

# Effects of pain management program on the length of stay of patients with decreased level of consciousness: A clinical trial

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## ABSTRACT

**Background:** Critical care patients are at higher risk for untreated pain. Pain has persistent and untreated effects on most of the body systems and results in development of complications, chronic pain, and increased length of stay. The aim of this study was to determine the effects of the implementation of a pain management program on the length of stay in patients with decreased level of consciousness, admitted in Al-Zahra hospital intensive care units (ICUs) in 2013.

**Materials and Methods:** In this clinical trial, 50 subjects with decreased level of consciousness were selected by convenient sampling from the ICU wards of Al-Zahra hospital, Isfahan, Iran and were randomly assigned to two groups of study and control. Pain management program was applied on the study group and routine care was implemented in the control group. Data including demographic data and length of stay of patients in the ICUs were collected and analyzed using descriptive statistics and Chi-square test, independent *t*-test, and paired *t*-test.

**Results:** Results showed that out of 50 subjects attending the study, there were 40% female and 60% male subjects in study, and 52% female and 48% male subjects in control group. ( $P = 0.395$ ). Overall mean length of stay of the patients in the ICUs was significantly lower in the case group [3.2 (1.4)] days compared to the control group [7.4 (4.8) days] ( $P < 0.001$ ).

**Conclusions:** This study showed that overall mean length of stay of patients in the ICUs was significantly lower in the study group compared to the control group. It is suggested to use this program for patients in ICUs with decreased level of consciousness after a general surgery.

**Key words:** ICU, length of stay, level of consciousness, pain management programs

## INTRODUCTION

Inappropriate management of pain is a worldwide problem.<sup>[1]</sup> Various studies showed that 45–82% of the patients hospitalized in intensive care units (ICUs) experience various degrees of pain.<sup>[2]</sup> Meanwhile, over 60% of them reported that they were not relieved of their pain after discharge from the hospital.<sup>[3]</sup> Pain can be caused by a surgery, trauma, a disease, or while receiving routine care in the ward.<sup>[4]</sup> Therefore, acute pain can be

counted as an important stressor in different situations in the ICUs.<sup>[5]</sup> The patients hospitalized in ICUs are prone to various risks due to inappropriate pain management, as continuation of pain and lack of its management can affect most of the body systems and lead to progression of the complications and a prolonged hospitalization.<sup>[6]</sup> An increase in endogenous catecholamine and stress hormone levels leads to physiological changes, which can result in hemodynamic instability.<sup>[7]</sup> On the other hand, the reflexive responses caused by that may lead to cardiac ischemia, pneumonia, atelectasis, ileus and intestinal motility disorder, wound infection, sepsis, increased risk of coagulation, thromboembolic disorders, imbalance in blood glucose, muscular spasm, delayed recovery,<sup>[8]</sup> and emotional disorders.<sup>[9]</sup> They may also result in impaired social

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function,<sup>[10]</sup> irritable bowel syndrome,<sup>[11]</sup> neurohormonal changes,<sup>[12]</sup> lack of coordination between the patients and ventilation device, insomnia, and delirium,<sup>[13]</sup> which can lead to prolonged hospitalization due to more complicated condition of the patients and taking sleep medications. Therefore, pain assessment in ICUs, especially, assessment of patients' response to treatment should be conducted regularly and continuously.<sup>[14]</sup>

If pain is not managed appropriately during patients' stay in the ICU, their prolonged hospitalization in the ICU and lowered speed of recovery result in dissatisfaction and suffering, as well as confusion of the medical team and increased risk of re-hospitalization.<sup>[12]</sup> On the other hand, inappropriate pain management, especially in ICUs in which many patients are not capable of expressing their pain is a complicated issue.<sup>[15]</sup> Research conducted in this field showed that the financial burden related to inefficient pain management is about US\$ 635 billion, i.e. 25% of all medical care costs.<sup>[4]</sup> Health care organizations that administer evidence-based pain management interventions showed an average reduction of US\$ 1500 for each hospitalization.<sup>[16]</sup> Meanwhile, pain assessment and management in mechanically ventilated patients who are mostly hospitalized in ICU is difficult and delayed due to changes in the level of consciousness followed by taking sedatives, head trauma, or the physiological status,<sup>[17]</sup> as patients' pain is paid little attention by nurses and physicians.<sup>[18]</sup> Inadequate knowledge concerning managerial skills and pain assessment<sup>[19]</sup> and wrong understanding of various professional health caregivers, especially the nurses, have been mentioned as efficient managerial barriers in adequate pain management.<sup>[20]</sup> Therefore, as pain management is essential for appropriate care of the patients hospitalized in the ICU, a high number of such patients experience a notable suffer.<sup>[21]</sup>

Nurses' and medical team's empowerment in efficient pain management in the patients hospitalized in ICU enables them to potentially reduce the costs and improve the clinical outcomes through development of managerial strategies.<sup>[22]</sup> Recent research showed that usage of an appropriate pain assessment tool in the patients with low level of consciousness improves both pain management and its clinical outcomes including proper usage of sedatives and sleep medication, length of ventilation, and the length of stay in ICU.<sup>[23]</sup> Few studies have been conducted on the effect of application of pain management program on patients' length of stay in ICU among the patients with low level of consciousness, hospitalized in the ICU. On the other hand, in the clinical setting, there is no specific care program for pain management for these patients, and nurses administer analgesic medication, mostly sedatives, merely based on physicians' orders, which has been shown not to relieve patients' pain but to increase their length of hospitalization and further complications.

Therefore, the present study aimed to investigate the effects of pain management program on the length of stay of patients with decreased level of consciousness.

## MATERIALS AND METHODS

This is a two-group, multi-stage clinical trial conducted in the ICUs of Al-Zahra hospital in Isfahan in 2013. Fifty subjects meeting the inclusion criteria were selected through convenient sampling from Oct 5, 2013 to Jan 5, 2014, out of the patients hospitalized in Al-Zahra hospital with abdominal and chest surgeries, to complete the sample size, and were randomly allocated to study and control groups. There was no dropping out of the subjects during the study [Figure 1]. The inclusion criteria were: age over 18 years, no severe injury in the face, ability of moving at least one limb, Glasgow Coma Scale GSC between 5 and 8 (despite being intubated), being connected to the ventilation device from the time of arrival to ICU after surgery, not being under muscular relaxant medication, not consuming sedatives continuously, no injury to spinal cord, no dependency on alcohol or drugs, no history of chest and abdominal surgery, no history of hepatic and renal diseases, and being admitted in ICU for less than 24 h. The subjects were excluded in cases of transfer to another ward or hospital, death, or a change in the level of consciousness (higher or lower than the determined level).

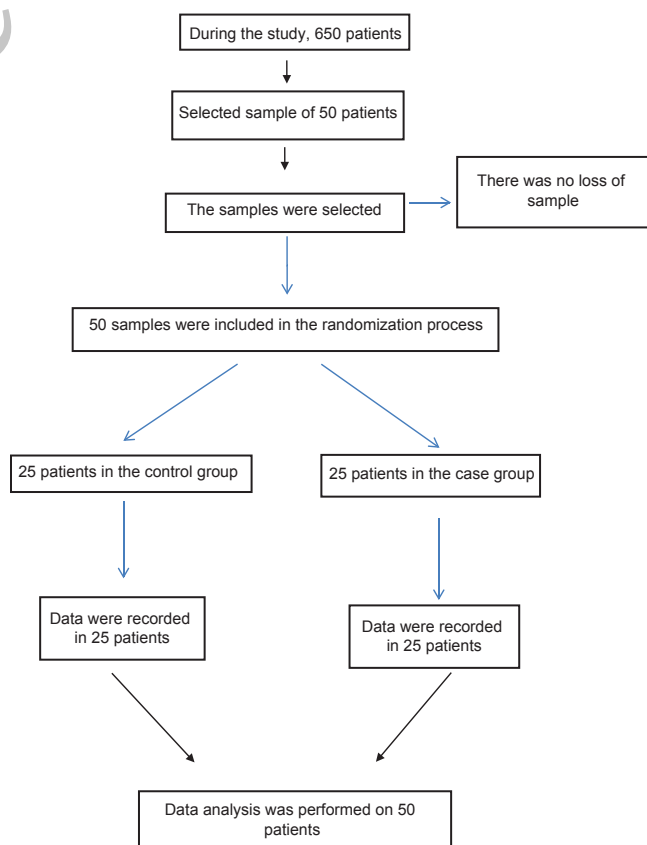


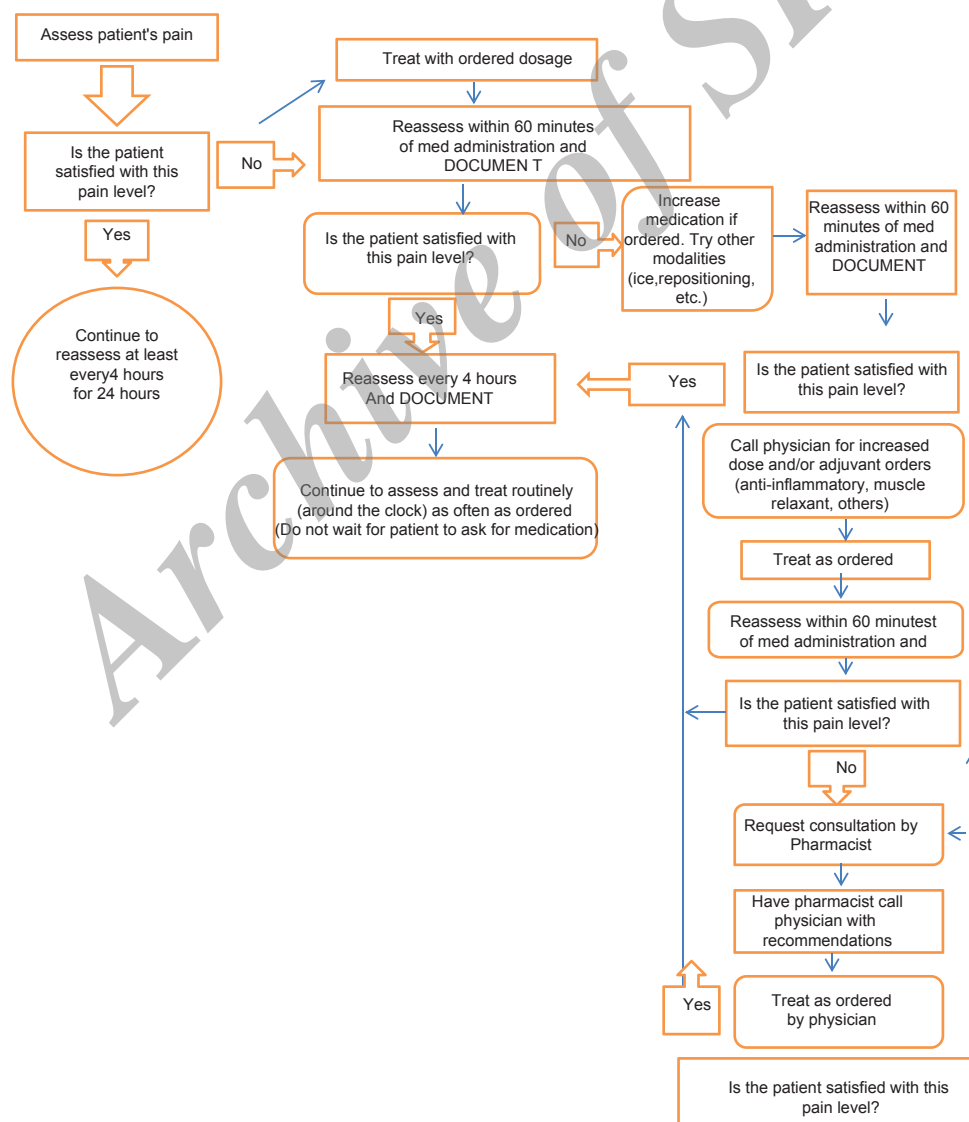
Figure 1: CONSORT diagram

To collect the demographic data, subjects' medical records were collected and to determine the severity of their pain, structured observation through Non-Verbal Pain Scale (NVPS) was adopted.<sup>[6]</sup> Data were collected in multiple stages. Before conducting the study, necessary coordination was achieved with the head nurse of the ICU and the residents of anesthesiology for the process of intervention. The goals of the intervention method were practically and orally explained to the medical team in two separate sessions by the research team.

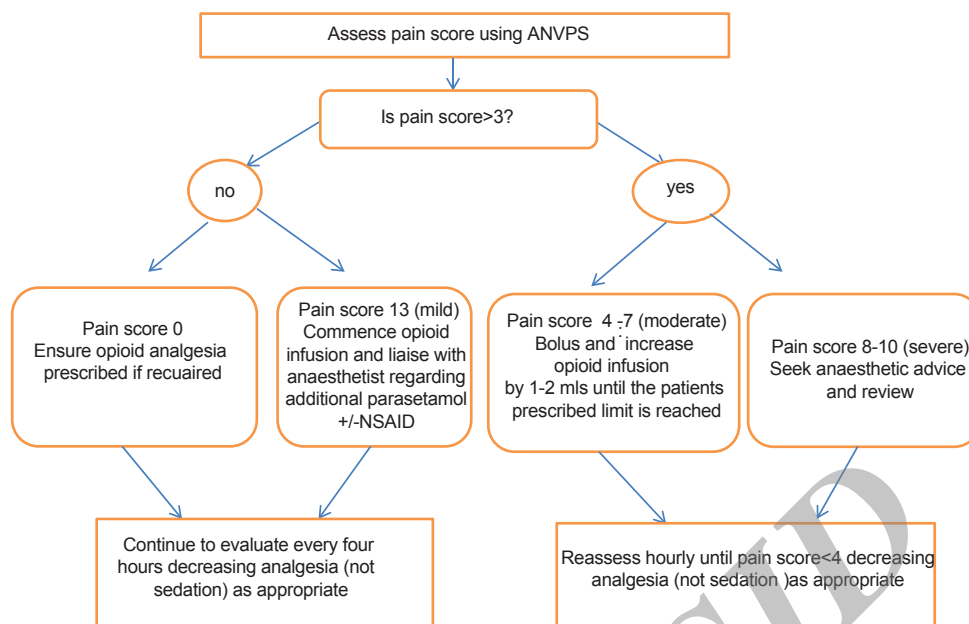
To administer the pain management program [presented in Figure 2], the subjects were selected based on the inclusion criteria, and then, pain management was applied among the subjects in the study group. Before intervention, pain severity scores of the patients, connected to Raphael ventilation and SADAT monitor, were determined by NVPS, and their BP, pulse, and arterial O<sub>2</sub> and respiration rate were

used to score the tool and recorded in the related chart. Then, pain management program was used based on pain severity graded in four levels [Figure 3]. In addition, the sedative selected, based on physician's order, was fentanyl if patient's systolic pressure was between 90 and 100 mm/Hg and morphine if it was more than 100 mm/Hg.

- If the patient's score was calculated as zero, the patient was watched, and the pain score was measured and recorded after 4 h again
- If the pain severity score was between 1 and 3, either morphine at a dose of 2 mg/kg or fentanyl at a dose of 1 mg/kg was infused in an hour, and then, the pain severity score as well as the amount of infused medication were determined and recorded in the related form. After 4 h, the pain severity score was determined again, and if it was zero, the infusion was stopped. Then, the pain severity score was calculated and recorded after 4 h; if it was between 1 and 3, the same process



**Figure 2:** Pain management algorithm from ([www.mypainprofile.com/PDF/evergreen/algorithm.pdf](http://www.mypainprofile.com/PDF/evergreen/algorithm.pdf))



**Figure 3:** Adult Non-Verbal Pain Scale score algorithm from ([www.baccnconference.org.uk/Studio/O30%20Lindsay%20Kirwan.pdf](http://www.baccnconference.org.uk/Studio/O30%20Lindsay%20Kirwan.pdf))

was continued, but if it was more than 3, a bolus dose of infused medication (morphine at a dose of 2 mg or fentanyl at a dose of 1 mg/kg) was injected and 25% of the primary calculated medication dose was added to the dose being infused. The bolus dose of medication and its time of administration were recorded in the related form. Finally, 1 h later, pain severity was measured

- If the pain severity score was between 4 and 7, a bolus dose was injected and the medication that was being infused was increased by 25%. Then, the pain severity score was calculated each hour. If the severity of pain had reduced, for instance, if it was zero, infusion was stopped, and if it was lowered from 6 to 4, the medication being infused was reduced by 25%. If the pain severity score had risen, another bolus dose was injected and the medication being infused was increased by 25%
- If the pain severity score was between 8 and 10, the anesthesiologist and the pharmacist were called.

In the control group, when the nurse realized that the patient was in pain, firstly patient's pain severity was determined by NVPS, and then, based on the amount of medication prescribed by the physician, bolus analgesic (morphine or fentanyl) and sedatives (midazolam) were intravenously injected, and 1 h later, patient's pain severity was measured and recorded.

To determine the effect of pain management program on the length of patients' stay in the ICU, the number of days of patients' stay in the ICU from patients' arrival to the ward to the discharge day was recorded. Data were analyzed by independent *t*-test and Chi-square test, and  $P < 0.05$  were considered significant.

### Ethical consideration

The Ethics Committee of Isfahan University of Medical Sciences approved the study. In this study, letter of introduction issued by Isfahan Nursing and Midwifery School was delivered to the authorities of research environment. Research goals were explained to the nurses and physician of research environment.

### RESULTS

In the present study, the data of 50 subjects were analyzed which showed that 60% of the subjects in the study group and 48% in the control group were male. Chi-square test showed no significant difference in gender frequency distribution between the study and control groups ( $P = 0.395$ ). Mean age of the subjects in the study and control groups were 57.8 (21.4) and 59.7 (11.9) years, respectively. Independent *t*-test showed no significant difference in mean age between the two groups ( $P = 0.703$ ). Mean weight of the subjects in the study and control groups were 72.4 (6.4) and 73.7 (8.4) kg, respectively. Independent *t*-test showed no significant difference in mean weight between the two groups ( $P = 0.558$ ). Chi-square test showed no significant difference in frequency distribution of the type of surgery between the two groups ( $P = 0.255$ ). The most common type of surgery was laparotomy in both groups (48% in the study group and 36% in the control group). Statistical tests showed no significant differences in subjects' personal and clinical characteristics between the two groups before intervention, and both groups were homogenous [Table 1].

Mean length of stay of the subjects in the ICU was calculated and compared in the study and control

**Table 1: Frequency of gastrointestinal surgery in the study and control groups**

Group Type of surgery	Study		Control	
	Number	Percent	Number	Percent
Gastrectomy	1	4	4	16
Thymectomy	2	8	0	0
Laparotomy	12	48	9	36
Cholecystectomy	2	8	5	20
Thoracotomy	3	12	3	12
Other surgeries	5	20	4	16
Total	25	100	25	100

groups ( $3.2 \pm 1.4$  days in the study group vs.  $7.4 \pm 4.8$  days in the control group). Independent *t*-test showed that length of stay was significantly less in the study group compared to the control group ( $P < 0.001$ ).

## DISCUSSION

Our obtained results showed that application of pain management program resulted in a reduction in length of hospitalization in the ICU, as subjects' mean length of stay was significantly less in the study group compared to control. This result reveals that administration of analgesics on time and less administration of sedation medication might have caused such an effect and led to earlier discharge of the patients from the ICU. There are controversial studies in this regard. There is limited evidence-based research available in this context, and few studies have been conducted on documentation of pain assessment among ICU patients. Many of these studies, conducted based on patients' medical files, are survey studies. Arbour *et al.* showed that although usage of a specific tool such as Critical-care Pain Observation Tool (CPOT) had not led to reduction in mean length of patients' connection to mechanical ventilation devices in the ICU, in the study group, it had reduced their length of stay in the ward by 50%,<sup>[23]</sup> which is in line with the results of the present study. Although a different method and tool had been adopted in the mentioned study, it can be concluded that application of specific methods and protocols to assess pain and for pain management, based on patients' conditions, can bring about positive outcomes.

On the other hand, Tressa *et al.*, in a study to evaluate the obtained results before and after usage of Richmond Agitation-Sedation Scale (RASS) to investigate the level of sedation and Behavioral Pain Scale (BPS) to relieve pain and achieve patients' sedation, showed no significant difference in mean length of stay in the ICU before and after intervention.<sup>[24]</sup> The difference between the results of this study and those of the present study can be due to the different pain management methods adopted. In their study,

sedatives and tranquilizers were administered, while in the present study, sedation was mostly used and tranquilizers were avoided as much as possible. In addition, the subjects were different in these two studies, as in their study, the patients had sepsis or trauma, or had undergone cardiac surgery, neurosurgery, and other surgeries. Rose *et al.*, in a study on defining the effect CPOT on the number of recorded pain assessments and prescription of sedatives and tranquilizers for ICU patients, who were not capable of pain self-report, showed that length of stay reduced from 2 to 1.8 days ( $P = 0.007$ ) in ICU and from 7 to 5.9 days in general surgery ward after application of pain management program, although the difference was not significant. The controversy in their results with those of the present study can be due to the use of different care program and application of various tools, as well as different subjects studied.

## CONCLUSION

Pain management program can make the nurses function better and affect their palliative care interventions, which may lead to a reduction in patients' length of stay in the ICU as well as in their treatment and hospitalization costs. Therefore, it is suggested to shorten the length of stay in the ICU among the patients with low consciousness level through application of care program education with an inter-professional approach and scientific pain management.

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