

Pain Management in Surgical Intensive Care Units: A Multi-Center Prospective Observational Study (THAI-SICU Study)

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Objective: This study is a part of the multi-center Thai university-based Surgical Intensive Care Unit Study (THAI-SICU Study). It aimed to evaluate the patterns of pain management in patients admitted to surgical intensive care units.

Material and Method: Case record forms (CRFs) were created by the working group. Data regarding pain management in the ICUs were documented on the daily record form. These included types of analgesics used (opioids and non-opioids), routes of administration (oral, intravenous, intramuscular, epidural and intrathecal) and methods of administration (continuous infusion, regular intermittent, as needed, patient-controlled analgesia and patient-controlled epidural analgesia).

Results: Data were gathered from 4,652 patients. The majority of the patients received analgesics (85.2%). The main stay analgesics were morphine (52.3%) and fentanyl (27%). Analgesics were frequently administered via the intravenous route (76.5%) on an as needed basis (48.6%).

Conclusion: Analgesics were commonly given to patients in the surgical intensive care units. The analgesics of choice were strong opioids, and the most preferred route and method of administration was the intravenous route and the as needed basis, respectively.

Keywords: Pain management, Intensive care units, Surgical intensive care units

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This study is a part of the multi-center Thai university-based Surgical Intensive Care Unit Study (THAI-SICU Study). Prior to it, two large multicenter, observational studies focusing on intraoperative events and postoperative outcomes were conducted (THAI and THAI-AIMS studies)^(1,2). However, they did not particularly focus on critically-ill surgical patients admitted to an intensive care unit. The THAI-SICU Study was designed to determine the general outcomes as well as the incidence of adverse events in Thailand's university-based surgical intensive care units⁽³⁾.

The THAI-SICU Study is a multicenter, prospective, observational study involving 9 country-wide, university-based, surgical ICUs which was approved by the Thailand Joint Research Ethics

Committees (JREC) and each individual institution's Ethics Committee or Institutional Review Board⁽³⁾.

We conducted this particular study as a part of the THAI-SICU study, principally to evaluate the patterns of pain management (types of analgesics used as well as routes and methods of their administration) among SICU patients.

Material and Method

Case record forms (CRFs) were created by the working group. The CRFs covered data from the admission, daily records and discharge periods. All patients aged over 18 years that were admitted to the ICUs during the enrolment period were included. Patients receiving cardiopulmonary resuscitation without a return of spontaneous circulation, moribund patients and those who stayed in the ICUs less than 6 hours were excluded⁽³⁾.

Data regarding pain management in the ICUs were documented on the daily record form. These included types of analgesics used [opioids (morphine,

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pethidine, fentanyl, tramadol, codeine) and non-opioids (paracetamol, non-steroidal anti-inflammatory drugs, selective cyclo-oxygenase 2 inhibitors)], routes of analgesic administration [oral, intravenous (IV), intramuscular (IM), epidural and intrathecal] and methods of analgesic administration [continuous infusion, intermittently around the clock (ATC), as needed (pro re nata - prn), patient-controlled analgesia (PCA), patient-controlled epidural analgesia (PCEA)].

Data were analyzed using STATA, version 11.0 (STATA Inc., College Station, TX). The descriptive categorical data like type of analgesics used as well as route and method of analgesic administration are presented as percentages.

Results

The details about each participating ICU's characteristics, type of admitted patients, ICU attending staffs' primary roles, their specialties, positions of intensivists', rotation of trainees, burden of nurses and quantity of existing specialties have been published⁽³⁾.

Throughout the enrolment period of 19.7 months (from April 2011 until January 2013), 6,548 patients were admitted to the ICUs under study. Based on the previously-mentioned exclusion criteria, 1,896 patients were excluded, leaving a total of 4,652 patients for the final analysis.

It was observed that 3,044 patients (65.4%) received only analgesics, while 921 others (19.8%) received both analgesics and sedatives. On the other hand, 141 patients (3.1%) received only sedatives while 546 patients (11.7%) received neither analgesics nor sedatives.

This study also found that ICU patients received both opioid and non-opioid analgesics. Regarding opioids, morphine (52.3%) was the most preferred, followed by fentanyl (27%), tramadol (5.3%), pethidine (4.8%), and codeine (0.5%). Paracetamol was given in 12.3% of the patients. Non-steroidal anti-inflammatory drugs (NSAIDs) and selective cyclo-oxygenase 2 inhibitors (COXIBs) were not widely used, having a rate of 1.8% and 0.5%, respectively (Table 1).

The most utilized route of analgesic administration was the intravenous (76.5%), followed by oral (12.8%), epidural (7.6%), intramuscular (0.8%), and the least utilized route was intrathecal (0.2%). No data of routes of administration available in the rest (2.1%) (Table 2).

The most preferable method of analgesic administration was 'as needed' (48.6%). The other methods, in a declining order were continuous infusion

(36.4%), patient-controlled analgesia (PCA) (18.6%), intermittent injections on an around the clock basis (13.4%), and patient-controlled epidural analgesia (PCEA) (3.8%). Some patients received more than 1 method of administration (Table 3).

Discussion

This study found that the majority of patients admitted to the Thai university-based surgical intensive care units (SICUs) received analgesics via the intravenous route on an as needed basis. Opioids were more commonly prescribed in comparison to non-opioids, and morphine was the mainstay analgesic of choice.

Some countries have conducted either a multi-center prospective observational study^(4,5) or a multi-center survey^(6,7) to determine the analgesic use in intensive care units (ICUs). However, prior to this, no nationwide large-scale studies to evaluate the analgesic use in Thailand's ICUs had been performed.

Pain is a common and distressing symptom in patients admitted to ICUs globally⁽⁸⁾. Pain management in ICUs is unique and challenging, involving assessment⁽⁹⁻¹¹⁾ as well as treatment. Pain in SICU patients may be due to their diseases, surgeries, invasive therapies, insertion of devices, complications, compulsory bedside care (e.g., turning, bed bathing) and even immobilization^(12,13).

Pain causes multiple negative consequences on all body systems, leading to physiological and psychological insults in critically-ill patients admitted in ICUs^(12,13). Therefore, proper pain management in ICUs is crucial. Adequate pain control is significantly important not only to patients, but also to their families, health care providers and hospital/health care system regulators⁽¹⁰⁾.

Among the 4,652 patients of our study, the majority (85.2%) received analgesics. It has been recommended that IV opioids be considered as the first-line drug class of choice to treat nociceptive pain in patients with critical illnesses⁽¹⁴⁾. The most prescribed analgesics in our survey were strong opioids like morphine (52.3%) and fentanyl (27%), with pethidine being the least-preferred strong opioid (4.8%). Weak opioids were infrequently administered to our patients, with 5.3% and 0.5% of them receiving tramadol and codeine, respectively. A large number of ICU patients exhibited severe pain⁽⁸⁾, so weak opioids with a ceiling analgesic effect are inadequate.

Mehta S, et al conducted a mail survey in Canada and reported that morphine (50% as continuous

Table 1. Type of analgesics used in ICU patients

Analgesics	Number of patients	%
Opioids		
Morphine	2,431	52.3
Fentanyl	1,254	27.0
Tramadol	248	5.3
Pethidine	225	4.8
Codeine	22	0.5
Non-opioids		
Paracetamol	571	12.3
NSAIDs	86	1.8
COXIBs	24	0.5

ICU = intensive care unit; NSAIDs = non-steroidal anti-inflammatory drugs; COXIBs = selective cyclo-oxygenase 2 inhibitors

Table 2. Route of analgesic administration in ICU patients

Routes	Numbers of patients	%
Intravenous	3,559	76.5
Intramuscular	36	0.8
Epidural	353	7.6
Intrathecal	11	0.2
Oral	593	12.8

ICU = intensive care unit

Table 3. Methods of analgesic administration in ICU patients

Methods	Number of patients	%
As needed (prn)	2,262	48.6
Intermittent on an around the clock basis	622	13.4
Continuous infusion	1,691	36.4
PCA	866	18.6
PCEA	175	3.8

ICU = intensive care unit; prn = pro re nata; PCA = patient-controlled analgesia; PCEA = patient-controlled epidural analgesia

infusion and 50% as boluses) was the most commonly preferred analgesic to prescribe, followed by fentanyl (39% as continuous infusion and 51% as boluses)⁽⁷⁾. Burry LD, et al performed a prospective, observational

study among 712 patients in 51 ICUs in Canada and revealed that fentanyl (54.3%) was the most frequently used opioid, with morphine (35%) and hydromorphone (7.7%) being used less often⁽⁴⁾. Woien H, et al carried out a survey in Norway and discovered that 93% of those surveyed reported the use of fentanyl, followed by morphine (67%), alfentanil (48%) and remifentanyl (21%)⁽⁶⁾. Payen JF, et al who conducted a prospective, observational study among 1,381 patients in 44 ICUs in France, found that, for managing painful procedures, sufentanil (35-40%) and fentanyl (30-35%) were the most often used opioids, followed by morphine (15-20%) and remifentanyl (10%)⁽⁵⁾.

Besides opioids, non-opioid analgesics were prescribed for ICU patients, too. This study revealed that 12.3%, 1.8% and 0.5% of our patients in Thailand received paracetamol, NSAIDs and COXIBs, respectively. These analgesics were not widely used in our SICU patients because for a lot of them, the oral intake was impossible and the IM route is not recommended.

Focusing on the route of analgesic administration, we have found that the largest portion of our patients received analgesics intravenously (76.5%). This is not surprising as ICU patients do have readily-available venous access lines. This particular route of administration provides the most rapid and reliable pain relief effect. The oral route (12.8%) was the second most commonly used in our studied SICU patients. A lot of SICU patients are of a nil per os status due to many reasons such as a recent surgery which may disturb bowel function; consequently, they are not candidates for oral analgesic intake. The IM route (0.8%) was not a preferred route in this study. The IM injection is painful and not suitable for patients with bleeding tendency and/or unstable hemodynamic status due to erratic absorption from the muscle into the systemic circulation.

In regard to methods of administration, we have found that the majority of our patients received analgesics on an as required or a prn basis, followed by continuous infusion. Giving analgesics on an as required basis is appropriate when pain is paroxysmal or continuous infusion is not beneficial and/or harmful to the ICU patients. Continuous infusion offers steady plasma concentration of the infused analgesic with a tendency of stable pain control (if the dose is sufficient). Woien H, et al reported that continuous infusion was the most common method utilized by Norwegian ICU personnel⁽⁶⁾. According to the Canadian cross-sectional mail survey, about half of the respondents

gave morphine as boluses and the other half as continuous infusion. Fentanyl was given as bolus doses and infusion by 51% and 39% of the respondents, respectively⁽⁷⁾.

There are a number of strengths of this study. It is the first multi-center trial to collect data in patients admitted to the Thai university-based surgical intensive care units. It has included a large number of patients of 4,652. The data have been collected to cover many aspects^(3,15).

The limitations of this study include no data collection on adverse effects from analgesics and patients' pain intensity (as some of them had delirium or delirium could not be ruled out)⁽¹⁵⁾.

Conclusion

To our knowledge, this is the largest multi-center, prospective, observational study on pain management in SICU patients. It has shown that the majority of the patients under this study received analgesics. The most preferred analgesics were strong opioids (morphine and fentanyl). The intravenous route was the most frequently used, and the as needed basis method of analgesic administration was the most common.

What is already known on this topic?

Patients admitted to intensive care units have pain and analgesics are given for pain relief.

What this study adds?

This study adds data on types of analgesics as well as routes and methods of administration utilized in SICU patients all across Thailand.

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Potential conflicts of interest

None.

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การบรรเทาความปวดในหอผู้ป่วยหนักคัดสรร: การศึกษาสถาบันไปข้างหน้าแบบสังเกตการณ์ (THAI-SICU study)

ศศิภานต์ นิยมานรชต์, กวีศักดิ์ จิตตวัฒน์รัตน์, สุณิรัตน์ คงเสรีพงศ์, สันติ โมรากุล, กลุ่มศึกษา THAI-SICU

ภูมิหลัง: การศึกษานี้เป็นส่วนหนึ่งของการศึกษาสถาบันในหอผู้ป่วยหนักทางคัดสรรของโรงพยาบาลมหาวิทยาลัยในประเทศไทย (THAI-SICU Study) มีวัตถุประสงค์เพื่อประเมินรูปแบบของการระงับปวดในหอผู้ป่วยหนักทางคัดสรร

วัสดุและวิธีการ: ทำการบันทึกโดยใช้แบบบันทึกข้อมูลประจำวันที่สร้างโดยคณะผู้ทำการศึกษานี้ ข้อมูลที่บันทึกได้แก่ชนิดของยาระงับปวดที่ใช้ (โอปิออยด์ ไม่ใช่โอปิออยด์) ทางที่บริหารยาระงับปวด (ปาก หลอดเลือดดำ กล้ามเนื้อ ช่องเหนือเยื่อหุ้มสมอง ช่องน้ำไขสันหลัง) และวิธีการบริหารยาระงับปวด (หยดอย่างต่อเนื่อง ให้เป็นครั้งๆ ตามเวลา ให้เมื่อขอ ให้โดยใช้เครื่องควบคุมด้วยตัวผู้ป่วยเอง)

ผลการศึกษา: เก็บรวบรวมข้อมูลได้จากผู้ป่วย 4,652 ราย ผู้ป่วยส่วนใหญ่ (ร้อยละ 85.2) ได้รับยาระงับปวด โดยร้อยละ 52.3 ได้รับมอร์ฟีน และร้อยละ 27 ได้รับเฟนทานิล ผู้ป่วยส่วนใหญ่ (ร้อยละ 76.5) ได้รับยาระงับปวดทางหลอดเลือดดำแบบได้รับเมื่อขอ (ร้อยละ 48.6)

สรุป: ผู้ป่วยส่วนใหญ่ในหอผู้ป่วยหนักทางคัดสรรได้รับยาระงับปวด ซึ่งส่วนใหญ่ได้รับโอปิออยด์ฤทธิ์แรง ช่องทางและวิธีที่นิยมบริหารยาระงับปวด คือการบริหารทางหลอดเลือดดำเมื่อผู้ป่วยขอ
