REUE | Original Article

Experience with sedation and analgesia in a tertiary care hospital pediatric Emergency Department

Silvia Rodríguez del Rosario, Carmen Goez Sanz, Jorge Carranza Ferrer, Elena Ortega Vicente, Patricia Justo Vaquero, Elsa Izquierdo Herrero

BACKGROUND AND OBJECTIVE. Greater awareness of pain has led most pediatric emergency departments to create protocols for sedation and analgesia in the interest of improving quality of care and management of therapy. Our aim was to analyze how our pediatric emergency department uses sedation and analgesia.

MATERIALS AND METHODS. Observational cohort study of patients under the age of 14 years who required sedation plus analgesia during emergency treatment between March 2015 and March 2020. We analyzed demographic variables, procedures used to deliver sedation and analgesia, drugs used, pain and anxiety levels, and time in the department.

RESULTS. A total of 483 patients were studied; 68.5% (n = 331) were boys and 50% were under the age of 5 years. The procedure requiring sedation with analgesia most often was fracture reduction (in 30.7%, n = 149). Other painful procedures requiring sedation and analgesia, according to frequencies within age groups, were lumbar puncture in patients under the age of 1 year (in 47.36%, n = 18); wound closure in 1 to 5 year olds (in 33.05%, n = 78); and fracture reduction over the age of 5 years (in 48.57%, n = 102). Midazolam was the drug most often used (in 48.1%, n = 233), mainly combined with fentanyl (78.5%, n = 183), which was usually given via intranasal spray (61.8%, n = 144). The reduction in pain and anxiety was statistically significant ($P < .001$). Most patients experienced no adverse effects, either in the short term (86.2% n = 418) or long term (94%, n = 457). The correlation coefficient between degree of satisfaction of parents and health care personnel was 0.883 ($P < .001$).

CONCLUSIONS. Sedation with analgesia is effective for decreasing pain and anxiety during diagnostic and therapeutic procedures in pediatric emergency departments. The low incidence of adverse effects supports pediatricians' use of these resources and generally favors early discharge.

Keywords: Deep sedation. Analgesia. Pain. Pediatric emergency services. Efficacy. Adverse effects.

Experiencia en sedoanalgesia en el servicio de urgencias pediátricas, en un hospital de tercer nivel

INTRODUCTION. La mayor conciencia sobre el dolor hace que, en la mayoría de los servicios de urgencias pediátricas (SUP), se hayan creado protocolos de sedoanalgesia para mejorar la calidad de atención y manejo terapéutico. El objetivo de este estudio es conocer las características de uso de la sedonanalgesia en un SUP.

MATERIALES Y MÉTODOS. Se realizó estudio observacional de cohortes en pacientes < 14 años atendidos en urgencias que precisaron sedoanalgesia entre los meses de marzo de 2015 y marzo de 2020. Se analizaron variables demográficas, procedimiento el que se usó esta técnica, fármacos utlizados, nivel de dolor, grado de ansiedad y tiempos de estancia en urgencias.

RESULTADOS. Se analizaron 483 pacientes. El 68,5% (n = 331) eran varones. El 50% fueron menores de 5 años. El procedimiento que requirió sedoanalgesia con mayor frecuencia fue la reducción de fracturas (30,7%, n = 149). Por edad, destaca su uso en punciones lumbares en < 1 año (47,36%, n = 18), reparación de heridas entre 1 y 5 años (33,05%, n = 78), y para reducción de fracturas en > 5 años (48,57%, n = 102). El fármaco más empleado fue midazolam (48,1%, n = 233), mayoritariamente en combinación con fentanilo (78,5%, n = 183), siendo la vía intranasal de elección (61,8%, n = 144). Se observaron diferencias estadísticamente significativas ($p < 0{,}001$) en la reducción del grado de dolor y ansiedad. La mayoría de los pacientes no presentaron efectos secundarios precoces (86,2% n = 418) ni tardíos (94%, n = 457). Finalmente, el coeficiente de correlación entre el grado de satisfacción de padres y sanitarios fue de 0,883 ($p < 0{,}001$).

CONCLUSIÓN. El empleo de sedoanalgesia en procedimientos diagnóstico-terapéuticos en urgencias pediátricas es eficaz en la disminución del grado de dolor y ansiedad. El escaso número de efectos secundarios permite realizarlo por pediatras, favoreciendo el alta precoz.

Palabras clave: Sedoanalgesia. Dolor. Urgencias pediátricas. Eficacia. Efectos secundarios.

Author Affiliations: Servicio de Pediatría, Urgencias Pediátricas, Hospital Clínico Universitario de Valladolid, Spain.
Corresponding Author: Silvia Rodríguez del Rosario. Servicio de Pediatría. Hospital Clínico Universitario de Valladolid. Avenida Ramón y Cajal, 3. 47005 Valladolid, Spain.
E-mail: silvia_0630@hotmail.com
Article Information: Received: 25-5-2023. Accepted: 20-7-2023. *Online:* 29-9-2023.
Editor in Charge: Guillermo Burillo-Putze.

© SEMES

Introduction

Pain is a localized and subjective sensory perception. It is a frequent circumstance in Pediatric Emergency Departments that has been undervalued and undertreated, not only in the context of diseases that cause pain, but also in that produced during treatment or additional examinations.[1-3]

In recent years, pain management in pediatric emergencies has come to be considered an essential practice, which can be performed in most patients by pediatric specialists.[4-7,8] Furthermore, it has been shown that appropriate and early management of pain and anxiety prevents unpleasant experiences and consequently results in better patient cooperation for future procedures.[1-3]

Sedation–analgesia refers to the procedure that allows better management of pain and anxiety through the administration of sedative and/or analgesic drugs.[9-11] However, it is not exempt from risks, which are greater at younger ages. The most frequently documented adverse effects are vomiting, agitation, and hypoxia.[8,12-15]

Before performing sedation–analgesia, it is important to conduct a patient evaluation considering the following: AMPLE (Allergies, Medications, Past medical history, Last oral intake, and Environment), as well as stratifying risk using the ASA physical status classification (American Society of Anesthesiologists), since only patients classified as ASA I or II may receive sedation–analgesia by non-anesthesiologist physicians, with treatment needing to be individualized in those with ASA III.[16] Regarding food intake, there is no solid evidence determining fasting times.[3,4]

Finally, the sedation–analgesia strategy to be employed must consider the degree of sedation, baseline anxiety level, age, and cognitive capacity of the patient. The application of non-pharmacological measures adapted to age is essential, as they may sometimes be sufficient to successfully carry out the procedure.

Endpoints

– To study the characteristics of pediatric patients treated in the emergency department who require sedation–analgesia.

– To compare the different drugs used for the procedures, as well as their routes of administration.

– To analyze the level of pain and anxiety during diagnostic–therapeutic procedures.

Material and methods

We conducted an observational cohort study on sedation–analgesia procedures performed in patients younger than 14 years treated in the pediatric emergency department of a tertiary referral center.

The study analyzed the period from March 15th 2015 through March 15th, 2020, obtaining data through review of patient health records and the sedation/analgesia guideline form used at the bedside at the time of sedation. Diagnostic and therapeutic procedures in which sedation–analgesia was used were recorded, along with the drugs used, their routes of administration, and length of the emergency department stay.

Pain and anxiety assessment was performed by the medical team responsible for sedation–analgesia at three time points: before, during, and after the procedure.

For pain assessment, the Visual Analog Scale (VAS) was used, which allows measurement of pain intensity (0–10) with high interobserver reproducibility. Values below 3 were considered mild pain; between 4 and 7, moderate pain; and values equal to or greater than 8, severe pain.[18]

Assessment of anxiety level was performed using the "Groningen Distress Scale," based on the distress subscale of the Behavioral Approach–Avoidance and Distress Scale, stratifying anxiety into 5 levels: 1. Calm; 2. Tension without crying; 3. Moderate tension with intermittent crying; 4. Moderate tension with continuous crying; and 5. Agitation, screaming, and physical resistance.[19] Finally, satisfaction of health care professionals and parents was assessed using a numerical scale from 0 to 10, with 0 being the lowest and 10 the highest score.

Data were analyzed using IBM SPSS Statistics version 24.0 for Windows. *P* values $< .05$ were considered statistically significant. Quantitative variables are expressed as mean and standard deviation or as median and interquartile range, and qualitative variables according to frequency distribution. The Kolmogorov–Smirnov test was used to assess normality.

Pearson's chi-square test was used to analyze the association between qualitative variables. When > 20% of cells had expected counts < 5, the likelihood-ratio test was applied.

Additionally, Spearman's Rho was used to calculate the correlation between parental and healthcare-provider satisfaction, and the Friedman test was used to compare the medians of pain and anxiety across the three time points.

Results

A total of 483 patients were recruited. Of these, 68.5% (331) were males. Regarding age, 31% (150) were < 3 years and 50% were < 5 years. Monitoring was performed in 77.7% of patients (375).

The procedure most frequently requiring sedation–analgesia was fracture reduction (30.7%, n = 149). However, when analyzed by age, in children < 1 year lumbar punctures were most common (n = 18, 47.36%), followed by hernia reduction (23.68%, n = 9), and to a lesser extent hydrostatic reduction of intussusception. Among children aged 1 to 5 years, wound repair was the most frequent (n = 78, 33.05%), followed by fracture reduction (n = 46, 19.49%), and at similar percentages, other minor surgical procedures including foreign-body removal and abscess drainage, with foreign-body extraction being the most common (n = 44, 18.64%). Lumbar punctures (n = 28, 11.86%) and burn care (n = 27, 11.44%) were somewhat less frequent. In children > 5 years, use for fracture reduction stood out (n = 102, 48.57%), followed by minor surgical procedures (n = 38, 18.09%), lumbar punctures (n = 35, 16.66%), and wound repair (n = 24, 11.42%) (Figure 1).

Regarding past medical history, a total of 96.3% (n = 467) had no medication allergies and 87.6% (n = 423)

© SEMES

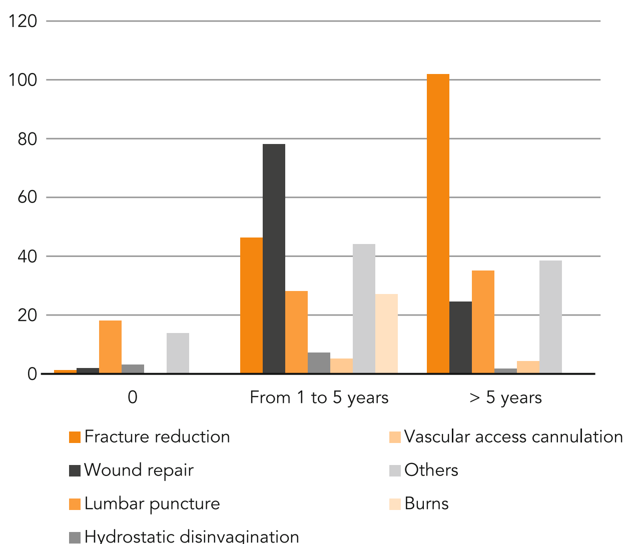

Figure 1. Classification of procedures for which sedation–analgesia was used, grouped by age.

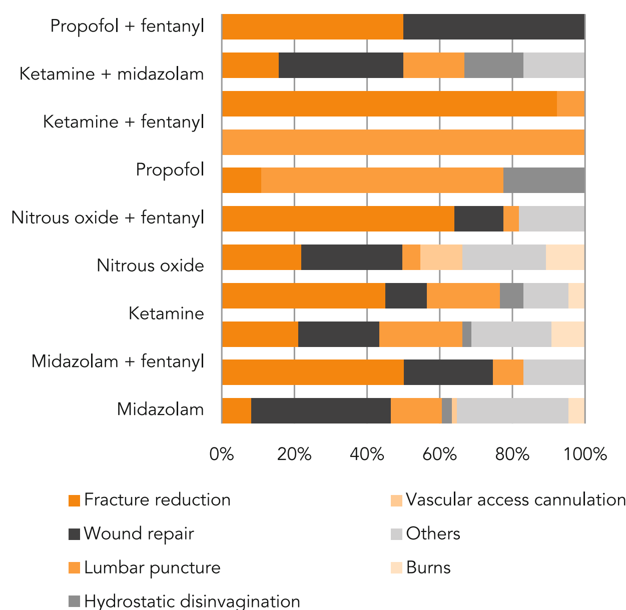

Figure 2. Classification of the drugs used in sedation–analgesia, according to the procedure.

were taking no regular medication. No adverse effects occurred nor was there any contraindication in patients with documented past medical history. A total of 82.4% (n = 398) were classified as ASA I and 17.39% (n = 84) as ASA II.

A total of 20.8% of patients (101) had consumed food 2–3 hours before administration of sedation–analgesia. In 6.4% (31), intake occurred within the hour prior. No early adverse effects occurred in 86.2% (418) nor late adverse effects in 94.2% (457). The most frequent early adverse effects were vomiting (n = 21, 4.3%) and respiratory alterations (2.1%, n = 10). Among the 41 patients with early adverse effects, only 1.2% (n = 3) had a fasting time under one hour. Regarding late adverse effects, the most frequent were vomiting (0.4%, n = 2) and blurred vision (0.4%, n = 2), with fasting time greater than 2–3 hours in all patients. The association between adverse effects and fasting time was not statistically significant.

Regarding the drugs used, the combination of midazolam with fentanyl was the most common (37.8%, n = 183), with the intranasal route chosen in 75% (108). Overall, midazolam was the most used drug (48.1%, n = 233), being used alone in 21.5% (50).

The 2nd most frequently used drug was nitrous oxide (23.8%, n = 115), administered alone in 60% (n = 69) and combined with fentanyl in the remaining cases (mostly intranasal fentanyl) (91.3%, n = 42).

Ketamine was used in 20.1% (97) of patients, used alone in 80.4% (78), combined with fentanyl in 13.4% (n = 13), and with midazolam in 6.2% (n = 6). The most common route of administration was IV (70.1%, n = 68), with intramuscular use in 7.2% (7) and intranasal use in a smaller proportion (3.1%, n = 3). No patient required antidotes to reverse sedation.

When analyzing drugs according to procedure (Figure 2), in fracture reduction the predominant regimen was midazolam plus fentanyl (25.50%, n = 38), preferably intranasal (65.78%, n = 25), followed by ketamine (23.48%, n = 35) via the IV route (91.42%, n = 32), and the combination of fentanyl with nitrous oxide (19.46%, n = 29), via intranasal and inhaled routes respectively (82.75%, n = 24).

For wound repair, the most frequent was midazolam plus fentanyl (39.80%, n = 41), via intranasal route (95.12%, n = 39), followed by nitrous oxide and intranasal midazolam used alone, both in the same proportions (18.44%, n = 19).

For lumbar puncture, midazolam plus fentanyl was preferred (50.61%, n = 41), intravenously (95.12%, n = 39), followed by ketamine (n = 16, 19.75%), midazolam (8.64%, n = 7), and propofol (7.4%, n = 6), administered intravenously in all patients. The 2 patients who received propofol plus midazolam did so to undergo this procedure.

For hydrostatic reduction of intussusception, ketamine was the most used (60%, n = 5), intravenously (80%, n = 4). In contrast, for IV cannulation, nitrous oxide was preferred (88.88%, n = 8).

For other procedures (hernia reduction, foreign-body removal, abscess drainage), midazolam plus fentanyl was used (43.75%, n = 42) intravenously in 71.42% (30), followed in similar percentages by nitrous oxide (16.66%, n = 16) and midazolam (15.62%, n = 15), intranasal (60%, n = 9). Finally, ketamine was used in 10.41% (10), intravenously (90%, n = 9).

For burn debridement, midazolam plus fentanyl was used in 57.14% (16) intravenously (81.25%, n = 13), followed by nitrous oxide (25%, n = 7) and ketamine intravenously (10.71%, n = 3).

Regarding pain assessment, prior to sedation–analgesia 30.1% (146) showed no pain, followed by moderate pain in 27.2% (132). During the procedure, better pain control was observed, increasing the percentage of no pain to 48.7% (236), reaching 75.3% (365) at the conclusion of the procedure (Figure 3).

© SEMES

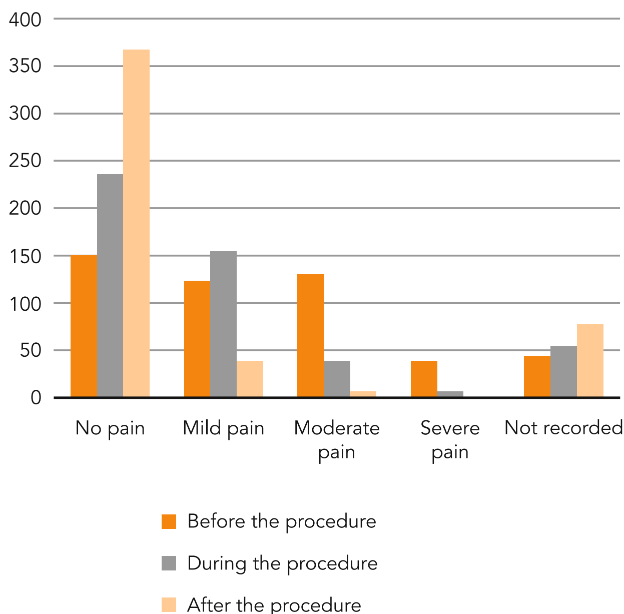

Figure 3. Pain assessment in patients undergoing sedation–analgesia.

Regarding anxiety level, before the procedure 33% (n = 160) were calm, increasing to 54.4% (n = 264) during and 79.5% (n = 385) after the procedure (Figure 4).

Comparing the medians of pain and anxiety reduction across the three time points showed statistically significant differences with $P < .001$.

Length of the emergency department stay depended on the drug administered. With midazolam plus fentanyl, 55.83% (104) stayed > 3 hours, similar to ketamine alone (80.7%, n = 63) or ketamine with fentanyl (n = 10, 76.92%). For propofol, propofol with midazolam, and ketamine with midazolam, all patients stayed > 3 hours. With fentanyl plus nitrous oxide, 65.2% (n = 30) stayed 2–3 hours, as did those receiving midazolam alone (n = 20, 40%) and fentanyl alone (n = 17, 68%). For nitrous oxide, 43.47% (n = 30) stayed 1–2 hours, with the remainder staying > 2 hours (Figure 5).

Regarding patient outcomes, 77.1% (374) were discharged home. From the remaining group, 20.6% (100) required hospital admission to the pediatric ward and 0.2% (1) required intensive care admission. However, none of the admissions were attributable to sedation–analgesia.

Finally, regarding satisfaction, 69.1% (335) of health care professionals considered the procedure satisfactory (> 5). Parent satisfaction data were available for 272 patients. Of them, 89.7% gave a score between 8 and 10. The correlation coefficient was 0.883 ($P < .001$), indicating that higher staff satisfaction was associated with higher parental satisfaction and vice versa, showing a strong and statistically significant correlation.

Discussion

This study describes the general characteristics of the use of sedation–analgesia in the pediatric population in emergency settings. It is important to consider that seda-

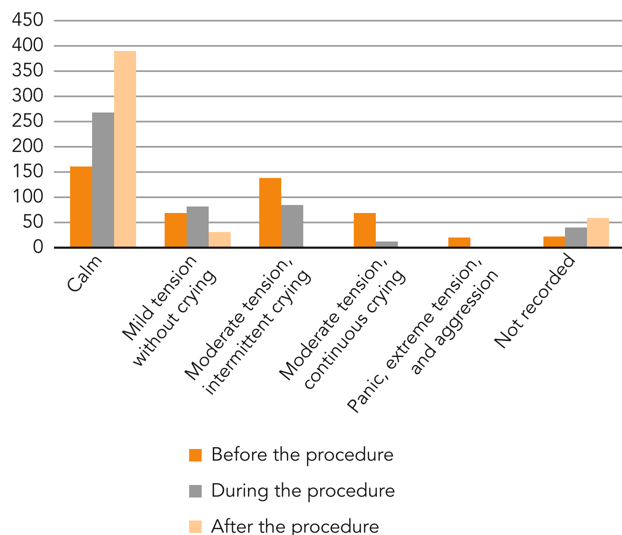

Figure 4. Anxiety assessment in patients undergoing sedation–analgesia.

tion–analgesia was used both in situations where the underlying disease already involves some degree of pain prior to the procedure—such as fractures, intestinal intussusception, or burns— and in other situations in which no prior pain is expected but rather pain derived from the procedure itself, such as IV cannulation or lumbar puncture, among others.

In our study, a higher percentage of males was observed (68.5%, 331), which are findings consistent with those described in other national studies.[3] Regarding age, the highest prevalence was in children under 5 years, representing 50% of the total.

With respect to the type of disease for which sedation–analgesia was used, the most frequent were fracture reduction (30.7%) and wound repair (21.2%). These results are consistent with a multicenter study[4] conducted by the sedation–analgesia working group of the Spanish Society of Pediatric Emergencies (SEUP), in which trauma-related indications were also the most frequent. Unlike that study, which identified lumbar puncture as the second-most common procedure, in our series wound repair was second and lumbar puncture third.

As in our study, other similar studies show that most pediatric emergency patients are healthy individuals, without relevant medical history, not taking regular medication, with normal physical examinations and no difficult airway, and thus categorized as ASA I–II, meeting the recommendations of the American Society of Anesthesiologists.[4,5,10,17]

In urgency procedures, such as those analyzed here, fasting is not a contraindication; instead, an individualized risk–benefit assessment is recommended. In our study, fasting duration was highly variable, with the most common interval being 2–3 hours. Similar studies show variable results, often with a higher percentage of patients fasting between 1–2 hours.[4] However, our findings agree with the literature in showing no clear correlation between fasting duration and adverse effects.

© SEMES

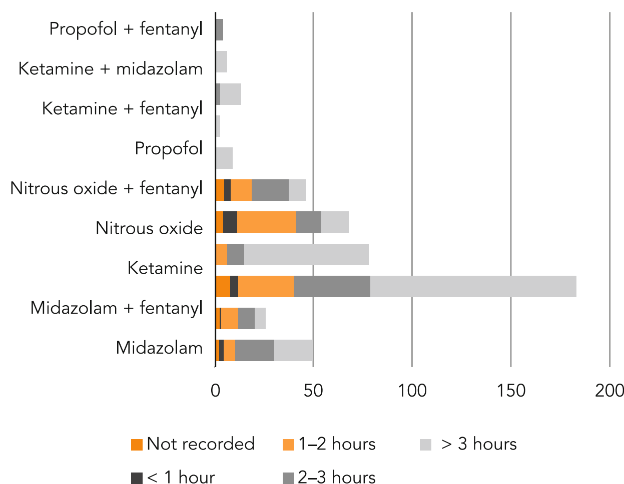

Figure 5. Length of the emergency department stay.

Regarding the administration of drugs for procedures with higher VAS scores, midazolam combined with fentanyl was the most frequently used, mainly for fracture reduction, followed by ketamine, similar to our findings. However, compared with the 2016 SEUP study, their most frequently used drug was ketamine and nitrous oxide, with isolated use of midazolam and fentanyl being rare. In contrast, we used fentanyl alone more frequently than reported in other studies.[4]

For minimally painful procedures, inhaled nitrous oxide was most frequently used, consistent with the literature. Nonetheless, we again used midazolam and fentanyl more often than other studies, which tend to use midazolam and ketamine as an alternative.[6,7] Numerous studies recommend nitrous oxide[17] due to its easy administration, rapid effect, and minimal adverse effects, making it the drug of choice for minor procedures. Finally, in the work by Krauss *et al.*, dexmedetomidine was used in 10% of cases, unlike in our study, in which it was not used.[3]

Monitoring was performed in 77.7% (n = 375) of patients, a practice also supported in literature, which considers vital-sign monitoring via pulse oximetry essential before and during the procedure. Some publications additionally refer to the use of capnography, especially in younger children, who may desaturate more quickly than school-aged children and adolescents. In our case, capnography was not recorded because it is not routinely used in sedation–analgesia procedures, but this represents an area for improvement.[7,8]

Regarding adverse effects, our results are consistent with published studies on the safety of the drugs used.[12,14,15] Risk increases when more than three different drugs are used or when dosing errors occur, with higher risk in children under 1 year or those with underlying diseases.[14,15] In children < 1 year, 3 patients (7.89%) had early adverse effects, and 6 patients classified as ASA II (7.14%) also presented adverse effects, vomiting being the most common. The presence of adverse effects is more frequent with midazolam and fentanyl due to risk of respiratory depression; however, in our study it occurred in 22.72% (10) of early events and in none of the late events, consistent with the rarity of such effects when doses are properly titrated.[7] Finally, we found no studies correlating emergency department length of stay with the drugs used.

A significant reduction in pain and anxiety levels was observed. Although the beneficial effect of sedation–analgesia in pediatric emergencies is widely known, in our literature review we found no studies specifically analyzing improvement in pain and anxiety levels using standardized scales, something that should be considered in future studies.

Regarding limitations of this work, first, it is a retrospective study in which procedures and drug selection may have evolved over the years, particularly during the final phase, which coincided with the onset of the COVID-19 pandemic.

Of note, the length of stay was measured from patient arrival in the emergency department until discharge. Although drug selection influences this time, it is also determined by underlying pathology and the need for additional diagnostic tests.

The role of non-pharmacological measures in pediatric emergency care is well known and these are considered an adjunct to sedation–analgesia. In our case, non-pharmacological measures such as parental presence during the procedure, maintaining a calm environment, reducing noise, distraction techniques, or music therapy were not recorded, and therefore no conclusions could be drawn. Including them would be beneficial for future studies. Likewise, the anxiety level of accompanying adults was not considered.

Finally, pain and anxiety levels were not analyzed individually for each specific pathology, which might be interesting for future projects. Additionally, the possible use of other analgesics (paracetamol/ibuprofen) prior to the procedure was not recorded.

Conclusions

The most frequently used drug combination in our series was midazolam with fentanyl, with fracture reduction being the procedure for which it was most often administered. Its use significantly reduces pain and anxiety at all three time points, safely and with few adverse effects, making it a suitable option to reduce suffering in patients requiring diagnostic–therapeutic procedures in the emergency department.

The use of sedation–analgesia in pediatric emergencies significantly reduces pain and anxiety at all three time points, safely and with minimal adverse effects. Conducting studies of this type allows monitoring of the quality of emergency care and, when necessary, modification of aspects that may improve it.

© SEMES

ARTICLE INFORMATION

Conflict of Interest Disclosures: None reported.

Funding: The authors declare the non-existence of funding in relation to this article.

Ethical Responsibilities: The authors have confirmed the maintenance of confidentiality and respect for the patient rights, agreement of publication, and transfer of rights to Revista Española de Urgencias y Emergencias.
This work was presented at the Spanish Society of Emergency Medicine Congress held in Pamplona, June 16th–18th.

Article not commissioned by the Editorial Board and with external peer review.

Note of the editors: This is a BOWMAN-generated English translation of the officially indexed Spanish-language article, which should be cited as Rev Esp Urg Emerg. 2023;2:198-203. In this translated version, the editors have supervised the process; however, it cannot be ruled out that some errors resulting from the artificial intelligence translation process may have gone unnoticed.

Acknowledgments: We thank all the staff of the pediatric emergency department for their contribution and participation in data collection.

REFERENCES

1. Adrián Gutiérrez J, Aldecoa Bilbao V, Alonso Salas MT. Manual de Analgesia y Sedación en urgencias de pediatría. Madrid: Ergón; 2° edición. 2012.
2. Míguez Navarro MC, Fernández Santervás Y, Vivas la Calle MC, Barasoain Millán A, Clerigué Arrieta N, González Posada A. Grupo de trabajo de Analgesia y Sedación de la SEUP. Protocolo de sedoanalgesia en urgencias pediátricas. Protocolos diagnósticos y terapéuticos en Urgencias de Pediatría. Sociedad Española de Urgencias de Pediatría (SEUP). 3ª Edición. 2019.
3. Krauss B, Green SM. Procedural sedation and analgesia in children. Lancet. 2006;367:766-80.
4. Míguez Navarro MC, Oikonomopoulou N, Lorente Romero J, Vázquez López P. Preparación de los procedimientos de sedoanalgesia en los servicios de urgencias pediátricos españoles: estudio descriptivo. Anales de Pediatría. 2018;89:24-31.
5. FeinJA, Zempsky WT, Cravero JP, Committee on Pediatric Emergency Medicine and Section on Anesthesiology and Pain Medicine; American Academy of Pediatrics. Relief of pain and anxiety in pediatric patients in emergency medical systems. Pediatrics. 2012; 130:1391-405.
6. Godwin SA, Burton JH, Gerardo CJ, Hatten BW, Mace SE, Silvers SM, et al. Clinical policy: procedural sedation and analgesia in the Emergency Department Ann Emerg Med. 2014;63:247-58.
7. Leroy PL, Gorzeman MP, Sury MR. Procedural sedation and analgesia in children by non-anesthesiologists in an emergency department. Minerva Pediatr. 2009;61:193-215.
8. Sahyoun C, Cantais A, Gervaix A, Bressan S, Löllgen R, Krauss B. Pediatric procedural sedation and analgesia in the emergency department: surveying the current European practice. Eur J Pediatr. 2021;180:1799-813.
9. Fein JA, Zempsky, WT, Cravero JP. Relief of pain and anxiety in pediatric patients in emergency medical systems. Pediatrics. 2012;130:1391-405.
10. Pitetti RD, Singh S, Pierce MC. Safe and Efficacious Use of Procedural Sedation and Analgesia by Nonanesthesiologists in a Pediatric Emergency Department. Arch Pediatr Adolesc Med. 2003;157:1090-6.
11. Shavit I, Keidan I, Augarten A. The practice of pediatric procedural sedationand analgesia in the emergency department. Eur J Emerg Med. 2006;13:270-5.
12. Leroy PLJM, Schipper DM, Knape JTA. Professional skills and competence for safe and effective procedural sedation in children: recommendations based on a systematic review of the literatura. J Pediatr. 2010;2010:934298.
13. Bhatt M, Johnson DW, Chan J, Taljaard M, Barrowman N, Farion KJ, et al; Sedation Safety Study Group of Pediatric Emergency Research Canada (PERC). Risk Factors for Adverse Events in Emergency Department Procedural Sedation for Children. JAMA Pediatr. 2017;171:957-64.
14. Roback MG, Wathen JE, Bajaj L, Bothner JP. Adverse events associated with procedural sedation and analgesia in a pediatric emergency department: a comparison of common parenteral drugs. Acad Emerg Med. 2005;12:508-13.
15. Bellolio MF, Puls HA, Anderson JL, Gilani WI, Murad MH, Barrionuevo P, et al. Incidence of adverse events in paediatric procedural sedation in the emergency department: a systematic review and meta- analysis. BMJ Open 2016;6: e011384.
16. American Society of Anesthesiologists Task Force on Sedation and Analgesia by non-anesthesiologists. Practice guidelines for sedation and analgesia by non anesthesiologists. Anesthesiology. 2002;96:1004-17.
17. Pedersen RS, Bayat A, Steen NP, Bouchy Jacobson ML. Nitrous oxide provides safe and effective analgesia for minor paediatric procedures – a systematic review 2013;60:A4.
18. Vicente Herrero MT, Delgado Bueno S, Bandrés Moyá F, Ramírez Iñiguez de la Torre MV, Capdevila García L. Valoración del dolor. Revisión comparativa de escala y cuestionarios. Rev Soc Esp Dolor. 2018;25:228-36.
19. Sauceda-García JM, Valenzuela-Antelo JR, Valenzuela-Antelo JR, Martín Maldonado-Durán J. Estrés ante la venopunción en niños y adolescentes. Bol Med Hosp Infant Mex. 2006;63(3).

© SEMES