ORIGINAL ARTICLE

Effectiveness of acute post-operative pain management by the acute pain service

Efectividad del manejo del dolor agudo postoperatorio por el Servicio de Dolor Agudo

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Abstract

Background: *Analgesia by specialists with formal training in pain management could be more effective, to find out, the results of a team of an acute pain service will be determined.* **Methods:** *Retrospective study (n = 108) of post-operative (POP) analgesia; two evaluations were taken: before starting analgesics in the immediate POP period and the second at 24 h. A multivariate analysis was performed to establish independent risk factors associated with the effectiveness of the treatment. Results: The effectiveness was 81.48% at 24 h. The risk factors associated with poor management effectiveness were: a comorbidity, prevalence ratio (PR) = 1.22; fibromyalgia (PR = 8.47), and cancer (PR = 2.47). The duration of surgery was associated with poor control PR = 1.10 for each hour elapsed. Protective factors for poor pain control: administration of non-steroidal anti-inflammatory drugs during the POP period (PR = 0.11) and use of analgesia controlled by the patient (PR = 0.29). Conclusion: POP pain relief is multifactorial; the participation of specialists was very effective. Identification of risk factors led to closer follow-up.*

Keywords: *Acute pain. Analgesia. Pain postoperative. Treatment outcome*

Resumen

Objetivo: *La analgesia por especialistas con entrenamiento formal en manejo del dolor podría ser más efectiva, para averiguarlo se determinarán los resultados de un servicio de dolor agudo.* **Material y métodos***: Estudio retrospectivo (n = 108) de analgesia postoperatoria; se tomaron dos evaluaciones: antes de iniciar analgésicos en el postoperatorio inmediato y la segunda a las 24 horas. Se realizó un análisis multivariado para establecer los factores de riesgo independientes asociados con la efectividad del tratamiento.* **Resultados:** *La disminución promedio fue 51,75% en el primer día postoperatorio. La efectividad fue del 81,48% a las 24 horas. Los factores de riesgo asociados con la mala efectividad del manejo fueron: una comorbilidad, razón de prevalencia (RP) = 1,22; fibromialgia (RP = 8,47) y cáncer (RP = 2,47). La duración de la cirugía se asoció con un mal control PR = 1,10 por cada hora transcurrida. Factores protectores para el mal control del dolor: administración de antiinflamatorios no esteroideos durante el postoperatorio (RP = 0,11) y uso de analgesia controlada por el paciente (RP = 0,29).* **Conclusión***: el alivio del dolor posoperatorio es multifactorial, la participación de especialistas fue muy eficaz. La identificación de los factores de riesgo condujo a un seguimiento más estrecho.*

Palabra clave: *Dolor agudo. Analgesia. Dolor postoperatorio. Resultado del tratamiento*

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Introduction

Managing post-operative (POP) pain can be challenging and continues to be a serious problem for healthcare institutions around the world, even though there are many analgesia protocols. In this regard, it has been reported that 86% of surgical patients experience POP pain, and, out of these, 75% describe it as moderate or severe within the first 24 POP h[1,2]. Inadequate pain management leads to multiple cardiovascular, pulmonary, metabolic, immunological, and hematological complications, especially in elderly or obese patients, and in those with cardiovascular or pulmonary comorbidities[3].

In the United States, hospitals with pain services range from 42% to 73%[1,4], while in Europe, according to a survey conducted in European countries, only 34% have a pain service[5].

Despite the implementation of pain services worldwide, about one-third of patients experience moderate-to-severe pain during their POP period, which can turn into chronic POP pain in 10-85% of these patients[6,7]. The evidence of poorly managed acute pain in most surgical patients, and wide variation in analgesic treatments, showed the need of formal standardized acute pain medicine services, based in anesthesiology. In this sense, a committee of experts has recommended basic quality criteria to be considered by pain services to have an efficient performance and, this way, achieving favorable outcomes in pain management. Somehow, in a survey conducted in European countries, found that < 10% of pain services met the quality criteria for being considered a "good pain service"[8].

Worldwide, most pain services oversee nursing or anesthesia care[9]. Analgesic management may be more effective when a pain management specialist is responsible for it, yet, currently, there is not enough evidence supporting this association.

Taking this into account, the main objective of this study was to determine the effectiveness of the analgesic management provided by the pain management specialists of a pain service for reducing acute pain during the first 24 POP h. In addition, a second objective was to identify the independent risk factors associated with the effectiveness of said pain management.

Materials and methods

Study setting and design

This was a single-center retrospective service evaluation conducted at a 200 beds University Hospital. The acute pain service (APS) is an anesthesiology-based POP pain service. Their responsibilities include coordinating hospital-wide acute POP pain services, teaching, implementation, and monitoring of acute pain guidelines.

Study population

Patients over 18 years of age who received analgesic management by the pain specialists' team of the Pain Service of the University Hospital and who met the following inclusion criteria:

- Being in their immediate POP period (up to 24 h)
- Being classified as ASA I, ASA II, or ASA III patients according to the ASA Physical Status Classification System
- Having a pain score ≥ 6/10 in the Numerical Rating Scale (NRS) in the first pain assessment.

The following patients were excluded from the study: those who underwent an emergency surgical procedure, those with a history of dementia, schizophrenia, delirium, or cognitive deficit (Mini-Mental State Examination score ≤ 24/30), and women who underwent any surgical procedure other than a cesarean section during pregnancy. Effectiveness was defined as the reduction of 2 points in the NRS (from 0 to 10 points), a 20% decrease in the NRS score or achieving an NRS score ≤4/10 24 h after the establishment of the analgesic management.

Statistical analysis

For the primary outcome, difference in pain intensity (NRS) between first and final pain assessments, differences of at least 20% were considered clinically relevant. A sample size of 108 patients was calculated using a $\alpha < 0.05$ and a statistical power of 80%. A univariate analysis was performed to establish the occurrence of the events and their magnitude through the distribution of absolute and relative frequencies for qualitative variables; in the case of quantitative variables, data normality was determined by means of the Shapiro–Wilks test. A bivariate analysis was performed to evidence the relation between variables, and to identify possible associations. Then, a multivariate analysis was carried out using the Poisson regression model to calculate prevalence ratios (PR), establishing the independence of each risk or protective factor. A significance value of $p < 0.05$ and a confidence interval of 95% were used for all statistical tests.

A simple random sampling of all patients treated at the pain service of the hospital from August 2016 to July 2017 was performed. Using these patients' medical records, a list of all those who were potentially eligible for the study was established, and out of this list, participants were randomly chosen using the Random.org service.

Variables that could be associated with the effectiveness of the analgesic treatment were assessed, namely: age; sex; history of smoking or being a smoker; having a comorbidity; history of anxiety, depression, chronic pain, chronic opioid use, and chronic benzodiazepine use; previous surgical procedures; surgical approach; surgical site; surgery duration; anesthetic technique used during the surgery; intraoperative use of opioids; intraoperative use of nonsteroidal anti-inflammatory drug (NSAID); intraoperative use of acetaminophen; POP administration of NSAID; POP use of acetaminophen; opioid PCA; scheduled opioid use and/or rescue doses use; administration of dexmedetomidine, analgesic lidocaine, ketamine, and gabapentinoids; POP NRS score; POP descriptive scale of pain; NRS score after 24 h; descriptive scale of pain after 24 h; opioid consumption within 24 h; POP nausea and/or vomiting; effectiveness of treatment at 24 h; and POP use of opioids. Data were entered into and stored in an Excel database (Microsoft Excel 2016TM), in which, all variables had already been preset. Data were processed using Stata software, version 12. A statistical significance higher than 95% with a type I error probability of < 5% ($p < 0.05$) was considered in all statistical tests. We hypothesized that the pain management protocol offered by the pain service is effective for reducing acute POP pain within the first 24 h after the procedure.

Results

A total of 1078 patients were treated by the pain service during the study period, from those patients, a sample of 108 was randomly selected for the study (Table 1).

Univariate analysis

Participants' mean age was 58.2 years (SD = 15.37) and most of them were male (67.59%); 25% had a history of smoking, either they were or had been smokers. In addition, 77.78% had had some comorbidity, being arterial hypertension (HT) and cancer the most frequent. Furthermore, 85.19% had undergone previous surgeries, and 18.52% and 11.11% had a history of chronic pain and chronic opioid consumption, respectively (Table 1).

Table 1. Socio-demographic and clinical characteristics of the study population (n = 108)

Feature	n (%)
Age†	58.20 (15.37)
Female	35 (32.41)
Male	73 (67.59)
Non-smoking	81 (75.00)
Smoking	27 (25.00)
Comorbidities*	84 (77.78)
High blood pressure	28 (25.93)
Mellitus diabetes	4 (3.70)
Fibromyalgia	3 (2.78)
Neoplasm	24 (22.22)
Other	25 (23.15)
Other chronic conditions	
Anxiety*	4 (3.70)
Depression*	5 (4.63)
Chronic pain*	20 (18.52)
Chronic opioid use*	12 (11.11)
Chronic benzodiazepine use*	2 (1.85)
Previous surgeries*	92 (85.19)

†S. Wilk = 0.0624
*Absolute frequency (Relative frequency).

The most frequently performed procedures were limbs surgeries which were done in 38.89% of patients followed by abdominal surgeries done in 37.96% (Table 2). Intraoperative remifentanil was used in the majority of patients, n = 98 (90.74%). General anesthesia was performed in 77 (77.3%) patients. Mean operative time was 204.5 min (interquartile range = 157.5-300.0).

Other findings observed in the POP follow-up include that 36 (33.33%) patients were administered NSAIDs, 100% were given acetaminophen, and that in 91.67%, intravenous opioid PCA was used. In addition, hydromorphone was the opioid most frequently used in the POP period (n = 64, 59.26%) followed by morphine (n = 32, 29.63%) and oxycodone (n = 9, 8.33%) and the median total consumption of oral morphine equivalents in 24 h was 31.5 mg (interquartile range = 13.5-58.5).

The average NRS score in the immediate POP period (first assessment) was 7.9/10 (standard deviation [SD] = 1.2), while in the second assessment (at 24 h of starting analgesia) it was 3.7/10 (SD = 2.4), that is,

Table 2. Characteristics of the surgical patients (n = 108)

Surgical site*	n (%)
CNS	2 (1.85)
Thorax	13 (12.04)
Abdomen	41 (37.96)
Spine	8 (7.41)
Urinary tract	2 (1.85)
Limbs	42 (38.89)
Endoscopic surgery*	20 (18.52)
Open surgery*	88 (81.48)
Regional anesthesia	8 (7.41)
General anesthesia	77 (71.30)
TIVA anesthesia	4 (3.70)
Combined (general and regional) anesthesia	19 (17.59)

*Absolute frequency (Relative frequency).
ORL: Otorhinolaryngology, TIVA: Total intravenous anesthesia, CNS: Central nervous system

Table 3. Pain intensity variations after surgery

Variable	n = 108	S. Wilk
NRS POP†	7.89 (1.18)	0.9589
NRS 24H†	3.71 (2.39)	0.0633
NRS DIF†	4.18 (2.72)	0.9430
NRS DIF %†	51.75 (32.15)	0.3023
Effectiveness at 24H*	88.00 (81.48)	

*Absolute frequency (Relative frequency), †Mean (Standard deviation),
POP: post-operative, H: hours, DIF: percentual change.

an average decrease of 4.2 points at 24 h, which is equivalent to approximately a 52% decrease in pain intensity during the first POP day.

Based on the definition of effectiveness used in the present study, that is, a decrease of at least 2 points or a 20% decrease in the NRS score or having a NRS score ≤ 4/10, an overall effectiveness of 81.48% was observed during the first 24 POP h (Table 3).

The independent risk factors associated with poor effectiveness of the analgesic management were having a comorbidity (PR = 1.22), having fibromyalgia (PR = 8.47), and being a cancer patient (PR = 2.47). The duration of the surgical procedure was also associated with poor pain control with a PR = 1.10 for each hour elapsed. Furthermore, the administration of POP NSAIDs (PR = 0.11) and the use of opioid PCA (RP = 0.29) were factors for ineffective pain control (Table 4).

Discussion

The results of this study suggest that POP pain management, when provided by a group of specialized anesthesiologists, is highly effective, since the overall effectiveness during the first 24 POP h was 81.48%. This high rate might be explained by several reasons. First, in the health institution where the study was carried out, there is an institutional pain management policy that guides health-care personnel to screen patients admitted to the hospital as well as POP patients with severe pain, looking for early recognition and proper treatment, this approach has been recommended to improve outcomes in hospitals[10]. Second, the POP pain management protocols and analgesic guidelines used by the pain service of the hospital are based on the best clinical evidence and the service works 24/7. It has been shown that evidence-based management recommendations provide better outcomes[11]. However, these good results cannot be attributed to one isolated factor, but to several variables, including the involvement of anesthesiologists in the pain management of patients. The participation of the anesthesia group supporting the acute pain group is essential because only the existence of protocols does not lead to an adequate treatment of pain as it was ratified in a study conducted in 1490 inpatients during their POP period; it was reported that 41% experienced moderate-to-severe pain during the first POP day and that, despite following analgesic protocols for POP pain control, this intensity remained until the 4th day in 14% of them. In addition, recent studies have found that up to 86% of surgical patients experience POP pain, and that, out of these, 75% rate it as moderate or severe in the first 24 h[6]. Identifying the risk factors associated with poor effectiveness of analgesic management (i.e., having a comorbidity, fibromyalgia, or cancer) allows establishing multimodal analgesia and close follow-up; however, this does not ensure adequate pain control. Additional studies are needed to improve clinical outcomes in this population.

Furthermore, since they require less time and cause less surgical trauma, minimally invasive surgical techniques should be preferred to achieve better POP pain control. Likewise, the implementation of multimodal analgesic management protocols that include the use of opioid patient controlled analgesia, NSAIDs, and

Table 4. Independent prognostic factors associated with pain control

Feature		PR		CI		P
Previous illness						
Fibromyalgia	1.22		1.04-1.42		0.028	
Oncological disease	8.47		7.53-9.52		0.000	
Duration of surgery	2.47		1.32-4.62		0.000	
POP NSAID	1.10		1.03-1.15		0.005	
PCA	0.11		0.02-0.79		0.028	

PR: prevalence ratio, CI: confidence intervals, POP: post-operative, PCA: analgesia controlled by the patient.

non-pharmacological treatments is recommended for the proper management of pain in these patients. The limited use of NSAID indicates the need for further education in the use of non-opioid drugs. Similarly, the high number of patients who use opioids before their surgery indicates the need for multimodal therapies and institutional guidelines that promote the limitation of this type of medication.

In this study, the acute pain team services made an impact on pain management on surgical wards; in other words, the pain team is an option to improve pain relief as previously shown[6]. However, it is only a small percentage of surgical patients. To optimized resources, APS should provide pain treatment for carefully selected patients who undergo surgery. Although data appear to have benefited from the interventions of an APS, the data must be interpreted with care because of retrospective nature of the study and the small sample size. Despite these limitations, this service audit allows to show areas of improvement both in the monitoring of the services provided and in their outcomes. Similar pain services can find relevant data for their own practice.

Conclusions

A hospital group of anesthesiologists specializing in the management of acute POP pain management can contribute to obtaining better results. The factors that contribute to these results are the institutional policy for the treatment of pain, the training of specialists, and timely access to services.

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Conflict of interest

The authors do not have conflicts of interest declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

References

1. Gan TJ, Miller TE, Apfelbaum JL. Pain: review Incidence, patient satisfaction, and perceptions of post-surgical pain: results from a US national survey. Curr Med Res Opin. 2014;30:149-60.
2. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. J Pain Res. 2017;10:2287-98.
3. Sinatra R, Pain C. Causes and consequences of inadequate management of acute pain. Pain Med. 2010;11:1859-71.
4. Puig MM, Montes A, Marrugat J. Management of postoperative pain in Spain. Acta Anaesthesiol Scand. 2001;45:465-70.
5. Rawal N. Organization, function, and implementation of acute pain service. Anestesiol Clin. 2005;23:211-25.
6. Werner MU, Kehlet H. Does an acute pain service improve postoperative outcome. Anesth Analg. 2002;95:1361-72.
7. Glare P, Aubrey KR, Myles PS. Transition from acute to chronic pain after surgery. Lancet. 2019;393:1537-46.
8. Rawal N, Allvin R. Acute pain services in Europe: a 17-nation survey of 105 hospitals. The EuroPain acute pain working party. Eur J Anaesthesiol. 1998;15:354-63.
9. Mackintosh C, Bowles S. Evaluation of a nurse-led acute pain service. Can clinical nurse specialists make a difference? J Adv Nurs. 1997;25:30-7.
10. Gordon DB, Dahl JL, Miaskowski C, McCarberg B, Todd KH, Paice JA, et al. American Pain Society recommendations for improving the quality of acute and cancer pain management: American Pain Society quality of care task force. Arch Intern Med. 2005;165:1574-80.
11. Rawal N. Current issues in postoperative pain management. Eur J Anaesthesiol. 2016;33:160-71.