies either fatigue, drug side effects, delirium or closeness to death and is sometimes included in the term stupor. **'Coma'** in this context is the absence of response to verbal or physical stimuli; some reflexes may or may not remain. The depth of coma may fluctuate throughout a 24 hour period.

Appendix C

Victoria Hospice Society
Learning Centre
FOR
PALLIATIVE
CARE

A Circle Of Care
Victoria Hospice
SOCIETY

The new Palliative Performance Scale (PPSv2) version 2

Over the past year, we have become aware that a few programs in at least one other country have been using PPS incorrectly. Also, there existed ambiguity in the interpretation of some words of the scale. Thus clarification at this point is critical to its proper use.

The new PPSv2 is only slightly altered, not in changing the meaning of various levels, but in improving the wording and clarity. We have also added instructions on how to use it correctly and a set of definition of terms used in the scale. Finally, we have identified it more clearly as a copyright scale restricting any altered use of PPS.

We will be publishing the new tool as a second iteration of the original one which was published in the Journal of Palliative Care in 1996. It is also being reviewed to see whether or not these changes are substantive enough to mandate a repeat of the original reliability and validity testing of PPS.

Therefore, please replace all existing copies of the original PPS, including teaching materials, and begin to use PPSv2 for all measurements of PPS from now on, effective July 2001.

An electronic form of PPSv2 in Microsoft Word table format is available if requested.

Sincerely,

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