# Effective Pain Management for Inpatients at Siriraj Hospital: A Retrospective Study

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***Background and Objective:*** *The prevalence of severe cancer and non-cancer pain among in patients has been reported at rates ranging from 15% to 36%. We examined the effectiveness of the pain management provided to inpatients by the Siriraj Pain Clinic.*

***Material and Method:*** *A retrospective chart review was conducted among inpatients who had consulted the clinic between January 2013 and December 2014. Patients with a numeric pain rating scale (NRS) ≤4 on the day of consultation, those discharged within seven days, and postoperative patients were excluded. Successful pain control was defined as NRS ≤4 within seven days of the initial consultation.*

***Results:*** *We identified 352 eligible patients, of which 231 (65.4%) had cancer pain. Only 42.6% achieved successful pain control. An absence of psychological problems (odds ratio (OR) 2.1, 95% confidence interval (CI) 1.1-4.2; p = 0.010); an initial NRS <7 (OR 1.9, 95% CI 1.2-3.0; p = 0.008); the use of either a non-steroidal anti-inflammatory drugs (NSAIDs) or a Coxibs (OR 2.3, 95% CI 1.3-3.9; p = 0.017); and abdominal pain (OR 2.7, 95% CI 1.5-4.7; p = 0.008) were factors associated with successful pain control.*

***Conclusion:*** *Adequate pain control was achieved in less than half of the inpatients in our institution. Psychological disturbance and severe pain predicted unsatisfactory pain control.*

***Keywords:*** *Pain management, Inpatients*

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Chronic pain, which has a worldwide incidence of approximately 31.7%[1], can be categorized as cancer pain or chronic non-cancer pain. A literature review found that the prevalence of severe pain among patients admitted to hospital ranges between 15% and 36%[2-4]. Despite widespread adoption of the World Health Organization (WHO) analgesic ladder - which encourages a systematic approach to the treatment of acute pain, cancer pain and chronic non-cancer pain - achieving adequate pain control in hospitalized patients can still be very challenging[5,6].

Pain impairs patients' functional status and quality of life, causes psychological disturbance, and is a substantial burden for patients, their careers and society as a whole. In the case of inpatients, persistent, moderate to severe pain increases the incidence of complications and prolongs hospitalization, thereby increasing the cost of health care[7]. Pain has also been reported to impair the immune function[8-10] and cause sleep disturbance[8,9,11], and it is associated with depression[12,13], anxiety[8,9,12] and suicidal ideation[14]. Effective pain control for inpatients can therefore improve their physical status and quality of life, as well as reduce the length of their hospital stay[10,15].

The Siriraj Pain Clinic was established in 1989 with the objective of improving pain management for outpatients and inpatients. The number of new consultations has been increasing every year, but the effectiveness of the clinic's interventions has not been examined. We therefore undertook a retrospective study to evaluate the effectiveness of pain control in hospitalized patients at Siriraj Hospital.

## Material and Method

We analyzed cases recorded in the Siriraj Pain Clinic's database between January 1, 2013 and December 31, 2014. Conduct of the study was approved by the Siriraj Institutional Review Board (653/2557

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[EC1]). Data was extracted manually.

***Study participants***

We included all patients admitted to Siriraj Hospital who received consultations for pain control during the study period. We excluded patients with postoperative pain; those with a pain intensity ≤4 on an 11-point, numeric rating scale (NRS) on the first day of consultation; those who were discharged from hospital within seven days of consultation; and those with missing data.

***Outcome measurement***

We collected patients' demographic and clinical characteristics, including their age, sex, marital status, comorbidities, primary diagnosis, pain diagnosis and location of the pain. We also recorded their mean pain scores (using the 11-point NRS) on the first day of their consultation, the day when their NRS score fell to ≤4, and their NRS score on their last day of admission. As for the NRS pain assessment, "0" indicated no pain, while "10" represented the worst-pain imaginable. Sleep disturbance was defined as having difficulty falling asleep or being woken by pain. Psychological disturbance was defined as experiencing anxiety or a low mood as a result of pain.

To evaluate the effectiveness of pain management, the primary outcome was the achievement of successful pain control, defined as a mean pain score ≤4 within seven days of consultation[16]. The secondary outcomes were factors positively influencing successful pain control. Other outcome measurements were sedation score, sleep disturbance, psychological disturbance, and the pain drugs used and their side effects.

***Statistical analysis***

The sample size was predetermined according to the observations from the Siriraj Pain Clinic. We found that at least 50% of the consulted, hospitalized patients had an NRS ≤4 with in seven days of consultation, with an allowable error of 5% at a 95% confidence interval (CI). Therefore, the estimated sample size was at least 323 patients.

Demographic data, primary diagnoses and pain diagnoses were analyzed using descriptive statistics. Patients were divided into two groups: those with a pain NRS ≤4, and those with a score >4. Differences between those groups were examined using, in the case of quantitative data, either the unpaired t-test (for normally-distributed data) or the Mann-Whitney U-test (for data that was not normally-distributed), and in the case of qualitative data, the Pearson Chi-square test or Fisher's exact test. Statistical significance was defined as a *p*-value <0.05. Forward step wise logistic regression was used to establish the influence of demographic and clinical characteristics in achieving satisfactory pain control; results are presented as the odds ratio (OR) and the adjusted OR, with a 95% confidence interval (CI).

**Results**

A total of 682 inpatients consulted the Siriraj Pain Clinic during the study period. We excluded 330 records from the analysis: 100 (14.6%) had an NRS ≤4 at the initial consultation, 139 (20.3%) were discharged with in seven days of the first consultation, 44 (6.4%) were unable to express the intensity of their pain using the NRS, while data was missing for the remaining 47 (6.8%). The number of eligible patients whose data was subject to analysis was 352 (51.6% of those screened against the inclusion and exclusion criteria).

***Demographic data***

A summary of the demographic and clinical characteristics of the study is at Table 1. The meanage of the patients was 50.0±18.2 years (range: 10-97 years). The most common comorbidity was hypertension (85 patients, 24.1%), and the majority of the patients were under the care of the orthopedic surgery department (96 patients, 27.3%). Approximately two-thirds of the patients had cancer pain (231 patients, 65.6%), with the remainder having chronic non-cancer pain (121 patients, 34.4%). The lower extremity was the most common source of pain (131 patients, 37.2%) (Table 2).

***Pain management outcomes during consultation***

The mean pain scores (± standard deviation) on the first day of consultation and on the last day of consultation were 7.5±1.9 and 3.7±2.8, respectively (Table 3). One hundred and fifty patients (42.6%) achieved effective pain control within seven days; their mean pain score decreased to 2.3±1.4. During the course of consultation, the number reporting sleep disturbance or psychological disturbance decreased from 125 (35.5%) to 38 (10.8%), and from 50 (14.2%) to 20 (5.7%), respectively.

Anti-convulsants and opioid were most commonly prescribed, and constipation was the most common side effect. The median duration of care by the Siriraj Pain Clinic was 18 days (range: 2-140 days), while the median time to achieve effective pain control

**Table 1.** Clinical and demographic characteristics of inpatients consulted for uncontrolled pain (n = 352)

| Patient characteristics | n (%)<br>mean ± SD |
|---|---|
| Age | 50.0±18.2 |
| Body weight (kg) | 58.2±13.3 |
| Height (cm) | 162.6±9.7 |
| Male | 190 (54.0) |
| Married | 236 (67.0) |
| Smoking | 55 (15.6) |
| Alcohol drinking | 34 (9.7) |
| Drug abuse | 4 (1.1) |
| Comorbidities | |
| Hypertension | 85 (24.1) |
| Diabetic mellitus | 53 (15.1) |
| Cardiovascular disease | 23 (6.5) |
| Central nervous system disease | 16 (4.6) |
| Kidney disease | 22 (6.3) |
| Liver disease | 7 (2.0) |
| Department | |
| Orthopedic | 96 (27.3) |
| Surgery | 81 (23.0) |
| Medicine | 52 (14.8) |
| Obstetrics and gynecology | 36 (10.2) |
| Radiation | 34 (9.7) |
| ENT | 13 (3.7) |
| Pediatric | 9 (2.6) |
| PM&R | 1 (0.3) |

SD = standard deviation; ENT = otorhinolaryngology; PM&R = physical medicine and rehabilitation

was 7 days (range: 1-115 days) (Table 3).

***Factors influencing successful pain control***

An absence of psychological disturbance (OR 2.1, 95% CI 1.2-4.2; $p = 0.010$); an NRS <7 on the first day of consultation (OR 1.9, 95% CI 1.2-3.0; $p = 0.008$); the prescription of a non-steroidal anti-inflammatory drug or Coxib (OR 2.3, 95% CI 1.3-3.9; $p = 0.017$); and pain located in the abdomen (OR 2.7, 95% CI 1.5-4.7; $p = 0.008$) were associated with successful pain control (Table 4).

## Discussion

We found that despite consultation by the Siriraj Pain Clinic, satisfactory pain control (NRS ≤4) was achieved for only a minority of inpatients (42.6%) within seven days of consultation. This was not influenced by the type of pain: the target was not achieved in approximately 40% of those with either

**Table 2.** Pain classifications, characteristics, locations and pain interventions (n = 352)

| Pain characteristics, locations, interventions | n (%)<br>mean ± SD |
|---|---|
| Cancer pain | 231 (65.6) |
| Local | 48 (13.6) |
| Advanced | 183 (52.0) |
| Non-cancer pain | 121 (34.4) |
| Nociceptive pain | 282 (80.1) |
| Neuropathic pain | 131 (37.2) |
| Pain location | |
| Head and neck | 35 (9.9) |
| Upper body | 26 (7.4) |
| Lower body | 15 (4.3) |
| Upper extremity | 15 (4.3) |
| Lower extremity | 131 (37.2) |
| Abdomen | 75 (21.3) |
| Perineum | 16 (4.5) |
| Back | 72 (20.5) |
| Pain interventions | 30 (8.5) |

SD = standard deviation

cancer pain or non-cancer pain. A prospective study by Shin et al reported that most cancer-pain patients (82.8%) achieved adequate pain control with an NRS <4 within one week of admission[17], but to the best of our knowledge, a similar study has not been under taken in patients with chronic non-cancer pain. The systematic approach to cancer pain treatment mandated by the WHO analgesic ladder (with progress from non-opioid analgesics to strong opioids, with palliative oncotherapy, adjuvant drugs and other symptomatic treatments guided by pain intensity and response) has been reported to reduce cancer pain to an NRS <4 with in 6 days[5]. Adequate and well-organized staffing, and having physicians, nurses and social workers who are experienced in palliative care, are also associated with significantly greater reductions in pain intensity[17]. It is essential to provide training in pain control to all staff, and to ensure that physicians with expertise are available for consultation in smaller or more rural institutions.

Medical error-including failure to assess and treat pain regularly and often, and failure to communicate with patients-adversely influences patients' pain scores. Okon et al reported that computer-generated, real-time alerts to prevent delayed re assessment improved pain outcomes[18]. Other risk factors for unsatisfactory pain control relate to patients and the pathophysiology of their pain. Patient factors

**Table 3.** Change in outcome measures during pain management consultation

| | First day of consultation (n = 352) | Effective pain control within 7 days (n = 150) | Effective pain control (n = 226) | Last day of consultation (n = 352) |
|---|---|---|---|---|
| Numerical rating scale | 7.5±1.9 | 2.3±1.4 | 2.5±1.4 | 3.7±2.8 |
| Sleep disturbance (%) | 125 (35.5) | 1 (0.6) | 19 (5.4) | 38 (10.8) |
| Psychological problems (%) | 50 (14.2) | 3 (2.0) | 11 (3.1) | 20 (5.7) |
| Medications (%) | | | | |
| Opioid | 205 (58.2) | 34 (57.6) | 161 (71.2) | 190 (53.9) |
| Weak opioid | 158 (44.9) | 20 (22.9) | 104 (46.0) | 128 (35.8) |
| Anticonvulsant | 288 (81.8) | 49 (83.1) | 214 (94.6) | 264 (75.0) |
| Antidepressant | 152 (32.0) | 19 (32.2) | 116 (51.3) | 148 (42.0) |
| NSAIDs/Coxibs | 75 (21.3) | 17 (28.8) | 53 (23.4) | 53 (15.0) |
| Benzodiazepine | 44 (12.5) | 10 (16.9) | 30 (13.2) | 41 (11.6) |
| Side effects (%) | | | | |
| Dizziness | 1 (0.3) | 1 (0.6) | 1 (0.4) | 2 (0.6) |
| Nausea, vomiting | 20 (5.7) | 6 (4.0) | 10 (4.4) | 17 (2.7) |
| Constipation | 58 (16.5) | 21 (14.2) | 39 (17.2) | 48 (13.6) |
| Drowsiness | 25 (7.2) | 9 (6.1) | 11 (4.8) | 15 (4.3) |
| Palpitation | 2 (0.6) | 1 (0.6) | 1 (0.4) | - |
| Dry mouth | - | - | - | - |

Data are presented as mean ± standard deviation, or number (proportion, %).
NRS = numeric pain rating scale; NSAID = non-steroidal anti-inflammatory drug

include age, neurological impairment (which causes difficulty with the evaluation of pain intensity), anxiety, depression and low mood, multiple comorbidities, and a low level of understanding of pain and its treatment[19]. Psychological factors were associated with inadequate pain control in our participants, as was severe pain (NRS ≥7) at the first consultation. The latter demonstrates that inpatients referred to specialist pain services are a particularly challenging group, who likely had not responded to the standard treatment provided by experienced clinicians from other specialties. For example, patients who have sustained multiple trauma and require extensive and repeated surgical intervention are at risk of experiencing pain for more than one week and of developing central sensitization and neuropathic pain, which responds poorly to many analgesics.

To improve the pain outcomes of inpatients at Siriraj Hospital, we will address multidisciplinary staff training and deployment, seek to reduce the incidence of medical errors, ensure that pain is assessed regularly and frequently, and follow the WHO guideline for cancer pain treatment. We will conduct a prospective study to document the impact of these changes.

Our study had some limitations. The study was conducted retrospectively. Consequently, we may have missed other factors that influenced pain outcomes that might not have been recorded in our data base.

In conclusion, adequate pain control was achieved with in seven days for less than half (42.6%) of the inpatients who consulted the pain clinic at our institution. Psychological disturbance and severe pain predicted unsatisfactory pain control.

**What is already known on this topic?**

Despite evidence that using the WHO analgesic ladder guideline is effective for treating cancer pain patients and althought here are many guidelines for controlling chronic non-cancer pain in hospitalized patients, achieving successful pain control in hospitalized patients can still be very challenging.

**What this study adds?**

We present the challenges of providing effective pain management for hospitalized patients in a developing country, and factors that affect pain outcomes.

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**Table 4.** Multivariate regression analyses to identify factors influencing success achieving pain control

| Factors | Failure (%) (n = 202) | Success (%) (n = 150) | *p*-value | Crude OR (95% CI) | Adjusted OR (95% CI) |
|---|---|---|---|---|---|
| Age ≥60 years | 72 (35.6) | 54 (36.0) | 0.945 | 0.9 (0.6-1.6) | - |
| Male | 113 (55.9) | 77 (51.3) | 0.391 | 1.2 (0.8-1.8) | - |
| Single | 128 (63.4) | 108 (72.0) | 0.088 | 1.5 (0.9-2.3) | - |
| Smoking | 31 (15.3) | 24 (16.0) | 0.867 | 0.9 (0.5-1.7) | - |
| Drinking alcohol | 24 (11.9) | 10 (6.7) | 0.101 | 1.9 (0.9-4.1) | - |
| Comorbidities | | | | | |
| Cardiovascular disease | 18 (8.9) | 5 (3.3) | 0.036* | 2.8 (1.1-7.8) | - |
| Central nervous disease | 13 (6.4) | 3 (2.0) | 0.048* | 3.4 (0.9-12.1) | - |
| Hypertension | 55 (27.2) | 30 (20.0) | 0.117 | 1.4 (0.9-2.4) | - |
| Diabetes | 37 (18.3) | 16 (10.7) | 0.047* | 1.9 (1.0-3.5) | - |
| Kidney disease | 13 (6.4) | 9 (6.0) | 0.867 | 1.1 (0.4-2.5) | - |
| Liver disease | 6 (3.0) | 1 (0.7) | 0.126 | 4.5 (0.5-38.2) | - |
| Cancer pain | 130 (64.4) | 101 (67.3) | 0.561 | 0.9 (0.6-1.4) | - |
| Nociceptive pain | 157 (77.7) | 9 (6.0) | 0.192 | 0.7 (0.4-1.2) | - |
| Neuropathic pain | 82 (40.6) | 1 (0.7) | 0.128 | 1.4 (0.9-2.1) | - |
| Pain location | | | | | |
| Head and neck | 14 (6.9) | 11 (7.3) | 0.884 | 1.4 (0.8-2.4) | - |
| Chest | 18 (8.9) | 8 (5.3) | 0.204 | 0.6 (0.2-1.4) | - |
| **Abdomen** | **33 (16.3)** | **42 (28.0)** | **0.008*** | **1.9 (1.2-3.3)** | **2.7 (1.5-4.7)** |
| Upper extremities | 9 (4.5) | 6 (4.0) | 0.834 | 0.7 (0.2-2.2) | - |
| Lower extremities | 80 (39.6) | 51 (34.0) | 0.282 | 0.7 (0.5-1.2) | - |
| Perineum | 12 (5.9) | 4 (2.3) | 0.145 | 0.4 (0.1-1.4) | - |
| Back | 36 (17.8) | 38 (25.3) | 0.087 | 1.6 (0.9-2.6) | - |
| **NRS <7** | **61 (30.2)** | **66 (46.0)** | **0.008*** | **1.8 (1.2-2.8)** | **1.9 (1.2-3.0)** |
| **No psycho problems** | **165 (81.7)** | **137 (91.3)** | **0.010*** | **2.4 (1.2-4.6)** | **2.1 (1.1-4.2)** |
| Sleep problems | 72 (35.6) | 53 (35.3) | 0.952 | 1.1 (0.6-1.6) | - |
| Pain medication used | | | | | |
| Opioid | 115 (56.9) | 93 (62.0) | 0.339 | 1.2 (0.8-1.9) | - |
| Weak opioid | 86 (42.6) | 65 (43.3) | 0.887 | 1.1 (0.6-1.5) | - |
| Anticonvulsant | 174 (86.1) | 114 (76.0) | 0.015* | 0.5 (0.2-0.8) | - |
| Antidepressant | 88 (57.9) | 64 (42.7) | 0.886 | 0.8 (0.6-1.5) | - |
| **NSAIDs/Coxibs** | **34 (16.8)** | **41 (27.3)** | **0.017*** | **1.9 (1.1-3.1)** | **2.3 (1.3-3.9)** |

OR = odds ratio; CI = confidence interval; NRS = numeric pain rating scale; NSAIDs = non-steroidal anti-inflammatory drugs
Data are presented as the number (proportion, %), statistically significant factors identified by logistic regression are shown in bold.
* $p<0.05$

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**Potential conflicts of interest**

None.

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## การศึกษาย้อนหลังเกี่ยวกับประสิทธิภาพในการระงับปวดของคลินิกระงับปวดสำหรับผู้ป่วยในโรงพยาบาลศิริราช

สุรัสวดี วังน้ำทิพย์, ปราโมทย์ เอื้อโสภณ, อรุโณทัย ศิริอัศวกุล, สุกัญญา จิระชัยพิทักษ์, จันทร์ระวี เหล่ารุจิสวัสดิ์, เกศินี วิมลวรรธนะสาร

**วัตถุประสงค์:** ความชุกของอาการปวดรุนแรงในผู้ป่วยที่นอนโรงพยาบาล ซึ่งประกอบด้วยอาการปวดเนื่องจากโรคมะเร็งและอาการปวดเรื้อรังอื่น ๆ มีประมาณ 15%-36% ผู้นิพนธ์ต้องการศึกษาประสิทธิภาพในการระงับปวดของผู้ป่วยในที่ได้รับการดูแลโดยคลินิกระงับปวดโรงพยาบาลศิริราช

**วัสดุและวิธีการ:** ผู้นิพนธ์ได้ทำการศึกษาข้อมูลย้อนหลังในผู้ป่วยที่ได้รับการดูแลโดยหน่วยระงับปวดโรงพยาบาลศิริราช ตั้งแต่เดือนมกราคม พ.ศ. 2556 ถึง ธันวาคม พ.ศ. 2557 ผู้ป่วยที่ไม่เข้าเกณฑ์การศึกษาได้แก่ ผู้ป่วยที่มีคะแนนปวด NRS น้อยกว่าหรือเท่ากับ 4 ตั้งแต่วันแรกที่ได้รับคำปรึกษา ผู้ป่วยที่มีอาการปวดเนื่องจากการผ่าตัด และผู้ป่วยที่ถูกจำหน่ายออกจากโรงพยาบาลภายใน 7 วัน จะถูกคัดออกจากการวิจัย เป้าหมายของประสิทธิภาพในการระงับปวดคือ มี NRS น้อยกว่าหรือเท่ากับ 4 ภายใน 7 วัน

**ผลการศึกษา:** มีผู้ป่วยเข้าเกณฑ์การศึกษา 352 คน โดยมีผู้ป่วย 231 คน (65.4%) มีอาการปวดจากโรคมะเร็งมีผู้ป่วยเพียง 42.6% ที่บรรลุเป้าหมายในการระงับปวดภายใน 7 วันปัจจัยที่ทำให้การระงับปวดบรรลุตามเป้าหมายได้แก่ ผู้ป่วยที่ไม่มีปัญหาทางด้านจิตใจ (odds ratio (OR) 2.1, 95% confidence interval (CI) 1.1-4.2; p = 0.010), และอาการปวดเริ่มต้น NRS น้อยกว่า 7 (OR 1.9, 95% CI 1.2-3.0; p = 0.008) ผู้ป่วยที่ใช้ยาแก้ปวดชนิด non-steroidal anti-inflammatory drugs (NSAIDs) หรือ Coxibs (OR 2.3, 95% CI 1.3-3.9; p = 0.017), และผู้ป่วยที่มีอาการปวด ในช่องท้อง (OR 2.7, 95% CI 1.5-4.7; p = 0.008)

**สรุป:** ผลของการระงับปวดภายใต้การดูแลโดยหน่วยระงับปวดโรงพยาบาลศิริราชสำหรับผู้ป่วยในประสบผลสำเร็จน้อยกว่า 50% โดยที่ปัจจัยที่ทำให้โอกาสประสบผลสำเร็จลดลงได้แก่ ปัญหาทางด้านจิตใจ และอาการปวดรุนแรง ในขณะที่ปัจจัยที่เพิ่มความสำเร็จในการระงับปวด ได้แก่ การใช้ยากลุ่ม NSAIDs/Coxibs และอาการปวดในช่องท้อง