JFSP Vol.12, No.1, May-August 2026, Page: 30-40
pISSN: 2549-9068, eISSN: 2579-4558
Jurnal Farmasi Sains dan Praktis
(JFSP)
http://journal.unimma.ac.id/index.php/pharmacy

COST-EFFECTIVENESS ANALYSIS OF THE USE OF NARCOTIC ANALGESICS IN PATIENTS WITH POST-CAESAREAN SECTION AT A MOTHER AND CHILD HOSPITAL IN PANDEGLANG

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https://doi.org/10.31603/dafmwq47

Article info:
Submitted : 05-03-2025
Revised : 22-05-2026
Accepted : 08-07-2026

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Publisher:
Universitas Muhammadiyah Magelang

ABSTRACT

The majority of patients undergoing cesarean section experience moderate to severe pain. To reduce pain after surgery, therapy can be used in the form of administering narcotic analgesics. The selection of the type of narcotic analgesic affects the level of effectiveness of treatment and the costs required. This study aims to identify the most cost-effective narcotic analgesic therapy in post-cesarean section patients. The study was conducted using a non-experimental method using a descriptive approach, as well as prospective data collection through cost analysis and direct interviews with patients using questionnaires. Cost-effectiveness analysis was conducted using the Cost Effectiveness Analysis (CEA) method using ACER and ICER values. The sample was selected by purposive sampling with a total of 90 patients, consisting of 38 patients in the Fentanyl group and 52 patients in the Fentanyl + Morphine group. The results showed that cost efficiency based on the Faces Pain Rating Scale pain scale produced an ACER value of IDR 1,561 for the Fentanyl group and IDR 1,499 for the Fentanyl + Morphine group. Meanwhile, based on the Visual Analogue Scale (VAS) pain scale, the ACER value for the Fentanyl group was IDR 751 while for the Fentanyl + Morphine group it was IDR 3,404. Based on these findings, the most cost-effective narcotic analgesic therapy according to the Faces Pain Rating Scale assessment is the combination of Fentanyl + Morphine, but based on the Visual Analog Scale assessment, the use of Fentanyl is more cost-effective than the combination of Fentanyl + Morphine.

Keywords: Caesarea Section; Cost Effectiveness Analysis; Fentanyl; Morphine

1. INTRODUCTION

A Caesarean section (CS) is a surgical method used to deliver a baby by making an incision in the mother's abdomen. It is typically advised when a vaginal delivery (VD) may endanger the health of the mother, the baby, or both. Such situations include prolonged or obstructed labor, fetal distress, high blood pressure or blood sugar levels, multiple pregnancies, or abnormal positioning or presentation of the baby, among other factors. For many years, this surgical procedure has been carried out either as a planned operation or in emergencies due to these factors, with well-established benefits. When performed for appropriate medical reasons, a CS significantly lowers the risk of illness and death for both the mother and the newborn. However, if done without proper indication, it can pose serious risks to both (Angolile et al., 2023).

According to WHO data in the 2019 Global Survey on Maternal and Perinatal Health, 46.1% of total births in the world were carried out through the Sectio Caesarea procedure. Meanwhile, based on RISKESDAS data in 2018, the number of deliveries using the Sectio Caesarea method in Indonesia reached 17.6%. The region with the highest number was DKI Jakarta at 31.3%, while Papua recorded the lowest number at 6.7% (Kementerian Kesehatan RI, 2018). Based on data from the Banten Provincial Health Service in 2018, the Sectio Caesarea delivery method was recorded at 44.1% of the total 229,983 deliveries that occurred in Banten Province (Haq et al., 2023). The high rate of cesarean deliveries in Indonesia indicates the need to provide effective and affordable pain therapy for post-operative patients.

Post-operative pain management of cesarean section can be done through a pharmacological approach. This approach involves the use of chemical drugs, such as analgesics, to relieve pain (Faatihah et al., 2023). Narcotic analgesics are a type of drug that is often used as the main choice for treating post-cesarean pain, because it is effective in relieving pain with moderate to severe intensity. The ideal analgesic should be able to provide a calming pain relief effect, support rapid recovery after its use, have a high safety margin, and minimal adverse side effects (Agung et al., 2023).

The variety of alternatives and drug choices makes pharmacology need to be supported by consideration of economic aspects in determining drugs that are appropriate to the cost review. Cost is one of the important components in cesarean section services. Analysis of costs incurred by patients after cesarean section can be done using a pharmacoeconomic approach with the Cost Effectiveness Analysis (CEA) method (Nurfita et al., 2018).

Previous studies have reported pharmacoeconomic evaluations of analgesic use in post-caesarean section patients; however, most studies focused on general analgesic therapy, minimal cost analysis, or were conducted in tertiary hospitals with different patient characteristics and treatment protocols (Nurfita et al., 2018; Maulina et al., 2019). Limited evidence is available regarding the cost-effectiveness comparison between single narcotic analgesic therapy (Fentanyl) and combination therapy (Fentanyl + Morphine), particularly using postoperative pain outcomes measured by both Faces Pain Rating Scale and Visual Analogue Scale instruments. In addition, studies evaluating narcotic analgesic use in maternal and child hospitals at the regional level, especially in Pandeglang Regency, remain scarce. Therefore, this study was conducted to address these gaps by evaluating the cost-effectiveness of narcotic analgesic regimens in post-caesarean section patients using two pain assessment approaches. The purpose of this study was to determine the cost-effectiveness of using narcotic analgesics in post-cesarean section patients at a Mother and Child Hospital in Pandeglang district.

2. METHODS

The type of research used is non-experimental with a descriptive approach, where data collection is carried out prospectively through cost analysis and direct interviews with patients with questionnaires. Samples were taken using non-probability sampling techniques with purposive sampling methods, with a total sample calculated using the Slovin formula of 90 patients.

The population in this study were all patients who underwent Sectio Caesarea surgery at a Mother and Child Hospital, Pandeglang Regency in 2024. The research sample consisted of patients who were included in the population and met the criteria determined in this study.

The inclusion criteria in this study included women who underwent Sectio Caesarea surgery, patients who used narcotic analgesic drugs during surgery, and patients who were willing to be respondents. Meanwhile, the exclusion criteria included patients who experienced decreased consciousness and patients who were treated in the ICU. Patients with decreased consciousness were excluded because pain assessment in this study relied on direct interviews using the Faces Pain Rating Scale and Visual Analogue Scale (VAS), which require active

patient participation and adequate cognitive function to provide valid responses. Meanwhile, patients admitted to the Intensive Care Unit (ICU) were excluded because they generally represent more severe clinical conditions, may require different analgesic management strategies, and have additional interventions that could affect pain perception and treatment outcomes, potentially introducing bias into the cost-effectiveness analysis.

Data collection was conducted through questionnaires and medical cost data collection carried out in the Postpartum Room and Pharmacy Installation. Interviews were conducted with patients to fill out questionnaires, which produced primary data in the form of patient identity (name, age, education), history of cesarean section, drugs used, and the scale of pain felt. Meanwhile, in the Pharmacy Installation, secondary data obtained in the form of direct costs or prices of narcotic analgesic drugs.

Pain assessment was performed using two standardized instruments, namely the Faces Pain Rating Scale (FPRS) and the Visual Analogue Scale (VAS). The FPRS instrument was used to categorize pain intensity through facial expressions representing different pain levels, while the VAS instrument assessed pain intensity using a numerical scale ranging from 0–100. In addition to pain assessment, a structured questionnaire was used to collect demographic and clinical characteristics, including age, educational background, history of caesarean section, and analgesic therapy received.

The questionnaires used in this study were adopted from previously validated pain assessment instruments. Content validity was evaluated through expert judgment involving clinical pharmacists and anesthesiology practitioners to ensure the relevance and clarity of the questionnaire items. Reliability assessment was performed using a pilot study before data collection. Internal consistency was analyzed using Cronbach's alpha coefficient, and the instrument was considered reliable if the alpha value exceeded 0.70.

Cost analysis in this study was conducted from a drug-therapy perspective by focusing specifically on the direct medical costs associated with postoperative narcotic analgesics (Fentanyl and Fentanyl + Morphine). Other cost components such as surgical procedures, hospitalization, physician services, anesthesia procedures, and medical consumables were not included because these costs were relatively similar among post-caesarean section patients and were not influenced by the choice of postoperative analgesic regimen. Therefore, the analysis aimed to identify the incremental economic impact attributable specifically to differences in analgesic therapy.

In addition to interviews and pharmacy cost data collection, medical records were also reviewed to obtain clinical and treatment-related information. Medical record data included patient demographic characteristics, history of caesarean section, type of narcotic analgesic administered, clinical status, and eligibility according to inclusion and exclusion criteria. The use of medical records aimed to validate patient information obtained through interviews and ensure the accuracy of clinical and therapeutic data used in the cost-effectiveness analysis.

The data were analyzed descriptively and presented in tabular form. After the data were collected, processing was carried out using Microsoft Excel to identify the distribution of characteristics, effectiveness, and costs. Analysis of effectiveness and cost data was carried out using the Statistical Package for the Social Sciences (SPSS) program. The Mann-Whitney test was applied to analyze the differences in costs and effectiveness between the group receiving Fentanyl and the group receiving Fentanyl + Morphine. The purpose of this analysis was to determine whether there were significant differences in effectiveness and costs between the two groups.

The effectiveness and cost values were analyzed using the Average Cost-Effectiveness Ratio (ACER) formula. This formula is used to compare direct medical costs with the level of effectiveness in each therapy group. In addition, the ACER value helps identify therapies that are more cost-effective compared to other alternatives. The therapy with the lowest ACER value

among all therapies compared and interpreted as the most cost-effective option (Restyana et al., 2024).

Effectiveness and cost values are used to determine the position of each therapy in the cost-effectiveness diagram, which consists of four quadrants. Quadrant I includes therapies that are highly effective but cost more than other options. Quadrant II describes therapies that are highly effective and cost less, and are therefore considered the most desirable option. Quadrant III shows therapies that are low in effectiveness but cost less than other options. Quadrant IV includes therapies that are low in effectiveness and cost more, and are generally considered inefficient. If the therapies being compared are in quadrants I and III, an Incremental Cost-Effectiveness Ratio (ICER) analysis can be applied. ICER is used to measure the difference in cost and effectiveness between therapies, and to determine the additional cost required to increase the effectiveness of a treatment by switching therapies (Restyana et al., 2024).

This study was approved by Health Research Ethics Committee Universitas Bakti Tunas Husada No. 073.01/E.01/KEPK-BTH/V/2024.

3. RESULTS AND DISCUSSION

This study involved direct interviews with cesarean section patients to measure the pain scale using the Faces Pain Rating Scale and Visual Analogue Scale (VAS). The data collected included 90 patients who met the study criteria. The sample was divided into two groups, namely the Fentanyl group and the Fentanyl + Morphine group. The Fentanyl group consisted of 38 patients who received single Fentanyl therapy, while the Fentanyl + Morphine group consisted of 52 patients who received combination therapy of Fentanyl and Morphine.

Two pain assessment instruments, namely the Faces Pain Rating Scale (FPRS) and Visual Analogue Scale (VAS), were used in this study because both instruments evaluate pain intensity using different approaches and provide complementary information. The FPRS assesses pain subjectively through facial expression representations and is easier for patients to understand during the early postoperative period. Meanwhile, the VAS provides a quantitative assessment of pain intensity using a numerical continuum, allowing more detailed evaluation of pain changes. The use of both instruments aimed to improve the comprehensiveness of postoperative pain assessment and reduce measurement bias associated with using a single instrument.

The research data were processed using the Cost Effectiveness Analysis (CEA) method to determine the most cost-effective narcotic analgesic drugs. The characteristics of patients in this study consisted of age, educational background, and Patient Operation History of Sectio Caesarea which can be seen in **Table 1**.

Table 1. Characteristics of Caesarean Section Patients

No	Characteristics	N = 90 Amount (n)	Percentage (%)
1.	Age		
	a. 17-25 Years	31	34.4%
	b. 26-35 Years	52	57.8%
	c. 36-45 Years	7	7.8%
2.	Educational Background		
	a. Elementary school	7	7.8%
	b. Junior High School	15	16.7%
	c. High School/Vocational School	41	45.6%
	d. Diploma/Bachelor's Degree	27	30.0%
3.	Patient Operation History Sectio Caesarea		
	a. History of first SC	51	56.7%
	b. History of Second SC	31	34.4%
	c. History of the Third	8	8.9%

SC

Based on the results obtained from 90 respondents of post-cesarean section patients at a mother and Child Hospital Pandeglang Regency, as seen in Table 1, the age group with the highest number is early adulthood (26-35 years) as many as 52 people (57.8%). The reproductive process is usually considered ideal in the age range of 20-35 years (Purborini & Rumaropen, 2023). This is due to better protection conditions and mental readiness in managing and caring for pregnancy. Women who are under 20 years old or over 35 years old tend to have a lower chance of getting pregnant (Asta et al., 2023). This is related to psychological and physiological readiness at the age of under 20 years, while those over 35 years are at higher risk of congenital abnormalities and complications during the delivery process (Sihombing et al., 2017).

Based on this, age has a significant effect on the intensity of labor pain, especially in young mothers (<20 years old) and those experiencing labor for the first time. A relatively young age can trigger anxiety in mothers, because of the first labor experience. In addition, mothers who are too old (>35 years old) also tend to experience anxiety related to higher risks, which can affect pain intensity. Increased anxiety can increase the response to pain during labor (Yiwa, 2022). Based on data on the level of education of post-cesarean section patients at a Mother and Child Hospital in Pandeglang Regency, as listed in Table 1, the highest results were found in patients with a high school/vocational high school education level of 41 people (45.6%). Educational background was included as a patient characteristic because educational level may influence an individual's understanding, perception, and response toward postoperative pain and recovery. Patients with higher educational levels tend to have better comprehension regarding medical information, postoperative procedures, pain management, and coping strategies, which may affect pain perception and reporting. Therefore, educational background was included to provide a descriptive overview of patient characteristics that potentially influence pain assessment outcomes, although it was not analyzed as the primary determinant of pain intensity in this study (Yiwa, 2022).

Based on the history of cesarean section in post-cesarean section patients at a Mother and Child Hospital in Pandeglang Regency, as seen in Table 1, most patients had never undergone a cesarean section before. A history of cesarean section can affect the intensity of labor pain. Patients who have undergone two cesarean sections often feel more intense pain compared to previous surgical experiences. A mother who has given birth before has a better understanding of the pain she will experience during the labor process. On the other hand, a mother who has never given birth does not have a clear picture of how much pain she will feel during her first birth (Yulizawati et al., 2019).

In this study, the effectiveness parameters based on the Faces Pain Rating Scale pain scale were analyzed by looking at patients who experienced mild pain (scale 1-3). If the patient feels pain on a mild scale, then narcotic analgesics are considered effective in treating cesarean section pain, so that the patient only feels mild pain. In this study, effectiveness was operationally defined as the proportion of patients experiencing mild pain (pain scale ≤3). Patients with pain scores above 3 were categorized as having suboptimal pain control for the purpose of cost-effectiveness analysis. However, this classification does not indicate that narcotic analgesics were completely ineffective, because pain perception after cesarean section may still be influenced by individual pain tolerance, surgical conditions, postoperative recovery status, psychological factors, and variation in response to analgesic therapy (Maulina et al., 2019).

The effectiveness parameters based on the Visual Analogue Scale (VAS) pain scale were analyzed by looking at patients who experienced pain at the level of improving health

conditions (scale 70-90). If the patient feels pain at the level of improving health conditions (scale 70-90), then narcotic analgesics are considered effective in overcoming cesarean section pain, so that the patient feels good health. In this study, effectiveness based on the VAS assessment was operationally defined as patients achieving pain scores above 70, representing better postoperative pain outcomes. Patients with scores below 70 were categorized as having less favorable pain control for analytical purposes. However, this classification does not indicate complete ineffectiveness of narcotic analgesics because postoperative pain responses may vary according to individual pain perception, clinical condition, psychological factors, and response to therapy (Kasih & Hamdani, 2023). The results of the assessment of the effectiveness of narcotic analgesic drug therapy using the faces pain rating scale and the therapy visual analogue scale can be seen in Table 2 and Table 3.

Table 2. Effectiveness of Narcotic Analgesic Drug Therapy Faces Pain Rating Scale

Drug Therapy Group	Pain Scale					
	Total	%	<3 Pain Scale	%	>3 Pain Scale	%
Fentanyl	38	100	13	34,2	25	65.8
Fentanyl + Morphine	52	100	34	65,4	18	34.6

Table 3. Effectiveness of Narcotic Analgesic Drug Therapy Visual Analogue Scale (VAS) Pain Scale

Drug Therapy Group	Pain Scale					
	Total	%	<70 Pain Scale	%	>70 Pain Scale	%
Fentanyl	38	100	11	28.9	27	71.1
Fentanyl + Morphine	52	100	37	71.2	15	28.8

Based on the assessment using the Faces Pain Rating Scale, the Fentanyl + Morphine group showed a higher effectiveness value compared to the Fentanyl group. However, in the assessment using the Visual Analogue Scale (VAS) Pain Scale, the Fentanyl group showed a higher effectiveness value compared to the Fentanyl + Morphine group.

The higher proportion of patients with pain scores >3 in the Fentanyl group indicates that a considerable number of patients still experienced moderate pain despite receiving analgesic therapy. This finding suggests that single fentanyl therapy may provide less optimal pain control compared to the fentanyl–morphine combination, although analgesic treatment still contributed to postoperative pain management.

The higher proportion of VAS scores below 70 in the Fentanyl + Morphine group indicates that some patients still experienced less optimal postoperative pain control. Nevertheless, this finding should be interpreted as relative differences in effectiveness between therapy groups rather than absolute failure of analgesic therapy.

The results of a study conducted by Gerbershagen & Baagil, (2024) showed that the combination of fentanyl and morphine provided significant benefits for pain using the Visual Analogue Scale instrument. In addition, the results of a study conducted by Weigl et al., (2017) showed that the combination of intrathecal fentanyl and morphine provided better effectiveness in treating post-cesarean pain using the Faces Pain Rating Scale Instrument.

Morphine is an opioid receptor agonist that binds to and activates μ-opioid receptors in the central nervous system. Activation of these receptors produces analgesic and sedative effects. Morphine is known to be an effective opioid for intraoperative spinal anesthesia and postoperative analgesia. However, its slow onset of action may be a limiting factor in its use (Heri & Subarnas, 2020). Therefore, the addition of fentanyl as a lipophilic opioid in spinal anesthesia is recommended to improve the quality of anesthesia and provide better postoperative

analgesia. Morphine has a longer duration of action (4 hours) and a rapid onset (<5 minutes for IV administration). Fentanyl has a slower initial action time, which is 12-24 hours, so that dose modification can be more effective when combined with opioids with a rapid onset of action such as morphine (Grape et al., 2023). Fentanyl has a very high lipid solubility (580:1 lipid solubility compared to morphine), which allows for more rapid clearance from the cerebrospinal fluid (CSF). This is thought to reduce the spread of fentanyl, resulting in fewer side effects compared to intrathecal morphine (Thornton et al., 2015).

The use of combined analgesics with various mechanisms of action and therapeutic target sites is known to be more effective in relieving pain than single use. Multimodal analgesia aims to achieve synergistic or additive effects, as well as to reduce the need for opioid doses (Damayanti, 2021).

In this study, the cost calculation was based on the unit price of Fentanyl and Fentanyl+Morphine usage. The cost of Fentanyl usage was IDR 53,391/ampule, while the price of Morphine was IDR 44,667/ampule. Thus, the total cost of the Fentanyl+Morphine combination reached IDR 98,058.

Although the overall cost of caesarean section is largely dominated by operative procedures and hospitalization expenses, this study intentionally focused on postoperative analgesic costs because the objective was to compare the economic efficiency between different narcotic analgesic regimens. Operative costs were assumed to be equivalent across patients since all subjects underwent the same surgical procedure (caesarean section), while variations mainly occurred in the type of analgesic administered. Therefore, postoperative pain management costs were considered the most relevant component for pharmacoeconomic comparison.

Cost-effectiveness analysis was conducted using the ACER (Average Cost Effectiveness Ratio) calculation method. The ACER value describes the total cost of a program or therapy divided by the clinical outcome, providing an overview of the cost ratio in currency units per specific clinical outcome obtained. Drug cost data obtained from cesarean section patients at a Mother and Child Hospital, Pandeglang Regency were then used to calculate the cost-effectiveness ratio expressed as the ACER (Average Cost Effectiveness Ratio) value. The results of the calculation of the cost effectiveness of narcotic analgesic drug therapy using the Faces Pain Rating Scale and Therapy Visual Analogue Scale can be seen in Table 4 and Table 5.

Table 4. Results of Calculation of ACER Values of the Faces Pain Rating Scale

Drug Therapy	Total Cost of Medicine	Effectiveness (%)	ACER Value
Fentanyl	IDR 53,391	34.2%	IDR 1,561
Fentanil+Morphine	IDR 98,058	65.4%	IDR 1,499

Table 5. Calculation of ACER Values of Visual Analogue Scale (VAS) Pain Scale

Drug Therapy	Total Cost of Medicine	Effectiveness (%)	ACER Value
Fentanyl	IDR 53,391	71.1%	IDR 751
Fentanyl+Morphine	IDR 98,058	28.8%	IDR 3,404

The results of the ACER calculation based on the Faces Pain Rating Scale assessment showed a value of IDR 1,561 for the Fentanyl group and IDR 1,499 for the Fentanyl + Morphine group. Meanwhile, the results of the ACER calculation based on the Visual Analogue Scale assessment showed a value of IDR 751 for the Fentanyl group and IDR 3,404 for the Fentanyl + Morphine group.

The most cost-effective intervention is the one with the lowest ACER calculation compared to other interventions (Restyana et al., 2024). The most cost-effective intervention is the one with the lowest ACER calculation compared to other interventions.

Based on the results of the ACER calculations in this study, it can be presented in the form of a cost-effectiveness quadrant diagram as shown in Figure 1 and Figure 2.

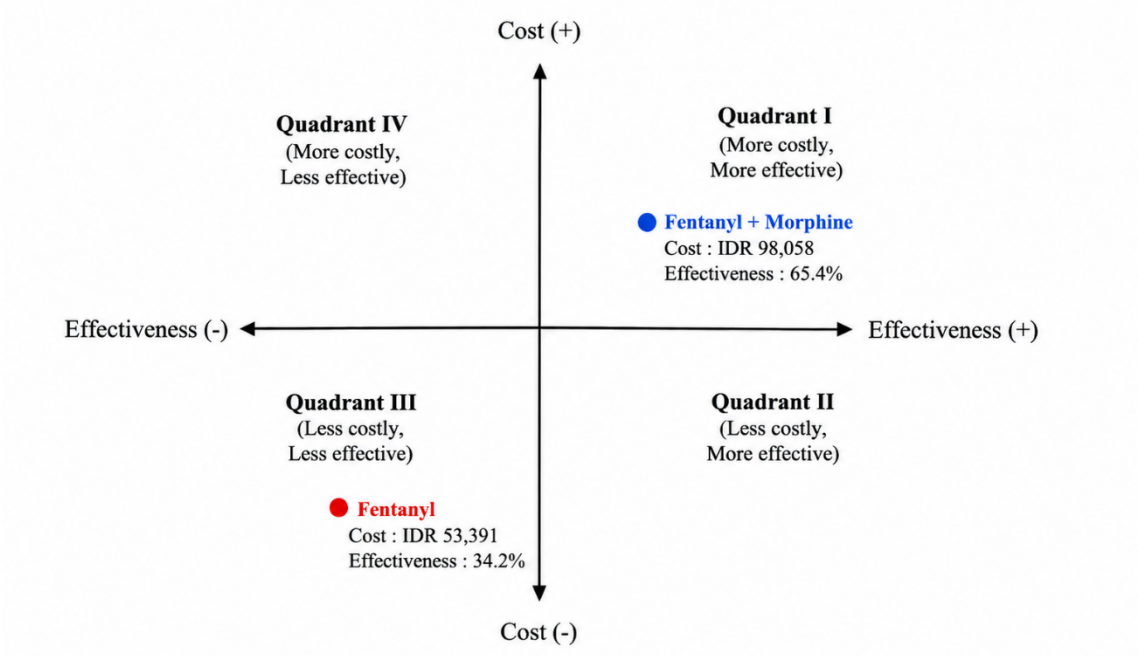


Figure 1. Cost Effectiveness Quadrant of Faces Pain Rating Scale

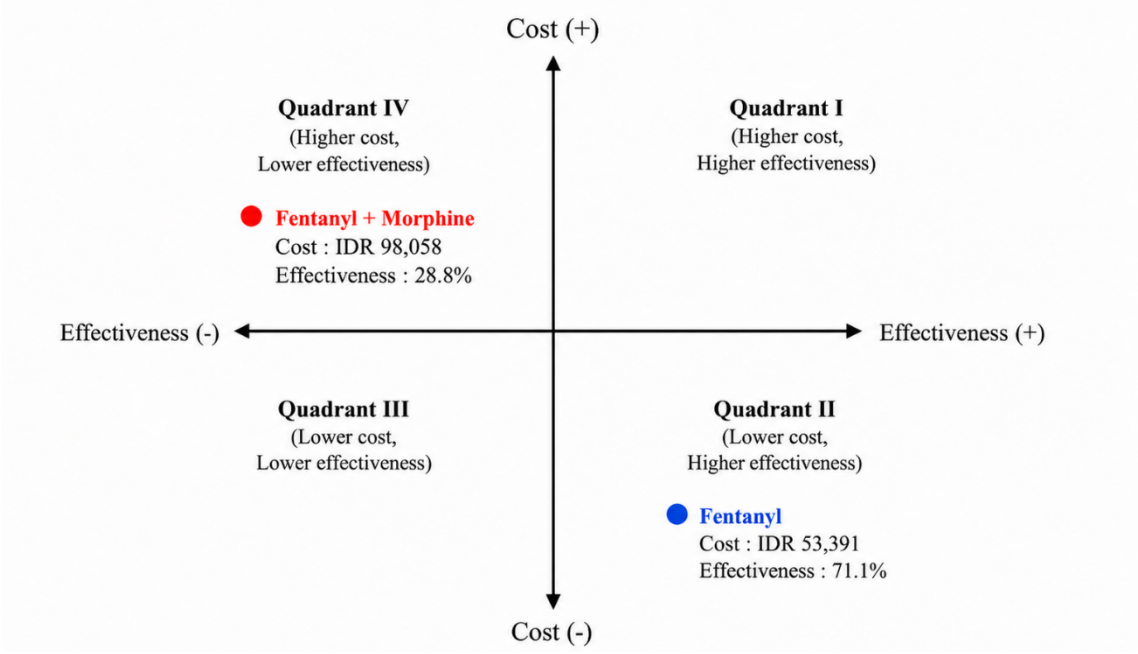


Figure 2. Visual Analogue Scale (VAS) Cost Effectiveness Quadrant

Figure 1 presents the distribution of both interventions in the cost-effectiveness plane. The Fentanyl intervention was positioned in Quadrant III because it had lower cost and lower

effectiveness, whereas the Fentanyl + Morphine combination was positioned in Quadrant I because it showed higher effectiveness with increased cost.

Figure 2 presents the positions of both interventions in the cost-effectiveness plane based on the Visual Analogue Scale (VAS) assessment. The Fentanyl intervention was positioned in Quadrant II because it demonstrated lower cost with higher effectiveness, indicating the most favorable cost-effectiveness profile. Meanwhile, the Fentanyl + Morphine combination was positioned in Quadrant IV because it showed higher cost and lower effectiveness. Therefore, based on the VAS assessment, single Fentanyl therapy was considered the preferred pharmacoeconomic option and ICER analysis was not required.

This indicates that the cost-effectiveness of using the Faces Pain Rating Scale questionnaire can be continued to the ICER calculation. However, based on the cost-effectiveness analysis using the VAS questionnaire, the Fentanyl group is in quadrant II, while the Fentanyl + Morphine group is in quadrant IV. Therefore, the use of single Fentanyl therapy as a narcotic analgesic after CS surgery is proven to be the main choice based on the VAS assessment. This indicates that the cost-effectiveness of using the VAS questionnaire cannot be continued to the ICER calculation. The results of the calculation of the incremental cost effectiveness of narcotic analgesic drug therapy using the Faces Pain Rating Scale can be seen in Table 6.

Table 6. ICER Calculation

Pain Scale	Intervention	Cost	Effectiveness	Nilai ICER
Faces Pain Rating Scale	Fentanyl+Morphine - Fentanyl	IDR 44,667	31.2%	IDR 1,431

The ICER calculation is used to determine the additional costs that a patient would incur if they changed interventions (Restyana et al., 2024). Based on Table 6, it can be seen that if a patient undergoing a cesarean section using Fentanyl wants to improve the healing process or reduce pain by using Fentanyl+Morphine, there will be an additional cost of IDR 1,431 per pain scale unit.

This study has several limitations, including the limited coverage of the location to only one hospital, so the results may not be generalizable to a wider population. In addition, another limitation of this study is that the economic analysis only included direct medical costs related to postoperative narcotic analgesics and did not incorporate total caesarean section costs, including surgery, hospitalization, anesthesia procedures, laboratory examinations, and indirect costs. Therefore, the results should be interpreted as a therapy-specific pharmacoeconomic evaluation rather than an overall hospital cost evaluation.

4. CONCLUSION

Based on the calculation results of the Average Cost-Effectiveness Ratio (ACER), the value calculated using the Faces Pain Rating Scale shows that the Fentanyl group has a value of IDR 1,561, while the Fentanyl + Morphine group has a value of IDR 1,499. The ACER calculation based on the Visual Analogue Scale shows a value of IDR 751 for the Fentanyl group and IDR 3,404 for the Fentanyl + Morphine group.

Based on the Faces Pain Rating Scale assessment, the Fentanyl+Morphine group was more cost-effective compared to the Fentanyl group, because it had a lower ACER value. Conversely, based on the Visual Analogue Scale assessment, the Fentanyl group was more cost-effective compared to the Fentanyl+Morphine group, because its ACER value was lower. This suggests that cost-effectiveness may vary depending on the effectiveness assessment instrument used.

Based on this study, hospitals can optimize the use of narcotic analgesics by considering cost efficiency without compromising the quality of patient care. These findings can also be the

basis for developing more specific clinical guidelines regarding the use of post-cesarean analgesics, thereby reducing complications and costs. In addition, by choosing more cost-effective analgesics, hospitals can improve access to care and patient satisfaction. Training programs for medical personnel on the use of cost-effective drugs are also recommended, along with periodic evaluations to ensure medication policies remain relevant.

5. ACKNOWLEDGMENT

We would like to thank all parties who have contributed to the preparation of this article. The support, input, and insights provided were very helpful in enriching the content of this article.

6. CONFLICT OF INTEREST

All authors declared that there was no conflict of interest.

7. REFERENCES

Agung, A., Putra, N., Prasetya, R., Dhrik, M., Marani, P. D., Studi, P., Farmasi, S., Tinggi, S., Mahaganesha, F., Studi, P., Tiga, D., Tinggi, S., Mahaganesha, F., & Sesar, O. (2023). *Perbedaan Efektivitas Kombinasi Analgesik Opioid*. *12*(2), 193–200.

Angolile, C. M., Max, B. L., Mushemba, J., & Mashauri, H. L. (2023). Global increased cesarean section rates and public health implications: A call to action. *Health Science Reports*, *6*(5), 1–5. https://doi.org/10.1002/hsr2.1274

Asta, A., Aisyah, S., & Silaban, T. D. S. (2023). Analisis Faktor-Faktor yang Berhubungan dengan Persalinan Sectio Caearia. *Jurnal Aisyiyah Palembang*, *8*, 1–13.

Damayanti, R. A. (2021). *Perbedaan Efek Tramadol Ketorolak dan Oksikodon Ketorolak Sebagai Analgetik Paska Operasi Mayor*. Universitas Islam Sultan Agung.

Faatihah, I. N., Noorratri, E. D., Widodo, P., Nurturing, B., & Led, B. (2023). Penerapan Biologic Nurturing Baby Led Feeding Terhadap Penurunan Skala Nyeri Pada Ibu Post. *Jurnal Ilmu Kesehatan*, *2*(8), 423–432.

Gerbershagen, M. U., & Baagil, H. (2024). Caesarean Delivery: A Narrative Review on the Choice of Neuraxially Administered Opioid and Its Implications for the Multimodal Peripartum Pain Concept. *Medicina (Lithuania)*, *60*(3). https://doi.org/10.3390/medicina60030358

Grape, S., El-Boghdadly, K., & Albrecht, E. (2023). Management of adverse effects of intrathecal opioids in acute pain. *Best Practice and Research: Clinical Anaesthesiology*, *37*(2), 199–207. https://doi.org/10.1016/j.bpa.2023.02.002

Haq, Y. E., Lestari, P., & Nurul Falah, E. S. (2023). Pengaruh Tingkat Pengetahuan Pasien Pra Operasi SC Sebelum dan Sesudah diberikan Pendidikan Kesehatan Tentang Mobilisasi Dini di Rumah Sakit Mitra Husada Tangerang Tahun 2022. *Jurnal Kesehatan STIKes IMC Bintaro*, *6*(1 SE-Articles), 47–55. http://jurnal.stikesimcbintaro.ac.id/index.php/djs/article/view/181

Heri, A. A. P., & Subarnas, A. (2020). Morfin: Penggunaan Klinis dan Asepk-Aspeknya. *Farmaka*, *3*(17), 121. https://doi.org/10.1007/978-90-313-6309-4_13

Kasih, N. S., & Hamdani, I. (2023). Perbandingan Efektivitas Penilaian Skala Nyeri berdasarkan Visual Analog Scale (VAS), Verbal Rating Scale (VRS), dan Numeric Rating Scale (NRS) pada Pasien Pasca Operasi Sectio Caesarea (SC) di RSU Muhammadiyah Medan. *Jurnal Implementa Husada*, *4*(4), 272–282. https://jurnal.umsu.ac.id/index.php/JIH/article/view/16741

Kementerian Kesehatan RI. (2018). *Riset Kesehatan Dasar (RISKESDAS)*. Kementerian Kesehatan RI.

Maulina, D. N., Afdhal, A. F., & Hasan, D. (2019). Analisis Farmakoekonomi Penggunaan Analgesik Narkotika Pada Pasien Operasi Sectio Caesaria Di Rumah Sakit Tipe C Di Daerah Jakarta Selatan Periode Januari - Juni 2018. *Tesis*, *56*.

Nurfita, Arifian, H., & Fadraersada, J. (2018). Analisis Biaya Minimal dan Efektivitas Biaya Penggunaan Analgesik Pada Pasien Bedah Sesar di Salah Satu Rumah Sakit Samarinda. *Proceeding of Mulawarman Pharmaceuticals Conferences*, *8*(November 2018), 75–80. https://doi.org/10.25026/mpc.v8i1.306

Purborini, S. F. A., & Rumaropen, N. S. (2023). Hubungan Usia, Paritas, dan Tingkat Pendidikan dengan Kehamilan Tidak Diinginkan Pada Pasangan Usia Subur di Surabaya. *Media Gizi Kesmas*, *12*(1), 207–211. https://doi.org/10.20473/mgk.v12i1.2023.207-211

Restyana, A., Faradiba, Farida, U., Wahyuni, K. S. P. D., Pambudi, R. S., Prasetyo, E. Y., Toyo, E. M., Admaja, W., Hendra, G. A., & Noviyani, R. (2024). Farmakoekonomi. In *FUTURE SCIENCE* (Vol. 6, Issue 1). http://repositorio.unan.edu.ni/2986/1/5624.pdf%0Ahttp://fiskal.kemenkeu.go.id/ejournal%0Ahttp://dx.doi.org/10.1016/j.cirp.2016.06.001%0Ahttp://dx.doi.org/10.1016/j.powtec.2016.12.055%0Ahttps://doi.org/10.1016/j.ijfatigue.2019.02.006%0Ahttps://doi.org/10.1

Sihombing, N., Saptarinia, I., & Putri, D. S. K. (2017). Determinan Persalinan Sectio Caesarea Di Indonesia (Analisis Lanjut Data Riskesdas 2013). *Jurnal Kesehatan Reproduksi*, *8*(1), 63–75. https://doi.org/10.22435/kespro.v8i1.6641.63-75

Thornton, P., Hanumanthaiah, D., O'Leary, R. A., & Iohom, G. (2015). Effects of fentanyl added to a mixture of intrathecal bupivacaine and morphine for spinal anaesthesia in elective caesearean section. *Romanian Journal of Anaesthesia and Intensive Care*, *22*(2), 97–102.

Weigl, W., Bieryło, A., Wielgus, M., Krzemień-Wiczyńska, Ś., Kołacz, M., & Dąbrowski, M. J. (2017). Perioperative analgesia after intrathecal fentanyl and morphine or morphine alone for cesarean section. *Medicine (United States)*, *96*(48). https://doi.org/10.1097/MD.0000000000008892

Yiwa, O. M. (2022). *Gambaran Respon Nyeri Pasien Pasca Bedah Sectio Ceasarea Setelah Pemberian Analgetik Ketamin Intravena Di Ruang Pemulihan (Recorvery Room) Rs Karitas Weitabula Nusa Tenggara Timur*. Institut Teknologi dan Kesehatan Bali.

Yulizawati, Insani, A. A., & Sinta, L. El. (2019). Asuhan Kebidanan Pada Persalinan. In *Asuhan Kebidanan Pada Persalinan*. Indomedia Pustaka.