

# Pain Outcomes of Inpatient Pain and Palliative Care Consultations: Differences by Race and Diagnosis

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## Abstract

**Background:** Pain management disparities exist among patients not receiving palliative care. We examined pain outcomes for disparities among patients receiving palliative care.

**Methods:** At a 542-bed teaching hospital in Honolulu, The Queens' Medical Center Pain and Palliative Care Department collected patient characteristics and pain severity (initial, final) for each consultation from 2005 through 2009. Analyses compared pain levels by race (white, Asian, Hawaiian/Pacific Islander [PI], other) and consultation diagnosis (cancer, noncancer medical, surgical [59% orthopedic], other). Multiple regression models analyzed factors associated with lower final pain levels and pain reduction.

**Results:** Study population included 4658 patients. No final pain was reported by more non-white patients (33%–39%) than white (27%,  $p < 0.0001$ ) and more cancer and noncancer medical patients (45%–54%) than surgical/other patients (20%–31%,  $p < 0.0001$ ). Asian (adjusted odds ratio [aOR] 1.24; 95% confidence interval [CI] 1.06–1.46;  $p = 0.007$ ) and PI (aOR 1.46, 95% CI 1.20–1.77,  $p = 0.0001$ ) races had increased likelihoods of lower final pain severity versus whites, controlling for age, gender, Karnofsky score, preconsult length of stay, and initial pain severity. Surgical diagnoses had decreased likelihood of lower final pain levels versus cancer (aOR 0.38, 95% CI 0.32–0.46,  $p < 0.0001$ ). Among 2304 patients reporting moderate/severe initial pain, 1738 (75.4%) reported pain reduction to mild/no final pain. PI race was associated with pain reduction versus whites (aOR 1.57, 95% CI 1.17–2.10,  $p = 0.003$ ). Surgical diagnoses had decreased likelihood of pain reduction vs. cancer (aOR 0.52, 95% CI 0.39–0.71,  $p < 0.0001$ ).

**Conclusion:** Pain outcomes were similar or better among non-white races than whites. Surgical patients reported more final pain than cancer patients.

## Introduction

THE EXAMINATION OF pain management across diverse populations is an important area of research in palliative medicine.<sup>1–3</sup> Recent studies describe disparities in the treatment of pain for patients with cancer<sup>4</sup> and patients in emergency departments.<sup>5</sup>

Palliative care, with its focus on pain and symptom management, effective communication skills and equitable access to care for all patients,<sup>6</sup> may be able to overcome obstacles to pain management among non-white patients. Data are lacking on whether patients who receive palliative care consultations also demonstrate these racial disparities in pain management.

Reports on pain management outcomes from inpatient hospital palliative care consultations have been limited.<sup>7</sup> It is

important to examine pain outcomes from an inpatient palliative care service, since in many communities, the hospital setting is the only place patients can access palliative care without enrolling in a hospice program. Studies have indicated that non-white patients may have lower rates of hospice use than white patients.<sup>8,9</sup> Thus, inpatient palliative care consultation services may care for a more diverse patient population than hospice programs. Previous studies including Asian American and Pacific Islander populations receiving consultations for pain or palliative care did not compare pain outcomes by racial categories.<sup>10–12</sup> No study has examined pain management by an inpatient hospital-based palliative care consultation service among different races and diagnoses.

It is important to examine pain management by patient characteristics to improve the quality of care provided for all patients. Studying the patterns of pain outcomes by diagnoses

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of patients broadens the understanding of palliative care challenges and opportunities in noncancer center settings. This study examined the impact of a palliative care consultation on pain outcomes using data collected prospectively at a major community-based referral hospital serving a diverse patient population. The study specifically examined pain outcomes after consultation by patient race and consultation diagnosis in order to: (1) identify possible racial disparities in pain outcomes among patients receiving palliative care consultations and (2) identify patient groups who currently benefit from the consultations and patient groups who may need additional intervention or study to enhance their pain management.

## Methods

### *Participants, design, and setting*

The Queen's Medical Center, a 542-bed community-based teaching hospital, is the major tertiary care referral center for the Pacific basin. The diverse patient population reflects the general population of Hawaii and the Pacific. In 2004, the nurse-run Pain Management Service converted to an interdisciplinary Pain & Palliative Care Department developed to meet the needs of hospitalized patients with acute pain, acute exacerbations of chronic pain, or palliative care needs including pain related to progressive or life-limiting illness. This study consisted of an analysis of data from the Pain and Palliative Care Department at The Queen's Medical Center. All adult hospital patients, with a recorded consultation diagnosis, at least 1 day of inpatient hospital stay and who received inpatient pain and palliative care team consultations from January 1, 2005 through December 31, 2009 were included. This study was approved by the University of Hawaii and The Queen's Medical Center Institutional Review Boards. Requirement for informed consent was waived based on the retrospective analyses of a de-identified dataset that was prospectively compiled during usual patient care over 5 years, making individual patient consent unfeasible.

### *Instrument procedures*

Patient demographic characteristics, Karnofsky score, and consultation diagnosis were recorded at the time of the consultation. Pain scores were prospectively obtained for each patient at the time of consultation and prior to discharge. Scores were based on patient report of pain at that moment using an 11-point numeric rating (0–10) scale. A verbal rating (none, mild, moderate, severe) was used when patients preferred to use the conceptually simple<sup>13</sup> adjective rating instead of a numeric pain score using the 11-point scale.<sup>14</sup> The verbal rating scale is often preferred by older patients or those with difficulty with abstract questions.<sup>13,15,16</sup> For analyses, in order to include the broadest population possible (including elderly patients and those unable to use the numeric scale), the 11-point numeric scale ratings were collapsed to the 4-point scale as follows: 0, no pain (rank=0); 1 to 3, mild (rank=1); 4 to 6, moderate (rank=2); and 7 to 10, severe (rank=3).<sup>17,18</sup> In a previous study comparing the verbal rating scale with 11-point scales, a cut point of 7 and higher to distinguish severe from nonsevere pain had a sensitivity of 89.6% and specificity of 79.6%. A cut point of 4 and higher to distinguish moderate to severe pain from mild or no pain had a sensitivity of 90.3% and a specificity of 79.2%.<sup>17</sup> Scores were primarily based on

patient report; surrogate report was used when patient report was not possible. Clinicians observed the level of pain behaviors (bracing, grimacing, restlessness, rubbing, and vocalizing) based on the Checklist of Nonverbal Pain Indicators<sup>19</sup> and graded pain as absent, mild, moderate, or severe only when neither patient nor surrogate report was possible. For a sample year with available pain score source data, 86% of pain scores were patient-generated, 13% were clinician-generated and 1% was surrogate-generated.

### *Definitions*

Racial data were obtained from patient self-report at the time of hospital admission. Races<sup>20</sup> reflected Hawaii's diverse population and consisted of Caucasian, Japanese, Okinawan, Hawaiian, part-Hawaiian, Korean, Chinese, Micronesian, Pacific Islander, Filipino, African American, Native American, Middle Eastern, East Indian, and mixed races. For analyses, the racial categories were clustered into the four largest groups: Caucasian or white; Asian; Hawaiian, part-Hawaiian, Pacific Islander and Micronesian; and other races.<sup>21</sup>

Diagnosis data reflected the palliative care clinician's assessment at the time of the initial palliative care evaluation of the major diagnosis leading to the consultation. This was a clinical assessment taking into account the medical record, the patient's history and findings on physical examination. Billing ICD-9 codes were not used to determine the diagnosis. The diagnoses were sorted into general categories including cancer and the following noncancer diagnoses: orthopedic, trauma, general surgical, urologic, gynecologic, cardiac, hepatic, stroke/coma, renal, pulmonary, dementia, psychiatric and other diagnoses not listed. For analyses, the diagnoses were grouped according to type of care the patient received in the hospital: surgical care (including orthopedic, trauma, general surgical, urologic and gynecologic), oncologic care, noncancer medical care (including cardiac, hepatic, stroke/coma, renal, pulmonary and dementia), or psychiatric/other/unknown, based on this primary diagnosis. These groupings were necessary to examine any patterns in pain management between different types of hospital patients receiving palliative care consultation. The consulting pain and palliative care team estimated the Karnofsky score at the initial consultation in 10% increments (10–100), as a proxy for overall level of illness.<sup>22</sup> Preconsultation hospital length of stay was recorded in days.

### *Outcomes*

The main outcome of interest was level of final pain severity as an ordinal variable. Pain was also analyzed as reduction in pain from moderate or severe to mild or none, excluding patients with mild or no initial pain. For pain reduction analyses, a dichotomous (yes/no) pain reduction variable was created. Patients with reduction in pain from moderate or severe (initial) to mild or none (final) were assigned a "yes" value (1) for pain reduction. Patients with final pain levels of moderate or severe were assigned a "no" value (0) for pain reduction.

### *Analyses*

Descriptive statistics of the patient population were generated, and characteristics of patients were compared using  $\chi^2$  and analysis of variance (ANOVA). The 4-point verbal rating

scale is a rank of pain, and the intervals between the ranks cannot be assumed to be equal. The Kruskal-Wallis statistic (an ordinal measure test analogous to the *t* test or ANOVA for continuous measures) was used to determine significance of difference in levels of initial and final pain severity by patient race and diagnosis. The pain outcomes were analyzed in multiple regression models in two different ways. First, factors associated with lower severity of final pain levels versus higher levels were analyzed using ordinal logistic regression models, controlling for age, race, diagnosis, gender, Karnofsky score, preconsult length of stay, and initial pain severity. A subgroup analysis excluded patients with no or mild initial pain, as patients with moderate or severe initial pain at the time of the first palliative care evaluation were most in need of effective pain management. Second, a multiple logistic regression model examined factors associated with reduction in final pain severity to none or mild among patients with moderate or severe pain on initial pain and palliative care evaluation, adjusting for the same covariates as the ordinal logistic regression model.

## Results

Demographic and clinical characteristics are displayed in Table 1. A total of 4658 adult patients received pain and pal-

lative care consultations during the five calendar years 2005 through 2009. Over 60% of the patients who received consultation were aged less than 65 years and 51% were male. Over 25% of patients had cancer as the primary diagnosis resulting in the consultation, while 46% had surgical diagnoses. The median Karnofsky score was 60%. The mean number of hospital days prior to consultation was 5.8 days. While initial pain was severe in 29% of patients and moderate in 35%, final pain was severe in 2% and moderate in 16%. Among the 2304 patients with moderate or severe pain initially, 75% had final pain reduced to mild or none.

Characteristics by consultation diagnosis are displayed in Table 2. The mean Karnofsky score was higher in the surgical (70%) and "other" diagnoses (60%) compared to the cancer (40%) and noncancer medical diagnoses (48%). The percentage of patients with severe initial pain was similar (26%–29%) across diagnoses, although the "other diagnoses" group had the highest percentage (34%) of patients with severe initial pain. A higher percentage of patients with cancer and noncancer medical diagnoses (21% and 23%, respectively) reported no initial pain compared to surgical (8.1%) and other diagnoses (7.8%). Less than 5% of patients in any diagnosis group reported severe final pain, but more patients in the surgical and "other" diagnoses groups reported moderate final pain (20% and 16%, respectively). Significantly more

TABLE 1. CHARACTERISTICS OF PATIENTS BY RACIAL CATEGORY

Characteristic	Overall n=4658 (%)	White n=2022 (43.4%)	Asian n=1601 (34.4%)	Hawaiian/Islander n=820 (17.6%)	Other race <sup>a</sup> n=215 (4.6%)	p value
Age <65 years	2955 (63.5)	1369 (67.7 <sup>b</sup> )	780 (48.8)	651 (79.4)	155 (72.1)	<0.0001
Age 65–74 years	822 (17.7)	344 (17.0)	318 (19.9)	125 (15.2)	35 (16.3)	
Age 75 years and older	880 (18.9)	309 (15.3)	502 (31.4)	44 (5.4)	25 (11.6)	
Male gender	2390 (51.3)	1042 (51.6)	781 (48.8)	442 (53.9)	125 (58.1)	0.02
Female gender	2267 (48.7)	979 (48.4)	820 (51.2)	378 (46.1)	90 (41.9)	
Consultation diagnosis						
Cancer	1255 (25.9)	365 (18.1)	560 (35.0)	275 (33.5)	55 (25.6)	<0.0001
Surgical <sup>c</sup>	2163 (46.4)	1093 (54.1)	677 (42.3)	295 (36.0)	98 (45.6)	
Noncancer Medical <sup>d</sup>	528 (11.3)	218 (10.8)	160 (10.0)	122 (14.9)	28 (13.0)	
Other Diagnosis <sup>e</sup>	712 (15.3)	346 (17.1)	204 (12.7)	128 (15.6)	34 (15.8)	
Mean Karnofsky score	58.0±25.3	61.8±23.6	54.8±26.6	54.3±25.2	60.4±25.3	<0.0001
Preconsult LOS <sup>f</sup>	5.8±16.5	4.7±12.4	6.7±21.4	7.2±15.4	4.8±10.4	<0.0001
Initial pain severity						
None	584 (13.3)	158 (8.2)	294 (19.8)	103 (13.3)	29 (14.2)	<0.0001
Mild	987 (22.5)	429 (22.4)	376 (25.3)	142 (18.3)	40 (19.6)	
Moderate	1529 (34.9)	708 (36.9)	459 (30.9)	289 (37.2)	73 (35.8)	
Severe	1282 (29.3)	622 (32.5)	355 (23.9)	243 (31.3)	62 (30.4)	
Final pain severity						
None	1216 (33.0)	439 (26.5)	480 (39.0)	243 (38.5)	54 (32.5)	<0.0001
Mild	1808 (49.0)	845 (51.0)	590 (47.9)	296 (46.8)	77 (46.4)	
Moderate	574 (15.6)	320 (19.3)	139 (11.3)	83 (13.1)	32 (19.3)	
Severe	90 (2.4)	54 (3.3)	23 (1.9)	10 (1.6)	3 (1.8)	
Pain reduced <sup>g</sup>	1738 (75.4)	796 (71.5)	518 (78.7)	349 (81.4)	75 (72.8)	<0.0001

<sup>a</sup>Other race group: African American (*n*=60, 1.3%), other races (other American/Native, cosmopolitan, unknown, Middle Eastern, declined, *n*=39, 0.7%), and missing race (*n*=116, 2.6%, including patients who reported Hispanic ethnicity but did not report race (*n*=90, 2.0%).

<sup>b</sup>Column percentages shown for racial groups.

<sup>c</sup>Surgical group: orthopedic (*n*=1277, 27.4%), trauma (*n*=268, 5.8%), surgery (*n*=575, 12.3%), gynecologic (*n*=19, *n*=0.4%) and urologic (*n*=24, 0.5%).

<sup>d</sup>Noncancer medical diagnoses included heart (*n*=224, 4.8%), liver (*n*=29, 0.6%), stroke/coma (*n*=30, 0.6%), kidney (*n*=49, 1.1%), lung (*n*=152, 3.3%), dementia (*n*=14, 0.3%), diabetes (*n*=12, 0.3%), and HIV/AIDS (*n*=18, 0.4%).

<sup>e</sup>Other diagnoses included psychiatric (*n*=16, 0.3%) and other diagnoses not listed (*n*=696, 14.9%).

<sup>f</sup>Length of stay (LOS) in the hospital prior to palliative care consultation, in mean number of days.

<sup>g</sup>Pain reduced among 2304 patients with initial pain moderate or severe, to final pain mild or moderate.

TABLE 2. PATIENT CHARACTERISTICS AND PAIN LEVELS BY PRIMARY DIAGNOSIS REQUIRING CONSULTATION

Characteristic	Cancer n=1255 (25.9%)	Surgical n=2163 (46.5%)	Noncancer medical n=528 (11.3%)	Other diagnosis n=712 (15.3%)	p value
Age <65 years	770 (61.4)	1429 (66.1)	291 (55.1)	465 (65.3)	<0.0001
Age 65–74 years	259 (20.7)	354 (16.4)	108 (20.5)	101 (14.2)	
Age 75 years and older	225 (17.9)	380 (17.6)	129 (24.4)	146 (20.5)	
Male gender	643 (51.2)	1095 (50.6)	318 (60.3)	334 (46.9)	<0.0001
Female gender	612 (48.8)	1068 (49.4)	209 (39.7)	378 (53.1)	
Karnofsky score (mean)	40.9±20.6	69.8±20.2	48.2±27.3	60.7±24.8	<0.00001
Mean preconsult LOS	7.2±16.4	3.6±14.8	10.5±19.6	6.8±17.8	<0.00001
Initial pain severity					
None	252 (21.0)	164 (8.1)	116 (23.0)	52 (7.8)	<0.0001
Mild	284 (23.7)	470 (23.3)	108 (21.4)	125 (18.8)	
Moderate	327 (27.3)	795 (39.5)	146 (29.0)	261 (39.3)	
Severe	335 (28.0)	586 (29.1)	134 (26.6)	227 (34.1)	
Final pain severity					
None	502 (54.0)	372 (20.4)	167 (44.8)	175 (31.4)	<0.0001
Mild	334 (35.9)	1043 (57.1)	160 (42.9)	271 (48.6)	
Moderate	82 (8.8)	361 (19.8)	42 (11.3)	89 (16.0)	
Severe	12 (1.3)	51 (2.8)	4 (1.1)	23 (4.1)	
Pain reduced <sup>a</sup>	434 (84.8)	839 (70.3)	172 (81.1)	293 (75.9)	<0.0001

<sup>a</sup>Pain reduced among patients with initial pain severity of moderate or severe, to final pain severity of mild or moderate, *n*=For each additional day the likelihood of a lower pain level increased 1%.

patients with cancer and noncancer medical diagnoses reported no final pain (54% and 45%, respectively), than patients with surgical (20%) and other (31%) diagnoses. Eighty-five percent of cancer and 81% of noncancer medical patients had clinically significant pain reduction from severe or moderate to mild or none, compared to patients with surgical (70%) and other (76%) diagnoses.

Lower levels of initial pain were associated with several factors in adjusted analyses. Increased likelihoods of lower levels of initial pain were significantly associated with older age (OR 2.29, 95% CI 1.97–2.65, *p*<0.0001, data not shown), Asian race (OR 1.50, 95% CI 1.31–1.70, *p*<.0001, versus white race, data not shown), and preconsult length of stay (OR 1.01, 95% CI 1.01–1.01, data not shown). Decreased likelihood of

lower levels of initial pain were significantly associated with surgical (OR 0.70, 95% CI 0.60–0.82, *p*<0.0001, data not shown) and other diagnoses (OR 0.55, 95% CI 0.46–0.66, *p*<0.0001, data not shown). There were no significant differences in association with lower levels of initial pain between Hawaiian/Pacific Islander ethnicity, “other” ethnicity and white ethnicity (data not shown).

Factors associated with lower levels of final pain severity, controlling for gender, Karnofsky score, preconsult length of stay and initial pain severity are displayed in Table 3. Age older than 75 years was associated with increased adjusted likelihood of lower final pain levels compared to patients younger than 75 years. Asian and Hawaiian/Pacific Islander races were associated with increased adjusted likelihoods of

TABLE 3. FACTORS ASSOCIATED WITH LIKELIHOOD OF LOWER PAIN SEVERITY RANKING AT DISCHARGE: MULTIPLE ORDINAL LOGISTIC REGRESSION

Factor	OR (95% CI) <sup>a</sup>	p value	OR (95% CI) <sup>b</sup>	p value
75 and older (vs. <75)	1.43 (1.19–1.72)	0.0002	1.72 (1.34–2.20)	<0.0001
Male (vs. female)	1.00 (0.87–1.14)	0.9	1.01 (0.86–1.19)	0.9
White (ref)	1.00		1.00	
Asian	1.24 (1.06–1.46)	0.007	1.12 (0.92–1.36)	0.3
Hawaiian Pacific Islander	1.46 (1.20–1.77)	0.0001	1.44 (1.15–1.80)	0.002
Other race	1.05 (0.76–1.47)	0.8	0.99 (0.67–1.47)	0.9
Cancer (ref)	1.00		1.00	
Surgical	0.38 (0.32–0.46)	<0.0001	0.42 (0.33–0.52)	<0.0001
Noncancer medical	0.73 (0.56–0.94)	0.02	0.69 (0.50–0.96)	0.03
Other diagnosis	0.54 (0.43–0.68)	<0.0001	0.56 (0.43–0.74)	<0.0001
Karnofsky score <sup>c</sup>	0.99 (0.99–0.99)	<0.0001	0.99 (0.99–0.99)	<0.0001
Preconsult LOS <sup>d</sup>	1.01 (1.00–1.01)	0.01	1.01 (1.00–1.01)	0.05
Initial pain level	0.51 (0.47–0.55)	<0.0001	0.64 (0.54–0.75)	<0.0001

<sup>a</sup>OR=odds ratio; 95% CI=95% confidence interval. OR is the likelihood of having a lower level of pain vs. higher levels.

<sup>b</sup>Subgroup analysis excluding patients with no pain (0) or mild pain (1) initially.

<sup>c</sup>For every 10% increase in Karnofsky score the likelihood of a lower pain level decreased 1%.

<sup>d</sup>For each additional day the likelihood of a lower pain level increased 1%.



TABLE 4. FACTORS ASSOCIATED WITH REDUCTION IN PAIN FROM MODERATE OR SEVERE (INITIAL CONSULT VISIT) TO NONE OR MILD (FINAL CONSULT VISIT): MULTIPLE LOGISTIC REGRESSION

Factor	OR (95% CI)	p value
75 and older (vs. <75)	2.27 (1.57–3.27)	<0.0001
Male (vs. female)	0.93 (0.76–1.13)	0.5
White (ref)	1.00	
Asian	1.19 (0.94–1.52)	0.2
Hawaiian Pacific Islander	1.57 (1.17–2.10)	0.003
Other race	1.01 (0.63–1.60)	0.9
Cancer (ref)	1.00	
Surgical	0.52 (0.39–0.71)	<0.0001
Noncancer Medical	0.84 (0.54–1.30)	0.4
Other diagnosis	0.65 (0.45–0.94)	0.02
Karnofsky score	0.99 (0.99–1.00)	0.02
Preconsult LOS	1.01 (1.00–1.02)	0.2
Initial Pain level	0.62 (0.50–0.75)	<0.0001

LOS, length of stay.

lower final pain levels than white race, although Asian race was no longer significant when patients with mild or no initial pain were excluded. Surgical, noncancer medical, and other diagnoses were associated with decreased adjusted likelihoods of lower pain levels at discharge compared to cancer diagnoses.

Factors associated with reduction in pain severity to mild or none from moderate or severe are displayed on Table 4. This analysis excluded patients with mild or no initial pain ( $n=2304$ ). Controlling for the same covariates, an increased adjusted likelihood of reduction in pain severity was associated with age older than 75 years compared to those younger than 75 years and Hawaiian/Pacific Islander race compared to whites. Surgical and other diagnoses were associated with a decreased adjusted likelihood of reduction in pain severity compared to cancer. Results on Tables 3 and 4 did not significantly change after excluding patients who died during the hospitalization.

## Discussion

This is the first study, to the authors' knowledge, to examine pain outcomes of inpatient palliative care consultations by patient race and diagnosis. This study did not find evidence of racial disparities in pain outcomes among non-white patients receiving inpatient palliative care consultations compared to white patients. However, the study clearly indicated associations between race, diagnosis, and pain outcomes of palliative care consultations. Compared to white patients, Hawaiian and Pacific Islander patients were 46% more likely to have a lower final pain severity than white patients. Compared to patients with cancer, patients with surgical pain were over 60% less likely to have lower final pain severity and 48% less likely to have pain reduction from moderate or severe to mild or none.

Overall, 75% of all patients with moderate or severe pain had clinically significant reduction in pain to mild or none. Interestingly, older patients with moderate to severe initial pain were over twice as likely to have pain reduction as younger patients. Better function on Karnofsky score was associated with reduced likelihood of lower final pain sever-

ity. Longer hospital stay prior to consultation was associated with lower final pain severity.

The racial differences in pain outcomes are in contrast to studies describing significant disparities in pain management.<sup>2,3,5,23–25</sup> Previous studies demonstrating disparities did not examine patients receiving palliative care consultations. The non-white races included in this study are predominantly Asian and Pacific Islander, are different from most previous research samples, and have received little previous study.

Previous studies have demonstrated variation in pain measurement and reporting among races.<sup>26,27</sup> In some studies, non-white patients reported higher levels of pain than white patients.<sup>28,29</sup> Racial variation in pain reporting may particularly be an issue<sup>30</sup> when pain is measured with affective terms.<sup>26</sup> However, in this study, a lower percentage of Asian race patients reported severe and moderate pain compared to patients of the other races. There were no significant differences between Hawaiian or Pacific Islander race, other races and white race in likelihood of lower initial pain levels, even after adjusting for diagnoses. Thus, the superior pain outcomes among Hawaiian and Pacific Islander race patients compared to white patients were unlikely to be due to underreporting of pain or lower levels of initial pain.

Pain management variation, noted in other studies,<sup>5,31</sup> is an unlikely explanation for the final pain severity variation in this study. Standard pain management guidelines<sup>32–34</sup> were used for the initiation and titration of all pain medications. Similarly, racial variations in opioid sensitivity<sup>35</sup> are unlikely to have affected pain reduction in this study. The patients with moderate or severe pain were referred for consultation when they could not be adequately managed by the primary team. At least 71% of patients in all the racial groups reported pain reduction to mild or no pain after consultation.

This study highlights some potential pain management challenges for inpatient palliative care teams, particularly patients with noncancer surgical diagnoses. More non-white patients had cancer diagnoses, while more white patients had surgical, particularly orthopedic, diagnoses, often with long-standing chronic pain issues. Thus, a subset of the patients (predominantly white with chronic orthopedic pain) may represent a more refractory pain management population than may be seen in many cancer centers, yet may be common in community hospital settings. However, even after excluding white patients with orthopedic diagnoses, the magnitude and significance of the likelihood ratios for pain outcomes associated with race and diagnosis persisted (data not shown).

There have been few previous studies comparing palliative care team pain management among patients with both cancer and noncancer diagnoses.<sup>36,37</sup> Much of the palliative care literature focuses on cancer pain.<sup>38,39</sup> The hospital in this study does not have an anesthesia-based pain management service or other pain management specialists that routinely provide inpatient services, although the pain and palliative care team refers patients to anesthesiology when interventional pain management procedures are required. The pain and palliative care service in this study provides care to patients with acute pain, patients with chronic pain experiencing acute exacerbations or intercurrent medical problems requiring hospitalization, and patients who are seriously or terminally ill and require palliative care including pain management. Many community hospital palliative care programs will be called on

to manage both acute cancer pain and chronic orthopedic or neuropathic pain among noncancer patients. While the patient-centered, interdisciplinary team approach of a pain and palliative care team might be expected to improve pain outcomes in these noncancer patients, more research is needed in this area.

The large sample size and use of data from an established and well-utilized pain and palliative care department are strengths of this study. The data were consistently and prospectively collected in a standard fashion at the time of patient care. This study addresses an important area in palliative care in a population that is diverse and understudied.

There are several limitations of this study. This study examined patients receiving inpatient palliative care team consultations, and excluded patients receiving consultation as outpatients because of the initial/final pain outcome study design. The short time period of hospitalization for many patients, particularly those with more chronic types of pain, may have limited the ability to demonstrate pain reduction in these patients, and perhaps might be further explored in studies of patients receiving palliative care consultations as outpatients. The use of the 4-point affective verbal (none, mild, moderate, severe) rating is a limitation of the study, yet the 11-point pain scores in this study were collapsed to the 4-point rating because many patients preferred to describe their pain in that manner, and one study goal was to include as broad a population as possible. Future areas of research should include examining pain reporting and measurement among the races in this study. Other patient characteristics which may affect pain measurement or reporting, such as socio-economic status, language barriers, health literacy levels, chronic pain, functional status, depression, and race of clinicians, were not examined, and are also important areas for future study.

Physician biases in referral to palliative care in terms of diagnoses and patient characteristics are important areas of future research. This study may have had a referral bias in which hospital patients were referred to the palliative care team. There were clearly more white patients with surgical diagnoses than with cancer or non-cancer medical diagnoses and more Asian and Pacific Islander patients with cancer and non-cancer medical diagnoses than surgical diagnoses. Surgical diagnoses posed a challenge for effective pain reduction with palliative care consultation, controlling for race. In contrast, after controlling for diagnosis, there were similar or improved pain outcomes with consultation among non-white patients compared to white patients. Further research is needed to determine the role of palliative care consultations in the optimal management of noncancer surgical pain, and in preventing disparities in pain management.

## Conclusions

Patients demonstrated significant reductions in pain after inpatient pain and palliative care consultation. While more Hawaiian and Pacific Islander patients had pain reduction and less severe final pain scores than white patients, pain outcome differences associated with diagnoses were also significant. Palliative care consultations may serve as a powerful intervention to reduce disparities in pain management. Future work is needed to examine referral patterns in diverse populations and to enhance the management of non-cancer pain by palliative care teams.

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## Author Disclosure Statement

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