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Summary / *Sumario*

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EDITORIAL

The specialty of Emergency Medicine, 50 years later

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Universal access to emergency care without barriers is a fundamental pillar of a community's or country's healthcare system. The system must guarantee high-quality, safe, efficient, and equitable care across its entire territory. Emergency services must be accessible to everyone in need, at any time and in any location, as the adequate organization of urgent and emergency care, coupled with quality treatment, saves lives.

In Spain, 2024 marked the establishment of the new specialty of Emergency Medicine (EM), a long-awaited development[(1)]. This specialty was first introduced 50 years ago in the United Kingdom, where 30 training places were announced in 1972. In the United States, EM was recognized as the 23rd specialty in 1979. Later, in 2013, the European Union of Medical Specialties formally recognized EM as the 40th specialty, when the requirement for one-third of European countries to have a 5-year training program was met[(2)]. Currently, a total of 34 European countries recognize EM as a specialty, while others consider it a subspecialty.

Scientific societies have consistently advocated for the recognition of EM as a distinct specialty, emphasizing that the highest standards of EM practice and clinical competence itself rely on formal training, continuous education, research, and innovation. These standards are based on a comprehensive body of knowledge acquired through formal training programs, known in our country as the MIR (Médico Interno Residente) System, the medical residency program.

In Spain, the publication of Royal Decree (RD) 127/1984 on 11 January 1984 established regulations for specialized medical training and the attainment of specialist physician qualifications in various fields. The Spanish Society of Emergency Medicine (SEMES) was founded in 1987, three years after the RD that formalized the MIR system. SEMES has consistently promoted EM as a mechanism to provide regulated training for all professionals working in both hospital emergency departments and emergency services, facilitating the effective planning of care needs in this field[(3,4)]. The *Societat Catalana de Medicina d'Urgències i Emergències* (SoCMUE) was established in 2009 through the unification of two scientific societies representing physicians, nurses, and emergency technicians: the *Associació Catalana de Medicina d'Emergències* (ACMES, 1992) and the *Societat Catalana de Medicina d'Urgències* (SCMU, 1996). Sharing the same objectives as SEMES, SoCMUE is now fully integrated with and aligned to it.

Pediatrics is an older specialty. The *Societat Catalana de Pediatria* dates back to October 1926 and, since its inception, the field of pediatric urgency and emergency has always been included. This is evident in the first issue of *Pediatria Catalana* (the journal of the *Societat Catalana de Pediatria*) published in 1928. In the *Memòria* section[(5)], topics discussed at the society's 1st Congress included diarrhea caused by spirochetes and an analysis of the recent influenza epidemic in children, and, in issue 2, a detailed description of the first two cases of anterior poliomyelitis (Figure 1)[(6)].

The Spanish Society of Pediatric Emergencies (SEUP) was founded in September 1995, as a result of the observation that Pediatric Emergency Medicine was undergoing a significant transformation driven by advancements in knowledge, progressive training, and the subspecialization of professionals managing pediatric emergencies. It serves as a clear example of how scientific progress necessitates greater specialization in specific competencies, enabling the delivery of excellent and more effective healthcare responses.

In the field of EM, characterized by a wide range of reasons for emergency department visits and clinical scenarios,

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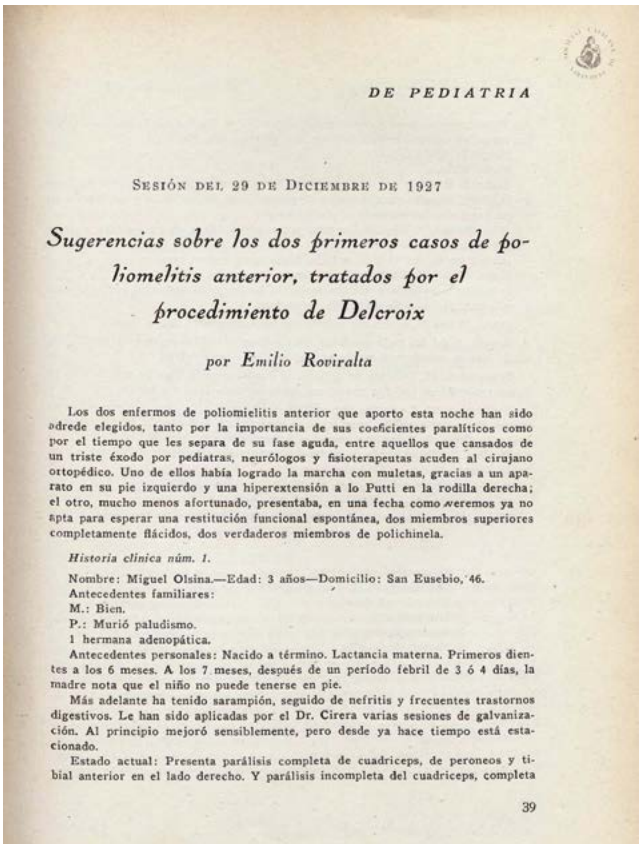

DE PEDIATRIA

SESIÓN DEL 29 DE DICIEMBRE DE 1927

Sugerencias sobre los dos primeros casos de poliomelitis anterior, tratados por el procedimiento de Delcroix

por Emilio Roviralta

Los dos enfermos de poliomielitis anterior que aporto esta noche han sido odrede elegidos, tanto por la importancia de sus coeficientes paralíticos como por el tiempo que les separa de su fase aguda, entre aquellos que cansados de un triste éxodo por pediatras, neurólogos y fisioterapeutas acuden al cirujano ortopédico. Uno de ellos había logrado la marcha con muletas, gracias a un aparato en su pie izquierdo y una hiperextensión a lo Putti en la rodilla derecha; el otro, mucho menos afortunado, presentaba, en una fecha como veremos ya no apta para esperar una restitución funcional espontánea, dos miembros superiores completamente flácidos, dos verdaderos miembros de polichinela.

Historia clínica núm. 1.

Nombre: Miguel Olsina.—Edad: 3 años—Domicilio: San Eusebio, 46.
Antecedentes familiares:
M.: Bien.
P.: Murió paludismo.
1 hermana adenopática.
Antecedentes personales: Nacido a término. Lactancia materna. Primeros dientes a los 6 meses. A los 7 meses, después de un período febril de 3 ó 4 días, la madre nota que el niño no puede tenerse en pie.
Más adelante ha tenido sarampión, seguido de nefritis y frecuentes trastornos digestivos. Le han sido aplicadas por el Dr. Cirera varias sesiones de galvanización. Al principio mejoró sensiblemente, pero desde ya hace tiempo está estacionado.
Estado actual: Presenta parálisis completa de cuadriceps, de peroneos y tibial anterior en el lado derecho. Y parálisis incompleta del cuadriceps, completa

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FIGURE 1. Emilio Roviralta. Suggestions on the first two cases of anterior poliomyelitis treated using the Delcroix procedure [in Spanish]. Pediatr Catalana. 1928; 1(2): 39-46. The text provides a detailed description of two clinical cases involving infants who, following a febrile period, developed muscle weakness that did not improve during follow-up. Available at: pediatrcatalana.cat/view_document.php?tpd=2&i=4579

where urgency and life-threatening situations necessitate the fast exclusion of conditions that require immediate care, professionals must develop the ability to make rapid decisions, often under conditions of uncertainty, which demands specific cognitive and technical skills that need to be trained[7]. This environment of high complexity and imminent life-threatening risk underscores the necessity for decisions to be made by professionals proficient in these competencies. It highlights the need for the professionalization of emergency services, which require teams equipped with all the necessary skills, available 24 hours a day, 365 days a year. These aspects are similar in the field of Pediatric Emergency Medicine, where highly trained professionals possess the expertise to manage urgent and emergency situations effectively.

The World Health Organization highlights that more than half of deaths and over one-third of disabilities in low- and middle-income countries could be significantly mitigated through the implementation of effective emergency and critical care. Priority should be given to an integrated approach consisting of early recognition, resuscitation, treatment, and the prevention of complications across a wide range of diseases affecting individuals throughout their lives. This integrated approach has been shown to reduce the morbidity and mortality associated with a substantial proportion of these conditions[8,9]. Developed countries are better prepared, as they often have well-organized healthcare systems with emergency services that are the initial access point for alerts and early medical care and, when necessary, the stabilization of patients and their transfer to appropriate facilities.

In all cases, emergency professionals are the first contact for children and adults experiencing medical, surgical, and obstetric emergencies, including severe trauma, sepsis, heart attacks, strokes, asthma, and acute pregnancy complications. Integrated emergency care services should enable the timely recognition of urgent and time-sensitive conditions, the provision of appropriate treatment, and, when necessary, the continuation of care for acutely ill patients at the appropriate level within the healthcare system, which should function collaboratively across other medical specialties.

The population expects quality emergency care and highly efficient organized emergency services. With an annual activity of around 22.8 million visits in the hospitals of the Spanish national health system, and 9 million in the 112/061 services in 2022[10], emergency professionals and scientific societies have a lot to contribute. We must undoubtedly take part in the strategic decisions that ensure the sustainability and resilience of the healthcare system to address emerging challenges, such as an ageing population, which inevitably leads to increased emergency activity; the ability to provide 24/7 high-quality care to children and adults across the entire territory; and the shortage of professionals dedicated to the field of emergency care. EM, alongside other specialties, will definitively play an essential role in improving our healthcare system.

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ORIGINAL ARTICLE

Patients with chronic conditions in the Emergency Department: what has the pandemic changed?

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Abstract

The SARS-CoV-2 pandemic has led to a decline in Pediatric Emergency Department visits. Morbidity and mortality have increased in children with chronic conditions; however, the impact of the pandemic on emergency care for this population remains unclear.

To address this issue, we conducted a retrospective study at a tertiary hospital. Our findings indicated no significant changes in the proportion of patients with chronic conditions seeking emergency care or in the most common reasons for presenting to the Emergency Department during the confinement period.

PACIENTES CON PATOLOGÍA CRÓNICA EN URGENCIAS: ¿QUÉ HA CAMBIADO LA PANDEMIA?

Resumen

La pandemia originada por el virus SARS-CoV-2 produjo una disminución de la asistencia a servicios de Urgencias en los pacientes pediátricos. Los pacientes pediátricos con patología crónica tienen una mayor morbimortalidad desconociendo hasta el momento el impacto de la pandemia en la asistencia a Urgencias de estos pacientes.

Realizamos, por tanto, un estudio retrospectivo en un hospital de tercer nivel en el que se objetivó que no hubo variación en la proporción de pacientes atendidos con este condicionante (padecer una enfermedad crónica), ni en el motivo de consulta más frecuente durante el período de confinamiento.

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INTRODUCTION

Pediatric patients with chronic conditions have increased morbidity, mortality, and functional limitations, associated with high healthcare resource use[1,2]. The SARS-CoV-2 pandemic in 2020 resulted in a decline in pediatric Emergency Department visits[3]; however, its impact on this specific patient group remains unclear.

Accessibility to the Emergency Department, the quality of primary care services, and caregivers' skills in home management are factors influencing PED use by these patients[4]. In the study conducted by Berry et al.[5], it was observed that patients with chronic conditions who most frequently visit the Emergency Department include those with asthma, epilepsy, and sickle cell anemia. Furthermore, the authors point out that Emergency Department visit rates double or even triple in patients with multiple comorbidities, congenital heart disease, or those requiring a medical device, such as ostomies or ventriculoperitoneal shunts.

Previous studies have explored the most common reasons for Emergency Department visits among pediatric patients with chronic conditions, with respiratory diseases being the most frequent[6]. Edelson et al.[2] reported that having a comorbidity in addition to a chronic medical condition is an independent risk factor for both mortality and hospital admission. In addition, the study highlights that in patients with congenital heart disease, the presence of comorbidities increases the likelihood of presenting with an emergency condition, such as acute renal failure, sepsis, or neurological damage. This, in turn, adds to the complexity of managing these patients.

The return visit rate has recently drawn attention as it is an important indicator of patient safety and quality of care[2]. Analyzing the reasons for return visits in patients with chronic conditions is therefore a priority, aiming to reduce healthcare costs and enhance the quality of care provided. Previous studies have identified younger age as well as the association of comorbidities as risk factors for higher return visit rates[2]. However, no studies on this topic have been conducted in our setting.

In Pediatric Emergency Departments, the triage system plays a crucial role. The primary objective of triage systems is to identify patients requiring immediate care from those whose care can be safely deferred[7]. These systems include discriminators that determine the priority assigned to each patient, such as the presence of a "relevant condition for the current episode." Appropriate use of these discriminators improves the quality of care for patients with chronic conditions.

The aim of this study was to assess the impact of the SARS-CoV-2 pandemic confinement on visits to the Emergency Department of a tertiary hospital by patients with chronic conditions. Specifically, the study sought to analyze the proportion of emergency visits these patients represented before and during the confinement period, as well as to describe their reasons for visiting, triage priority, hospital admission rates, discharge outcomes, and return visit rates.

METHODOLOGY

A retrospective, single-center cohort study was conducted in the Emergency Department of a tertiary-care hospital in Madrid, Spain. The study included patients aged 1 to 16 years with chronic conditions who visited the pediatric Emergency Department during the study period. Chronic conditions were defined as underlying health issues that could affect the clinical presentation of the reason for visiting, as identified in the TRIPED© triage system using the discriminator "relevant condition for the current episode." Patients who were incorrectly assigned to the denominator—either due to the absence of an underlying condition or because their reason for visiting the Emergency Department was unrelated to their chronic condition—were excluded. This group of patients was analyzed in two periods: March-June 2019 (pre-COVID cohort) and March-June 2020 (during the confinement: COVID cohort). Demographic data and clinical features of the children who visited during both periods were collected.

Absolute frequencies and percentages were used to describe qualitative variables (demographic data, reason for visiting the Emergency Department, triage priority, need for diagnostic tests, hospital admission, and return visits), while medians with interquartile ranges (IQR) were used for quantitative variables (age, days to return visit). The Chi-square test was used to compare proportions. A statistical significance level of $\alpha = 0.05$ was set. Data analysis was performed using IBM SPSS Statistics 24. The study was approved by the Ethics Committee (CEIm) of our institution, and electronic medical records were reviewed for data collection.

RESULTS

A total of 960 patients met the inclusion criteria: 705 in the pre-COVID cohort and 255 in the COVID cohort. Patients with chronic conditions accounted for 3.6% of pre-COVID visits and 4.2% of visits during the confinement (p= 0.055). No differences were observed in demographic characteristics between the cohorts, including mean age, sex, and type of relevant chronic condition (Table 1).

Fever was the most common reason for visiting the Emergency Department in both cohorts (14% in the pre-COVID cohort and 15.3% in the COVID cohort, p= 0.347), followed by respiratory difficulties in the pre-COVID cohort (10.2%) and vomiting (9%) in the COVID cohort. There was a decrease in the percentage of patients consulting for respiratory symptoms and an increase in those consulting for dysuria in the COVID cohort (Table 2).

No differences were found in the triage priority assigned to patients: level 1 (0.7% vs. 0.0%, p= 0.333); level 2 (10.8% vs. 8.6%, p= 0.331); level 3 (88.5% vs. 91.4%, p= 0.206). The rate of diagnostic tests performed during their stay in the Emergency Department was higher in the COVID cohort compared to the pre-COVID cohort (63.9% vs. 53.9%, p= 0.003); however, there were no differences in the proportion of patients requiring admission (19.3% vs. 23.1%, p= 0.112) or return visits (89 [12.6%] vs. 23 [9.0%], p= 0.075).

DISCUSSION

This study examines the impact of the SARS-CoV-2 pandemic on patients with chronic diseases visiting the

TABLE 1. General characteristics of the study cohorts.

Variable	Pre COVID n= 705	COVID n= 255	p-value
Age at diagnosis (years)*	7.12 (4.9)	6.54 (5.2)	0.051
Sex: female	290 (41.1%)	113 (44.3%)	0.378
Relevant complex condition	332 (47.1%)	117 (45.9%)	0.740
Diagnostic tests	380 (53.9%)	163 (63.9%)	**0.006**
Requiring a medical device	88 (12.5%)	48 (18.8%)	**0.013**
Observation in the Emergency Department	292 (41.4%)	110 (43.1%)	0.634
Final diagnosis	N: 46 (6.5%) D: 63 (8.9%) R: 81 (11.5%) I: 265 (37.6%) O: 250 (35.5%)	N: 19 (7.5%) D: 42 (16.5%) R: 16 (6.3%) I: 70 (27.5%) O: 108 (42.4%)	**< 0.001**
Days to return visit*	1.54 (1.3)	2.09 (1.8)	0.188

*Data are expressed as absolute frequency and percentage. *Data are expressed as mean and standard deviation.*
N: neurological; GI: gastrointestinal; R: respiratory; I: infectious; O: other.

TABLE 2. Most common reasons for the Emergency Department visit in each cohort

	Pre COVID n= 705	COVID n= 255	p-value
Fever	99 (14%)	39 (15.3%)	0.347
Respiratory difficulties	72 (10.2%)	15 (5.9%)	**0.023**
Cough	68 (9.6%)	10 (3.9%)	**0.002**
Vomiting	58 (8.2%)	23 (9%)	0.392
Abdominal pain	42 (6%)	18 (7.1%)	0.313
Dysuria	10 (1.4%)	10 (3.9%)	**0.020**

The results are expressed as absolute frequency and percentage.

Emergency Department. Patients with chronic conditions frequently present to pediatric Emergency Departments9. The findings showed no significant change in the proportion of patients with chronic conditions or in the most common reason for visits, fever. In other words, the decline in Emergency Department visits during the confinement period was similar for both these patients and the general population.

The decrease in pediatric patient care during the SARS-CoV-2 confinement period raised concerns about patients with chronic conditions, specifically regarding the potential delay in their visits to the Emergency Department, which could lead to delays in the diagnosis and treatment of serious conditions. Our results show that during the confinement period of the first wave of the SARS-CoV-2 pandemic, although patients with chronic conditions visited the Emergency Department less frequently, they did so in a proportion similar to that of the pre-pandemic period (3.6% vs. 4.2%, p= 0.055). Similar findings were reported in a study conducted in the United States by DeLaroche et al.[8], which showed that although the overall number of children visiting the Emergency Department decreased, the proportion of patients with chronic conditions remained stable (23.7% in the pre-COVID cohort vs. 27.8% in the post-COVID cohort; p< 0.001).

In a study conducted in the United States by Hartnett et al.[9] to evaluate Emergency Department visits during the COVID-19 pandemic, it was observed that the number of patients presenting to Emergency Departments for reasons other than COVID-19 exposure or respiratory symptoms decreased significantly compared to the pre-pandemic period, particularly among patients younger than 14 years. The proportion of patients under 10 years of age seen in the Emergency Department in 2019 was 12%, compared to 6% during the pandemic period. Additionally, it was noted that pediatric patients visited the Emergency Department less frequently than adults seeking a diagnosis of SARS-CoV-2 infection.

Consistent with the findings presented above, the study by Dean et al.[10] reported a decrease in both the total number of visits and the incidence of critical illness in pediatric Emergency Departments during the pandemic.

Regarding the reasons for seeking care in the Emergency Department, we observed a decrease in visits for respiratory symptoms, such as cough and respiratory difficulties, with no significant differences in other complaints except for dysuria. Similar findings were reported in the previously mentioned study[8], which demonstrated a 70% reduction in Emergency Department visits for respiratory disorders during the confinement period. The authors attributed this decrease to social distancing measures, which likely reduced viral transmission—a conclusion supported by the study conducted by Auger et al.[11]. At the same time, a decrease was observed for less serious reasons for visits, such as otitis media and upper respiratory tract infections, with reductions of 75.1% and 69.6%, respectively. However, the decline was less pronounced for other reasons for visits, such as mental health-related conditions (29%) and poisoning (33.1%).

On the other hand, no differences were observed in the need for high-priority care, as the proportions of level 2 and 3 cases were comparable between the two cohorts, as were the rates of admission and return visits, factors that have not been analyzed in other studies. It is likely that the confinement did not influence the decision to seek care but that

the overall reduction in illness accounted for the decrease in Emergency Department visits during this period. An increase in the number of diagnostic tests was noted in the confinement cohort, likely due to the routine performance of SARS-CoV-2 PCR testing.

The limitations of the study include its single-center and retrospective nature. Additionally, the specific types of diagnostic tests performed on each patient were not analyzed. It is also important to consider the context of Pediatric Emergency Departments during the confinement period, when urgent pediatric care was centralized in other hospital centers, with the exception of patients with chronic conditions, who were recommended to continue attending their referral centers.

CONCLUSION

During the period of confinement, the number of chronic patients visiting the Emergency Department decreased compared with the pre-pandemic period; however, this decrease was proportional to that observed in the rest of the pediatric population. Moreover, the reasons for their visits remained similar, and they did not require more priority care, hospital admissions, or frequent return visits.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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REVIEW

High-flow nasal cannula weaning protocols in children: A narrative review

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Protocolos clínicos
Soporte respiratorio no invasivo
Cuidados críticos pediátricos
Mejora de calidad

Abstract

High-flow nasal cannula (HFNC) therapy is a widely used non-invasive respiratory support system for pediatric acute respiratory failure (ARF), both within and outside pediatric intensive care units (PICUs). Despite its widespread adoption over the past decade, studies have highlighted its overuse in terms of indications and duration, contributing to increased hospital costs and diminished care value. One strategy to reduce HFNC overutilization is the implementation of weaning protocols tailored to specific contexts. This review examines the pediatric literature on HFNC weaning protocols published up to December 2023. It identifies nine pediatric HFNC weaning protocols applied in PICUs, with two also used in general pediatric wards. In 4/10 studies, protocols were led by physiotherapists, while in 6/10, all healthcare professionals participated. Most studies involved patients with ARF as the main cause of hospitalization. Protocol implementation was associated with reductions in HFNC exposure time, PICU stays, and overall length of stay. All protocols were considered safe, with no major complications reported. Implementation of HFNC weaning protocols, both within and outside PICUs, appears to be a safe strategy for reducing HFNC overuse in pediatric hospital settings.

PROTOCOLOS DE RETIRO DE CÁNULA NASAL DE ALTO FLUJO EN NIÑOS: UNA REVISIÓN NARRATIVA

Resumen

Las cánulas nasales de alto flujo (CNAF) son un sistema de soporte respiratorio no invasivo (SRNI) muy utilizado en Pediatría para el sostén del fallo respiratorio agudo (FRA), tanto fuera como dentro de unidades de cuidados intensivos pediátricos (UCIP). Diversos estudios han mostrado evidencia de uso excesivo de CNAF (sobreuso), lo que aumenta los costos hospitalarios y disminuye la calidad de atención. Una estrategia para reducir este sobreuso es implementar protocolos de retiro de CNAF adaptados a cada contexto. La presente revisión examina la literatura pediátrica disponible sobre estos protocolos hasta diciembre de 2023. Identificamos nueve protocolos aplicados en UCIP y dos también en salas generales de pediatría. En algunos estudios, fisioterapeutas lideraron la implementación, mientras que en otros participaron todos los profesionales sanitarios participantes de la atención. La mayoría de los estudios incluyeron pacientes con FRA como causa principal de admisión. La implementación de estos protocolos se asoció a una disminución del tiempo de uso de CNAF, así como de estancia en UCIP y hospitalaria. Todos los protocolos se comprobaron como seguros y no se reportaron complicaciones graves tras su implementación. Concluimos que la implementación de protocolos de retiro de CNAF, tanto dentro como fuera de UCIP, es una estrategia segura que se asociaría a reducción de sobreuso de CNAF en ámbitos hospitalarios.

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INTRODUCTION

High-flow nasal cannula (HFNC) is a method of non-invasive respiratory support (NIRS) that delivers inspiratory gas via the nasal route, with or without added oxygen, heated and humidified and provided at supra-physiological flow rates (≥ 1 L/kg/min for patients weighing up to 10 kg or ≥ 10 L/min for those over 10 kg)[1]. Although the precise significance of its proposed mechanisms of action—such as washing out carbon dioxide from the nasopharyngeal dead space and generating positive airway pressure—is not fully understood, HFNC has been widely adopted in hospitals worldwide as a key tool in managing acute respiratory failure (ARF), both within and outside pediatric intensive care units (PICUs)[2]. Its widespread acceptance is attributed to reported clinical benefits, including reduced work of breathing and the comfort of the technique[3-7].

The clinical adoption of HFNC in pediatrics preceded robust evidence of efficacy for most indications, driven by promising results from observational studies and shifts in institutional practices[8]. However, several meta-analyses of controlled clinical trials indicate that while HFNC appears superior to conventional oxygen therapy, it demonstrates similar effectiveness to other traditional NIRS methods, such as CPAP, in preventing invasive mechanical ventilation (IMV) in children with moderate-to-severe acute lower respiratory infection (ALRI)[9-12]. Many authors have pointed out that the widespread use of HFNC may lead to increased hospitalization costs, due to the overuse of this technique in children with ALRIs. HFNC may be less cost-effective than more traditional methods, such as CPAP[12,13]. Additionally, concerns have been raised about its environmental impact, particularly the carbon emissions associated with its increased use[14]. The rise in hospital costs is associated with prolonged hospital stays and higher overall expenses, a phenomenon well-documented outside PICUs[15].

In an effort to reduce overuse and optimize the use of this therapeutic resource in the PICU, multiple guidelines have been developed to focus on optimizing the initiation of HFNC in children with ARF outside the PICU[16-19]. However, the weaning of HFNC is typically left to the discretion of the clinicians who initiated it, and protocols for its weaning have been less well developed. For example, a 2020 survey of 176 pediatric intensive care physicians from 36 centers conducted by Suzanne et al. found that only 10% of pediatric centers had a written weaning protocol[20]. Moreover, the literature on this topic is fragmented, and no reviews are available to consolidate the knowledge in this area. This is particularly relevant, as it could facilitate the development of new protocols for the weaning of this costly resource.

The objective of this review was to compare and contrast the available published research on the use of HFNC weaning protocols in children with ARF. To achieve this, we conducted a literature search for articles in English or Spanish, covering the entire range of bibliometric databases up to December 2023, using the following resources: PubMed/Medline, Google Scholar, CINAHL, Scopus, and SciELO. We identified relevant studies by combining terms and synonyms related to HFNC/CNAF, weaning protocols, pediatrics, and included MeSH (Medical Subject Headings) terms where available. Additional publications were manually selected by the authors from the articles initially identified during the first review. We excluded grey literature, case reports, editorials, and studies involving populations older than 21 years.

HFNC WEANING PROTOCOLS IDENTIFIED

The search yielded a total of twelve articles of which nine met the selected search criteria and were analyzed in full. Table 1 presents the main characteristics of the selected articles.

TYPES OF STUDIES AND COMPARATIVE INTERVENTIONS

The majority (8 out of 9) of the protocols reported and analyzed in the present review were quality improvement projects[21-28]. Only Udurgucu et al. conducted a prospective observational study analyzing the application of two weaning protocols and comparing their outcomes[29]. No controlled clinical trials were identified. In three studies, the weaning protocol was part of a broader initiative aimed at optimizing the indication, escalation, and weaning of HFNC. Wiser et al., Huang et al., and Peterson et al. described the effects of these initiatives; however, isolating the specific impact of the weaning protocol remains challenging[22,23,26]. Nevertheless, consistent benefits were reported, including a reduction in the duration of HFNC exposure.

POPULATIONS AND CLINICAL SCENARIOS STUDIED

It is noteworthy that the majority (5/9) of the protocols were studied in young children under 24 months of age with a diagnosis of ALRI, primarily acute bronchiolitis[23,24,26-28]. In three studies, the protocols were applied to the general medical-surgical pediatric population in the PICU who required HFNC[21,22,29]. Only one study specifically focused on the use of the protocol for critically asthmatic children older than two years admitted to the PICU[25]. Regarding the clinical setting of the studies, we found that six protocols were implemented exclusively in PICUs[21-25,29]. Of the remaining studies, two were applied in both PICUs and general pediatric wards of medium complexity[26,28], while the study by Charvat et al. applied the protocol only in general pediatric wards[27]. Notably, all studies were conducted in middle- and high-income countries and in hospitals equipped with PICUs. These contextual infrastructure details are crucial when extrapolating the results to different clinical scenarios, such as settings lacking the capacity for prompt admission to intensive care when necessary.

METHODS IMPLEMENTED DURING WEANING PROTOCOLIZATION

In four of the studies, the protocol was led by PICU physiotherapists or respiratory therapists[21,23-25]. In the remaining

TABLE 1. Characteristics of the studies on HFNC weaning protocols reviewed.

Study (year)	Type of study	Scale used	Setting	Professional guiding the protocol	Weaning strategy and Comparison Group	Population and number of patients (N)	Clinical impact LOS*/LOT*	
Betters KA et al.[21] (2017)	Quality improvement Project	RAS*	PICU*	PT*	Holiday protocol *vs.* No protocol	All patients admitted to the PICU requiring HFNC* N: 133	5/21 days	2,5/2,1 days
Wiser RK et al.[22] 2021	Quality improvement Project	Score BQ*	PICU	Personal médico no médico	Gradual reduction of flow and FiO_2* vs No protocol	Patients under 21 years of age who were admitted to the PICU and required HFNC 2 groups BR no BR N: 584	6.8/5.9 days	3.8/2.04 days
Peterson RJ et al.[23] 2021	Quality improvement Project	Riley score	PICU	FST	Gradual reduction vs No protocol	Patients under 24 months of age with BR requiring HFNC N: 590	2.6/2.1 days	2.5/1.8 days
Maue DK et al.[24] 2023	Quality improvement Project	Riley score	PICU	FST	Protocol of gradual reduction[23] vs Incorporation of Holiday approach	Patients under 24 months of age with BR requiring HFNC N: 720	2.1/1.5 days	1.8/1.3 days
Maue DK et al.[25] 2023	Quality improvement Project	Asthma score	PICU	FST	Progressive weaning albuterol and HFNC followed by Holiday approach vs No protocol	Patients aged 2 to 18 years with BOC* requiring HFNC and continuous albuterol N: 410	41/ 31.8 h	26.8/ 18.1 h
Huang JX et al.[26] 2023	Quality improvement Project	RAC*	PICU and ward	Equipo de destete	Gradual reduction of flow and FiO_2 vs No protocol	Patients under 24 months of age with BR requiring HFNC N: 223	4/2.8 days	44/36 h
Charvat C et al.[27] 2021	Quality improvement Project	CRS*	Ward	Equipo de destete	Holiday protocol followed by discontinuing or reducing flow to 50% according to CRS vs No protocol	Patients under 18 months of age with BR requiring HFNC N: 283	84/ 60 h	48/31 h
Hoefert JA et al.[28] 2022	Quality improvement Project	Own BR score	PICU and ward	Equipo de destete	Holiday protocol vs No protocol	Patients under 2 years of age with BR admitted to the hospital requiring HFNC N: 442	56/ 38 h	52/28 h
Udurucu M et al.[29] 2022	Prospective observational study	RAS*	PICU	Personal médico no médico	Gradual reduction vs Holiday	Patients between 1 month and 17 years of age admitted to the PICU requiring HFNC N: 113	9.5/6.1 days	60/36 h

PT: physiotherapist; BR: bronchiolitis; RAS: respiratory assessment score; PICU: pediatric intensive care unit; HFNC: high-flow nasal cannula; FiO_2: fraction of inspired oxygen; LOS: length of stay; LOT: length of treatment; BOC: broncho-obstructive crisis; RAC: respiratory assessment classification; CRS clinical respiratory score; h: hours .

five studies, two different implementation approaches were identified. The first involved creating a dedicated interdisciplinary wean team consisting of physicians, respiratory therapists, and nurses[26-28]. The second approach involved all PICU professionals, including both medical and non-medical staff[22,29].

In our review, we identified two main strategies for HFNC weaning. One approach used protocols where flow and the inspired oxygen fraction (FiO_2) were gradually decreased[22,23,26,29]. These studies utilized various methods to assess patient eligibility for weaning, employing different severity scales. Nevertheless, three of the protocols[22,23,26] shared a common method: once a patient was considered eligible, the flow was reduced progressively by 2 liters every 2 hours, accompanied by a decrease in FiO_2 to maintain oxygen saturation between 90% and 95%. The protocol by Udurgucu et al. implemented a 25% reduction in oxygen flow every 12 hours.

The other weaning protocol design incorporated a "window" or "holiday" period, during which patients were assessed using various respiratory severity scales or based on their FiO_2 requirements, ensuring these did not exceed specific cut-off values (which varied across scales and studies) to determine suitability for the holiday period[24,25,27,29]. For these patients, high-flow oxygen was abruptly discontinued, and they were transitioned to conventional oxygen therapy[21,23-25]. Alternatively, in some cases, oxygen therapy was withdrawn entirely, allowing the patient to breathe spontaneously in room air[27,28]. During the holiday period, patients were monitored for a short duration (typically 15-30 minutes). If no clinical deterioration was observed—assessed using the previously applied severity scales—HFNC

was permanently discontinued. The holiday technique was first described and evaluated by Betters et al.[21] and was subsequently adopted by five more recent protocols[24,25,27-29], with slight variations in the severity scales used and the FiO_2 reduction. This window period was consistently considered safe, with no adverse events reported in any of the studies that implemented it[21,24,25,27-29].

The study by Udurgucu M et al., which compared two weaning protocols (holiday versus gradual reduction), found that the holiday approach was associated with a greater decrease in both the duration of HFNC use and hospital length of stay, without an increased risk of adverse effects. However, the observational nature of the study limits the ability to draw definitive conclusions or accurately determine the effect size of this association.

KEY FINDINGS, CLINICAL IMPACT, AND CHALLENGES DURING IMPLEMENTATION OF PROTOCOLS

All the protocols reviewed consistently demonstrated significant improvements in clinically relevant outcomes. Following implementation, all studies reported reductions in both the duration of HFNC exposure and hospital length of stay. Notably, most (8/9) of the studies analyzed were part of quality improvement initiatives that involved multiple and changing cycles of learning and revision of the intervention, aimed to adapt the protocols to the specific clinical contexts in which they were applied. This contextual adaptation should be carefully considered when interpreting the effects of these protocols and extrapolating them to other settings. An example is the systematic work conducted by researchers at Riley Hospital in Indianapolis, United States[23-25]. Over the years, their series of implementation and quality improvement efforts demonstrated the progressive refinement of the protocols. Initially, these protocols used a gradual reduction approach, but they were later adapted to incorporate the holiday technique after quantifying its superior outcomes while maintaining safety[23,24]. Teams aiming to implement protocols should consider continuous training and revision cycles to ensure adherence and achieve the desired clinical impact.

CONCLUSIONS

- Our review of the available literature revealed that most studies on protocolized weaning from HFNC were part of quality improvement projects conducted mainly in PICUs and focused on children with primary respiratory conditions.
- The implementation of HFNC weaning protocols was associated with a reduction in HFNC exposure and length of hospital stay, and they were found to be safe without increasing the rate of complications.
- The consistent reduction in exposure times to HFNC may indicate the overuse of this therapeutic intervention in hospital settings for children with ARF and ALRI. Therefore, reviewing and adjusting both the indication for and duration of HFNC use is a crucial area for future research.
- Given the context in which the analyzed protocols were implemented (using quality improvement methods and implementation science, and conducted in high-resource settings), clinicians applying them should consider their own contexts when extrapolating the findings of this review.

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By and for Stella.

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SPECIAL ARTICLE

Implementing an Emergency Department Improvement Methodology course: Insights and experiences from Cincinnati to Latin America

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Quality improvement requires an approach that enables individuals to understand the functioning of organizational systems and implement changes to better and more consistently address patient needs and management. Improvement methods are integrated into an 'Improvement Model' based on the philosophy of Deming[a].

In 2022, the Latin American Society of Pediatric Emergency Medicine (SLEPE) partnered with Cincinnati Children's Hospital to deliver a course on improvement methodology. The objective of the course was to provide a practical introduction to the theory of improvement methodology, aiming to address existing barriers in healthcare systems and enhance the quality of care provided to patients in pediatric emergency departments across Latin America.

The SLEPE confirmed the participation of five teams from institutions from different Latin American countries: Paraguay, Uruguay, Argentina, Costa Rica, and Guatemala. One of the requirements was that each team included a leader and consisted of pediatric residents, nurses, and assistant pediatricians. Guided by Knowles' principles of andragogy, a curriculum was developed that integrated theoretical concepts and practical exercises, providing participants with the knowledge and tools needed to successfully implement an improvement project within their respective institutions.

The course content draws partially on concepts from the 'Institute for Healthcare Improvement' (IHI) and the improvement methodology outlined in the book by Langley, while also addressing knowledge gaps identified through a participant survey. The primary distinction between traditional scientific research and improvement methodology lies in the latter's 'learning-by-doing' approach. This method involves progressively testing a series of solutions and changes, starting with small-scale interventions and gradually expanding them to determine which yield a significant positive impact on the system.

From the outset, all five teams demonstrated exceptional enthusiasm in addressing and solving the challenges in their respective workplaces. This dedication was crucial to effectively manage and lead their teams throughout the year in their roles as leaders. From a teaching perspective, the most notable aspect of this experience was the active participation of all involved, contributing ideas and suggestions to the projects. A collaborative environment was created, enabling mutual learning among residents, nurses, attendings, and us as instructors. We all shared a common goal: to enhance patient care in the Emergency Department.

Graduation day marked a significant milestone as the teams presented their final projects, demonstrating the successful achievement of their objectives and highlighting the positive impact on their respective systems. This accomplishment represented a meaningful step towards bridging the gap between education and healthcare.

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[a]William Edwards Deming (1900 – 1993), an American physicist and statistician, was the promoter of the concept of quality. His philosophy focuses on identifying ways to improve the quality of products and services.

In this issue of the journal, the first of the projects is presented, followed by the others, all of which have had a significant impact on the institutions of the members.

Our final message to the participants is this: Continue breaking down barriers. Now is the time to persist in the search for that 'ideal system' in which all patients, regardless of race, education, or socioeconomic status, receive quality medical care.

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SPECIAL ARTICLE

Improving communication during triage in a Pediatric Emergency Department

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Abstract

Introduction: Effective communication during triage is essential for managing patients awaiting care in an Pediatric Emergency Department (PED).

Objective: This study aimed to increase by 10% the proportion of the patients informed about: a) their triage level, b) the waiting time to be seen, and c) the possibility of reevaluation.

Method: From January 2023 to February 2024, a multidisciplinary team implemented a communication improvement methodology during triage. The target population consisted of patients classified as triage levels IV and V who presented to the ED. Baseline data on patient awareness of their triage level were collected through situational mapping. Plan-Do-Study-Act (PDSA) cycles guided the interventions, which included problem quantification, the development of educational materials, regular reminder workshops, addressing barriers to effective communication, providing feedback, and conducting focus groups.

Results: Over the study period, 29,253 patients were triaged as levels 4 and 5. The percentage of adequately informed patients increased from a baseline of 35% to a median of 63%.

Conclusion: The percentage of informed patients during triage increased by 33%, exceeding the initial goal, demonstrating the effectiveness of the implemented interventions.

MEJORA DE LA COMUNICACIÓN DURANTE EL TRIAGE EN UN DEPARTAMENTO DE EMERGENCIAS PEDIÁTRICAS

Resumen

Introducción: *La buena comunicación en el triage es un elemento fundamental para la gestión de pacientes que esperan ser atendidos en un departamento de Emergencias Pediátricas (DEP).*

Objetivo: *El objetivo fue aumentar en un 10% el número de pacientes informados sobre: a) nivel de triage; b) tiempo de espera para ser atendidos; y c) la posibilidad de reevaluación.*

Método: *Un equipo multidisciplinario aplicó la metodología de mejora en la comunicación durante el triage entre enero de 2023 y febrero de 2024. La población objetivo fue los pacientes de nivel IV y V que acudieron al DEP. Se realizó un análisis de la situación para conocer la línea basal de pacientes informados sobre el nivel de triage, aplicando ciclos de Planificar, Hacer, Estudiar y Actuar (PDSA). Las áreas de intervención principales incluyeron la cuantificación del problema, el diseño de material educativo, talleres recordatorios periódicos y sistemáticos, la interpretación y eliminación de barreras para la comunicación asertiva, retroalimentación y grupos focales.*

Resultados: *Se triaron 29.253 pacientes como niveles IV y V durante el período de evaluación. El porcentaje de pacientes adecuadamente informados se incrementó del 35% al 63% (mediana).*

Conclusión: *Se obtuvo un aumento del 33% en la población informada durante el triage, superando nuestro objetivo propuesto.*

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INTRODUCTION

The management of the waiting room is essential for the safety and satisfaction of patients waiting to be seen in a pediatric emergency department (PED)[1]. Triage is the first contact with healthcare personnel prior to medical consultation, allowing patients to be categorized according to their priority of care[2]. Knowing the waiting time according to the assigned triage level, as well as considering going for reevaluation if the child feels unwell, is part of understanding the care process in the PED and is expected to improve the patient/caregiver experience, increasing their satisfaction[3]. The lack of information, conversely, leads to dissatisfaction, disorder in the waiting room, and unnecessary use of medical time. Physicians reported caregiver discomfort, which was attributed to insufficient or inadequate communication. In our organization, it is specified that triage professionals must provide this information at the conclusion of the triage process.

A systemic issue was identified, and it was decided to assess the scope of the problem and develop a sustainable improvement plan.

The overall aim was to enhance communication with patients in the triage area. To achieve this, we implemented a quality improvement (QI) plan to ensure families receive the necessary information throughout the care process.

Our specific objective was to increase the percentage of patients adequately informed about: a) their triage level, b) the expected waiting time to be seen, and c) the possibility of reassessment during the triage visit at the PED, from 35% to 45% by 28 February 2024.

METHOD

Context

This project was conducted in a tertiary, academic, urban PED that receives 120,000 pediatric patient visits annually. The emergency medical team included board-certified pediatric emergency medicine physicians, pediatric residents, and pediatric emergency fellows. As part of the routine triage process, a nurse determined the priority level using a structured triage system integrated into the hospital's software, MAT/SET web_e-PAT v4.15, based on the Andorran Triage Model. Patients are assigned a triage level from 1 to 5 and directed to separate waiting areas. Those with low-severity conditions receive a score of 4 or 5. In our PED, 67% of patients are assigned a score of 4 or 5. The target population for this project included level 4 and 5 patients attending the PED. The project was conducted between January 2023 and February 2024 as part of the Improvement Methodology Course conducted by Cincinnati Children's Hospital and the Latin American Society of Pediatric Emergency Medicine (SLEPE).

Interventions

A multidisciplinary team was established to implement the interventions, comprising two staff physicians, the chair of the PED, the PED head nurse, and the hospital nurse manager supervisor. The team used the Improvement Model based on Deming's theory, consisting of four key components: the theory of knowledge, appreciation of a system, knowledge of variation, and knowledge of psychology of change in people4. Through process mapping, barriers and potential solutions for patient care were identified. Improvement objectives were defined and organized into a key factors diagram, which served as a strategic roadmap for the interventions (Figure 1).

From August 2023 to February 2024, we implemented Plan-Do-Study-Act (PDSA) cycles. The multidisciplinary intervention team met every 15 days initially and then monthly, conducting multiple PDSA cycles to decide on new processes. The primary areas of intervention included quantifying the problem, designing educational materials, implementing these materials through periodic and systematic reminder workshops, identifying and addressing barriers to assertive communication, and conducting feedback sessions and focus groups.

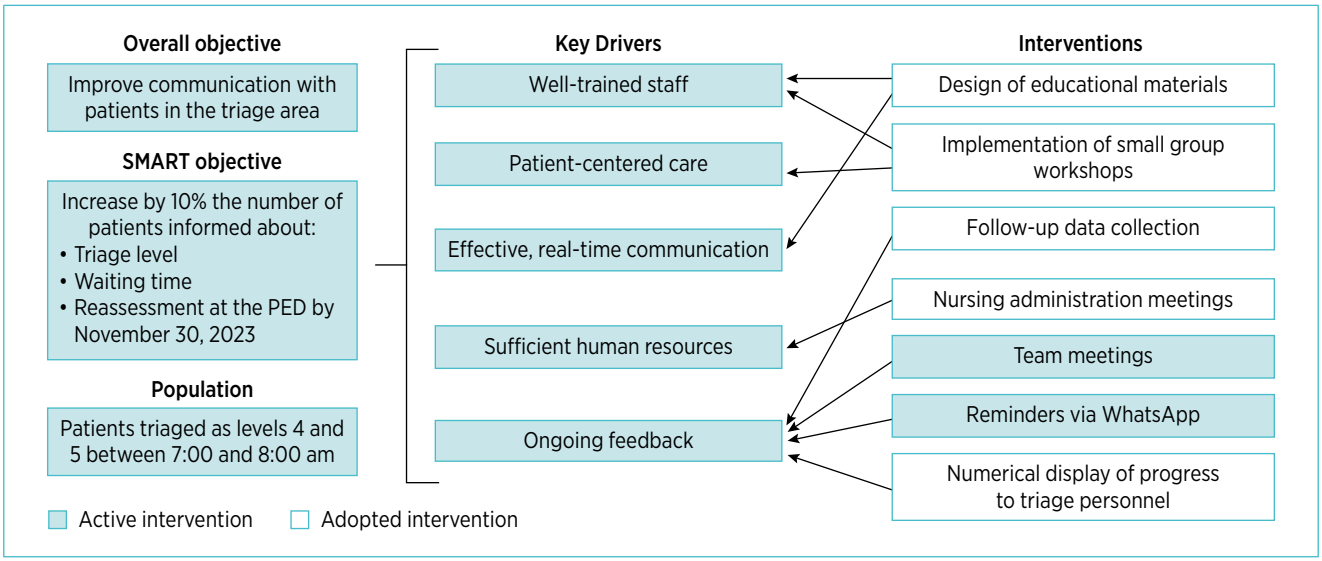

FIGURE 1. Diagram of key drivers.

- **Quantification of the problem:** To identify the scope of the issue, a survey was conducted with parents and caregivers daily across all three triage shifts: morning, afternoon, and evening, during September 2023. Patients categorized as triage levels 4 and 5 were assessed using three questions: 1) Are you aware of the triage level assigned? 2) Do you know the expected waiting time for that level at the time of the triage assessment? 3) Were you informed that, if the patient's clinical condition worsens, you should return for reevaluation?
- **Design of Educational Material:** Educational materials were developed in July and August 2023 with the specific objective of effectively communicating the three key aspects identified as fundamental by the multidisciplinary team.
- **The application of this material in workshops:** The application of this material was conducted through workshops designed to educate triage nurses. These small-group workshops, conducted in October and November 2023, included five to seven participants per session, ensuring all 32 PED triage nurses received targeted training. Each workshop began with an assessment of the strengths, opportunities, weaknesses, and threats in triage communication, followed by the use of the specifically developed educational materials.
- **Periodic and systematic reminders:** End-of-shift visits to the triage area were conducted by a member of the multidisciplinary intervention group, complemented by weekly reminders sent via WhatsApp over a three-month period.
- **Interpretation and elimination of barriers to assertive communication:** During the work team meetings, it was identified that certain stages of the project experienced a reduction in the information provided. To address this, it was recommended to conduct focus groups with members of the multidisciplinary team and the triage team in January 2024 to identify the underlying causes.
- **Feedback:** Feedback was provided to the triage professionals on two occasions, focusing on the information records obtained during January 2024.
- **Focus group:** conducted in January 2024 to identify new barriers to communication. Example: Parents did not accept low triage levels as they considered their children were too sick; triage staff avoided reporting the assigned level to prevent confrontations. Twenty-six of 33 triage staff participated in the focus group.

OUTCOME MEASURES AND ANALYSIS

The primary outcome measure was to improve communication with patients in the triage area, defined as providing information about the triage level, waiting time, and the possibility of reassessment.

Data collection

A baseline survey was conducted for triage levels 4 and 5, with data collected across three shifts: morning (06:00 to 08:00 AM), afternoon (12:00 to 14:00), and night (20:00 to 22:00). The following variables were included: the day of the week the survey was conducted, the shift, whether the patient's caregiver was informed of the triage level assigned to their child (the triage system has five levels of care, assigned based on the severity of the child's condition upon arrival at the PED), whether the waiting time corresponding to the assigned triage level was communicated (times may vary depending on delays in care during the shift), and whether it was explained that if the child's health condition worsens, they should return to triage for reassessment.

The baseline was established at 35% for the information provided in the initial measurement, with the target set at a 10% increase in the information provided.

Analysis

The denominator was defined as the number of children surveyed during each shift and day of the week. We used run charts (QI Macros, version 2020; KnowWare International Inc., Denver, Colorado) to measure the effects of our interventions over time.

We used data collected prior to the implementation of the initial intervention to calculate the initial central line or median. The baseline period was from September to October 2023, and the intervention period from October to November 2023. Significant changes in the measures (i.e., special cause variation) were identified using traditional rules for patterns in run charts, including eight consecutive data points consistently above or below the median, six consecutive points trending upward or downward, or a zigzag pattern. A new central line was calculated if a system change meeting the special cause rule was observed.

Ethical considerations

This project was conducted as a QI initiative within the PED and was determined not to constitute human subjects research. The authors declare no conflicts of interest.

RESULTS

A total of 50,917 patients visited the PED between September 1, 2023, and February 28, 2024. A total of 29,253 patients were triaged as level 4 and level 5 during this period.

After the intervention period, the percentage of adequately informed patients increased from 35% to 63%, exceeding the initial target of 45%.

Our baseline for adequately informed patients, set at 35%, showed alternating points during the intervention. By the end of the intervention, we achieved a 33% improvement in the proportion of patients informed about their triage level, waiting time, and reassessment. This improvement was represented by a sustained increase of six consecutive points (Figure 2).

From 28 December 2023 onwards, there was a sustained decline in the provision of information, with the mean stabilizing at 28%. Causality was investigated through a focus group.

On 19 January 2024, a sustained increase in the provision of information began, reaching a peak of 80% and a median of 63%.

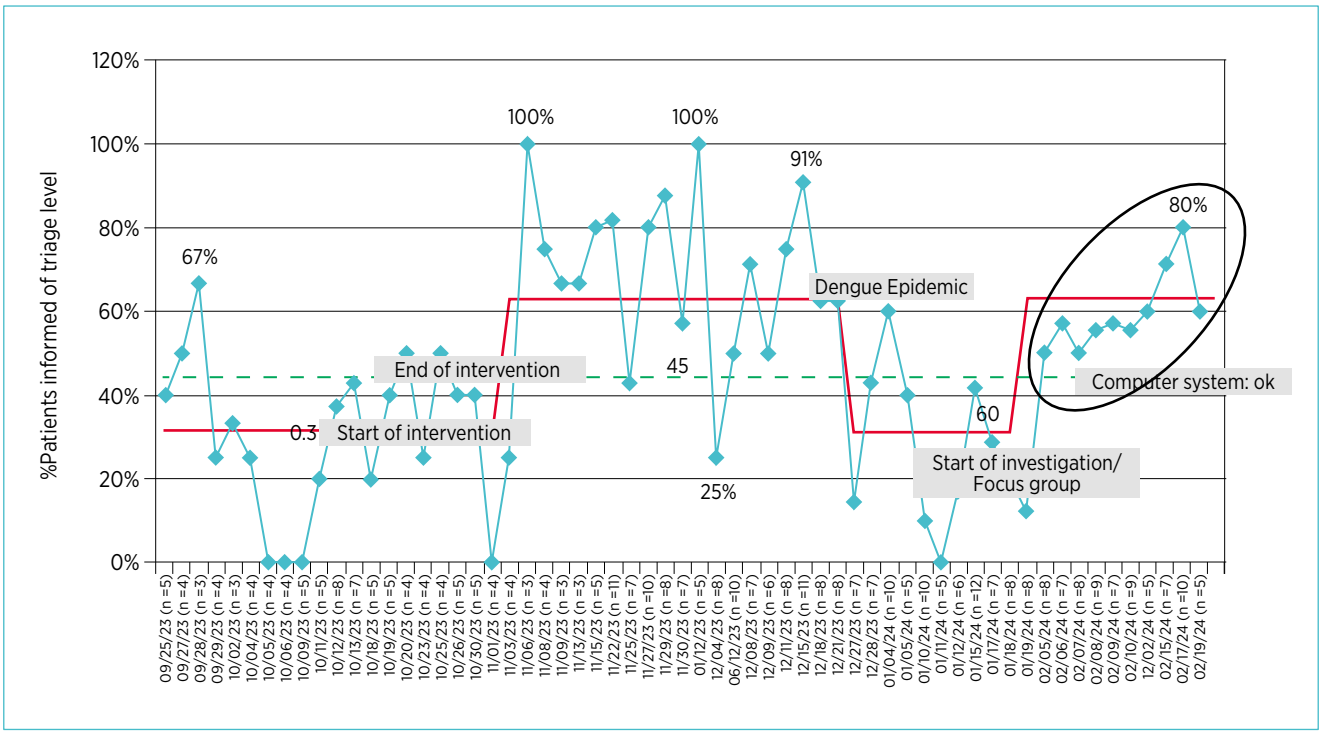

FIGURE 2. Proportion of patients adequately informed during the triage process.

DISCUSSION

The PED triage communication QI initiative proved successful, leading to better-informed patients and improved waiting room management. Previous studies have reported successful QI initiatives in PEDs aimed at enhancing parent-provider communication5,6. In the study by Porter et al., the "3 Cs" initiative (communication, clear, and concise) was shown to improve parents' communication experiences with emergency providers. In our project, we increased the number of adequately informed patients, exceeding the objectives set out in the SMART Aim.

During the development of the project, we observed significant one-point drops on 22 November and 4 December, which were linked to a specific triage worker who had not attended the training sessions due to a leave of absence. Following an initial improvement, during which we achieved the objectives outlined in the improvement plan, a sustained decrease in patient information was identified. Consequently, a focus group was set up, and the previously described interventions were continued. The focus group identified several issues contributing to the decrease in patient information, which were attributed to an increase in visits due to a dengue outbreak. These issues included: 1) Lack of acceptance of the assigned triage level by the family or accompanying person; 2) Lack of acceptance of the justification for the assigned level provided by the triage professional; 3) Overuse of the re-evaluation process; 4) Incidents of violence during triage; 5) Episodes of computer system malfunctions, leading to patient backlogs. As a result, reducing the amount of information provided allowed triage staff to feel less exposed to complaints by avoiding confrontations over level assignments. During the outbreak, it was decided that the physician responsible for managing patient flow would provide periodic reports in the waiting room to support the triage team, as there was no increase in human resources during that period. The application of the improvement methodology enabled a thorough analysis and informed decision-making, considering and evaluating the contextual factors. In dynamic environments like emergency departments, the improvement methodology proves to be a valuable tool for the continuous assessment of processes, guiding interventions, and determining their timing.

During the training of the educators, we observed that incorporating sociocultural aspects into the training processes is essential. Throughout the intervention, the need for external assistance with data uploading and ensuring measurement sustainability became apparent. The institution's management recognized this need and provided the necessary support staff.

Although this study has strengths, such as the implementation of planned, executed, and evaluated interventions that achieve the proposed objective, it also has some limitations. Since the QI initiative was conducted within a training course on QI strategies, the measurements and the number of patients surveyed were limited by the duration of the training. A longer measurement period and a larger patient sample would be needed to assess the sustainability of the interventions.

CONCLUSIONS

A 33% increase in the population informed during triage was achieved, exceeding our proposed aim. Understanding the barriers to project implementation is crucial for the development of an improvement plan. The interventions implemented are easily reproducible in other PEDs.

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CASE REPORT

Sulfhemoglobinemia: A case report

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Palabras clave:
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Cianosis
Cooximetría

Abstract

Sulfhemoglobin (SHb) is formed through the oxidation of hemoglobin (Hb) with the incorporation of sulfur atoms, leading to reduced oxygen affinity and rendering it incapable of transporting oxygen to tissues. Causes include environmental and pharmacological factors, as well as intestinal hydrogen sulfide production in constipated patients with certain gut bacteria. Affected individuals present with cyanosis and low oxygen saturation without significant clinical implications, necessitating a high index of suspicion for diagnosis. Acid-base status measurements using multiparameter devices with co-oximetry to assess Hb fractions can indicate the presence of sulfhemoglobinemia and aid in its diagnosis. We present a case and its progression to emphasize the importance of a multidisciplinary approach.

SULFOHEMOGLOBINEMIA: A PROPÓSITO DE UN CASO

Resumen

La sulfohemoglobina (SHb) se genera por la oxidación de la hemoglobina (Hb) y posterior adquisición de átomos de azufre, provocando una disminución de la afinidad por el oxígeno de la Hb, haciéndola incapaz de transportarlo a los tejidos. Las causas pueden ser ambientales, farmacológicas y también pueden ocurrir en pacientes constipados portadores de bacterias intestinales productoras de sulfuro de hidrógeno. Los afectados presentan cianosis y saturación de oxígeno baja sin repercusión clínica, siendo necesario un alto índice de sospecha. La medición del estado ácido base en equipos multiparamétricos que utilizan cooximetría para medir las fracciones de Hb alertan la presencia de sulfahemoglobinemia y pueden resultar útiles para el diagnóstico. Presentamos un caso clínico y su evolución a fines de discutir la importancia del trabajo multidisciplinario.

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INTRODUCTION

Sulfhemoglobin (SHb) forms through the oxidation of hemoglobin (Hb) and the subsequent incorporation of sulfur atoms. This modification results in Hb with a low oxygen affinity, leading to clinically evident cyanosis[1], reduced pulse oximetry (PO) readings, and normal arterial oxygen pressure[2]. It is an uncommon condition with a pharmacological cause[2] (Table 1). Currently, no routine method exists to quantify SHb; however, co-oximetry available in multiparametric equipment can identify its presence. This study aims to describe a case of sulfhemoglobinemia and emphasize the importance of interdisciplinary collaboration in interpreting results and achieving an accurate diagnosis.

TABLE 1. Pharmacological causes of sulfohemoglobinemia2[2-5].

Environmental
• Well water (nitrates and nitrites)
• Sulfur dioxide
Pharmacological
• Phenazopyridine
• Metoclopramide
• Sulfasalazine
• Ferrous sulfate
• Sulfonamides
• Zopiclone
Others
• Constipation with colonization by *Morganella morganii* (a hydrogen sulfide-producing bacterium)
• Hydroxylamine sulfate

CASE REPORT

With parental consent, we present the case of a 10-year-old girl diagnosed with Steinert's disease (a myopathy associated with myotonia, muscle atrophy, and weakness). During routine follow-up visits, she was noted to have cold, cyanotic extremities and perioral cyanosis. Consequently, she was admitted for further evaluation and treatment with oxygen.

On her first day of hospitalization, perioral cyanosis persisted despite the administration of supplemental oxygen while remaining clinically stable, with vital signs within normal limits for her age, except for a peripheral oxygen saturation of 85%. The complementary studies conducted during her hospitalization are summarized in Table 2.

Due to the discrepancy between peripheral oxygen saturation of 85% (measured by PO) and arterial oxygen saturation of 96% (measured by co-oximetry), in the context of an arterial partial pressure of oxygen (PaO_2) of 128 mmHg, a hemoglobinopathy with low oxygen affinity was proposed as a diagnostic hypothesis.

In a patient presenting with hypoxia and central cyanosis, but without hypoxemia, hypercapnia, or clinical signs of respiratory distress, a multidisciplinary approach was undertaken, involving a toxicology specialist and biochemists from the critical care team.

The hospital is equipped with an ABL800 FLEX multiparameter device (Radiometer)[6], which is part of the point-of-care testing (POCT) system. The arterial acid-base status was measured again, and in addition to the result, the following alarm was triggered: "Warning: SHb detected."

The mother was further interviewed on the medical history of the child to identify any exposure to sulfate groups that could explain the presence of SHb. It was learned that treatment with ferrous sulfate had been initiated two months earlier due to anemia, and that polyethylene glycol was being administered at maintenance doses as a regular medication for her daughter's chronic constipation.

Taking into account the pathophysiology and the absence of other potential causes for the clinical presentation, it was decided to discontinue the ferrous sulfate. The patient evolved favorably, with the resolution of perioral cyanosis and an increase in peripheral oxygen saturation (Table 2). No new symptoms were observed during post-discharge follow-up, so guidelines to prevent exposure to sulfate groups

TABLE 2. Clinical and laboratory course.

	Day 1 of hospitalization	Day 3 of hospitalization	Discharge
Laboratory	Arterial blood gases: • **pH** 7.43 • **PaO_2** 132 mmHg • **$SatO_2$** 95% Arterial co-oximetry: • **MetHb:** not measurable • **COHb** 0.3% Blood count: Hb: 12 g/dl	Arterial blood gases: • **PaO_2** 128 mmHg • **$SatO_2$** 96% Arterial co-oximetry: • **MetHb** 0.5% • **COHb** 0.2%	Arterial blood gases: • **PaO_2** 141 mmHg • **$SatO_2$** 96% Arterial co-oximetry: • **MetHb** 0.3%
Images	Chest X-ray no lesions Echocardiogram: No structural heart disease, preserved systolic function, no signs of pulmonary hypertension		
Clinical features	Central and peripheral cyanosis Pulse oximetry 85%	Perioral cyanosis Pulse oximetry 85%	Asymptomatic Pulse oximetry 97%

PaO_2: Partial pressure of oxygen; $SatO_2$: Oxygen saturation; COHb: Carboxyhemoglobin; MetHb: Methemoglobin.

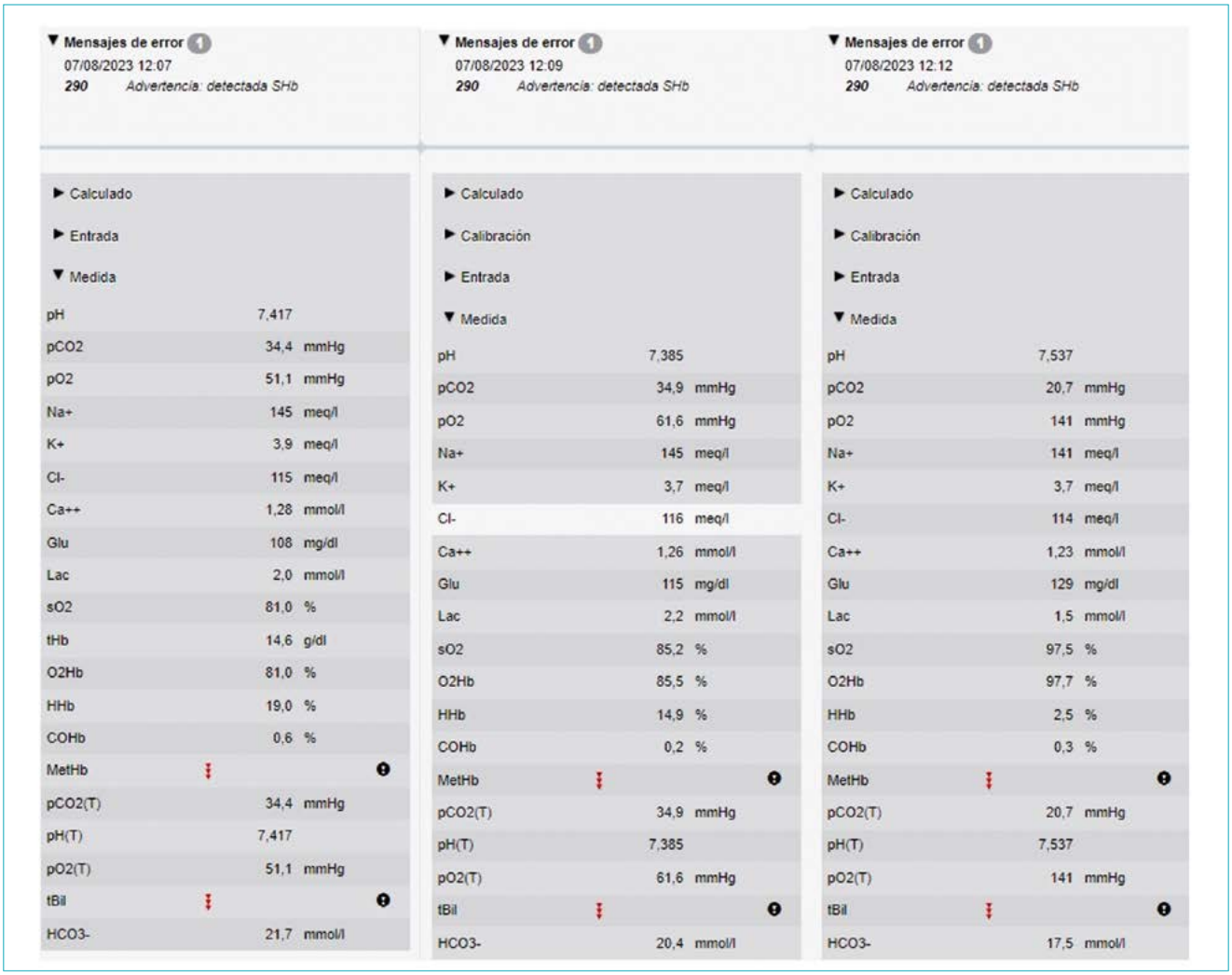

FIGURE 1. Arterial ABE with "Warning: SHb detected". Reference: ↓ MetHb < 0.1%.

were reinforced, and she continued to be monitored by her multidisciplinary team.

DISCUSSION

Total hemoglobin concentration (ctHb) measures the total potential oxygen-carrying capacity of the blood. The fractions of hemoglobin that are effective in oxygen transport are oxyhemoglobin (O_2Hb) and deoxyhemoglobin (HHb). Other fractions, known as dyshemoglobins, are ineffective in transporting oxygen to the tissues. A ctHb result (measured spectrophotometrically) within the reference range does not necessarily ensure adequate oxygen transport. Therefore, it is crucial to determine the different hemoglobin fractions through co-oximetry[7,8].

SHb is produced by the interaction of a sulfur donor group with Hb and can form two distinct structures: in one form, it binds reversibly to the iron in Hb, while in the other, it binds irreversibly to the porphyrin ring. Both forms are considered equivalent and are collectively referred to as sulphohemoglobin[9]. This alteration decreases Hb's oxygen affinity, rendering it unable to transport oxygen to the tissues. The condition persists until physiological elimination of SHb from the erythrocyte occurs.

Patients with sulfhemoglobinemia typically present with central cyanosis, decreased pulse oximetry readings, and normal PaO_2 levels, in the absence of cardiovascular or respiratory disease. The blood acquires a green-greyish appearance, leading to a more pronounced cyanotic presentation compared to similar levels of methemoglobinemia. However, methemoglobinemia is more common and represents the primary differential diagnosis for sulfhemoglobinemia. Both conditions can be distinguished using co-oximetry[2].

In sulfhemoglobinemia, the Hb dissociation curve shifts to the right, increasing the expected p50 values (partial pressure of O_2 required to achieve 50% Hb saturation), increasing the delivery of O_2 to the tissues. As cellular hypoxia does not occur, it does not improve with oxygen therapy. Consequently, dyspnea is absent unless SHb levels are exceptionally high. In contrast, methemoglobinemia has a greater clinical impact[2] as hemoglobin is unable to bind and transport oxygen effectively, causing a leftward shift in the hemoglobin dissociation curve.

The spectrophotometric technique used to determine ctHb and its main fractions—O_2Hb, HHb, fetal hemoglobin (HbF), carboxyhemoglobin (COHb), and methemoglobin (MetHb)[3]—is called co-oximetry. This method employs an optical system consisting of a 128-wavelength spectrophotometer with a measurement range of 478–672 nm. This

method is based on the Lambert-Beer law, which states that the absorbance of a substance is directly proportional to its concentration and the length of the light path through the sample[6]. SHb and MetHb have an absorption peak near 626 nm. Analyzers using co-oximetry do not provide a quantitative value for SHb but warn of its presence. The optical system in ABL800 FLEX analyzers corrects for SHb interference by suppressing its spectrum and generating a SHb detection warning. If the detection range is below 10%, the analyzer issues an "SHb detected" alarm, applies the correction for interference, and reports the MetHb value. However, if the detection exceeds 10%, the warning changes to "SHb too high," indicating compromised measurement accuracy. In such cases, the analyzer does not perform the correction or report MetHb values, and a repeat measurement is recommended[6]. It is important to note that the presence of SHb does not cause falsely elevated MetHb values. As previously mentioned, any interference is corrected by the analyzer. If correction is not possible, the MetHb value is not reported.

CONCLUSION

Sulfohemoglobinemia is a rare condition, and its diagnosis can be challenging due to limitations in measuring SHb in routine practice. The inability of co-oximeters to quantify SHb may result in misinterpretation of results, emphasizing the importance of teamwork and interdisciplinary collaboration, particularly the involvement of a biochemist, for timely diagnosis. While no specific antidote exists, strict clinical monitoring and supportive treatment are recommended, considering the half-life of erythrocytes.

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THE FELLOW-MIR'S CORNER

Intranasal ketamine for sedation and analgesia in wound repair without local anesthesia in the Pediatric Emergency Department

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Palabras clave:
Sedoanalgesia
Sutura
Ketamina
Vía intranasal

Abstract

Introduction: Wounds requiring suturing with sedation and analgesia (SA) are a common reason for visiting the Pediatric Emergency Department (PED).

Objective: To evaluate the adequacy of SA achieved with intranasal (IN) ketamine during simple wound suturing in the PED.

Material and Methods: A descriptive observational study was conducted. Children weighing up to 30 kg who presented with a simple wound requiring repair between November 2022 and February 2023 were included. A dose of 7 mg/kg of IN ketamine was administered in aliquots of 0.5 ml per nostril using a MAD Nasal™ atomizer, alternating between sides. The study variables included: demographic data, clinical characteristics, degree of SA, sedation duration, operator roles (sedation and suturing), vital signs, sedation, and pain levels (Ramsay and Campbell scales), physician satisfaction, and parent satisfaction. Data were analyzed using SPSS v21, and the protocol was approved by the institutional ethics committee.

Results: Thirty-five patients were included, with a median age of 5 years (p25-75: 3–8), and 24/35 (68.6%) were male. Median weight was 21 kg (p25-p75: 16–27). SA with IN ketamine was successful in 29/35 (82.8%) patients (Ramsay score ≥ 2 and Campbell score ≤ 3). Adverse effects included vomiting in 5/35 (14.3%) and hypertension in 1/35 (2.9%). The mean sedation duration was 29.8 ± 8.95 minutes, and the total suturing time was 10.3 ± 3.57 minutes. At the end of the procedure, 7/29 (24.1%) patients reported no pain, while 22/29 (75.9%) reported mild pain. Physicians were satisfied with the level of SA in 32/35 (91.5%) procedures. All parents indicated they would consent to a similar procedure again.

Conclusion: Adequate SA was achieved with IN ketamine administration without the need for local wound infiltration of the wounds during suturing in the PED.

SEDOANALGESIA CON KETAMINA INTRANASAL EN LA REPARACIÓN DE HERIDAS SIN ANESTESIA LOCAL EN EL DEPARTAMENTO DE EMERGENCIAS PEDIÁTRICAS

Resumen

Introducción: *Las heridas que requieren sutura con sedoanalgesia (SA) son un motivo de consulta frecuente en el Departamento de Emergencias Pediátricas (DEP).*

Objetivo: *Determinar si los pacientes alcanzan una SA adecuada con ketamina intranasal (IN) en suturas de heridas simples en el DEP.*

Material y Métodos: *Estudio observacional descriptivo. Fueron incluidos niños hasta 30 kg atendidos en el DEP con una herida simple que requirió reparación en el periodo*

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de noviembre de 2022 a febrero de 2023. Se administró 7 mg/kg de ketamina IN en alícuotas de 0,5 ml por fosa nasal con un atomizador MAD Nasal®. Variables: Datos demográficos y características clínicas, grado de sedoanalgesia, duración y operador de la sutura, signos vitales, sedación y dolor (Ramsay ≥ 2 y Campbell ≤ 3), satisfacción de médicos, y satisfacción de los padres. Los datos se analizaron con SPSSv21. El protocolo fue aprobado por el comité de ética institucional.

Resultados: *Incluimos 35 pacientes, con mediana de edad 5 años (p25-75: 3-8), varones 24/35 (68,6%). Peso 21 kg (p25-p75: 16-27). En 29/35 (82,8%) pacientes la SA con ketamina IN fue exitosa. Los efectos colaterales fueron vómitos 5/35 (14,3%) e hipertensión arterial 1/35 (2,9%). El tiempo medio de sedación (minutos): 29,8 ± 8,95 y el tiempo total de sutura 10,3 ± 3,57. Al finalizar el procedimiento: no sintieron dolor 7/29 (24,1%) de los pacientes y refirieron dolor leve 22/29 el (75,9%). Los médicos estuvieron satisfechos con el grado de SA alcanzado en 32/35 (91,5%) procedimientos. La totalidad de los padres volvería a aceptar un procedimiento similar.*

Conclusión: *Se logró un buen nivel de SA con la administración IN de ketamina sin infiltración local de las heridas durante las suturas en el DEP.*

INTRODUCTION

Wounds requiring sutures are a common occurrence among children presenting to the Pediatric Emergency Department (PED). It is essential for emergency physicians to possess the necessary skills to manage these cases effectively. Pain and anxiety management should be regarded as fundamental components of wound care in PEDs[1]. Sedation and analgesia (SA), when administered by emergency physicians trained in these procedures, have been well demonstrated to be safe and effective outside the operating room[2-4].

Topical anesthetics and tissue adhesives have been shown to facilitate wound treatment. However, their use may not always be feasible in certain clinical situations, and these options are not universally available across all countries and healthcare settings. In our country, alternative non-infiltrative local anesthetic agents for open wounds, such as LAT gel, are unavailable[5].

Lidocaine infiltration remains a commonly used local treatment alongside systemic SA during wound repair in children outside the operating room[6].

Ketamine, a sedative agent frequently used in procedures in the PED, offers a combination of sedation, amnesia, and analgesia while maintaining spontaneous breathing and preserving normal airway reflexes, making it a preferred choice over other sedative agents[7-9].

Evidence supports the use of intravenous (IV) ketamine without local infiltration or the application of local anesthetics for the successful repair of minor wounds. Studies have shown no significant differences in pain scale scores between patients who received local infiltration or anesthetics and those who did not[10,11].

Intranasal (IN) administration is a well-studied method in PEDs. It is fast, non-invasive, well-tolerated, and capable of achieving adequate plasma concentrations of sedative agents and specific analgesics for relieving acute pain[12-16]. This method is particularly advantageous in overcrowded emergency departments, as it optimizes the time of medical and nursing staff while avoiding the pain and anxiety associated with IV line placement[17]. The effective dose of IN ketamine for minor wound repair has been investigated and established in previous research[18-20].

Although rare, local lidocaine infiltration can cause local and systemic adverse effects[21-23], making its avoidance a potential added benefit. In this context, the present study was designed to describe the characteristics of procedural SA achieved with IN administration of ketamine without local lidocaine infiltration during simple wound sutures in the PED. Secondary objectives included determining the time required to achieve adequate SA, the duration of sedation, identifying adverse effects, and evaluating the perceptions of parents or caregivers as well as the attending physicians.

MATERIAL AND METHODS

Study design and population

A prospective, descriptive, observational study was conducted in the PED of a tertiary academic pediatric hospital. Following informed consent from parents or guardians, pediatric patients weighing 10 to 30 kg, who presented with a simple wound less than 5 cm requiring suturing outside the operating room between November 1, 2022, and February 28, 2023, and with an ASA score less than 3, were included by non-probabilistic sampling at the convenience of the investigators. Children with behavioral difficulties, a history of adverse reactions to ketamine, wounds requiring intervention by a pediatric surgeon due to complexity, facial trauma, or nasal and facial malformations, moderate or severe airway infections, or congenital heart disease were excluded.

Measurement of the variables

Patient demographic data (sex and age), clinical variables (weight and personal medical history), and wound location were recorded. The following aspects of personal medical history were assessed: allergies, adverse reactions to SA or previous anesthesia, and the presence of comorbidities. Sedation level was evaluated using the Ramsay scale[24], with adequate sedation defined as a value ≥ 2. Pain was assessed

TABLE 1. Satisfaction survey of physicians and parents regarding procedural sedation and analgesia using intranasal ketamine.

		Very satisfied	Satisfied	Neutral	Not very satisfied	Dissatisfied
Pysician satisfaction	Degree of sedation and analgesia achieved					
	Duration of the procedure from start to finish					
	No need for local anesthesia					
Parent/caregiver satisfaction	Degree of satisfaction with the procedural sedation and analgesia					

using the Campbell scale[25], with adequate analgesia defined as a score ≤ 3. For both scales, scores were recorded before the procedure and at 1, 5, 10, and 30 minutes after the procedure began.

Patients were monitored throughout the procedural SA until recovery. Vital signs, including respiratory rate (RR), heart rate (HR), blood pressure (BP), and oxygen saturation (SpO_2), were measured before the start of the procedure and at 1, 5, 10, 30, and 45 minutes after IN ketamine administration.

The time (in minutes) required to achieve adequate sedation, the duration of sedation, and the duration of the suturing procedure were recorded as quantitative variables.

Data were collected on the professional categories of those who performed the sedation and suturing procedures, including pediatric residents, emergency medicine fellows, pediatricians, and emergency physicians.

Possible adverse effects were monitored, including hypertension, hypotension, bradycardia, laryngospasm, vomiting, nystagmus, tremor, headache, and irritability.

At the end of the procedural SA, patients assessed their perceived pain using age-appropriate pain scales: the Wong-Baker scale for patients under seven years of age[28] and the numeric rating score for patients aged seven years or older[28].

Successful IN SA was defined as achieving the desired scores on the Ramsay scale (≥ 2) and the Campbell scale (≤ 3) from baseline to the completion of the procedure. Procedural failure was defined as the inability to achieve adequate SA within 30 minutes following IN ketamine administration. In such cases, data were collected regarding the need for infiltration with a local anesthetic or the placement of a peripheral venous line (PVL) for ketamine administration at a dose of 1–2 mg/kg.

The perceptions of parents and physicians regarding the SA procedure were assessed using a survey. The survey included two closed-ended questions for parents and four for physicians, with responses measured on a Likert scale (Table 1). Parents were asked whether they would agree to the administration of IN SA if given the opportunity, with a dichotomous response option (Yes or No).

Procedure

Three operators participated in each procedure: 1) the individual responsible for enrolling patients, explaining the study, obtaining informed consent from the parents, and collecting data; 2) the supervisor overseeing drug administration and patient monitoring; and 3) the person in charge of wound suturing.

After obtaining informed consent, IN ketamine was administered at a dose of 7 mg/kg using a MAD Nasal™ atomizer in volumes of 0.5 to 1 ml per nostril, alternating sides. The maximum dose was set at 200 mg (equivalent to 4 ml), determined by volume. If the required volume exceeded 1 ml, the medication was administered in repeated increments until the full dose was achieved. This method was used to facilitate absorption through the mucosa, enhance tolerability, and prevent runoff of the drug into the pharynx.

Data analysis

Data were analyzed using the SPSS 21 program. Qualitative variables were expressed as percentages, while quantitative variables were presented as means with standard deviations or medians with ranges, according to their distribution.

Ethical considerations

The study was approved by the hospital ethics committee, and informed consent was obtained from the parents or caregivers.

RESULTS

A total of 41 patients were eligible for the study. Thirty-five of these patients received IN ketamine for procedural SA and were included in the analysis. Six patients were excluded due to their refusal to receive medication via the IN route. None of the patients had a history of previous adverse reactions to SA or any comorbidities.

The median age of the patients was five years, with a male predominance. The majority of wounds were located on the head. The characteristics of the patients included in the study are detailed in Table 2.

SA with IN ketamine was successful in 29 out of 35 patients (82.8%), as assessed by achieving a Ramsay score of ≥ 2 and Campbell score of ≤ 3. In these patients, neither local infiltration nor the use of a PVL was required. SA via the IN route without additional local anesthetic was unsuccessful in six patients (17.2%). Among these, three patients (8.5%) required local anesthetic infiltration in addition to IN ketamine, while two patients (5.7%) required PVL placement and IV ketamine administration. One patient received both local anesthesia and IV ketamine. Adverse effects occurred in 17.2% (6/35) of the children, with vomiting being the most

TABLE 2. Demographic data and clinical characteristics of patients who received procedural sedation and analgesia with intranasal ketamine. N: 35.

Variables	n (%)
Sex	
Male	24 (68.6)
Age (years)	
Median (p25 – p75)	5 (3-8)
Wound location	
Face/Forehead	11 (31.4)
Scalp	9 (25.7)
Upper limb	6 (17.1)
Lower limb	9 (25.7)
Weight (kg)	
Median (p25-p75)	21 (16-27)
PMH	
Yes	2 (5.7)
No	33 (94.3)
Allergy	2 (5.7)

PMH: personal medical history.

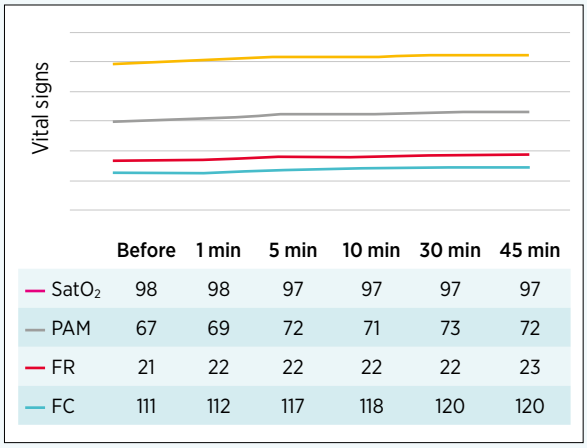

FIGURE 1. Mean variation of vital signs during procedural SA.

common, observed in 14.3% (5/35). One patient (2.9%) experienced arterial hypertension. These data are summarized in Table 3.

The SA operator was a second-year pediatric emergency medicine fellow in 31 out of 35 procedures and a senior emergency physician in the remaining four procedures. The suture operator was a pediatric resident in all cases. The mean total sedation time was 29.8 minutes (±8.95), while the mean total suture time was 10.3 minutes (±3.57).

The mean values of vital signs (SpO_2, BP, RR, and HR), recorded before the procedure and at 1, 5, 10, 30, and 45 minutes, are presented in Figure 1. The mean time to achieve SA before initiating wound repair was 10 minutes. Specifically, the mean time to achieve a Campbell scale score of ≤ 3 was 10 minutes (±0.7 SD), and the mean time to reach a Ramsay scale score of ≥ 2 was 10 minutes (±0.5 SD). Among the patients with successful SA using IN ketamine, seven out of 29 (24.1%) reported no pain at the end of the procedure, while 22 out of 29 (75.9%) reported mild pain.

TABLE 3. Patients with successful and unsuccessful outcomes of intranasal ketamine as a sole medication and associated adverse effects.

Variables	n (%)
***Adequate SA n (35)**	
Yes	29 (82.8)
Local anesthesia + IN Ketamine	
Yes	3 (8.5)
***PVL + IV Ketamina**	
Yes	2 (5.7)
Local anesthesia + IV Ketamine	
Yes	1 (2.8)
***Pain n (29)**	
No pain	7 (24.1)
Mild	22 (75.9)
Adverse effects	
Vomiting	5 (14.3)
AHT	1 (2.9)

***Adequate SA:** SA achieved with a level of sedation measured with a Ramsay scale ≥ 2 points and analgesia measured with a Campbell scale ≤ 3 points; **PVL:** peripheral venous line; **IV:** intravenous; **Pain:** assessed using the Wong-Baker scales in children ≤ 7 years and numeric score in children older than 7 years.*

TABLE 4. Degree of physician satisfaction with the administration of intranasal sedation and analgesia.

Variables	n (%)
With the level SA	
Dissatisfied	0
Not very satisfied	2 (5.7)
Neutral	1 (2.9)
Satisfied	10 (28.6)
Very satisfied	22 (62.9)
With the procedure duration	
Dissatisfied	0
Not very satisfied	2 (5.7)
Neutral	9 (25.7)
Satisfied	9 (25.7)
Very satisfied	15 (42.9)
With the lack of need for IV SA	
IDissatisfied	1 (2.9)
Not very satisfied	1 (2.9)
Neutral	0
Satisfied	8 (22.9)
Very satisfied	25 (71.4)
With the lack of need for local anesthesia	
Dissatisfied	0
Not very satisfied	7 (20)
Neutral	3 (8.6)
Satisfied	5 (14.3)
Very satisfied	20 (57.1)

SA: Sedation and analgesia; IV: intravenous.

Physician satisfaction with IN SA (the level of sedation achieved, duration, no need for PVL placement, and no need for local anesthetic infiltration in the wound) was evaluated using a Likert scale, as shown in Table 4.

None of the patients had prior experience with SA, and all caregivers (35/35) indicated they would consent to similar

procedural SA in the future. In the satisfaction survey, 94% (33/35) of caregivers reported being satisfied or very satisfied with the procedure; one caregiver was indifferent, and one reported being not very satisfied. No caregiver expressed dissatisfaction.

DISCUSSION

The administration of IN SA with ketamine in the PED resulted in a significant reduction in pain scores, achieving adequate sedation levels in the majority of patients without requiring local lidocaine infiltration into the wounds.

Previous studies on SA with IV ketamine[10,11] have demonstrated that using ketamine without local anesthetic infiltration offers advantages, including reduced costs (supplies and drugs) and avoidance of potential adverse effects associated with lidocaine administration. The undesirable effects of lidocaine include local reactions, such as pain, edema, hematomas, hyperalgesia, and muscular trismus, as well as systemic effects such as seizures, arterial hyper- or hypotension, and respiratory depression[21,22]. In this context, IN ketamine appears to provide a safer and more cost-effective alternative.

In our patients, IN procedural SA avoided the need for PVL placement in eight out of ten cases, providing clear benefits by reducing the anxiety and pain associated with line placement. Although not specifically evaluated in our study, the IN technique may also result in resource savings, despite potentially increasing administration time for nursing staff. Nevertheless, this approach simplifies the process by eliminating the need for IV line placement, which represents a significant advantage in high-demand settings.

Several studies support IN administration of ketamine as a safe and effective method for procedural SA for procedures performed outside the operating room[28]. The benefits of atomized administration include reduced drug loss in the oropharynx, higher ketamine concentrations in the cerebrospinal fluid, and greater patient acceptability[29]. As such, the IN technique offers advantages over other routes of administration, such as IV or intramuscular routes.

With regard to the dose of IN ketamine, several studies have demonstrated the effectiveness of doses of 3 mg/kg, 6 mg/kg, and 9 mg/kg[18,20]. However, a study by Tsze et al. suggested that a dose of 3 to 6 mg/kg may not be sufficient to achieve adequate sedation, as assessed by the Ramsay score, during simple wound suturing procedures in the PED[19]. In our study, a dose of 7 mg/kg was used, which proved effective for most patients, although the findings by Tsze et al. indicate that higher doses might be required in certain cases.

An operational challenge was the pharmacological presentation of ketamine in our setting, which is 50 mg/ml. This required administering the drug in aliquots to avoid exceeding the maximum recommended volume. To ensure tolerability and minimize discomfort from repeated IN doses, a maximum dose of 200 mg (equivalent to 4 ml) was established.

The time required to achieve adequate sedation in our patients was approximately 10 minutes, which is longer than the onset time reported in studies using IV ketamine, where sedation is typically achieved within one to two minutes. This difference may be attributed to the need to administer the drug in sequential doses due to its pharmacological presentation. However, some studies have reported comparable sedation times for both methods of administration[30,31].

The mean time required to complete wound repair was 10 minutes, which was shorter than the duration of SA. This finding suggests that a shorter sedation period may be sufficient for suturing minor wounds, potentially reducing the risk of adverse effects.

The Ramsay scale has been used in numerous studies on SA with ketamine[19,32] and was valuable in assessing sedation in our study. The effects of ketamine are classified into different ranges: analgesic dose, recreational dose, partially dissociative dose, and dissociative dose. In minor procedures, patients may experience partial or complete dissociation. Partial dissociation occurs when the dose is insufficient for complete dissociation but still affects the patient's consciousness, partially disconnecting them from external stimuli. Complete dissociation, which is typically the goal in painful procedures or during endotracheal intubation, fully isolates the patient from external stimuli[33].

The pain perceived by patients at the end of the procedure was reported as either absent or mild. This result may have been influenced by ketamine-induced amnesia, which limits the reliability of pain assessment at this time. However, measurements taken during the wound repair procedure, using the Ramsay and Campbell scales, indicated that SA was adequate for wound repair in our patients.

Regarding adverse effects, vomiting was the most frequent, occurring more often than in other studies using IV or intramuscular doses of ketamine[34,35]. This finding suggests the need for further research with comparatively lower doses of IN ketamine to determine whether the incidence of vomiting can be reduced. One patient developed arterial hypertension during the procedure, which improved within 30 minutes without the need for additional medical intervention.

The satisfaction survey indicated that physicians were highly satisfied with the implementation of this technique, as were parents and caregivers, who stated that, if necessary, they would choose this method again for their children. This is a positive indication of the technique's acceptance in both clinical and family settings.

Although the use of topical anesthetics applied to wounds remains the standard in many developed countries, the IN alternative is valuable in settings where these anesthetics are unavailable. In the case of suturing in the PED, SA with IN ketamine has recently been explored by Rached-d'Astous et al. in Canada[36]. The advantage of performing SA in a single step with a single, fast-acting drug is particularly beneficial in high-demand settings.

This study has limitations inherent to its observational design. Since only one dose of ketamine was used, it was not possible to determine the optimal dose for this type of procedure. In addition, the use of convenience sampling and the small sample size may have introduced biases that affect the generalizability of the results. Nevertheless, we consider the results obtained to be of interest, as they demonstrate the feasibility of IN SA in wound repair with fewer supporting steps. These findings could serve as a foundation for future,

larger studies exploring efficacy, ideal dosing, and the most appropriate age range for its application.

CONCLUSION

A dose of 7 mg/kg of IN ketamine, administered via a MAD Nasal™ atomizer, achieved a satisfactory level of SA in 80% of the included pediatric patients during wound repair, without the need for local infiltration or IV access. These findings should be validated in controlled studies.

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WORKING GROUP

Triage working group of the Spanish Society of Pediatric Emergency Medicine: the key to urgency

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Triage is an essential process for the safe and efficient use of an Emergency Department. A research study conducted by Fernández et al. in 2016 (unpublished), pointed out the coexistence of different systems used in Pediatric Emergency Departments (PEDs) that are members of the Spanish Society of Pediatric Emergency Medicine (SEUP), as well as a considerable variability in the training and learning methods received by the professionals who perform this process.

At that time, the SEUP did not have a group dedicated exclusively to this aspect of care. In 2020, the Triage Working Group (WG) was established with the primary goal of focusing on this area. Its key objective is to develop clear criteria for the triage process and to promote its standardization through various training and research initiatives.

This is the first SEUP WG led by a nurse. The decision to have a nurse lead the group is based on the fact that currently hospital triage is mainly performed by nurses. Their experience, education, and specialized training bring valuable insights to the research and training activities undertaken by the group. However, given the multiprofessional nature of pediatric care, the inclusion of pediatricians was also essential.

The group began with nine members from seven different centers, seven of whom were nurses. It has since expanded to 16 members from 10 hospitals (Figure 1), and we hope to continue growing in the coming years.

We started in this group by analyzing the triage practices in Spanish PEDs through a cross-sectional, descriptive, multicenter study conducted in 2020, using an ad-hoc electronic survey distributed to the 86 centers affiliated with the SEUP, based on the survey developed by Fernández et al. in 2016. A total of 25 centers participated, resulting in two scientific publications, which were published in the journal *Emergencias Pediátricas* in 2023.

Firstly, the scientific letter titled **"Características del triaje en los servicios de urgencias pediátricos en España"**[1] (Characteristics of Triage in Pediatric Emergency Departments in Spain) highlights the persistent variability in several aspects of triage, including the type of Triage System (TS) used, the software employed, and the materials available. The study revealed that one in five centers lacked a dedicated pediatric triage area, and in one in 10 centers, pediatric patients shared a waiting room with adults. Moreover, in over two-thirds of the centers, it was not possible to observe pediatric patients in the waiting room from the triage station, despite this being a requirement of the SEUP triage protocol[2].

Secondly, the article **"Características asistenciales y formativas del personal que realiza triaje en ED de pediatría en España"**[3] (Care and Training Characteristics of Staff Performing Triage in Pediatric Emergency Departments in Spain) shows the variability in the education and training of professionals responsible for triage, which is predominantly acquired within the PED itself. There is significant variation in the required length of experience for performing triage, the number of consecutive hours dedicated to triage, and whether professionals are exclusively assigned to this role. Advanced triage is commonly performed, with the prescription of medication by nurses standing out as a key activity.

These findings motivated the SEUP Working Group (WG) to create the **document Essential Requirements for Pediatric Triage**[4], to ensure the quality of triage processes across all Spanish PEDs.

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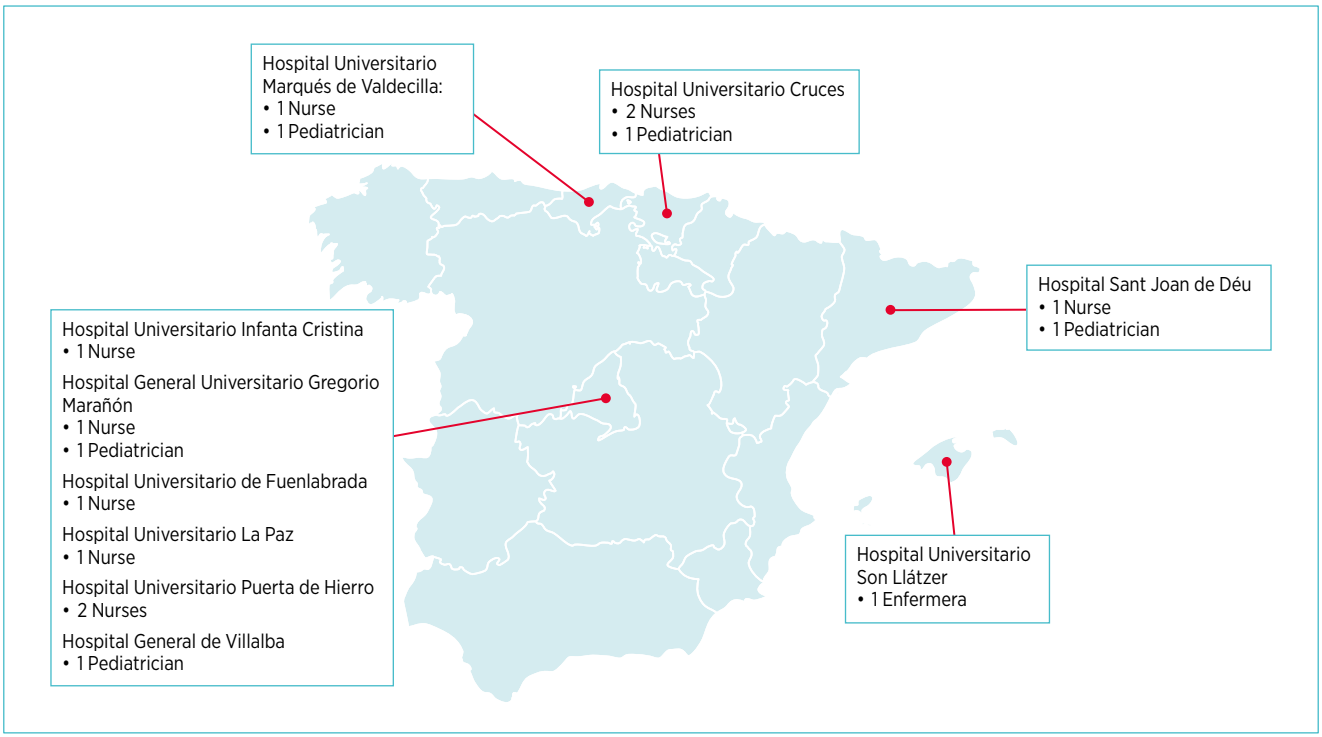

FIGURE 1. Map of the members of the Triage Working Group of the Spanish Society of Pediatric Emergency Medicine.

Although the implementation of a Triage System (TS) is recommended in all PEDs, it becomes essential when patient demand exceeds available care resources. A TS serves as a quality indicator of risk-effectiveness for hospital emergency departments, facilitating the distinction between perceived urgency and true urgency or emergency.

Among the key requirements of an ideal pediatric TS is the implementation of a structured TS with demonstrated validity, reproducibility, and usefulness. The system should be a quick and easy-to-use tool with a strong predictive value for assessing urgency/severity, clinical progression, and the resources required. Furthermore, pediatric TSs should incorporate the Pediatric Assessment Triangle into the triage process.

The professional performing triage should possess essential educational, ethical, and personal qualities. They must be specifically trained in the assessment, treatment, and management of pediatric emergency conditions. Additionally, they should demonstrate empathy, resilience, and a commitment to confidentiality, as well as strong observational and listening skills. Effective communication is also a key requirement.

The triage process should be designed to function continuously, operating 24 hours a day, 365 days a year. It must meet minimum standards to ensure the accurate prioritization and appropriate allocation of patients based on the assessment conducted.

With regard to infrastructure, triage should be conducted in a designated, clearly identified area that meets minimum size and material requirements. Its architecture should facilitate the effective assessment of the patient's level of urgency. Patient privacy and the safety of professionals must be ensured. Additionally, the triage area should be strategically located and connected to enable staff to monitor patient arrivals and the waiting room and ensuring quick access to the stabilization room.

The implementation of a TS in a PED requires a multidisciplinary team to establish a timeline for the following phases: selecting the classification system and the computer application tool, training triage personnel, designing or selecting quality indicators to monitor its operation, drafting a theoretical reference document on the triage process and patient flowcharts, and, finally, scheduling its implementation. Prior to this, it is essential to inform both professionals and families about the planned changes.

The Triage WG has prepared a manuscript detailing the development of the essential requirements document, which is currently pending publication. Additionally, the group is conducting a multicenter research project to assess compliance with these requirements in Spanish PEDs.

Other projects undertaken by the group include the development of five do-not-do recommendations5, created in coordination with the other SEUP working groups. These recommendations are based on the results of previously described studies and the available scientific evidence on good practices (Figure 2).

As training activities are one of our objectives, we conducted the workshop **"Triage, the key to emergency care: cases and role-playing, do you dare?"** at the 2024 SEUP Meeting. The workshop was highly successful, reaching full capacity and receiving positive feedback in the surveys conducted. As a result, it will be held again at the 2025 SEUP Meeting.

We are currently collaborating with the Quality Improvement WG on a document outlining quality indicators in triage, as well as a consensus document on Advanced Triage

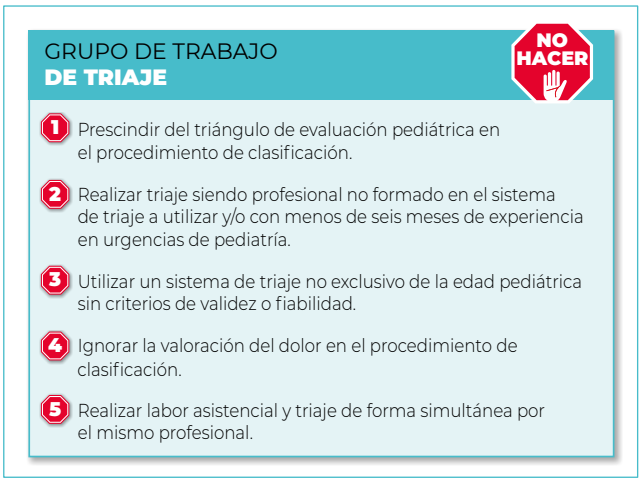

FIGURE 2. Do-not-do recommendations of the Triage Working Group of the Spanish Society of Pediatric Emergency Medicine.

and the WG's position on medication prescription by triage nurses in the PED.

Although we are a newly formed and small WG, we remain committed to enhancing this critical area of pediatric emergency care. We welcome the participation of new members from centers not yet represented, as their involvement will further enrich our efforts.

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SCIENTIFIC LETTER

Neonatal visits to the Pediatric Emergency Department of a tertiary hospital: changes over the last 20 years

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INTRODUCTION

Neonatal patients are particularly vulnerable, facing potential complications inherent to this early stage of life, beyond their presenting concerns. Consequently, when using the five-level triage system in the Pediatric Emergency Department (PED), they are often assigned to higher urgency categories, such as levels 2 (emergency) and 3 (urgent). However, studies indicate that a considerable proportion of neonatal PED visits involve non-urgent conditions or parental concerns that could be effectively addressed in other healthcare settings[1-5]. Most of these studies were conducted over five years ago and in different settings. Recent developments, such as the implementation of early discharge protocols in maternity wards[6], changes in maternal demographics (an increase in late primiparous women[7], more pregnancies achieved through assisted reproduction[8,9], and a growing immigrant population[10] ...) and the appearance of the SARS-CoV-2 pandemic[4], may have influenced the frequency and reasons for neonatal visits to PEDs.

In 2003, a review of the reasons for neonatal visits was conducted in our PED[5], and the aim of the present study was to analyze the changes in the patterns of these visits 20 years later.

We present a descriptive-observational study conducted in the PED of a tertiary-level maternal and child hospital in Barcelona. The study included neonatal visits (patients under 29 days of age) managed in 2022. Patients seen only by the Surgery and Traumatology Departments were excluded. After receiving approval from the Hospital Ethics Committee (PIC-161-22), the electronic medical records of the patients were reviewed. The data were then compared with those from the 2003 study[5]. In both periods, the data extracted were analyzed using the IBM® SPSS® Statistics for Windows® software. Tests were applied to assess data distribution (Kolmogorov-Smirnov), compare quantitative data (Student's t-test, Mann-Whitney U test), and compare qualitative data (χ^2, contingency table, Fisher's exact test). P-values of < 0.05 were considered significant.

In 2022, a total of 95,054 pediatric visits were attended in the PED, of which 1,737 (1.8%) were for neonates. These visits corresponded to 1,486 patients, with a return visit rate of 14.5%. The mean age was 14.7 ± 7.7 days (421 [24.2%] ≤ 7 days, 478 [27.5%] 8-14 days, 414 [23.8%] 15-21 days, and 424 [24.4%] 22-28 days); 933 (53.7%) were male. In 309 (17.8%) cases, the neonates had been previously seen by another physician who referred them to the PED for evaluation. The distribution of visits by day and month was fairly homogeneous. As for the time of day, 473 (27.2%) visits occurred between 06:00 and 14:00, 832 (47.9%), between 14:00 and 22:00, and 432 (24.9%) between 22:00 and 06:00. The most frequent reasons for visits were upper respiratory tract symptoms (207; 11.9%) and crying/irritability (194; 11.2%). A diagnostic test was performed in 855 (49.2%) cases. The most frequent diagnoses at discharge from the PED were upper respiratory tract infection (247; 14.2%) and jaundice (147; 8.5%), while in 305 (17.6%) cases no disease was found. There were 404 (23.3%) admissions, mainly for bronchiolitis (117; 29%). The proportion of patients admitted was higher

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The study was presented as an oral communication at the XXVII Meeting of the Spanish Society of Pediatric Emergency Medicine (Las Palmas de Gran Canaria, May 2023).

TABLE 1. Comparison of the characteristics of neonatal visits between 2003 and 2022.

Characteristics	2003 (n= 1481)	2022 (n= 1737)	p
Age ≤ 7 days	17.7%	24.7%	***< 0.001***
Male sex	53.7%	53.7%	*1*
Referred by another physician	24.5%	17.8%	***< 0.001***
Time 14-22 h	43.3%	47.9%	***0.009***
Diagnostic studies	45.9%	49.2%	*0.061*
Blood analysis	28.2%	24.9%	***0.035***
Urinalysis	29.7%	23.5%	***< 0.001***
CSF analysis	10.3%	6.2%	***< 0.001***
Chest X-ray	14.7%	1.7%	***< 0.001***
Respiratory virus testing	12.2%	22.9%	***< 0.001***
Hospital admission	26%	23.6%	*0.072*

among referred patients (45.4% vs. 18.3% of those who came on their own initiative; p< 0.001).

Compared to 2003, no significant differences were observed in the prevalence of neonatal visits (1.9%; p= 0.256), the rate of return visits (15.8%; p= 0.301), or the proportion of admissions among referred patients (40.7%; p= 0.222). Table 1 and Figure 1 present the comparative clinical-epidemiological characteristics of the patients across the two periods.

This study shows that neonatal visits continue to be frequent in the PED, with an increase parallel to that of the total number of PED visits, contrasting with the decline in the birth rate in our country in recent decades[11]. One possible cause could be the increased difficulty of accessing primary care centers in 2022 due to the SARS-CoV-2 pandemic[4], which would also explain the decrease in the number of patients consulting their family physician. Likewise, the widespread practice of early discharge from maternity wards may have contributed to this. There was a notable increase in the number of visits during the first week of life, as well as in the number of visits in which no disease was detected. With a shorter hospital stay, families may receive less training in the care of healthy newborns, and in the event of any concerns, their anxiety may increase, prompting them to consult a healthcare professional.

On the other hand, a redistribution of reasons for visits, admissions, and discharge diagnoses was observed, with an increase in respiratory diseases, likely also a consequence of the SARS-CoV-2 pandemic[4]. The changes in the number and types of diagnostic investigations detected would align with this trend.

The main limitations of the study are related to its retrospective and single-center design.

In conclusion, the increase in the number of visits during the first week of life and in visits where no objective disease was identified should be noted. These trends may be related to early discharge from maternity wards and concerns regarding basic neonatal care.

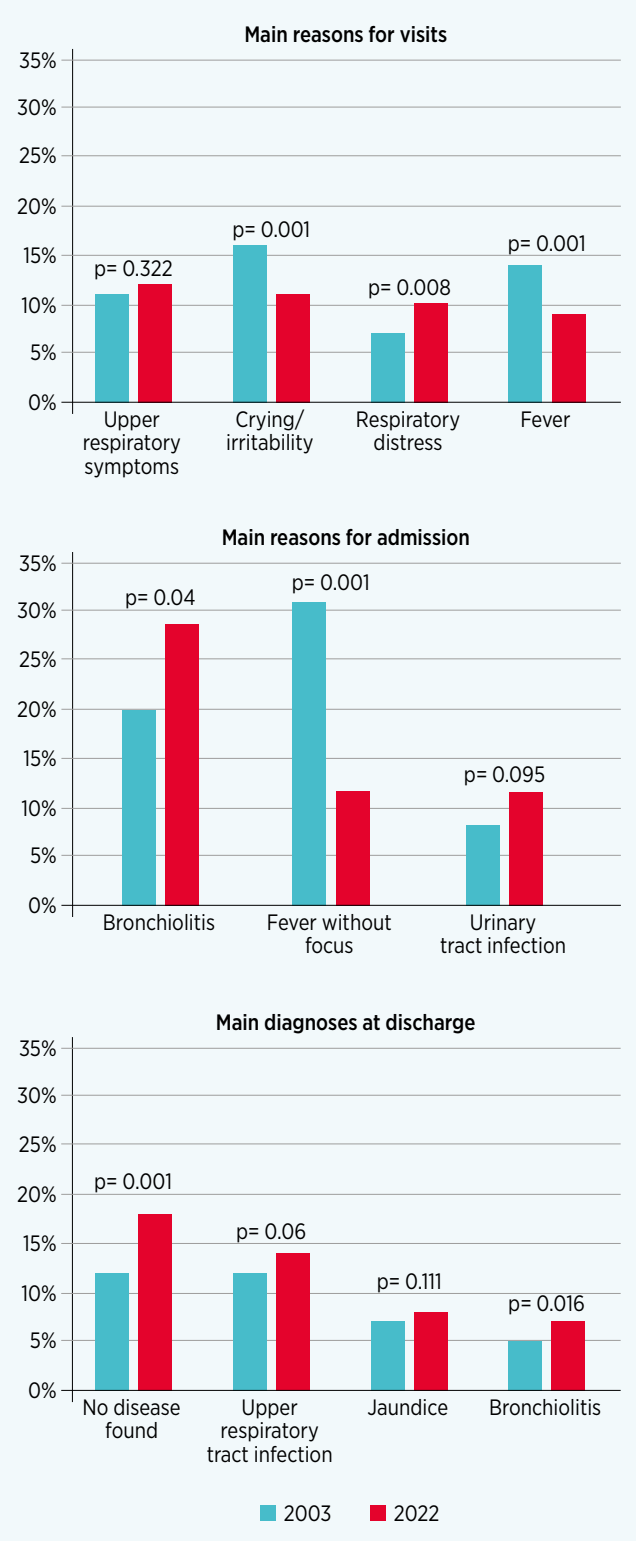

FIGURE 1. Comparison of the main reasons for visits, reasons for admission, and discharge diagnoses of neonates seen in the Emergency Department between 2003 and 2022.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest and have not received any funding related to the work undertaken.

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LETTER TO THE EDITOR

Artificial Intelligence: on the verge of revolutionizing Pediatric Emergencies

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In recent years, Artificial Intelligence (AI) has emerged as a revolutionary tool in many fields, including medicine[1-3]. AI consists of computational mathematical systems and algorithms designed to simulate human capabilities. These systems process large volumes of data to identify patterns, make predictions, and automate complex tasks with great efficiency and precision. The great breakthrough in AI lies in the improvement of Machine Learning, a branch of AI that allows systems to program, adapt, and improve autonomously from data[1]. This has enabled the design of complex Deep Neural Network systems (Deep Learning)[4] that emulate human brain function to perform complex tasks such as image recognition, Natural Language Processing, or the generation of new content (Generative AI)[5].

In the context of Pediatric Emergency Medicine, AI has demonstrated its potential by improving and automating various areas[6,7], such as the development of more specific and objective triage systems for better patient prioritization[8], early prediction of hospitalization to reduce patient overcrowding[9-11], early prediction of patient severity to improve urgent care or transfer to an Intensive Care Unit[10,12], support for the preparation of clinical documentation that reduces the non-care workload of professionals[13], analysis of imaging tests such as X-rays[14], support in patient diagnosis[15], early detection of specific diseases such as sepsis[16], the selection of the best therapeutic plan for each patient[17], among others. The list of publications on new applications is growing rapidly, thanks to AI itself which facilitates the creation of scientific publications[18].

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On the other hand, AI poses certain ethical and practical challenges[1]. Given its complexity and automatic programming, it often presents operational opacity (black box), which generates mistrust. Additionally, there are doubts about the legal responsibilities of decisions made by AI[19]. The information used to develop AI systems is fundamentally based on biased data from specific populations, mostly adults, which should be considered when using AI in pediatric populations[20]. There is a legal requirement regarding copyright and data privacy used to develop AI, which should be monitored when using and providing data to AI[19]. Finally, the integration of AI into clinical workflows demands profound changes in processes and specialized training for professionals.

In summary, the implementation of AI faces great challenges, but its potential to transform Pediatric Emergency Medicine at clinical, management, and workload levels is undeniable. For this reason, every healthcare professional should contribute to the proper development of AI in Pediatric Emergency Medicine, as it seems we are witnessing a singular moment in history.

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LETTER TO THE EDITOR

Much more than a recognition, Emergency and Emergencies specialty

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I would like to take this opportunity to once again extend my congratulations, on behalf of the Spanish Society of Pediatric Emergency Medicine (SEUP), on the well-deserved and definitive establishment of the specialty of Emergency Medicine in our country.

As the author states, "the year 2024 has been the year," with Spain joining 34 other European countries in establishing the specialty of Emergency Medicine. This achievement marks the culmination of a long process involving the efforts of various public administrations, particularly the explicit support of the autonomous communities and the invaluable collaboration of Scientific Societies, including the SEUP.

The Spanish Association of Pediatrics advocates for the recognition of 19 ACEs (Areas of Specific Training), and in December 2024, the Ministry issued the royal decree for the ACE in Neonatology. This marks a year of celebration, with two significant milestones in 2024 that demonstrate we are on the right path. The establishment of the Emergency Medicine specialty will ensure that Spanish patients receive care from specialists with regulated, standardized, and recognized training, regardless of their location. Furthermore, the recognition of the ACE in Neonatology is expected to enhance the quality of life for neonates and reduce their morbidity and mortality rates, as has been observed in other countries.

Similarly, both the Emergency Medicine specialty and the ACE in Neonatology will lead to the standardization of our professionals with those in other European countries, facilitating professional exchange and mobility. In addition, this will enable better planning of human resources in both the short and long term, which is essential for the financial sustainability of our National Health System.

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Finally, in the case of ACEs, it will be possible to define the positions to be filled with professionals possessing the appropriate skills, always within accredited teaching centers. However, there are critical aspects that must not be overlooked, such as a structured training calendar and the evaluation of training. Emergency Medicine must address urgent and emergency needs across all age groups, including children. This is particularly important as many emergency physicians work in lower-complexity hospitals without pediatricians. Consequently, it would be an excellent opportunity for the SEUP to collaborate in developing a training program tailored to emergency physicians who care for children in their daily practice. Such a program would not only ensure the effective and safe care of pediatric patients but also enhance the value and recognition of training within the specialty.

The SEUP is making significant efforts to achieve its ACE, with the necessary documentation already submitted to the regional ministries. This represents the right path forward, as the substantial advances in recent decades have necessitated the acquisition of specific competencies and the incorporation of highly specialized knowledge and techniques, whose mastery requires dedicated training in accredited centers. These recognitions mark a clear advancement in our healthcare system, and by working together, progress will become more achievable. My sincere congratulations.

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LETTER TO THE EDITOR

Parallel stories: accreditation of Pediatric Emergencies in Latin America

Eugenia Argentina Álvarez Gálvez

President of the SLEPE. Chair of the Pediatric Emergency Department, Hospital general San Juan de Dios. Coordinator of the Postgraduate Course of Pediatrics. Universidad de San Carlos de Guatemala. Guatemala

Dear Editor:

After reading with great pleasure the editorial, "The Specialty of Emergency Medicine, 50 Years Later," which clearly outlines the evolution of both general and pediatric emergency medicine in Spain, I observed similarities in the development of pediatric emergency medicine in Latin America. Your review highlights the importance of this specialty—referred to as a "super-specialty" due to its complexity—in health systems. In many regions, particularly in middle- and low-income areas, pediatric emergency medicine often serves as the first and sometimes only point of access to healthcare, becoming the welcoming face of public health systems.

Super-specialized care, with dedicated areas and highly trained personnel, directly impacts the quality of care provided to patients. The March 2024 WHO report[1] indicates that in 2021, the infant mortality rate for children under five reached a historic low. This demonstrates that providing accessible, high-quality healthcare services with qualified personnel is an effective strategy that objectively improves child health outcomes.

Emergency medicine is an integral part of the pediatric curriculum and has developed alongside it[2]. In Latin America, the growth of pediatric emergency medicine varies across countries. However, there is a clear trend of increasing recognition and certification of the specialty in the region. According to a 2018 study by Kohn Loncarica et al.[3], the specialty was first recognized and accredited in Mexico in 2006. Between 2010 and 2015, it gained recognition in Peru, Costa Rica, Uruguay, Argentina, Brazil, Paraguay, and the Dominican Republic. Gradually, the path to specialized care in emergency medicine is being established throughout Latin America.

Likewise, as you mention, scientific societies play a crucial role in promoting the growth of the specialty by defining international quality standards for its practice[4].

In 2016, the Latin American Society of Pediatric Emergency Medicine (SLEPE) was founded in Uruguay. This scientific society aims to promote, disseminate, and advance the development of pediatric emergency medicine. Many countries are part of SLEPE, which contributes positively to this effort through courses, conferences, publications, and research.

Care in the emergency department is complex and is expected to become even more so. Specialists in this field must develop specific competencies to manage life-threatening injuries and diseases, particularly those prevalent in the pediatric population[5,6], such as acute diarrheal illness, dehydration, respiratory diseases, shock, malnutrition, trauma, psychiatric disorders, and substance abuse, among others.

Similarly, the advancement of other specialties, such as neonatology, cardiology, and intensive care, has enabled more children with severe and complex conditions to survive, resulting in a growing population of complex chronic patients who will inevitably seek care in pediatric emergency services.

As pediatricians, we understand that health strategies focused on preventing childhood diseases—such as promoting safe delivery, nutrition, breastfeeding, vaccination, and access to clean water and sanitation—should be the cornerstone of child health. However, timely access to high-quality emergency care for critically ill children is equally essential to saving lives.

We have made significant progress in achieving recognition for the specialty of emergency medicine, but considerable challenges remain. These include ensuring that the specialty is accredited in all countries, addressing overcrowding in emergency services caused by limited access to

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healthcare, insufficient availability of hospital and intensive care unit beds, understaffing, and staff burnout[6,8].

Our goal must be to provide optimal care for critically ill children, with highly trained personnel and dedicated emergency areas designed for that purpose[8-10]. This is the ultimate goal of emergency medicine. It is not a luxury... it is a necessity.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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OBITUARY

Prof. Dr. Osvaldo Bello (1947-2024)

On December 10, 2024, Dr. Osvaldo Bello, affectionately known as "Profe Bello" by the pediatric community, passed away in Montevideo, Uruguay. A pediatrician, intensivist, neonatologist, and emergency physician, he was instrumental in advancing pediatric emergency care in Uruguay and throughout Latin America.

Beginning his career in the care of critically ill patients in pediatric and neonatal intensive care units (Hospital Filtro, the Pediatric Intensive Care Unit [NICU] of Centro Hospitalario Pereira Rossell, and the Instituto de Diagnóstico y Asistencia Pediátrica Especializada [IDAPE] at Hospital Español), he was known for his dedication to his patients, his commitment to elevating the role of nursing care, and his thorough analysis of issues related to the unique needs of these patients. His distinctive handwriting in the clinical records of the NICU and IDAPE reflected a thoughtful reasoning that demonstrated his deep knowledge and therapeutic approaches, which were closely followed by his colleagues. In 1984, the publication of the book *Enfermería Pediátrica – Insuficiencia Respiratoria Aguda,* co-authored with nursing graduates, already showed his interest in publishing scientific texts and articles.

Those of us who experienced the challenges of caring for pediatric patients in emergency care settings during the 1980s at his beloved Pereira Rossell Hospital —with severe deficiencies in all aspects, including physical facilities, equipment, trained human resources, and management— recognize a turning point when Osvaldo assumed the role of Head of the Pediatric Emergency Department in 1988. His appointment marked the beginning of a new era. Until then, it had been a neglected area, where young interns and a small group of dedicated pediatricians worked tirelessly to address the difficulties.

Osvaldo surrounded himself with colleagues and created a strong team, got the support of the authorities to manage and develop the Pediatric Emergency Department, introduced care protocols, and traveled to reference centers to observe firsthand how pediatric emergency care operated in more developed countries. This marked the beginning of a productive relationship with hospitals and pediatricians in the United States, Europe, and Latin America.

Together with his team, he enhanced the Pediatric Emergency Department at the Pereira Rossell Hospital by establishing specific areas, including an Inhalation Therapy Unit, Resuscitation and Stabilization Area, Observation Area, and Triage, as well as implementing management processes. At the time, these initiatives were pioneering in both the country and the region.

In addition to fostering connections with his intensivist colleagues through the Latin American Society of Pediatric Intensive Care and co-founding the Uruguayan Society of Neonatology and Pediatric Intensive Care, his passion for pediatric emergency care became increasingly evident and impactful.

Publications in national and international scientific journals, contributions to national textbooks and specialty manuals, chapters in international books, as well as guides and guidelines on Pediatric Emergency Medicine, along with his active participation in national and international congresses through lectures, conferences, and case presentations, strengthened Osvaldo's leadership in Uruguay and across Latin America. The book *Urgencias y Emergencias Pediátricas,* co-authored with Sehabiague, De Leonardis, and Prego, was a landmark in Uruguay and became an essential reference for pediatricians working in emergency care, as well as the book Agua y Sal, co-authored with Prego.

He was the founder of the *Sociedad Integrada de Emergencia Pediátrica del Uruguay* (Integrated Pediatric Emergency Society of Uruguay), which is now in its seventeenth edition, providing Uruguayan pediatricians with the opportunity to learn from and connect with leading national and international experts, alongside colleagues from the region who have since joined the initiative.

Always driven and innovative, he was distinguished by his commitment to teaching the discipline from its early days, both in the healthcare setting and later through academic recognition by the School of Medicine at the University of the Republic. He became the first Professor of Pediatric Emergency Medicine, established the postgraduate course in the

specialty, and advocated for the creation of the Pediatric Emergency Medicine residency program.

Together with his team, he traveled across Uruguay, conducting academic activities that were always warmly received by colleagues. He was instrumental in founding Pediatric Intensive Care Units in various departments outside the capital and in establishing Alternative Pediatric Emergency Services, as well as a Network of Inhalation Therapy Units in Montevideo and the metropolitan area. He also had the interest to elaborate projects on Specialized Pediatric Transfer addressed to national authorities, still to be completed.

His connections and recognitions enabled him to travel to nearly all Latin American countries, where he visited hospitals and engaged with the leading experts in Pediatric Emergency across the region. He actively participated in conferences and congresses and was also a member of the Pediatric Simulation Interest Group (GISP).

He played an active role in the initiative to establish the Latin American Society of Pediatric Emergency (SLEPE), marking a significant milestone in his career as an emergency physician. This vision, shared with several colleagues, was officially inaugurated in 2016 in Montevideo during the *XIII Jornadas Integradas de Emergencia Pediátrica.* From there, SLEPE began to grow, undertaking numerous activities, including congresses, courses, training programs, scholarships, internships, and the creation of the journal *Emergencias Pediátricas* in collaboration with the Spanish Society of Pediatric Emergency Medicine, as well as the development of key documents and protocols. Today, SLEPE is a reality and has become a leader in the region. Its first congress, held in Montevideo in 2018, was a landmark event, attracting distinguished colleagues from the United States, Europe, and Latin America.

Those of us who had the honor and privilege of knowing Osvaldo, working alongside him at the Pereira Rossell Hospital, and collaborating to advance Pediatric Emergency Care in our country and the region, sharing complex and sometimes painful situations, overcoming barriers and obstacles, but also having lived great and joyful moments, feel proud to have been part of his team.

We cannot overlook his passions for football and horse racing, the camaraderie shared with friends and colleagues, and his dedication to his family, who supported him unconditionally.

There are undoubtedly many aspects of his career and personal life that have not been mentioned in these lines. Those who knew him will surely recall and cherish these memories, keeping them close to their hearts.

At the conclusion of his tenure as Full Professor in April 2012, during a session in the meeting room of the Council of the School of Medicine at the University of the Republic, he ended an outstanding presentation with the following words: “I must also thank MY DISCIPLES, from whom I have learned so much. One does not know who their true disciples are—they do. I never felt I was their teacher. It is the disciples who, one day, recognize the teacher, and that recognition often takes time.”

All of us who had the privilege of knowing him see ourselves as his disciples and recognize Osvaldo as our teacher and mentor. We will never forget him and will always hold him in our thoughts, carrying forward the responsibility of continuing the path paved by “Profe Bello.”

Prof. Dr. Javier Prego
February 2025. Montevideo, Uruguay

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