# Cancer Pain Presentation, Management, and Outcomes in the Emergency Department

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# Abstract

**Purpose:** To describe the experience of patients with cancer presenting to the emergency department (ED) with pain and to identify patient and treatment factors that may affect patient outcomes.

**Methods:** We conducted a retrospective cohort study to evaluate adult patients with active cancer, who presented to one of two academic EDs with a chief complaint of pain between June 1st, 2012 and December 31st, 2015. Variables analyzed included disease and demographic characteristics, pain character, treatment methods, ED disposition, and revisit rate. We utilized multivariable logistic regression to evaluate the association of our exposure variables on ED disposition.

**Results:** We included 483 patients with active cancer with a chief complaint of pain. Patients with severe pain on arrival tended to be younger than those who did not present with severe pain (median: 58 vs 62 respectively, OR 8.0 $p<0.01$). Patients with high ECOG statuses (3-4) with severe pain on arrival ($\geq$ 7 out of 10) had less improvement in their pain (OR 8.4, $p<.01$). Long delays in initial analgesic administration were associated with increased rates of subsequent admission (OR 3.4) [$p = 0.14$]. Although opioid analgesics led to greater decreases in pain than non-opioid analgesics, patients treated with opioids were more likely to be admitted (43% vs 34.5% AOR 1.51, $p = .048$).

**Conclusion:** Several factors appear to play a role in the effectiveness of ED cancer pain management including patient and treatment characteristics. We hope that these findings will inform future studies and best-practice initiatives targeting ED cancer pain.


# Introduction/ Background

The management of cancer-related pain has been historically difficult and remains a significant issue in the overall care of patients with active cancer. In 1994, Cleeland et al published a seminal article on the prevalence and management of cancer pain and reported that two-thirds of medical oncology outpatients with advanced cancer required analgesic use. However, pain management was found to be inadequate for approximately 40% of these patients [1]. Several initiatives have since been instituted to improve analgesia in patients with cancer, yet despite these changes and established pain treatment guidelines, investigators found that pain management still remained inadequate in 33% of patients with cancer in a subsequent paper published in 2012 [2]. Experts have posed several barriers to improved pain control, including poor pain assessments by healthcare workers, patients' fear of complications relating to opioid use, and patients' reluctance to report pain[2–5].

Much of the existing literature focuses on the outpatient setting, and it remains unclear whether these outpatient studies can be applied to acute care settings, namely the ED, where patients with active cancer visit frequently. In fact, cancer patients account for greater than 4.5 million ED visits in the United States annually, and that number continues to rise [6, 7]. A 2019 multicenter cohort study reported that the majority of patients with active cancer visiting the ED presented with pain as their chief complaint, and that more than half of these ED visits resulted in admission [8].

Despite pain being one of the most common chief complaints in the ED, analgesics are often underutilized and delays in treatment are common [9]. These problems are further amplified among minority populations [10]. The effects of insufficient analgesic use are likely amplified in patients with active cancer, who are already at high-risk for poor pain control. A recent study demonstrated that patients who suffer from moderate to severe cancer-related pain often receive inadequate doses of pain medication while in the ED [11]. Given the large proportion of cancer patients who frequent the ED for pain, this poses a serious challenge for emergency practitioners. We hypothesize that there is a need for improvement in the emergency care of cancer pain and that a detailed analysis may provide future targets for quality improvement measures.

## Methods

# Study Design and Setting

We conducted a retrospective cohort study to evaluate patients presenting to two academic EDs with cancer-related pain from June 1st, 2012 to December 31st, 2015. Each of these EDs is affiliated with a National Comprehensive Cancer Network (NCCN) designated cancer center.

# Selection of Participants

We included all patients who were 18 years of age and older with active cancer who presented to the study EDs during our enrollment period with a chief complaint of pain. Active cancer was defined as a diagnosis of cancer with ongoing treatment, ongoing symptoms relating to cancer, or a known recurrence of a previous cancer. Patients excluded included those who were in remission, had non-melanomatous skin cancer (i.e., basal cell carcinoma, squamous cell carcinoma), benign tumors, or carcinoma in-situ.

# Methods of Measurement

Data were collected through an electronic medical records system and entered into an electronic database by trained research associates (AK, VR, DL). Each data abstractor underwent dedicated training to assure validity in data collection. Monthly meetings were conducted to ensure adherence to study protocols. All research associates were blinded to the study hypotheses. Predictor and outcome variables were defined a priori, and a measurement of inter-rater reliability was performed on 5% of patient charts. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) methods were utilized when conducting and reporting this study.

We collected demographic data as well as several potential exposure variables, including chief complaint, cancer type, Eastern Cooperative Oncology Group (ECOG) performance status, pain character, pain scores, type of pain medications administered, and time-to-analgesia (including both presentation-to-medication and bed-to-medication). Outcome variables included initial pain score, final pain score, delta

pain (final pain score minus initial pain score), ED diagnosis, ED disposition, admission level of care, and return ED visit within 72 hours. The ECOG score, which is a measurement of the performance status, was determined based on oncology visits that preceded the index emergency visit (within 90 days) in addition to ED provider notes [12]. We defined a high ECOG as those with a score of 3 or 4, representing those with very limited functional status. We categorized pain based on the numerical scale as: none (0), mild (1–4), moderate (5–6), and severe (7–10). Cancer type and pain were both grouped according to primary organ system involvement. Elderly patients were categorized as those who were ≥ 65 years of age, while young patients were categorized as patients below the age of 65.

# Statistical Methods

We utilized descriptive statistics to characterize patient demographics, ECOG score, and outcome frequencies. We compared means for normally distributed continuous variables using the students t-test, and medians for non-normally distributed continuous variables using the Kruskal Wallis test. We utilized multivariable logistic regression to evaluate the association of our exposure variables on hospital admission/discharge. We considered an alpha of 0.05 significant.

## Results

# Cohort Characteristics

We identified 553 patients during our study period who were over the age of 18, had a past medical history of cancer, and presented to the ED with a pain-related chief complaint. Of these patients, 38 were excluded because their condition was not considered a true malignancy (e.g., colon polyp, non-melanomatous skin cancer, carcinoma in situ), while 32 additional patients were excluded for having a non-active cancer. The remaining 483 patients were included in the final analysis (Fig. 1). Our test of inter-rater reliability resulted in a kappa score of .78, which represents substantial agreement.

Our cohort had a median age of 59, was predominantly non-Hispanic white (60%), and was 53.80% female (Table 1). The most common cancer types were colorectal, gastrointestinal, leukemia/lymphoma, and female reproductive malignancies in descending order (Table 2). Among those with a primary pain diagnosis upon ED Disposition (n = 232), the most common pain types were abdominal, diffuse/non-specific, and musculoskeletal in descending order (Table 3). Our cohort had a median ECOG score of 1. Approximately 1/3 of our patients were admitted to the hospital (39.33%). Of the patients that were discharged, 12.63% revisited the ED within 72 hours.

Table 1
Demographics of study population. Quantified metrics of patients' age, sex, race/ethnicity, and ECOG status are depicted in the following tables.

| Variable | Metric |
|---|---|
| Age, mean (SD) | 57.55 (15.16) |
| Sex, % (n) | |
| Male | 46.20% (223) |
| Female | 53.80% (260) |
| Race/Ethnicity, % (n) | |
| Non-Hispanic White | 60.00% (290) |
| Hispanic | 23.00% (111) |
| Asian/Pacific Islander | 6.40% (31) |
| African American/Black | 7.20% (35) |
| Other | 2.90% (14) |
| ECOG Status, % (n) | |
| 0 | 27.30% (132) |
| 1 | 39.93% (190) |
| 2 | 13.25% (64) |
| 3 | 18.42% (64) |
| 4 | 1.66% (8) |
| Disposition/Outcome, % (n) | |
| Admitted | 39.33% (190) |
| Discharged | 60.66% (293) |
| ED Revisit within 72 hours | 12.63% (37) |

Table 2
Pain Scores Stratified by Cancer Type. Initial, final, and delta pain scores stratified by different cancer types.

| Type of Cancer | | Initial Pain | Final Pain | Delta Pain |
|---|---|---|---|---|
| Breast (n = 44) | Mean | 6.75 | 4.88 | -1.79 |
| | Median | 7 | 5 | -1 |
| CNS (n = 26) | Mean | 6.38 | 3.54 | -2.85 |
| | Median | 7 | 3.5 | -3.5 |
| Colorectal (n = 55) | Mean | 6.64 | 3.84 | -2.8 |
| | Median | 8 | 3 | -2 |
| Endocrine (n = 7) | Mean | 7.14 | 4.29 | -2.86 |
| | Median | 8 | 4 | -3 |
| ENT (n = 20) | Mean | 6.7 | 4.65 | -2.05 |
| | Median | 7 | 5.5 | -1 |
| Gastrointestinal (n = 75) | Mean | 6.88 | 3.71 | -3.17 |
| | Median | 8 | 3 | -3 |
| Kidney/Ureter/Bladder (n = 17) | Mean | 7.53 | 4.35 | -3.18 |
| | Median | 8 | 5 | -3 |
| Leukemia/Lymphoma (n = 65) | Mean | 6.74 | 4.11 | -2.64 |
| | Median | 7 | 4.5 | -2.5 |
| Lung (n = 25) | Mean | 7.56 | 5.32 | -2.24 |
| | Median | 8 | 5 | -2 |
| Melanoma (n = 14) | Mean | 7.71 | 3.93 | -3.79 |
| | Median | 8 | 4 | -4 |
| Neuroendocrine (n = 6) | Mean | 6 | 3.67 | -2.33 |
| | Median | 6 | 4.5 | -2.5 |
| Reproductive Female (n = 54) | Mean | 7.94 | 4.46 | -3.48 |
| | Median | 8 | 4.5 | -3 |
| Reproductive – Male (n = 37) | Mean | 7.08 | 3.27 | -3.81 |

| Type of Cancer | | Initial Pain | Final Pain | Delta Pain |
|---|---|---|---|---|
| | Median | 8 | 2 | -4 |
| Sarcoma (n = 17) | Mean | 7.47 | 5.47 | -2 |
| | Median | 7 | 5 | -2 |
| Unspecified (n = 18) | Mean | 7.33 | 4 | -3.33 |
| | Median | 8 | 4 | -3 |

Table 3
Pain Scores Stratified by Pain Character. This table represents the statistics of initial pain, final pain,and delta pain stratified by the different pain characters in those that had a pain-related diagnosis on ED disposition (n = 232)

| Type of pain | | Initial Pain | Final Pain | Delta Pain |
|---|---|---|---|---|
| Abdominal (n = 82) | Mean | 7.38 | 3.66 | -3.72 |
| | Median | 8 | 3.5 | -3 |
| Chest (n = 35) | Mean | 6.14 | 3.29 | -2.86 |
| | Median | 7 | 2 | -3 |
| Non-specific (n = 46) | Mean | 7.76 | 5.13 | -2.67 |
| | Median | 9 | 5 | -2 |
| ENT (n = 8) | Mean | 5.87 | 3.25 | -2.63 |
| | Median | 6 | 2 | -2 |
| MSK (n = 40) | Mean | 7.72 | 5.63 | -2.10 |
| | Median | 8 | 5 | -1 |
| Neurologic (n = 7) | Mean | 7.29 | 1.43 | -5.86 |
| | Median | 10 | 1 | -5 |
| Pelvic (n = 10) | Mean | 7.20 | 3.70 | -3.50 |
| | Median | 8 | 3 | -3 |
| Rectal (n = 2) | Mean | 8.00 | 1.50 | -6.50 |
| | Median | 8 | 1.5 | -6.5 |
| Urologic (n = 2_ | Mean | 6.00 | 1.00 | -5.00 |
| | Median | 6 | 1 | -5 |
| Total | Mean | 7.26 | 4.11 | -3.16 |
| | Median | 8 | 4 | -3 |

# Cancer Types

Pain score frequencies stratified by cancer type is depicted in Table 2. Of note, breast, central nervous system (CNS), colorectal, Ear/Nose/Throat (ENT), gastrointestinal, leukemia/lymphoma, lung, female reproductive, and male reproductive cancers had strata that consisted of at least 20 patients with greater

than 50% reporting initial severe pain. Of these, reproductive female cancers had the greatest percentage of patients presenting with severe pain (82.9%). The cancer types with the least improvement in pain (delta pain < 2.5) upon ED disposition were breast, colorectal, ENT, and lung. There was no statistical difference in initial, final or delta pain based on cancer type after adjusting for age, sex, race/ethnicity and ECOG score. There was also no statistical difference between solid and hematologic malignancies when assessing for delta pain.

# Pain Character

Pain score frequencies stratified by pain character is addressed in Table 3. When investigating the type of pain that patients encountered and how this affected their response to analgesia, we discovered that among patients who had a primary diagnosis of pain upon ED disposition (n = 233, e.g. abdominal pain, musculoskeletal pain, pelvic pain), those presenting with musculoskeletal pain tended to have a higher resistance to pain control. Specifically, patients with musculoskeletal pain had significantly less improvement in reported pain than all other pain types (delta pain − 2.1 vs -3.4, OR 2.3 p = 0.025).

*Age*: Patients who presented to the ED with severe pain tended to be younger than patients who did not present with severe pain (median: 58 vs 62 respectively, OR 8.0 p < 0.01). There were no significant age differences, however, among those that had severe pain on ED disposition, nor were there significant differences in delta pain with respect to age.

# ECOG

Among patients with a high ECOG status (n = 97) 51.5% were admitted, which is significantly greater than those who presented with lower ECOG statuses after adjusting for age, sex and race/ethnicity (n = 386, 37.8% admitted) (AOR 1.6, p = .034). Patients with high ECOG scores who presented with severe pain commonly remained in severe pain throughout their ED encounter. Specifically, 93% of patients with both high ECOG status and severe initial pain continued to have severe pain on ED disposition. In comparison, only 25.1% of patients with a high ECOG but without severe pain on presentation had severe pain on ED disposition. The median delta pain for patients with high ECOG statuses and severe initial pain was − 1, while the median delta pain for all other patients was − 3. Patients with high ECOG statuses and severe initial pain saw significantly less improvement in their pain than others in the cohort (OR 8.4, p < .01).

*Pain Scores Among Admitted and Discharged Patient Groups*: We compared initial pain, final pain, and delta pain between admitted and discharged groups (Table 4). Although initial pain levels were found to be roughly the same between both groups, discharged patients tended to have lower final pain scores (mean: 3.73) than admitted patients (mean: 4.82). Discharged patients had greater improvement in their pain, as indicated by significantly lower median delta pain than admitted patients (-3 vs -2 respectively) [OR 1.101, p = 0.001].

Table 4
Pain Scores of Admitted and Discharged Cohorts. Initial pain, final pain, and delta pain scores stratified by admitted, discharged, and total cohorts.

| | | Initial Pain | Final Pain | Delta Pain |
|---|---|---|---|---|
| Admitted (n = 190) | Mean | 7.09 | 4.82 | -2.26 |
| | Median | 8 | 5 | -2 |
| Discharged (n = 290) | Mean | 7.00 | 3.73 | -3.27 |
| | Median | 8 | 3 | -3 |
| Total | Mean | 7.04 | 4.16 | -2.87 |
| | Median | 8 | 4 | -3 |

# Time to First Medication

Delays in analgesic administration appeared to have an influence on hospital admission. We found that patients who experienced a delay of greater than 180 minutes from being placed in their ED room to first analgesic administration were more likely to be admitted to the hospital after adjusting for age, sex, race/ethnicity and ECOG status (AOR 3.4, p = 0.014).

# Medications

When comparing response to analgesics, we found that patients who received a non-opioid analgesic had a median decrease in pain of 2, whereas patients who received opioids had a median decrease of 3 (OR 0.921, p = 0.005). We found that patients who received opioids, however, were admitted more frequently than those who did not receive opioids. Specifically, 43.3% of patients who received opioids were admitted to the hospital versus 34.5% of patients who did not receive opioids after adjusting for demographic factors (AOR 1.51, p = .048).

We also found that among patients who did not already have a home opioid prescription, the majority received a prescription for opioids upon discharge from the ED if they required any opioid (PO or IV) while in the ED for pain control. Specifically, 36% of those who were administered an opioid in the ED received a prescription, versus 7.4% of those patients who did not receive an opioid for pain in the ED. We found that patients without a home opioid prescription who received an opioid for pain control in the ED were less likely to return to the ED within 72 hours if they also received an opioid prescription upon ED discharge (11.6% vs 14.5%), however, this result was non-significant. A general breakdown of analgesic frequency can be found in Fig. 2.

## Discussion

Cancer pain management has always been difficult. This is especially true during periods of acute exacerbation that require a visit to the ED. Previous literature has helped elucidate the scope of the problem [1–3, 13], but a more in depth analysis of ED cancer pain management and associated outcomes is lacking. Prior studies have demonstrated limited improvement in pain management despite targeted interventions, highlighting the need for further study in this area [3]. We performed this study to better define the population at risk, the current status of pain management in the ED, and the associated outcomes, in an effort to identify future targets for intervention.

# Cancer Types:

After stratifying pain scores by cancer type, we noted that breast, colorectal, and ENT cancers had both a high volume of initial severe pain presentations and a low median delta pain. As a result, these cancers were of particular interest because they seemed to be the least responsive to pain management in our cohort.

Pain from breast cancer is often a result of the dissemination to other organs, most commonly to bone [14]. Prior literature suggests that roughly 30–40% of breast cancer patients experience pain following surgical interventions, and that chronic pain thereafter is common [14, 15]. In a separate study investigating chronic pain prevalence in breast cancer survivors, 25.3% presented with neuropathic pain, 18.7% with nociceptive pain, and 15.4% with central sensitization pain [16]. A recent study reported that 30–50% of patients with breast and colon cancer presenting to community cancer centers did not report discussing, getting advice, or receiving desired help for pain, fatigue, or emotional distress, thereby highlighting an area of improvement in the management for these two cancers and beyond [17].

Patients with head and neck cancer often suffer from episodes of acute pain (commonly nociceptive or neuropathic in nature) superimposed on chronic pain throughout the duration of the illness [18, 19]. Chronic pain in long-term head and neck cancer survivors are generally classified as post-surgical pain syndromes (i.e., loss of sensation and function), radiation-induced pain (i.e., neural damage and osteoradionecrosis) and chemotherapy-induced pain (i.e., peripheral neuropathy) [20, 21]. Ultimately, the consequences of pain in this patient population can cause nutritional problems, decreased quality of life, reduced treatment response, and increased hospitalization.

# Pain Character

When comparing differences in delta pain between admitted and discharged patients, we found that discharged patients tended to have higher delta pain scores, indicating greater improvement in their pain. Given that admitted patients and discharged patients had similar initial pain scores at presentation, it appears that refractory pain is associated with higher admission rates. Our analysis revealed that those patients with musculoskeletal pain encountered a significantly greater resistance to pain management than other pain types. This finding suggests that patients with bony metastases and other musculoskeletal complications may require more aggressive pain management strategies. Tumors that

metastasize to bone induce skeletal remodeling, fractures, anemia and significant pain. Unfortunately, the actual mechanisms that drive cancer-related bone pain require further investigation [22]. Treatment of bone pain from metastases remains palliative at present, and typically involves a combination of systemic analgesics, anti-tumor agents, hormones, chemotherapy, steroids, local surgery, anesthesia, and/or external beam radiation [23]. To our knowledge there are no published protocols for the specific management of acute pain crises for cancer-related musculoskeletal pain. This serves as a critical target for future intervention.

# Age and Severe Pain

We found that patients with severe pain on arrival to the ED tended to be younger than those who presented without severe pain. Though no causative explanation can be drawn, we suspect that possible explanations for this finding include generational differences in experiencing and reporting pain, different age groups being more susceptible to certain cancer types, or other potential pathophysiological differences. For instance, we suspect that younger patients may be predisposed to cancer types or variances of pain that present in an acute manner (i.e., short-term, sharp, spontaneous, etc.). Alternative characteristics reported in the literature include how aging decreases sensitivity to low intensity pain and increases pain thresholds [24]. One study specifically reported a correlation between decreasing cancer pain severity and increasing age [25]. As younger patients tend to have shorter-lasting cancers when compared to elderly patients, they are less likely to have acclimated to their condition. Elderly patients are more likely to experience chronic pain from other medical conditions and may thereby be less affected by cancer pain, especially in the initial stages [26]. Furthermore, elderly patients may be less likely to report pain because of attitudes of stoicism, fatalism, and resignation [26]. Younger patients may be less likely to visit the ED unless their pain escalates to a severe state, thereby reinforcing the trend of higher initial pain scores in this population. We encourage oncology and emergency teams to be acutely aware of how cancer-pain may be experienced and consequently reported incongruously between different age groups.

# Using ECOG with Initial Pain Levels to Guide Patient Care

By analyzing patients' functional status in conjunction with their pain scores, we found that patients who presented to the ED with a high ECOG status and severe initial pain had significantly less improvement in their pain than all other patient groups. We suggest that this vulnerable patient group may experience little improvement in pain not because of poor ED management but rather due to inherent qualities of their illness that are difficult to address in the acute setting. We encourage ED physicians to recognize this phenomenon, adjust their expectations for pain relief, and understand that even a minor decrease in pain may be difficult to achieve.

Given the apparent influence of ECOG on pain management outcomes, we also recommend that ECOG status be routinely documented in both the ED and oncologic settings for cancer patients; especially in those who are experiencing acute pain. Patients with a high ECOG status and severe initial pain could be

flagged in EHR systems to alert the care team regarding the increased odds of refractory pain and hospital admission. This flag could also trigger the need for a palliative care consultation and guide clinicians towards more aggressive pain management protocols whether in a specialized ED observation unit or on an inpatient ward. This EMR strategy is an area of potential further study as discussed below.

# Improving Analgesic Utilization

Our analysis identified that patients who experienced a significant delay in analgesic administration were more likely to be admitted to the hospital. Given the often busy and chaotic environment of the ED, delays in treatment are common [27]. Creating a culture that stresses the importance of cancer pain management with appropriate timing and dosing is imperative in improving patient care and decreasing admissions for cancer pain management.

# Opioid Analgesics

Though several non-opioid treatment modalities are available, opioid analgesics have been the mainstay for treating patients with moderate-to-severe cancer-related pain [28]. Consistent with the literature, we identified that patients who received opioids had superior pain control relative to those that received non-opioid medications. Interestingly, we also found that patients who received IV opioids for pain management in the ED were more likely to be admitted than those who did not. There are several factors that may contribute to this phenomenon. First, patients that require stronger pain medication may be more ill at baseline and are therefore more likely to be admitted. Secondly, once IV opioids are initiated, it may be difficult for clinicians to transition these patients to oral regimens in a timely manner, thus requiring admission for observation.

Beyond the administration of IV opioids, we were also interested in analyzing the patient cohort that received a home opioid prescription upon ED disposition. We specifically analyzed the subgroup of patients who were not already taking opioids at home. As expected, we found that these patients were more likely to receive a home opioid prescription if they were given an opioid analgesic during their ED visit. In the literature, there has been discussion regarding the use of step 2 “weak opioids” and step 3 “strong opioids”, in which studies have indicated that opioid-naïve cancer patients with moderate pain are more likely to respond to low-dose morphine, a strong opioid, than to weak opioids [28–30]. This poses an interesting point for emergency physicians to consider when deciding on the strength and dosing of analgesic agents for patients with active cancer-related pain.

# Limitations and Future Areas of Study

Due to the nature of retrospective studies, an inherent limitation is the inability to assume causation. Additionally, this study was performed at a specific region in the United States, and therefore may not be

generalizable to other populations. Regarding areas of further study, future investigations into pain characteristics (i.e., duration, location, quality) may help identify a subgroup of pain that is more in need of targeted intervention. We believe that a more detailed survey of cancer types can help identify features that catalyze exacerbations of cancer-related pain. Another realm of further study should focus on visits involving severe initial pain at presentation to gain insight on potential risk factors. Lastly, a better understanding of differing cancer pain experiences between young and elderly patients may help formulate more tailored protocols for pain management and ideally decrease the number of preventable ED visits for cancer-related pain.

## Conclusion

Through this investigation of patients with active cancer presenting to the ED with pain, we were able to identify several factors that were associated with adverse outcomes. Notably, delayed administration of pain medication as well as high ECOG status were associated with an increased likelihood of admission. Additionally, patients who presented with severe pain and a high ECOG status were highly refractory to treatment in the ED. We suspect that by increasing awareness of the challenges involved in ED cancer pain management, in addition to implementing systemic interventions involving EHR system-based modifications, we can improve the process of identifying vulnerable patients, develop tailored cancer pain management protocols, and improve the overall experience of patients with cancer who present to the ED with pain, while decreasing preventable hospital admissions.

## Declarations

# Funding

- Unfunded

# Conflicts of interest/Competing interests

– No conflicts of interest by the authors.

# Availability of data and material

– Data available upon request

# Code availability

– Not Applicable

# Authors Contributions

- CC conceived of the study and the methods. VR, AK and CC participated in data acquisition. CC RG and LL participated in data analysis and interpretation. RG took the lead in writing the manuscript. RS provided critical insight as a content expert to help shape the discussion. All authors provided critical feedback and helped shape the research, analysis and manuscript. CC takes responsibility for the project as a whole.

# Ethics approval

– This study was approved by our institutional IRB.

# Consent to participate

– Not applicable

# Consent for publication

– Not applicable

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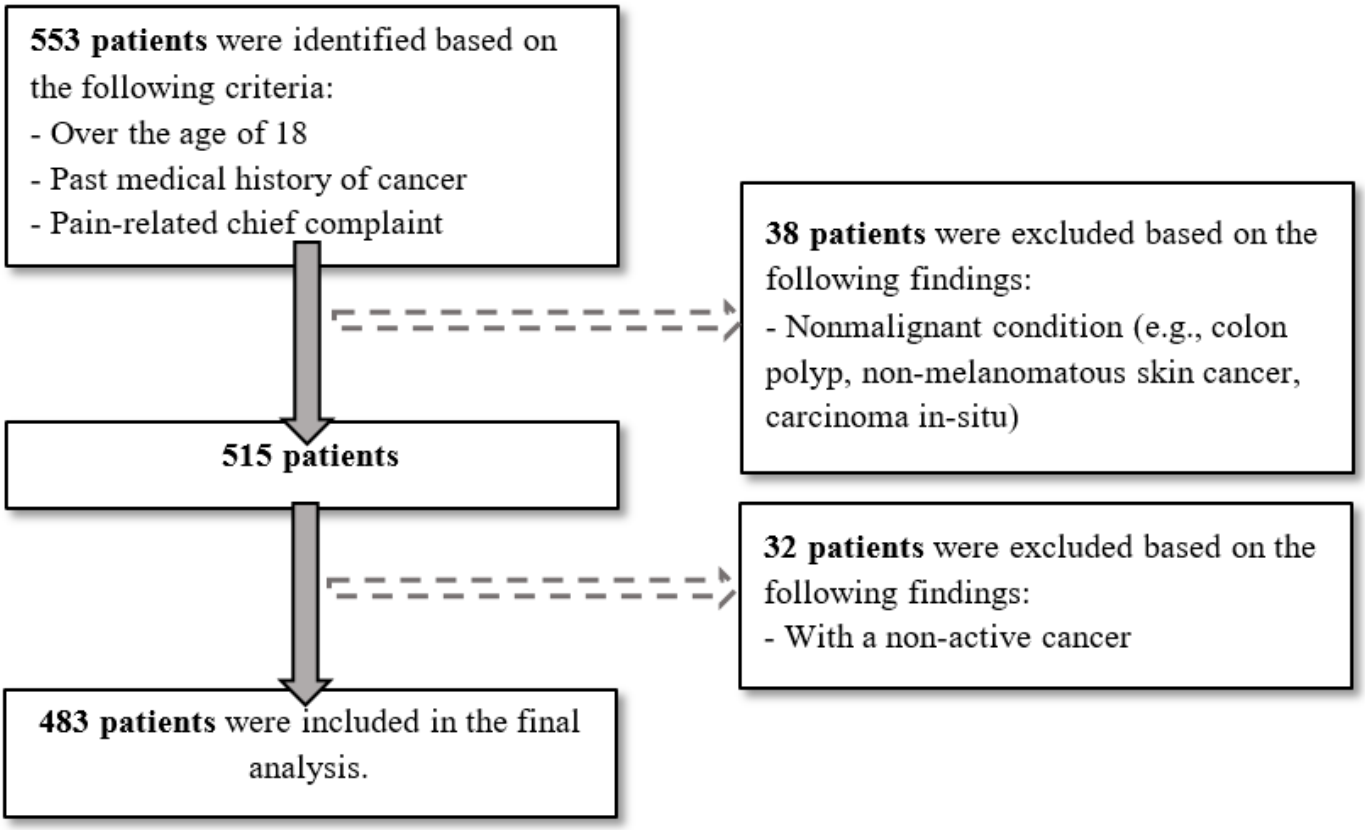
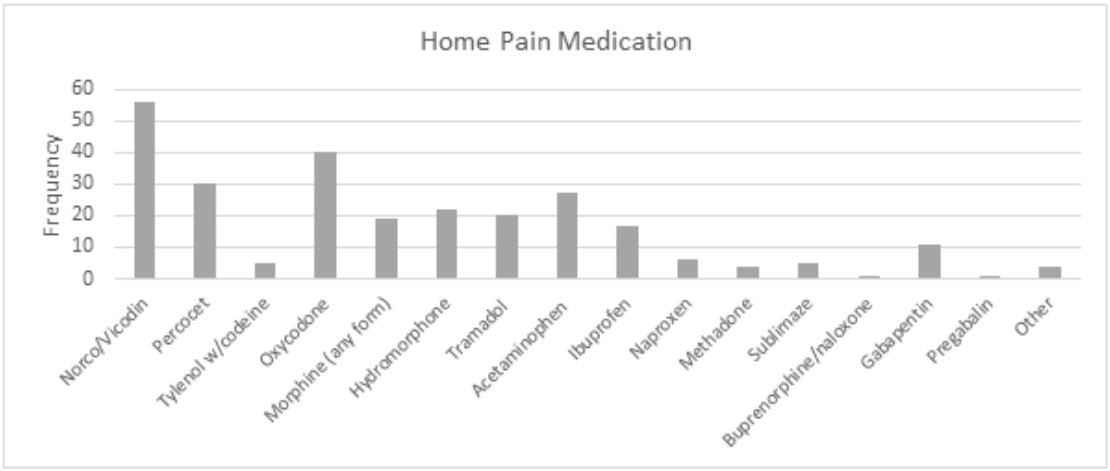
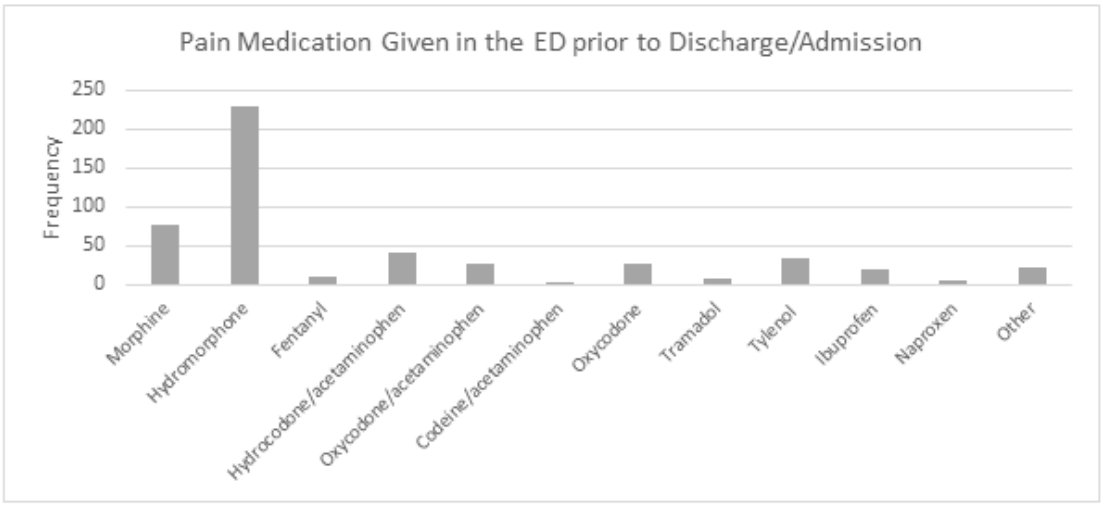
# Figures




## Figure 1

Flowsheet of Study Design. 483 out of 553 patient charts were retrospectively reviewed and included in the study. Exclusion criteria included patients over the age of 18 with past medical history of cancer who presented to the ED with active cancer and a chief complaint of pain. Active cancer was defined as a diagnosis of cancer with ongoing treatment, ongoing symptoms relating to cancer, or a known recurrence of a previous cancer.



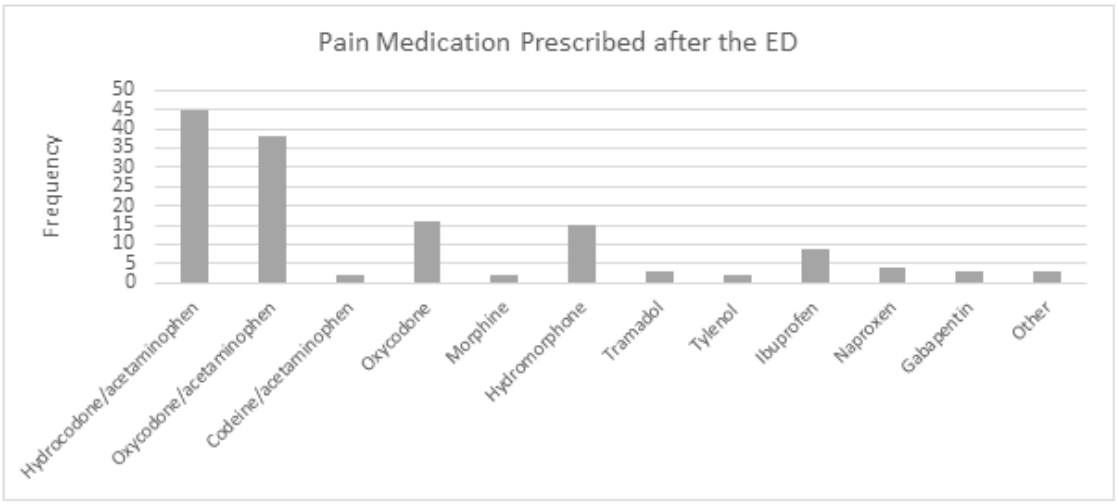




**Figure 2**

Medications. Distributions of medications stratified by home pain medication, pain medication given in the ED prior to discharge/admission, and pain medication prescribed upon ED disposition.

# Supplementary Files

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- 9.SupplementalMaterials.docx