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Factors Influencing Emergency Department Visits for Pain Among Cancer Patients: A Retrospective Study

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Abstract:

Objective: To understand the factors influencing emergency department (ED) visits for pain to help optimize palliative care strategies and improve pain management.

Material and Methods: This study examined factors linked to pain-related ED visits among cancer patients at a Thai tertiary hospital. A retrospective cross-sectional study was conducted with adult cancer patients (≥18 years) who visited Songklanagarind Hospital ED between January 2010 and December 2020. Extracted data included demographic variables, cancer type, metastasis, treatment history, pain intensity, and pain medication use. Univariable and multivariable logistic regression were performed to assess the factors associated with pain-related ED visits.

Results: Among 15,144 patients, 18.8% visited the ED at least once due to pain (more commonly among younger patients and females). Pain complaints varied significantly by cancer type, with the highest rates in metastatic solid organ tumors (19.7%) and the lowest in hematopoietic and lymphoid malignancies (16.0%). Among 37,482 total ED visits, 20.2% were pain-related, which occurred more frequently during nighttime. Opioid use was linked to increased ED visits. An increased likelihood of ED visits due to pain was associated with female sex, nighttime visits, having metastatic cancer, recent chemotherapy and surgery, and prior opioid use. Conversely, older age (≥65 years) and recent radiation therapy were associated with a significantly decreased likelihood of pain-related ED visits.

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Conclusion: This study highlights the potential benefits of standardized pain assessment and continuous symptom management to reduce unnecessary ED visits. A multimodal approach to pain management is essential to improve the quality of life for cancer patients.

Keywords: advanced cancer, emergency room, opioid use, palliative care, pain management, quality of life

Introduction

Pain is a prevalent and distressing symptom among cancer patients, affecting approximately 55% of those undergoing active treatment and up to 66% of individuals with advanced cancer[1,2]. Effective pain management is essential for improving quality of life (QoL), reducing emotional distress, and enabling patients to maintain functionality[3]. However, despite advancements in palliative care, many patients encounter barriers to adequate pain relief, often resulting in emergency department (ED) visits due to pain[4,5].

Notably, the number of ED visits for cancer-related pain highlights gaps in outpatient pain management and palliative care services. These visits disrupt patients' lives, increase healthcare costs, and strain hospital resources. Studies have identified several factors influencing ED utilization for pain, such as patient demographics, cancer type, disease stage, and prior treatment history[6,7]. Inadequate pain management, particularly in resource-limited contexts, underscores the need for targeted interventions to address these challenges[8]. In Thailand, the burden of cancer is steadily increasing, with limited access to comprehensive palliative care services posing significant challenges for effective pain management[9,10]. Understanding the factors associated with ED visits due to pain in this context is crucial for improving care delivery, minimizing ED dependency, and optimizing resource utilization.

Uncontrolled cancer pain is a key driver of emergency care utilization, reflecting unmet palliative care needs. Identifying the factors contributing to ED visits for pain provides valuable insights for enhancing outpatient care guidelines and reducing the frequency of avoidable ED visits. This study explores the demographic, clinical, and treatment-related characteristics associated with ED visits due to pain among cancer patients. The findings produced by analyzing patterns of care-seeking behavior can inform strategies to improve pain management protocols, enhance accessibility to palliative care services, and reduce the burden on emergency departments in resource-limited contexts.

Material and Methods

Study design

This retrospective cross-sectional study identified and analyzed the characteristics and factors associated with ED visits due to pain among cancer patients at a tertiary care hospital.

Study setting and data

The study was conducted at Songklanagarind Hospital, a tertiary care center in southern Thailand. The target population comprised adult cancer patients aged 18 years or older who sought care at the hospital's ED between January 1, 2010 and December 31, 2020. Patient eligibility for this study was determined by specific inclusion and exclusion criteria. Inclusion criteria were as follows: individuals aged 18 years or older with a confirmed diagnosis of malignant neoplasms, classified according to the International Classification of Diseases, Tenth Revision (ICD-10). Exclusion criteria were as follows: pregnant patients and patients presenting with traumatic injuries.

Sample size calculation

The required sample size was calculated using the formula for estimating population proportions with an unknown prevalence. A Type I error (α) of 0.05, corresponding to a z-score of 1.96, and a margin of error of 0.02 were specified. Based on prior research indicating a pain complaint prevalence of 59.4% among cancer patients under 65 years of age, the minimum required sample size was 2,316 patients. The total records of this study exceeded the number.

Dependent variables

Data collected included patient demographics (sex, age, nationality, and religion), cancer type (classified as non-metastatic (localized), metastatic cancer, hematopoietic and lymphoid malignancies), and the number of metastatic sites. Cancer treatment history within 30 days of the ED visit (surgery, chemotherapy, and radiotherapy) and use of pain medication within the 3 months preceding data collection (categorized as no pain medication received, no opioid received, and opioid-received) were also recorded. Pain intensity was available in the medical records as a numerical pain rating scale. Numerical pain scores, when available, were categorized according to established guidelines: 1–3 (mild), 4–6 (moderate), and 7–10 (severe). ED visit times were categorized as daytime (6:00 AM–5:59 PM) or nighttime (6:00 PM–5:59 AM).

Outcome ascertainment

The outcome of this study is the ED visits attributable to pain. The classification was assessed through a review of patients' medical records. This review assessed the documented reason for the ED visit, classifying visits as pain-related if pain was the primary presenting complaint or a significant contributing factor and as non-pain-related otherwise. The specific criteria used to determine pain-related visits were documentation of pain as the chief complaint or mention of pain in the physician's notes.

Data collection and management

Data were extracted from the Songklanagarind Hospital Information System (HIS) with the support of the Division of Digital Innovation and Data Analysis. The extracted dataset encompassed patients' chief complaints (categorized as pain-related or other), demographic characteristics (sex, religion, and age), and clinical characteristics. Clinical data included cancer type, number of metastatic sites, pain intensity, cancer treatment history, and pain medication usage.

To classify pain levels, text mining techniques were employed to identify instances of "pain" within physician notes documented in the hospital information system. We developed a data dictionary to standardize and convert chief complaints, which were initially recorded in Thai free-text doctor annotations, into common English terminology. This process involved extracting the chief complaints by identifying the string marker "cc" within the annotations. The retrieved Thai text was then converted into English using our specially designed data dictionary. Finally, these converted chief complaints were grouped into pain- and non-pain-related ED visits.

The recorded pain scores were retrieved independently, regardless of the chief complaint. Data cleaning procedures were implemented to remove duplicate entries and identify and flag missing or erroneous data, such as outliers in age or pain scale values.

Statistical analysis

Descriptive statistics were employed to summarize patients' demographic and clinical characteristics, with results presented as frequencies, percentages, and corresponding p-values. Chi-squared tests were used to assess associations between categorical variables. Univariable and multivariable logistic regression analyses, utilizing the generalized estimating equations, were performed to identify the factors associated with ED visits due to pain, accounting for within-subject correlation due

to patient revisits. Results from the regression analyses are reported as odds ratios (OR) with 95% confidence intervals. Statistical significance was defined as p-value<0.05. All statistical analyses were performed using R version 4.1.0.

Results

A total of 63,454 cancer patients were identified at Songklanagarind Hospital. After excluding 1,909 patients younger than 18 years, 18,794 of the remaining adult patients had at least one ED visit between 2010 and 2020. From this group, we excluded 3,650 patients whose ED visits occurred entirely before their cancer diagnosis. This resulted in a final study cohort of 15,144 patients (Figure 1). In an analysis by ED visits, initially 57,976 eligible visits from 15,144 patients were included; 18,345 pre-diagnosis ED visits were removed, leaving 39,618 post-diagnosis visits. Further exclusions for trauma (n=2,124) and pregnancy (n=12) visits resulted in a cohort of 37,482 ED visits for final analysis (Figure 2).

Among the 15,144 cancer patients, 18.8% (n= 2,840) complained of pain. Pain complaints were more prevalent among patients aged 18–64 years (20%) than those aged 65 years or older (16.8%) and among females (20%) compared to males (17.6). Pain complaints varied significantly by cancer type (p-value<0.001), with the highest rates among patients with metastatic cancer (19.7%) and the lowest observed in those with hematopoietic and lymphoid malignancies (16.0%) (Table 1).

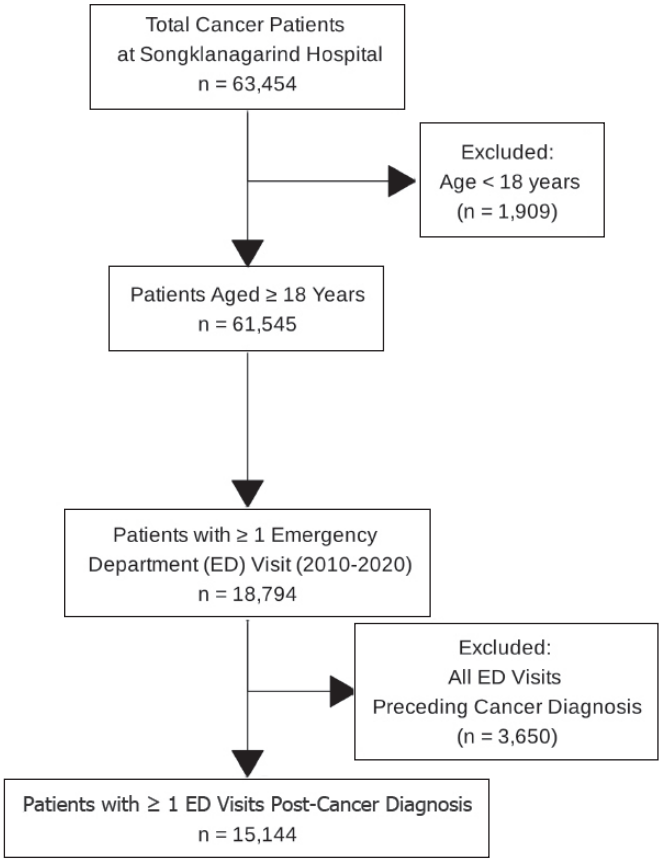

Figure 1 Flow diagram of patient selection and exclusion criteria

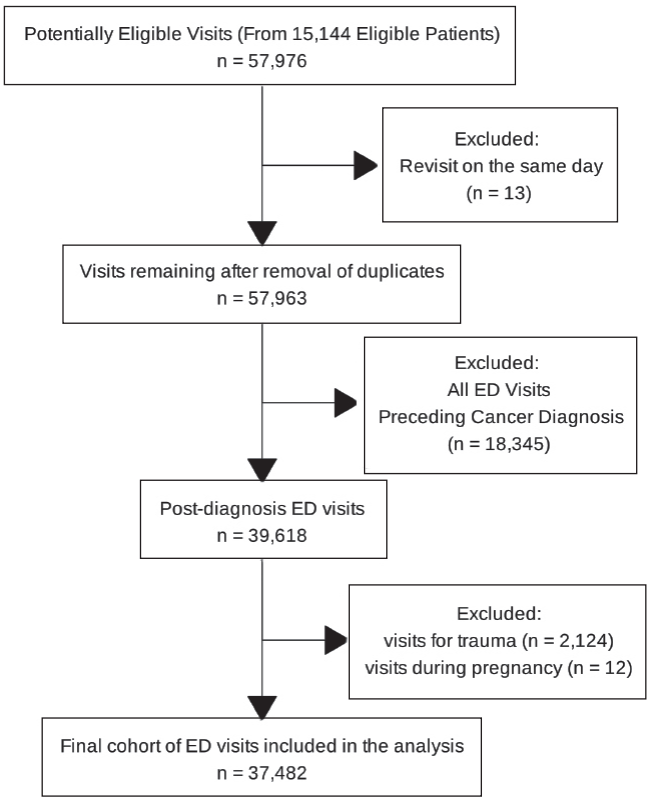

Figure 2 Selection of post–diagnosis emergency department visits from the eligible patient cohort

Table 1 Patient characteristics

Variables	Pain complaint			p–value
	Yes, n (%)	No, n (%)	Total, n (%)	
Total numbers of unique patients	2,840 (18.8)	12,304 (81.2)	15,144 (100)	
Age				<0.001
18–64 yrs	1,863 (20)	7,465 (80)	9,328 (61.6)	
65 yrs and older	977 (16.8)	4,839 (83.2)	5,816 (38.4)	
Sex				<0.001
Female	1,471 (20)	5,893 (80)	7,364 (48.6)	
Male	1,369 (17.6)	6,411 (82.4)	7,780 (51.4)	
Religion				0.232
Buddhism	2,456 (18.8)	10,638 (81.2)	13,094 (86.5)	
Christian	3 (7.3)	38 (92.7)	41 (0.3)	
Islam	380 (19)	1,618 (81)	1,998 (13.2)	
Others	1 (9.1)	10 (90.9)	11 (0.1)	
Cancer type				<0.001
Non–metastatic (localized)	1,985 (18.8)	8,596 (81.2)	10,581 (69.9)	
Metastatic cancer	668 (19.7)	2,728 (80.3)	3,396 (22.4)	
Hematopoietic and lymphoid malignancies	187 (16.0)	980 (84.0)	1,167 (7.7)	

Table 1 (continued)

Variable	Pain complaint			p-value
	Yes, n (%)	No, n (%)	Total, n (%)	
Number of metastasis sites				0.190
0	2,163 (18.5)	9,538 (81.5)	11,701 (77.3)	
1	510 (19.9)	2,050 (80.1)	2,560 (16.9)	
2	122 (17.7)	568 (82.3)	690 (4.6)	
3	41 (23)	137 (77)	178 (1.2)	
≥4	4 (26.7)	11 (73.3)	15 (0.1)	

Table 2 Clinical characteristics

Variables	Pain complaint (Number of visits)			p-value
	Yes, n (%)	No, n (%)	Total, n (%)	
Total numbers of visits	7,559 (20.2)	29,923 (79.8)	37,482 (100)	
Period of ED visit				<0.001
Daytime	4,582 (60.6)	19,337 (64.6)	23,919 (63.8)	
Nighttime	2,977 (39.4)	10,586 (35.4)	13,563 (36.2)	
Intensity of pain (numerical pain scale)				<0.001
Zero pain score	437 (5.8)	26,245 (87.7)	26,682 (71.2)	
Mild (1-3)	4,675 (61.8)	418 (1.4)	5,093 (13.6)	
Moderate (4-6)	775 (10.3)	1,434 (4.8)	2,209 (5.9)	
Severe (7-10)	1672 (22.1)	1,826 (6.1)	3,498 (9.3)	
Cancer treatments within 30 days				
Surgery				<0.001
Yes	228 (3)	1,157 (3.9)	1,385 (3.7)	
No	7331 (97)	28,766 (96.1)	36,097 (96.3)	
Chemotherapy				0.006
Yes	1,172 (15.5)	5,037 (16.8)	6,209 (16.6)	
No	6,387 (84.5)	24,886 (83.2)	31,273 (83.4)	
Radiation therapy				<0.001
Yes	906 (12)	5,013 (16.8)	5,919 (15.8)	
No	6,653 (88)	24,910 (83.2)	31,563 (84.2)	
Other treatments (Hormonal therapy, targeted therapy)				0.118
Yes	248 (3.3)	879 (2.9)	1127 (3)	
No	7,311 (96.7)	29,044 (97.1)	36,355 (97)	
Pain medications within 3 months				<0.001
No pain medication received	3,362 (19.5)	13,865 (80.5)	17,227 (46.0)	
No opioids received	1,162 (18.4)	5,151 (81.6)	6,313 (16.8)	
Opioids received	3,035 (21.8)	10,907 (78.2)	13,942 (37.2)	

ED=emergency department

A total of 37,482 ED visits were analyzed, with 20.2% (n=7,559) including a pain complaint. The proportion of visits with an associated pain complaint was significantly higher among nighttime ED visits (21.9%) compared to daytime visits (19.2%). Significant differences were also observed concerning recent cancer treatments: among patients who had undergone radiation therapy within 30 days, 15.3% presented with a pain complaint, and for those

with recent surgery, 16.5% had a pain complaint. Among recent chemotherapy recipients, 18.9% had an ED visit with a pain complaint. Prior pain medication use within 3 months also significantly correlated with the presence of a pain complaint at the ED visit; notably, 21.8% of patients who had received opioids presented with a pain complaint, compared to 19.5% of those with no prior pain medication and 18.4% of those who had received non-opioid analgesics (Table 2).

In a multivariate logistic regression analysis (Table 3), several factors were independently associated with ED visits due to pain. Females had significantly higher odds of a pain-related ED visit compared to males (adjusted odds ratio (aOR) 1.24, 95% confidence interval (CI): 1.17-1.30). Patients aged 65 years and older demonstrated lower odds of such visits compared to those aged 18-64 years (aOR 0.79, 95% CI: 0.75-0.83). Nighttime ED visits were associated with increased odds of being pain-related compared to daytime visits (aOR 1.19, 95% CI: 1.12-1.25). Regarding cancer characteristics, patients with non-metastatic (localized) cancer and those with metastatic cancer had significantly higher odds of a pain-related ED visit compared to patients with hematopoietic and lymphoid malignancies. Among recent cancer treatments within 30 days, surgery and chemotherapy were associated with increased odds of a pain-related visit. Conversely, recent radiation therapy was associated with significantly lower odds. Finally, concerning pain medications within the previous 3 months, patients who had received opioids had higher odds of an ED visit due to pain, compared to those who received no pain medication, while receiving only non-opioid analgesics was not significantly associated. Complete results, including specific p-values, are presented in Table 3.

Table 3 Multivariate and univariate analysis of factors associated with emergency department (ED) visit due to pain

Groups of variables	Variables	Univariate OR [95% CI]	Univariate p-value	Multivariate OR [95% CI]	Multivariate p-value
Sex	Male	ref		ref	
	Female	1.26 [1.19-1.32]	<0.001	1.24 [1.17-1.30]	
Age	18-64	ref			
	≥65	0.78 [0.74-0.82]	<0.001	0.79 [0.75-0.83]	<0.001
Period of ED visit	Daytime	ref		ref	
	Nighttime	1.19 [1.13-1.25]	<0.001	1.19 [1.12-1.25]	<0.001
Cancer type	Hematopoietic and lymphoid malignancies	ref		ref	
	Non-metastatic (localized)	1.32 [1.19-1.46]	<0.001	1.40 [1.26-1.55]	<0.001
	Metastatic cancer	1.48 [1.32-1.66]	<0.001	1.48 [1.32-1.66]	<0.001
Cancer treatment within 30 days	Surgery	1.07 [1.01-1.13]	0.022	1.09 [1.03-1.15]	0.004
	Chemotherapy	1.07 [1.02-1.12]	0.010	1.12 [1.06-1.19]	<0.001
	Radiation therapy	0.76 [0.72-0.80]	<0.001	0.68 [0.64-0.72]	<0.001
Pain medications (within 3 months)	No pain medication received	ref		ref	
	No opioids received	0.93 [0.86-1.00]	0.056	0.97 [0.90-1.04]	0.370
	Opioids received	1.15 [1.09-1.21]	0.013	1.19 [1.12-1.26]	<0.001

OR=odds ratio, CI=confidence interval

Discussion

The observed lower likelihood of ED visits among patients aged 65 and older (aOR: 0.79) and females (aOR: 1.24) may indicate potential disparities in healthcare utilization or pain reporting within these demographics. This aligns with existing literature, indicating that older adults may underreport pain due to misconceptions that pain is a normal part of aging, leading them to limit activities rather than seek treatment[11]. Additionally, older adults receiving home care may underreport pain to avoid burdening family caregivers[12]. Bischof et al. (2022) conducted a prospective observational study revealing that older adults with cancer frequently present to the emergency department for symptom-related diagnoses but receive fewer symptomatic interventions compared to younger cancer patients. This suggests significant opportunities to improve symptom management, including pain controls, for this vulnerable population in the emergency setting[13]. Regarding gender differences, studies have shown that women report higher pain prevalence than men, suggesting that men may underreport pain or delay seeking care[13]. These highlight the need for targeted interventions to address underreporting and ensure adequate pain management in these populations.

The significant association between pain complaints and solid organ metastatic cancer emphasizes the importance of integrating palliative care principles early in the cancer care continuum. Early palliative care has been shown to improve QoL and pain outcomes for cancer patients[14]. The findings also reveal that a substantial proportion of cancer patients visiting the ED due to pain (44.5%) did not receive any pain medication before their ED visit, highlighting a critical area for improvement. Implementing standardized pain assessment tools and protocols for cancer care can enhance pain management and ensure timely administration of appropriate analgesics[15].

The observed higher odds of ED visits among patients with metastatic cancer may be attributed to the aggressive nature and symptom burden associated with these malignancies[16]. The chronic nature of these symptoms means it is vital to establish outpatient management strategies[17]. Additionally, the increased likelihood of ED visits among patients with 2 or more metastasis sites underscores the complexity and heightened symptom burden in advanced cancer stages. Multiple metastases can lead to a range of acute symptoms, including severe pain, prompting patients to seek emergency care[18].

The higher proportion of nighttime visits among cancer patients underscores potential deficiencies in symptom management during off-hours. This trend suggests that patients may experience exacerbations of symptoms or crises when regular services are less accessible due to fewer specialists being available at night, especially after midnight. To address this issue, it is crucial to ensure that palliative care resources are available 24/7. This includes providing around-the-clock access to palliative care professionals who can provide guidance and support during symptom exacerbations, potentially reducing the need for ED visits[20].

The observed association between opioid use and increased ED visits among cancer patients, with an aOR of 1.19 for those receiving opioid therapy compared to no pain medication, underscores the multifaceted challenges in achieving adequate pain control, managing side effects, or addressing opioid-related adverse events. This trend aligns with recent reports indicating that as opioid prescriptions for cancer patients, particularly near the end of life, declined by 15.5% between 2007 and 2017, pain-related ED visits concurrently surged by 50.8% during the same period[20]. Similarly, a prospective observational trial by Coyne et al. (2021) found that severe pain at ED presentation was associated with increased 30-day mortality, and opioid receipt correlated with higher hospital admission and readmission rates[22]. Collectively, these findings highlight the urgent need for targeted interventions and improved

services to manage severe pain effectively in cancer patients within the emergency setting, thereby mitigating adverse outcomes.

Limitations and future research

The retrospective design of this study limits its ability to infer causality. Additionally, psychosocial factors and cultural attitudes toward pain reporting were not evaluated, which could provide deeper insights into pain management. Future research should explore these aspects and focus on developing evidence-based interventions to optimize pain management, address healthcare disparities, and promote proactive, multidisciplinary palliative care strategies. In addition, the analysis was based on existing medical records, primarily compiled for clinical service rather than research. Consequently, we were unable to thoroughly differentiate pain mechanisms or etiologies in detail. Future studies should examine pain origin, providing deeper insights into the factors associated with pain in cancer patients.

Conclusion

This study highlights gaps in pain management and ED utilization among cancer patients, emphasizing the potential benefits of standardized pain assessment. Disparities in ED visits among older adults and males suggest the underreporting of pain. Variations in visit likelihood by cancer type and metastatic burden reflect complex symptom management needs, while the increased frequency of nighttime visits underscores the potential benefits of continuous pain monitoring. The association between opioid use and higher ED visits highlights challenges in pain control. Balanced, patient-centered approaches are essential for reducing unnecessary ED visits and improving patients' QoL.

Ethical consideration

This study was approved by the Institutional Review Board of the Prince of Songkla University (Ethics Approval Number: REC 64-360-9-4). The need for informed consent was waived owing to the retrospective nature of the study.

Consent for publication

Due to the retrospective nature of this study and the use of de-identified data, signed informed consent was not required from individual patients.

Availability of data and materials

Data described in this manuscript are available upon reasonable request to the corresponding author, subject to Prince of Songkla University institutional review board approvals and data sharing agreements.

Authors' contributions

RP, OF, TI, and SN contributed to the conception and design of the study. RP collected the data. OF supervised the proposal writing and application for IRB approval. RP and TI performed the statistical analysis. All authors contributed to the interpretation of the results and the writing of the manuscript. All authors approved the final manuscript.

Conflict of interest

The authors declare that they have no competing interests.

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