

MEDICATING CHILDREN IN PAIN: A JOINT EXERCISE BETWEEN EMERGENCY
PERSONNEL

By
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Abstract

This service learning thesis was informed by a literature review, University of Arizona Emergency Services guidelines and expert consultation to design a curriculum to explore and address inadequate prehospital pain management in pediatric patients, emphasizing the emotional, clinical, and systemic challenges faced by EMS providers. Jeruzal et al. (2019) identified the emotional strain pediatric cases place on EMS providers, particularly when managing distressing pain in children and their families. These emotional burdens were compounded by the technical difficulties of managing pediatric trauma and pain, highlighting the need for enhanced training, better feedback systems, and recovery processes. Similarly, Holmström et al. (2019) underscored the emotional and logistical barriers experienced by prehospital nurses in pediatric care, especially regarding pain assessment, caregiver reactions, and heavy workloads. Both studies stressed the necessity of tailored training programs, reflection and repetition of local administrative guidelines, and emotional resilience strategies to improve care quality for sick children and overall provider well-being when reflecting on pediatric calls.

Eimer et al. (2023) presented a quantitative analysis revealing significant disparities in prehospital pain management between pediatric trauma and non-trauma patients—indicating that children are not adequately medicated for pain. The study found that both children with traumatic complaints and medical complaints were not adequately medicated, but children with medical complaints reported even worse pain scales upon assessment to a significant extent, indicating medication under dosage (Eimer et al., 2023). This gap was partly attributed to provider hesitancy regarding opioid use in children, with ketamine being preferred but still used scantily for its perceived safety. This review collectively suggests that targeted training, improved guidelines, and comprehensive emotional and clinical support systems are essential for enhancing pediatric pain management practices. The curriculum developed for, and presented to prehospital providers integrates these insights, offering a practical solution to bridging the knowledge gap and supporting

EMS teams in addressing pediatric pain effectively, with attention to both the emotional and technical aspects of care.

Introduction

Every year, approximately 6 million children (individuals aged from birth to 18 years) are transported to a hospital via ambulance (National Highway Traffic Safety Administration, 2023). Prehospital services, like ambulances, air ambulances (usually fixed-wing planes or helicopters), and non-transport services (vehicles with personnel that do not transport all fall into this category) interact with millions of patients every year and transport many of them to the hospital, so that they can receive further care. Out of all the patients transported to the hospital, about 13% are children (Shah et al., 2008). The uneven ratio of encounters of adult patients and pediatric patients has led to prehospital providers to feel uncomfortable or unknowledgeable and, therefore, hesitant to medicate their pediatric patients for pain. It is essential to medicate patients in moderate-to-severe pain unless contraindicated, and a lack of confidence on behalf of providers contributes to inadequate pain management, even in the prehospital setting. This thesis aims to create an educational curriculum that can be presented to first responders to bolster their confidence when caring for patients in the applicable population. The purpose of the thesis is to create a service learning project that involves developing and sharing a curriculum with first responders regarding the pharmacologic treatment for the pain of pediatric patients in the prehospital setting. This project will be done in partnership with the University of Arizona Emergency Medical Services agency, with the goal of educating the University of Arizona's EMTs and Paramedics about pediatric pain management. This thesis will discuss the background, significance to nursing, and purpose in the first chapter, search method, and review of literature in the second chapter, implementation in the third chapter, and outcome evaluation in the fourth chapter.

Background of Issue

The provision of effective prehospital care to pediatric patients facing traumatic experiences is a critical aspect of emergency medical services (EMS). Every year, millions of children are transported to hospitals via ambulances, constituting a significant proportion of EMS encounters (National Highway Traffic Safety Administration, 2023). However, a pervasive issue hampers the optimal management of pediatric pain in prehospital settings. Paramedics and other prehospital providers often express discomfort and hesitation when it comes to administering potent analgesics to children in pain due to trauma. This reluctance is rooted in a perceived lack of knowledge and confidence, resulting in suboptimal pain management practices for pediatric patients (Jeruzal et al., 2019).

The discomfort experienced by prehospital providers in administering potent analgesics to pediatric patients is underscored by a notable discrepancy in encounters with adult and pediatric patients (Jeruzal et al., 2019). The unique challenges associated with managing pain in children, particularly in the context of trauma, contribute to providers feeling uneasy and uncertain about the appropriate interventions. Effective pain management is essential for pediatric patients experiencing moderate to severe pain, and the hesitancy of prehospital providers to administer adequate analgesia can have detrimental consequences, potentially leading to worsened outcomes for the pediatric population.

Research literature on this issue delves into various facets, including preferred drugs and routes of administration, challenges in patient handovers from prehospital to hospital settings, and the emotional complexities faced by healthcare professionals, particularly nurses, in providing prehospital care to children in pain. Systematic reviews have identified ketamine, methoxyflurane, morphine, and fentanyl as preferred drugs for prehospital pediatric pain relief,

with a notable focus on traumatic cases and specific routes of administration (Abebe et al., 2021). However, these findings are accompanied by limitations, including the retrospective nature of data collection and the inability to assess less potent drugs.

Additionally, studies exploring nurses' experiences with prehospital encounters involving children highlight challenges related to standardized handovers, communication breakdowns, and the emotional toll of providing care to distressed pediatric patients (Sanjuan-Quiles et al., 2019; Holmström et al., 2019). The reluctance to administer analgesics is further reflected in quantitative analyses of prehospital analgesia practices, where concerns about unpredictable reactions to opioids in pediatric patients lead to a preference for ketamine (Eimer et al., 2023).

In essence, the hesitancy of prehospital providers in administering potent analgesics to pediatric patients is a complex issue with far-reaching implications for the quality of care provided in the prehospital setting. Addressing this issue requires a comprehensive understanding of the factors contributing to provider discomfort, the impact on patient outcomes, and potential interventions to improve pediatric pain management practices in prehospital care.

Importance to Nursing and Healthcare

The issue of prehospital providers' hesitancy in administering potent analgesics to pediatric patients in pain due to trauma holds significant implications for nursing and nursing practice. As front-line healthcare professionals, nurses play a crucial role in advocating for optimal patient care, and their involvement in the prehospital setting is integral to achieving positive outcomes for pediatric patients.

To apply the importance of this topic on a local level, there are currently three fire departments that serve the greater Tucson Area, Tucson Fire Department, Northwest Fire Department, and Golder Ranch Fire Department. These departments interface with two major

hospitals capable of providing advanced care for critical pediatric patients as determined by the Southern Arizona EMS foundation, Banner University Medical Center Tucson and Tucson Medical Center (SAEMS, 2015). These departments do not interact with each other often, and only interact with emergency department staff when handing off patients by ambulance. Care provided by prehospital providers, regardless of level of licensure, directly informs the care provided by emergency department staff. Creating a curriculum that informs both parties and gives them an opportunity to collaborate allows a better continuum of care for individual patients and their outcome (SAEMS, 2015).

One of the primary reasons why this issue is pivotal to nursing is the inherent vulnerability of pediatric patients. Children experiencing trauma require specialized care that acknowledges their unique physiological and psychological needs. Effective pain management is central to providing compassionate and competent care, and nurses, as advocates for their patients, must address barriers that hinder the timely administration of appropriate analgesics. The discomfort and hesitation expressed by prehospital providers directly impact the quality of care delivered to pediatric patients, highlighting the need for targeted nursing interventions and education to enhance providers' confidence in managing pediatric pain.

Moreover, the issue resonates with nursing practice due to the interconnectedness of prehospital and hospital care. Seamless transitions between these settings are critical for ensuring continuity of care and preventing gaps in treatment. The challenges identified in patient handovers from prehospital to hospital settings, as revealed by qualitative research (Sanjuan-Quiles et al., 2019), underscore the importance of effective communication and standardized protocols. Nurses, equipped with their expertise in care coordination, can contribute

significantly to the development and implementation of standardized handover processes, facilitating smoother transitions and improving overall patient care.

The emotional complexities faced by nurses in providing in-hospital care to children in pain after an emotionally traumatic transport incident for a pediatric patient (Holmström et al., 2019) further emphasize the need for targeted support and education. Nursing practice encompasses not only technical skills but also the ability to navigate the emotional terrain of patient care. The reluctance of prehospital providers to administer analgesics may stem from concerns about adverse reactions or uncertainties about pediatric pain management. Nurses, with their holistic approach to patient care, can play a pivotal role in developing educational initiatives and support systems that address these concerns, fostering a more confident and competent prehospital healthcare workforce.

Additionally, the findings of quantitative analyses highlighting preferences for certain analgesics over others (Eimer et al., 2023) underscore the importance of evidence-based practice in nursing. Nurses, as advocates for patient safety and effective pain management, can contribute to the development and implementation of guidelines that align with the best available evidence. By actively participating in research and quality improvement initiatives, nurses can influence prehospital analgesia practices, ensuring that pediatric patients receive the most appropriate and evidence-based care.

In conclusion, the issue of prehospital providers' hesitancy in administering potent analgesics to pediatric patients in pain due to trauma is of paramount importance to nursing and nursing practice. Nurses, with their commitment to patient advocacy, holistic care, and evidence-based practice, are well-positioned to address the challenges identified in the literature. By actively engaging in educational initiatives, contributing to the development of standardized

protocols, and advocating for evidence-based practices, nurses can play a central role in improving the quality of prehospital care for pediatric patients and ultimately contribute to positive patient outcomes.

Statement of Purpose

This thesis is dedicated to addressing the pivotal issue of prehospital providers' hesitancy in administering potent analgesics to pediatric patients undergoing trauma. The overarching objective is to develop an educational curriculum specifically tailored for first responders and Emergency department staff, with a primary focus on elevating their confidence and proficiency in delivering optimal care to pediatric patients in the prehospital environment in incidents calling for analgesic administration.

The curriculum's creation will extend into the realm of practical application through the implementation of teach-back learning, where providers learn the content and answer a series of questions after to establish a more firm understanding of the content presented. This curriculum and continuing education will serve as a service learning project. This endeavor aims to transcend theoretical knowledge by immersing first responders in in-person and important educational experiences, fostering collaborative learning, and enhancing practical skills in pediatric pain management within the prehospital context.

This project will be developed in alignment and collaboration with the University of Arizona Emergency Medical Services's policies and guidelines. By collaborating directly with this institution, the thesis leverages the expertise of emergency medical professionals, ensuring that the educational curriculum aligns seamlessly with the nuanced challenges faced by first responders.

The recipients of this educational initiative encompass both general and probationary members within the University of Arizona Emergency Medical Services. This tailored approach seeks to provide foundational knowledge to new recruits while concurrently offering advanced insights and updates to members needing continuing education. The aim is not merely to impart pharmacological expertise but also to instill a culture of continuous learning and improvement within the prehospital care community.

Conclusion

In conclusion, the multifaceted issue of prehospital providers' hesitancy in administering potent analgesics to pediatric patients in pain due to trauma is a critical concern that demands attention within the realm of healthcare, particularly in the context of nursing and nursing practice. The background provided underscores the widespread nature of this challenge, affecting millions of pediatric patients annually who rely on prehospital care for timely interventions.

The literature review delves into the complexities surrounding prehospital pediatric pain management, revealing insights from systematic reviews, qualitative studies, and quantitative analyses. Preferred drugs and routes of administration, challenges in patient handovers, emotional complexities faced by nurses, and variations in prehospital analgesia practices emerge as key themes. While systematic reviews provide valuable insights into pharmacological interventions, qualitative studies offer a nuanced understanding of nurses' experiences and the challenges associated with patient handovers. Quantitative analyses shed light on the actual practices, preferences, and limitations encountered in the field.

The significance to nursing and nursing practice is evident in the pivotal role that nurses play in advocating for optimal patient care. Addressing the hesitancy of prehospital providers is not only crucial for improving pediatric pain management but also aligns with the broader goals

of enhancing patient outcomes and ensuring continuity of care between prehospital and hospital settings. Nurses, armed with their expertise, compassion, and commitment to evidence-based practice, are well-positioned to lead initiatives aimed at overcoming the identified challenges.

Subsequent chapters will delve into a comprehensive search method and review of literature, exploring the existing gaps, strengths, and limitations in the current body of knowledge. The implementation phase will focus on the development and delivery of an educational curriculum tailored to prehospital providers, particularly within the University of Arizona Emergency Medical Services agency. The outcome evaluation chapter will critically assess the impact of the implemented educational interventions on the confidence and practices of prehospital providers, with the ultimate goal of contributing to improved pediatric pain management in the prehospital setting.

In essence, this thesis seeks to bridge the existing gaps in knowledge, empower prehospital providers with the necessary skills and confidence, and ultimately enhance the quality of care provided to pediatric patients in distress. Through collaboration, education, and a commitment to evidence-based practices, nursing professionals can play a central role in addressing this critical issue and making a meaningful impact on the well-being of the pediatric population in the prehospital setting.

Chapter 2: Review of Literature

Chapter two provides an overview of the articles used for the literature review for which this thesis is based upon. The articles all address medicating children for pain in the prehospital environment and the efficacy of those treatments. The literature search and review included studies on pre-hospital medication administration for pediatric patients, trying to answer the question, “Are children adequately medicated for pain in the prehospital setting?” All studies were published between 2019 and 2023 in peer-reviewed journals.

Three of the reviewed studies discussed what medications would be most effective in delivering adequate pain management. The first article, described below, specifically addresses medications given to children for pain in the prehospital setting. The second article addresses medications given to children for pain throughout an inpatient admission. The final document is the World Health Organization Protocol Analgesia Stepladder, that informs facilities on effective ways to medicate patients for pain and what medications the WHO recommends (Anekar et al., 2023).

Pre-Hospital Pain Medication Practices For Pediatric Patients

The purpose of this systematic review was to comprehensively search databases to examine what the preferred drugs for prehospital pediatric pain relief were, regardless of what was causing the pain to the patient (Abebe et al., 2021). Because this article was a systematic review, the sampling technique was predefined by the guidelines set forth by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA). The authors searched for articles independently from each other on the databases PubMed, Ovid Medline, Ovid Embase, CINAHL, Epistemonikos, and Cochrane Library (Abebe et al., 2021). The authors determined that the article inclusion criteria were articles that only focused on pre-hospital pharmacological interventions among pediatric patients in acute (compared to chronic) pain (Abebe et al., 2021). Articles addressing adult prehospital pain management were eligible for the review if they

contained a section specifically addressing pediatric pain. The publications included in the review were randomized control trials, non-randomized control studies, cohort (with an included control group) studies, interrupted time studies, cross-sectional series studies, and case series studies (Abebe et al., 2021). After reviewing 328 full-text studies and comparing the studies to the inclusion criteria, 320 studies were excluded, and the article sample size was eight (Abebe et al., 2021). The total number of participants in all eight studies was 71,674, with six of the studies being only focused on pediatric patients and two of the studies including both adult and pediatric patients. The data for this review was collected through a custom extraction template made on Covidence 2.0. The data was analyzed through a textual narrative analysis of the content of each of the eight studies (Abebe et al., 2021).

The results of this systematic review determined that the preferred drugs used prehospitally for pediatric pain management were ketamine, methoxyflurane, morphine, and fentanyl (Abebe et al., 2021). These drugs were used significantly more for patients with a traumatic complaint compared to a medical complaint. The most common routes of analgesic administration was intranasal and inhalation. Routes of administration commonly used for adults, like intramuscular and intravenous routes, were undesired due to these routes commonly causing patient agitation.

The strengths of this review included an extremely thorough evaluation of selected articles, the results of the review correlating with the results of other systematic reviews done in previous years, and the credibility of the evaluation of the selected articles according to

established systematic review criteria. The authors of this review identified three major limitations. The first was the inability to contact four of the eight article authors included in the systematic review, leaving the review authors unable to gather more information about the studies included in their review. The second major limitation was the inability to evaluate the use and efficacy of less potent drugs on prehospital pediatric patients in acute pain (drugs like acetaminophen and NSAIDs) due to a lack of literature fitting the inclusion criteria for this review. The third major limitation identified was the nature of the articles chosen for the review: many of the chosen studies collected their data through retrospective chart review, which, according to the authors of this systematic review, was not the preferred data collection method overall (Abebe et al., 2021).

An additional systematic review with the purpose of discussing current practices and recent advancements in pediatric pain management, specifically focusing on effective assessment tools and updated pharmacological approaches (DiSarno et al., 2023). The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. Eligible papers were identified through searches in PubMed and the Cochrane Library from inception until February 2023 (DiSarno et al., 2023). Inclusion criteria encompassed papers discussing pain management in pediatric subjects in English-language, peer-reviewed journals. Non-English papers, conference proceedings, case studies, and those focusing on adult populations were excluded. Abstracts were screened initially, and eligible papers were fully reviewed and analyzed. Data extraction included author, year, study type, sample size, study purpose, and major findings. A qualitative analysis was conducted due to the heterogeneity of the articles (DiSarno et al., 2023).

The scoping review identified 10 relevant articles. The review covers both non-opioid and opioid analgesics, discussing their mechanisms of action, pharmacological characteristics, adverse effects, and optimal administration. It emphasizes the importance of *multimodal balanced analgesia* with use of both opioid medications that are unavailable prehospitally in Southern AZ like hydromorphone and fentanyl, and the need for a thorough understanding of pharmacology and principles of administration in pediatric pain management (DiSarno et al., 2023). For prehospital providers, the data from this review can inform their approach to pediatric pain management by highlighting the effectiveness and considerations for various analgesic options, as well as strategies for minimizing adverse effects (DiSarno et al., 2023).

Strengths of the study include adherence to PRISMA guidelines, comprehensive search strategies, and qualitative analysis of selected papers (DiSarno et al., 2023). Limitations may include potential bias introduced by exclusion criteria, reliance on English-language publications, and the absence of quantitative synthesis of data. Additionally, the review did not require ethical approval, potentially limiting the depth of analysis (DiSarno et al., 2023).

A protocol included in this review also includes the World Health Organization Analgesic Ladder (Anekar et al., 2023). The WHO analgesic ladder protocol is a clinical guideline aimed at managing pain, particularly cancer-related pain, in a stepwise manner. At the first step of the ladder, non-opioid analgesics like acetaminophen (paracetamol) and nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen or aspirin are recommended for mild pain (Anekar et al., 2023). These medications work by reducing inflammation and sensitization of pain receptors. If pain persists or increases, the protocol suggests adding weak opioid analgesics like codeine or tramadol at the second step. These provide stronger pain relief and are suitable for moderate pain. Weak opioids are often combined with non-opioid analgesics for enhanced

efficacy. In cases where pain becomes severe or unmanageable, strong opioid analgesics such as morphine or oxycodone are introduced at the third step. Strong opioids offer potent pain relief by acting on specific receptors in the brain and spinal cord. They may be used alone or in combination with other medications for optimal pain management (Anekar et al., 2023). The protocol emphasizes tailoring treatment to individual patients and encourages the use of adjuvant medications and non-pharmacological interventions to enhance pain relief and improve overall patient comfort and quality of life (Anekar et al., 2023).

Possible Reasons for Inadequate Prehospital Pain Management in Children

Another article I investigated was a qualitative study discussing how prehospital providers feel when they interact with pediatric patients (Jeruzal et al., 2019). Pediatric 9-1-1 calls present unique challenges for emergency medical service providers, combining technical and emotional difficulties. This study aimed to understand these challenges and identify organizational strategies to support EMS clinicians (Jeruzal et al., 2019). The research used qualitative focus groups with 17 participants from rural and metropolitan areas in a single U.S. ambulance service (Jeruzal et al., 2019). Through semi-structured discussions, participants explored key difficulties, preparation strategies, coping mechanisms, and desired resources.

The study identified five themes contributing to the complexity of pediatric calls (Jeruzal et al., 2019). Providers emphasized the emotional weight tied to the social value of children and the clinical intricacies of pediatric care. High-acuity cases involving children often intensified stress, and providers frequently managed distressed caregivers, adding a secondary layer of responsibility (Jeruzal et al., 2019). Furthermore, many providers reported personally identifying with patients or their families, further amplifying emotional strain.

Preparation strategies included mental rehearsals and focusing on the technical aspects of their duties to manage pre-arrival anxiety (Jeruzal et al., 2019). Post-call coping largely relied on informal social support from colleagues and peers (Jeruzal et al., 2019). However, participants expressed a need for additional resources, such as more frequent pediatric training, institutionalized recovery periods, improved feedback systems, and better organization of pediatric-specific equipment (Jeruzal et al., 2019).

The strengths of this study lie in its qualitative design, which provides rich, detailed insights into EMS providers' experiences with pediatric calls (Jeruzal et al., 2019). The use of focus groups allowed participants to build on each other's responses, revealing nuanced perspectives. Additionally, the study's practical recommendations have clear implications for policy and training improvements. However, the research is limited by its small sample size and focus on a single ambulance service, which may restrict the generalizability of the findings (Jeruzal et al., 2019). Future studies should include diverse settings and larger participant pools to validate and expand on these results.

These findings underscore the importance of organizational initiatives tailored to pediatric emergencies. By implementing enhanced training, structured recovery processes, and resource improvements, EMS agencies can better equip their clinicians to manage these challenging calls effectively, ensuring both provider well-being and high-quality patient care (Jeruzal et al., 2019).

Another article was included in the review with the intent to further reflect on nurses' experiences in interacting with children with critical pain complaints. This qualitative descriptive design study had two aims. The first aim was to describe nurses' experiences with prehospital

encounters with children in pain, and the second was to describe nurses' challenges in treating children in pain (Holmström et al., 2019). The sampling technique was non-probabilistic intentional sampling. The inclusion criteria for emergency medical services (EMS) stations where invitations to participate in the study were offered were that the stations saw a moderate-to-high call volume each calendar year (Holmström et al., 2019). The inclusion criteria for participation in the study were to have a registered nurse (RN) certification, be employed at one of the stations where invitations to participate were offered, to have experience working in prehospital care for at least two years, to have interacted with pediatric patients in pain, and to speak fluent Swedish. Forty-two nurses that fit the inclusion criteria were invited to participate in the study, and 18 RNs accepted the invitation to participate (Holmström et al., 2019). The characteristics of this sample were as follows; eleven RNs were men, and seven were women. All RNs interviewed were Swedish, eight had a bachelor's degree, and seven of the RNs had an advanced certificate in varying areas. The range of experience in years for the RNs was from 2-36 years of experience (Holmström et al., 2019). Lastly, sixteen of the RNs were grandparents or parents (Holmström et al., 2019). The data was collected through three focus-group-style interviews with a specific five-question structure to ensure homogeneity (Holmström et al., 2019). A fourth focus group and two individual interviews (for each participant) were planned, but due to a high workload, only two RNs could complete individual interviews. The data was analyzed through qualitative content analysis by reading the content of the interviews several times, dividing the text into "meaning units," where the units were abstracted and made into codes. Finally, the codes were compared and subsequently sorted into categories and subcategories of data (Holmström et al., 2019). Graneheim and Lundman developed this method of qualitative content analysis. The results found one central theme: there was a challenge to provide comprehensive care and focusing on the child's care without feeling excessively emotional (Holmström et al., 2019). The strengths of this article were the thorough analysis of nurses' attitudes towards children and a sophisticated analysis tool used to compile the

participant responses into distinguished categories. The weaknesses of this article were a lack of a thorough discussion of bias (although there was a discussion of potential author bias), and a lack of the “limitations” section (although general limitations were vaguely discussed in the “discussion” section of the paper) (Holmström et al., 2019).

This article's findings highlight critical challenges prehospital nurses face when interacting with children in significant pain (Holmström et al., 2019). The central theme of the study—balancing the provision of comprehensive care while managing personal emotional responses—reflects the unique demands of treating pediatric patients in acute distress for all prehospital providers, not only nurses who work prehospitally (Holmström et al., 2019). Nurses often struggle to focus on the technical and clinical aspects of care without becoming overly emotionally invested, which can impact decision-making and the quality of care provided, especially given medications that aren't commonly administered to children prehospitally (Holmström et al., 2019). This underscores the importance of emotional resilience, repeated training, tailored communication strategies in prehospital pediatric pain management (Holmström et al., 2019).

Furthermore, the study's detailed exploration of nurses' experiences reveals key barriers, including difficulties in assessing pain levels in children and managing parents' emotional reactions during emergencies. These findings emphasize the need for targeted training programs to enhance nurses' competencies in pediatric pain assessment and communication in high-stress

situations. The study also sheds light on systemic issues, such as heavy workloads, which limit opportunities for individual care and may impact the overall quality of interactions with pediatric patients. Overall, Holmström et al. (2019) provide valuable insights into the complexities of prehospital care for children in pain, highlighting areas for improvement in training, support, and resource allocation.

Are Children Adequately Medicated for Pain by EMS Personnel?

The final article used in this review addressed the central question guiding this thesis, is the pre-hospital use of analgesics in children with trauma or pain due to other reasons effective (Eimer et al., 2023)? The researchers set a hypothesis for this article, which was that prehospital pain management in pediatric trauma patients is restrained and largely inadequate. The study method was a quantitative comparative retrospective analysis (Eimer et al., 2023). The sample consisted of 20,405 patients from various calls, with 56% of the patients being male and 41.1% being female. Out of the overall sample, 12,000 patients had traumatic injuries, 8,108 had a non-traumatic complaint, and 297 had both a traumatic and non-traumatic complaint (Eimer et al., 2023). The sampling technique was retrospective sampling based on inclusion and exclusion criteria (Eimer et al., 2023). The inclusion criteria were patients being children (identified as persons aged 0-16) in rescue calls during the years 2012-2020. Patients with a Glasgow Coma Scale (GCS) score of 3 (an indication of anesthetization) were excluded from the study, along with patients whose documentation was either incomplete or corrupted. The data was collected through retrospective analysis of patient care reports, and the data was analyzed through comparing numerical rating scales of pain before and after treatment for patients as documented in patient care reports (Eimer et al., 2023).

The findings of this study indicated that in patients complaining of pain greater than “4” on a numerical pain scale upon EMS arrival, 4.9% of trauma patients, and 16.0% of non-trauma patients reported their pain was still greater than 4 (Eimer et al., 2023). No pain medication was given to 9.4% of patients with traumatic injuries prehospitally versus 28.4% with non-traumatic injuries (Eimer et al., 2023). Pain management was better for trauma patients than non-trauma patients, despite reported similar pain levels. Providers preferred to use Ketamine over an opioid analgesic because of “uncertain reactions” by pediatric patients to opioid medications (i.e., providers thought ketamine was less dangerous to their patients). The authors found that for patients in severe pain, trauma patients generally received an adequate amount of pain management, whereas non-trauma patients did not. These results were statistically significant ($p < 0.05$) (Eimer et al., 2023).

The strengths of this study were the overwhelming amount of evidence and data used to support and test the hypothesis and that the scale used to determine pain is internationally recognized and credible. The limitations of this article were the retroactive nature of the data collected and used, and the researcher’s inability to determine the impact of non-pharmacologic interventions used to decrease pain levels.

Summary

The reviewed articles explore the complexities and challenges of prehospital pain management in pediatric patients, revealing emotional, clinical, and systemic factors that influence care. Jeruzal et al. (2019) identified the emotional weight of pediatric calls for EMS providers, compounded by the clinical intricacies of high-acuity cases and the need to manage distressed caregivers. Providers employed mental rehearsals and technical focus as preparation strategies but expressed the need for enhanced pediatric training, recovery processes, and feedback systems. Similarly, Holmström et al. (2019) highlighted the struggle of prehospital nurses to provide comprehensive care while managing their emotional responses during pediatric encounters. The

study emphasized barriers such as assessing pediatric pain levels, managing caregivers' reactions, and systemic issues like heavy workloads. Both studies underscored the need for targeted training, emotional resilience, and resource improvements to enhance care quality and provider well-being.

Eimer et al. (2023) quantitatively assessed prehospital analgesic use, finding significant disparities in pain management between trauma and non-trauma pediatric patients. While trauma cases were more likely to receive adequate pain relief, non-trauma cases frequently went untreated, often due to providers' concerns about opioid safety in children. Across the studies, limitations include small sample sizes, focus on single EMS systems, and gaps in assessing long-term outcomes of interventions. Strengths include detailed qualitative insights and quantitative rigor, offering practical recommendations for policy and training improvements. Future research should address diverse settings, larger populations, and a broader examination of systemic factors to enhance pediatric pain management and support prehospital providers effectively.

Chapter Three

In this chapter, I will describe the process of developing the curriculum/service learning project curriculum. I used the University EMS Pediatric Guidelines as a source, created by the University of Arizona EMS Physician's Group, and expert consultation of the University of Arizona EMS's EMTs and Paramedics, in addition to the literature review as seen in Chapter Two of this thesis. The curriculum evolved over time as I learned more about the guidelines that shape the policies of the EMS groups in Southern Arizona and assessed the knowledge level and confidence of the providers I was presenting to. I received expert feedback from the Medical Directors of the University of Arizona's EMS as well as the Medical Director of the Tucson Fire Department, who altered my "rough draft" curriculum (See Appendix B) and gave insight into the creation of the final curriculum and presentation (See Appendix C) See Appendix B for the original curriculum outline for the project, followed by reflections and recommendations I implemented over the course of designing the curriculum. The finished curriculum and the associated presentation slides can be found in Appendix C. Below one can find the purpose of each section of the planned curriculum and an explanation of why it is essential for provider learning in the population I assessed and designed the curriculum for.

I. Introduction

Pain management in pediatric patients, particularly in prehospital settings, poses unique challenges due to physiological differences and limited understanding among healthcare professionals. This curriculum aims to address this gap by providing comprehensive education to paramedics and ER nurses on medicating children prehospitally for pain. It begins with an exploration of the background of pain management in pediatric patients, highlighting the significance of proper pain management and the rationale behind developing this curriculum.

II. Understanding Pediatric Pain

Understanding pediatric pain involves recognizing the developmental differences in pain

perception among children of various ages. It also entails identifying common causes of pain in pediatric patients and mastering the assessment techniques specific to this population.

III. Pharmacology of Pain Management in Children

This section delves into the pharmacological aspects of pain management in children, including the principles of pharmacokinetics and pharmacodynamics. It discusses safe and effective analgesic agents for pediatric patients, emphasizing dosage calculation and administration considerations to ensure optimal pain relief while minimizing risks.

IV. Prehospital Pain Management Protocols

An overview of existing protocols and guidelines for prehospital pain management sets the stage for discussing the adaptation of these protocols for pediatric patients. It underscores the

importance of interdisciplinary collaboration in tailoring approaches to meet the unique needs of children.

V. Practical Skills and Techniques

This section covers both non-pharmacological and pharmacological pain management strategies. Non-pharmacological interventions such as distraction techniques are explored alongside pharmacological interventions, including various administration routes and techniques. Emphasis is placed on the importance of continuous monitoring and reassessment of pain relief effectiveness.

VI. Communication and Family-Centered Care

Effective communication with pediatric patients and their families is essential for successful pain management. This section provides strategies for engaging with children and their families, addressing concerns, and involving them in decision-making processes to promote a collaborative approach to care.

VII. Ethical and Legal Considerations

Ethical dilemmas and legal implications associated with pediatric pain management in prehospital settings are discussed in this section. Topics include informed consent, documentation requirements, and navigating complex ethical scenarios while ensuring patient-centered care.

VIII. Case Studies and Simulation Exercises

Case studies and simulation exercises provide opportunities for learners to apply their knowledge and skills in realistic scenarios. Debriefing sessions facilitate reflection and learning from experiences, both simulated and real-life, enhancing preparedness for managing pediatric pain in diverse contexts.

IX. Evaluation and Assessment

This section outlines methods for objectively assessing learning outcomes and gathering feedback for continuous improvement. Long-term impact assessment strategies are discussed to measure the effectiveness of the curriculum in enhancing practice and improving patient care.

Final Outline of Service Learning Curriculum-Pre Implementation

- I. Table of Contents
- II. Purpose of Exercise
- III. Background and Literature Review
 - A. Background
 1. National Structure
 2. Southern Arizona Structure
 - B. Literature Review
 1. Medication articles (3)
 2. Perception articles (2)
 3. Adequate Medication (1)
- IV. Recommendations
 - A. Prehospital Recommendations

1. Medication Administration Review and Suggestion for Implementation
 2. Operational Implementations
 - B. Emergency Department Recommendations
 1. EMS Report Recommendations
- V. Integration of Practice
- A. Narcotics Administration Sheet
 - B. Continuing Education Opportunities
- VI. References and Opportunity for Teach-Back/Questions

Curriculum Development and Project Implementation

The implementation phase of this service-learning project involved discussion and presentation of the contents of a slideshow presentation. After consulting with the Medical Director and executive leadership team of the University of Arizona's EMS program, it was agreed upon that the thesis would be presented during the Pediatric and OBGYN-related emergency training module. Below is a written reflection detailing how the curriculum was created, along with weekly reflections as this author progressed through the meeting process to complete the thesis.

Curriculum Design Process

This curriculum was developed in collaboration with the University of Arizona EMS Physician's group through the use and reference to their current Administrative Guidelines (Gaither et al., 2024). The guidelines referenced and researched for this curriculum were pediatric respiratory, pediatric bradycardia, pediatric tachycardia, and pain control¹. To implement them, I read each guideline and notated each medication and the orders written for administration. I also researched off-label uses for any of the medications in efforts to see if any of the medications could be administered with on-line medical direction for a different purpose, like pain control or anxiety management.

Additionally, in designing the curriculum, I discussed provider confidence in interactions with pediatric patients with the University of Arizona EMS's Executive Leadership Team. With both Advanced and Basic Life Support providers present within the organization's staff, attention to both basic and advanced skills and interactions with pediatric patients were important to consider when designing my presentation. I created a presentation, with these things in mind, that discusses the evidence-based interventions for prehospital and in-hospital staff that Southern

¹ Please see Appendix A for guidelines

Arizona EMS organizations currently use in order to act as a refresher course for my population I was presenting to, who do not interact with pediatric patients very often. Only a few small changes were made to the presentation as I developed it due to the consistency of the data I was receiving from the EMS organization regarding what would benefit the EMTs and Paramedics most.

Week 1: Reflection on Communication and Research Progress

During the first week, I focused on establishing the foundation for my educational curriculum aimed at enhancing pediatric pain management among prehospital providers. A primary challenge was figuring out how to communicate complex pharmacological information clearly while keeping it accessible for the audience, particularly EMTs and paramedics. In reviewing the existing literature on pediatric pain management, I found that many studies advocate for specific analgesics like ketamine, morphine, and fentanyl in trauma situations, yet providers often hesitate to administer these drugs to children. This reluctance stems from a lack of familiarity and confidence with pediatric care.

In my approach, I made an intentional effort to incorporate language that balanced medical precision with clarity and approachability. This effort aligns with Barton's (2020) emphasis on effective communication, especially when dealing with sensitive and complex topics. However, I soon realized that simply presenting information was not enough. I had to find ways to make it relevant and engaging for providers, which I hope will increase their confidence in making decisions regarding pediatric pain management. Going forward, I plan to refine the curriculum to include case studies and examples that directly address common concerns, such as potential side effects and the emotional impact of treating pediatric trauma patients.

Week 2: Reflection on Collaboration and Problem-Solving

This week, collaboration played a central role as I began working more closely with the University of Arizona EMS team, specifically the department's Captain of Training. During these discussions, it became clear that the curriculum needed to be adaptable to both the training schedules and the varying experience levels of providers. It became evident that a one-size-fits-all approach would not work, and I needed to find ways to differentiate the content to meet the needs of both new recruits and more seasoned professionals.

Through this collaboration, I also realized that some aspects of the curriculum needed more practical, real-world application. I saw that many providers felt uncomfortable with certain medications, particularly opioids, due to concerns about potential side effects in children. For this reason, I described and inserted the 6 rights of medication administration for all medications commonly used for prehospital pain management. I also inserted references and descriptions to Addressing these concerns directly and offering evidence-based solutions, including the use of ketamine, could help ease their hesitations. Barton (2020) highlights the importance of problem-solving in these kinds of situations, and I found that using feedback from EMS professionals allowed me to adapt the curriculum in a way that would be more relevant and practical in the field. They described what medications they were more familiar with and gave me some pearls of wisdom to include in the curriculum for other EMS agencies who may be less familiar with pain medications. In the upcoming weeks, I plan to incorporate more interactive elements, such as hands-on training scenarios, to better prepare providers for real-life applications of the material.

Week 3: Reflection on Empathy and Resilience

By week three, I had begun to think more about the emotional aspects of pediatric trauma care. The emotional toll on providers when treating children is significant, and I knew that this

needed to be addressed in the curriculum. Empathy, as described by Barton (2020), plays an important role not only in the care of patients but also in supporting healthcare providers who may feel overwhelmed by the nature of their work. For example, when providers encounter a pediatric patient in severe pain, it's not just the physical aspects of care that are challenging, but the emotional strain of seeing a child in distress.

As I reflected on my own role in the development of this curriculum, I found that resilience also played a key role. I realized that, much like the providers I was working to educate, I too had moments of doubt and emotional fatigue. However, overcoming these obstacles and continuing to develop a curriculum that addressed both technical and emotional aspects of care was crucial. Moving forward, I plan to include strategies for emotional resilience, both for providers and for myself, such as coping techniques and opportunities for debriefing after difficult cases. This will allow for a more holistic approach to pediatric pain management that includes not just the technical aspects, but also the emotional tools needed for effective care.

Week 4: Reflection on Self-Efficacy and Critical Thinking

In the fourth week, I spent a considerable amount of time reflecting on my own self-efficacy. As I reviewed the curriculum's progress, I recognized that while I was confident in the research and theoretical components, I still needed to develop more strategies to help prehospital providers put the theory into practice. The literature emphasizes that confidence in one's ability to act is a critical part of improving performance (Barton, 2020), and this insight was important as I evaluated how to foster this confidence among providers.

Critical thinking was another key area this week. I realized that I needed to incorporate more opportunities for providers to think critically about pediatric pain management in real-world scenarios. Simply presenting them with the correct information would not be

sufficient; I needed to create exercises that challenged them to make decisions and solve problems on the spot. I plan to incorporate more interactive case studies and role-playing exercises into the curriculum in the future for this EMS group to allow providers to practice making difficult decisions in a safe, supportive environment. This, I hope, will build both their confidence and their critical thinking skills.

Week 5: Reflection and Final Evaluation

As the final week before the presentation of the curriculum developed in this service learning project approached, I found it crucial to reflect on the entire process and assess how the curriculum might impact prehospital providers. It was clear to me that the curriculum had evolved significantly from its initial stages, but the real question remained: would it lead to tangible improvements in pediatric pain management practices? Barton (2020) stresses that reflection and evaluation are critical for assessing the success of educational initiatives, and I found this to be true as I reviewed the content and its potential impact on providers.

One thing I learned was that the curriculum's success will depend not only on how well it conveys information but also on how well it addresses providers' concerns and fears. Therefore, a follow-up evaluation will be crucial. I plan to implement post-training assessments to gather feedback on the effectiveness of the curriculum and determine whether it translates into improved clinical practice. These evaluations will also give me insight into areas that may need further refinement.

This process has underscored the importance of continuous improvement. Reflecting on the entire experience, I see how much I have grown, both as a researcher and as someone committed to improving pediatric care. I am excited to see how this curriculum will be received

by prehospital providers and how it will contribute to better outcomes for pediatric patients in distress.

Chapter Summary

In conclusion, the development and implementation of this pediatric pain management curriculum for prehospital providers has been a comprehensive and transformative process for me and in terms of answering the questions I set forth when designing this thesis. Collaboration with the University of Arizona EMS program and thorough research into administrative guidelines ensured the curriculum was evidence-based and tailored to the needs of both Advanced and Basic Life Support providers in the agency. Weekly reflections highlighted key challenges, such as effectively communicating complex pharmacological concepts and addressing provider hesitancy regarding pediatric care but through iterative improvements, including case studies, hands-on scenarios, and a focus on empathy and emotional resilience, the curriculum evolved to balance technical precision with practical application for the group. I feel confident the final curriculum not only educates on best practices but also empowers these Southern Arizona providers to make informed, confident decisions. Moving forward, post-training evaluations will assess its impact, ensuring continuous improvement and better outcomes for pediatric patients.

In conclusion, this curriculum serves as a comprehensive guide for educating paramedics and ER nurses on medicating children prehospitally for pain. By addressing the unique challenges and considerations associated with pediatric pain management, it aims to empower healthcare professionals to deliver safe, effective, and compassionate care to pediatric patients in prehospital settings.

Chapter 4: Description of Curriculum Implementation

The implementation of my pediatric pain management curriculum was the most important and culmination of this service-learning project, taking place at Campus Health at the University of Arizona. The audience comprised a diverse group of 26 prehospital providers, including two paramedics and 24 EMTs, all affiliated with the University of Arizona Emergency Medical Services. This group represented a mixture of experience levels, ranging from newly certified EMTs to seasoned paramedics, making it essential to create a curriculum that addressed varying levels of familiarity and confidence in pediatric care.

The session began with a presentation that outlined the key components of pediatric pain management, including evidence-based interventions and the medications commonly used in prehospital settings. Special emphasis was placed on addressing the common hesitations providers experience when administering medications to pediatric patients, such as concerns about side effects and dosing. I also discussed prehospital and Emergency Room policies in place in Southern Arizona that create a smoother workflow for pediatric patients to ensure the highest-quality patient care. To ensure the material was accessible, I used a blend of visual aids, real-world examples, and concise explanations to bridge the gap between theoretical knowledge and practical application.

Following the presentation, I conducted a question-and-answer session. This segment allowed the audience to seek clarification, discuss specific concerns, and share their own experiences. While no formal feedback was provided during the presentation, the questions raised by the participants offered valuable insight into their priorities and challenges. Many of the questions centered on practical scenarios, such as when to escalate care for a pediatric patient or how to communicate effectively with anxious parents, highlighting the need for continued

education and support in these areas. There was also a question about medications used outside of the United States.

The most interactive part of the implementation involved hands-on skills practice, which included role-playing scenarios. Participants were divided into small groups to practice history-taking and assessment techniques for pediatric patients. These activities not only reinforced the information presented but also provided an opportunity for providers to build confidence in a controlled, supportive environment. The role-playing exercises emphasized communication skills with younger children, empathy for children of all ages, and the importance of a non-systematic but individualized approach to pediatric assessment.

While no formal evaluations or surveys were conducted during the session, the engagement level and participation in the hands-on activities were encouraging indicators of the curriculum's relevance. The lack of immediate feedback suggests a potential need for follow-up evaluations to assess the long-term impact of the training on clinical practice. Overall, the implementation of this curriculum was a critical step toward enhancing the competence and confidence of prehospital providers in managing pediatric pain, with hands-on activities and open discussion serving as key components of its success.

Conclusion

In conclusion, the development and implementation of this pediatric pain management curriculum marked a significant step toward improving prehospital care for pediatric patients in Southern Arizona. From the initial collaboration with the University of Arizona EMS leadership to the final presentation for that EMS group, the project emphasized evidence-based practices, practical application, and the emotional resilience of providers. The curriculum's focus on bridging gaps in knowledge and confidence through hands-on role-playing and interactive discussions provided participants with tools to approach pediatric care with greater competence and empathy, and allowed them to ask questions knowing that they would be supported in future interactions with children. Although formal evaluation remains a future step, the engagement and participation of the audience underscored the curriculum's potential impact. This project has not only enhanced my skills as a researcher and educator but also demonstrated the power of targeted education in addressing real-world challenges in emergency medical services—I feel very grateful that I had the opportunity to take on such an important topic for my Honors Thesis.

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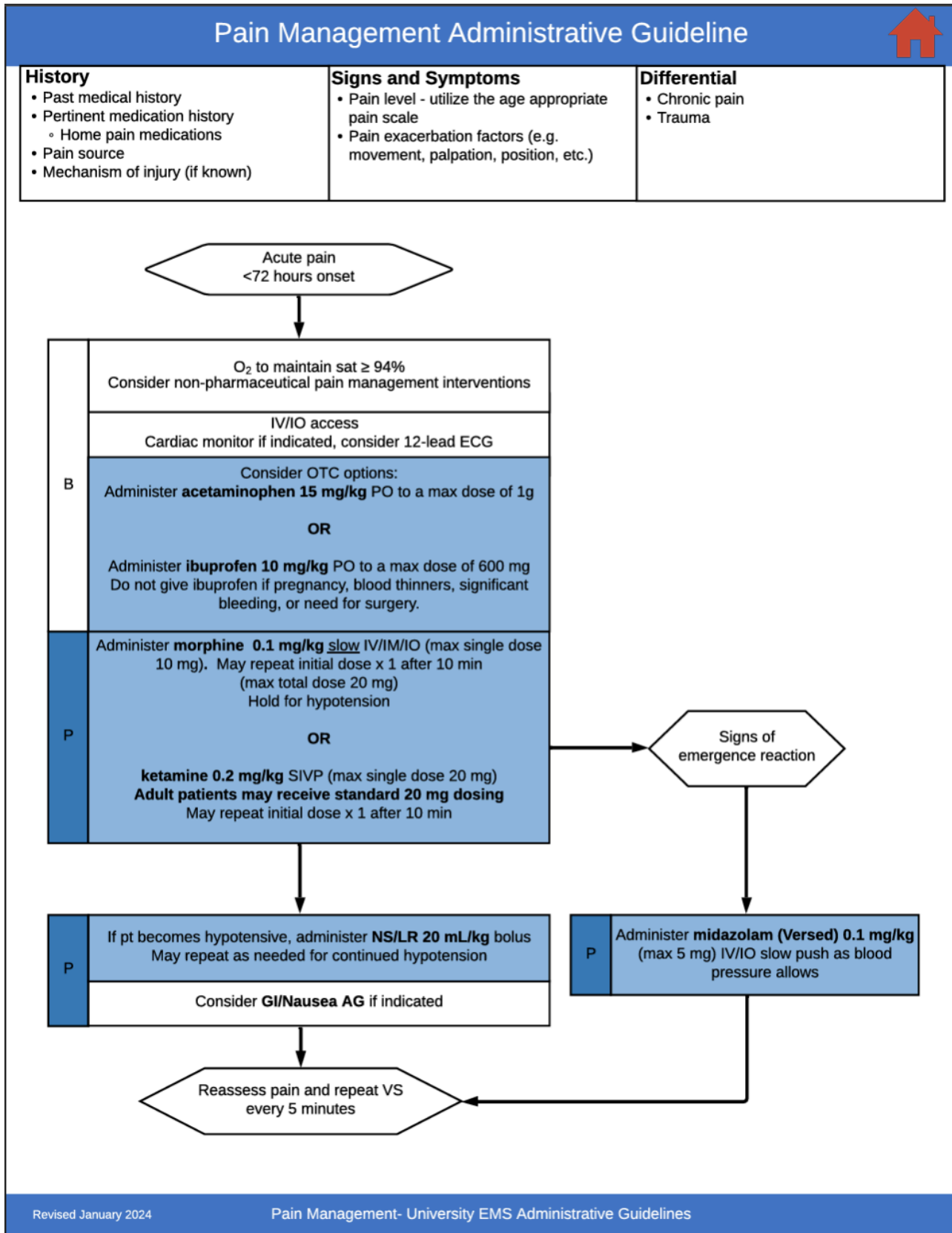
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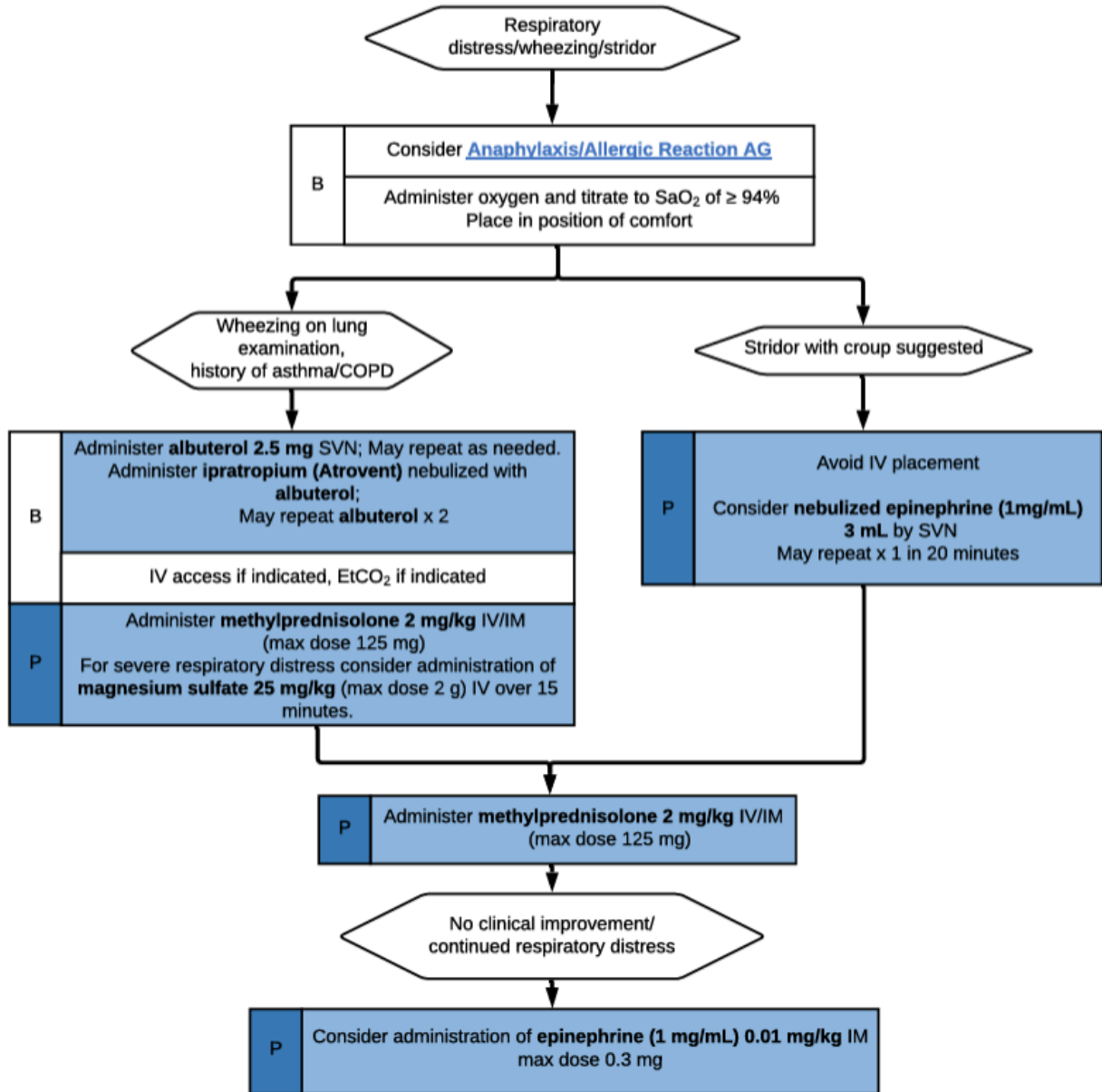
n-control-ems



Pediatric Respiratory/Asthma/Croup Administrative Guideline (Age < 14)



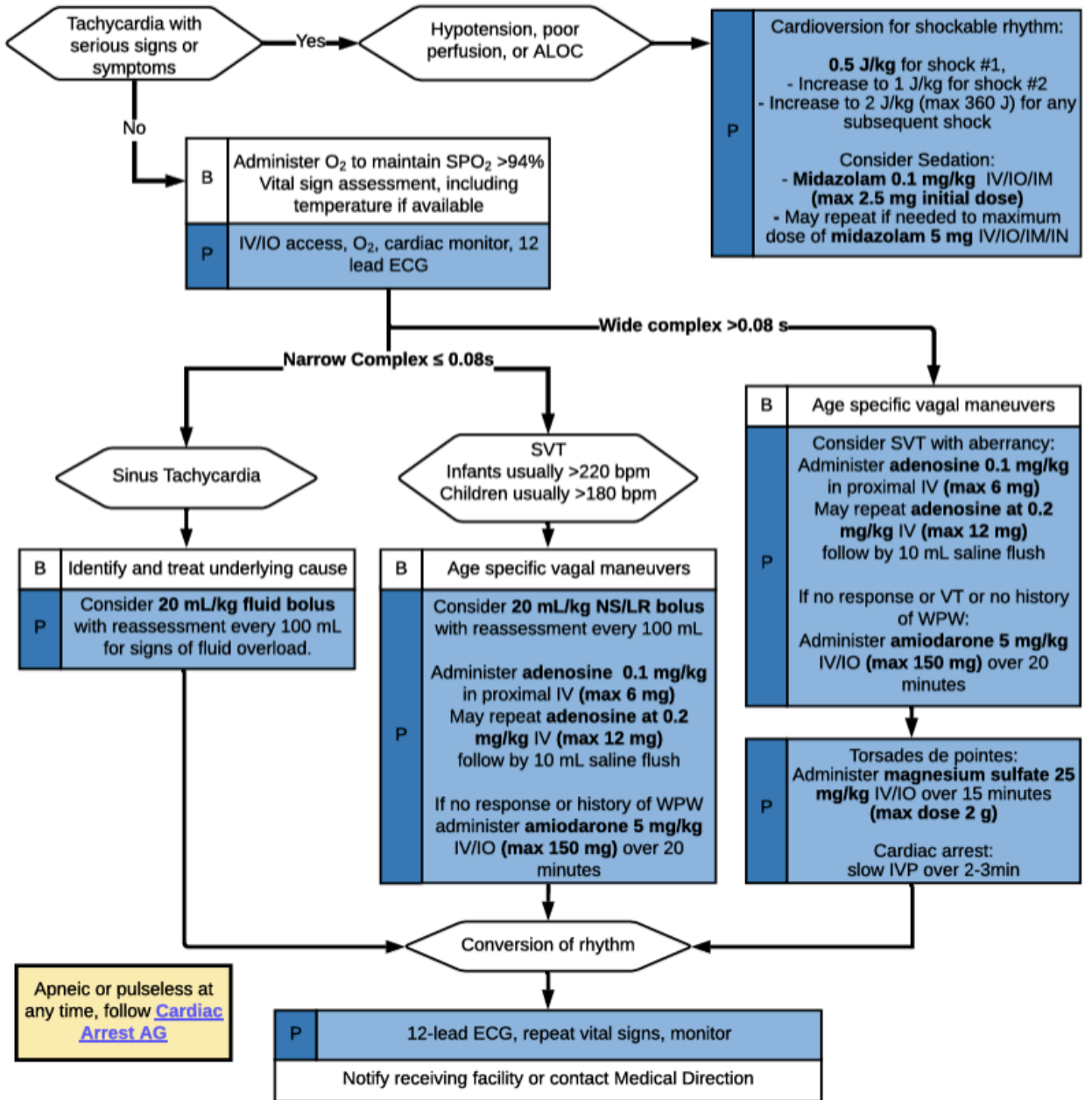
History	Signs and Symptom	Differential
<ul style="list-style-type: none"> Asthma; COPD -- chronic bronchitis, emphysema, Congestive heart failure Home treatment (oxygen, nebulizer) Medications (theophylline, steroids, inhalers) Toxic exposure, smoke inhalation 	<ul style="list-style-type: none"> Shortness of breath Decreased ability to speak Increased work of breathing/accessory muscle use Wheezing, rhonchi Fever, cough Tachycardia 	<ul style="list-style-type: none"> Asthma Anaphylaxis Aspiration/inhaled foreign body Croup Pneumonia Pulmonary embolus Hyperventilation Inhaled toxin (i.e. carbon monoxide)



Pediatric Tachycardia Administrative Guideline (Age < 14)



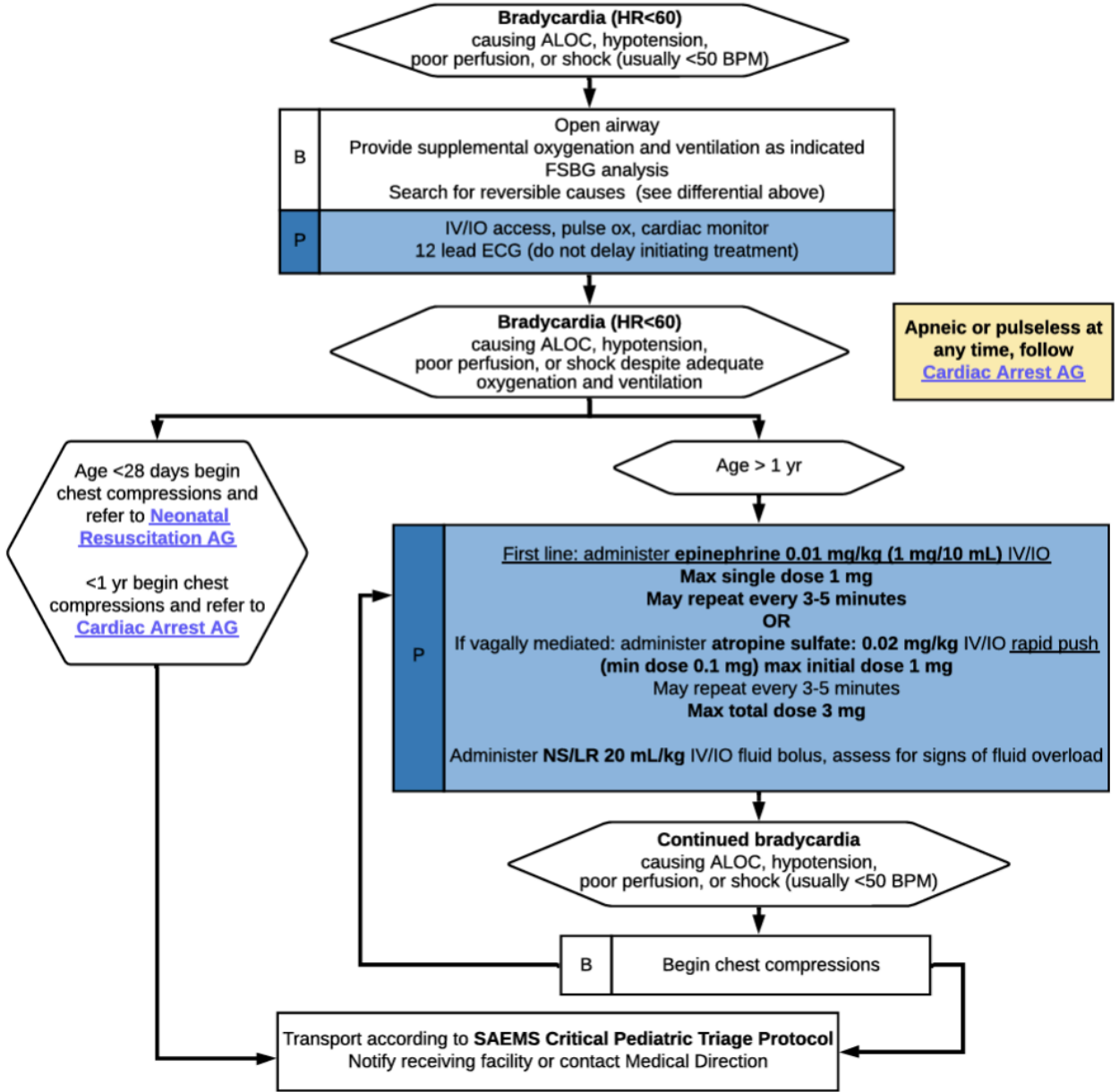
History <ul style="list-style-type: none"> • Past medical history • Medications or Toxic Ingestion • Drugs (nicotine, cocaine) • Congenital Heart Disease • Respiratory Distress • Syncope or Near Syncope 	Signs and symptoms <ul style="list-style-type: none"> • Heart rate: (child >180/bpm, Infant > 220/bpm) • Pale/cyanotic/diaphoretic • Hypotension/ALOC • Pulmonary congestion/tachypnea • Syncope 	Differential <ul style="list-style-type: none"> • Heart disease (Congenital) • Hypo/hyperthermia • Hypovolemia or anemia • Anxiety/pain/emotional stress • Fever/infection/sepsis • Hypoxia, hypoglycemia • Medication / Toxin / Drugs (see HX) • Trauma
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Pediatric Bradycardia (age <14) Administrative Guideline



History	Signs and Symptoms	Differential
<ul style="list-style-type: none"> Past medical history Foreign body aspiration Respiratory distress Apnea Possible toxic exposure or ingestion Congenital diseases Medication (maternal or infant) 	<ul style="list-style-type: none"> Decreased heart rate Delayed capillary refill or cyanosis Mottled, cool skin Hypotension or arrest Altered level of consciousness 	<ul style="list-style-type: none"> Respiratory failure Foreign body/secretions Infection (croup, epiglottitis) Hypovolemia (dehydration) Congenital heart disease Trauma Hypothermia Toxin, medication Hypoglycemia



Apneic or pulseless at any time, follow [Cardiac Arrest AG](#)

Appendix B: Rough Draft/Pre-Implemented Curriculum Outline

I. Introduction

- A. Background on pain management in pediatric patients
- B. Importance of proper pain management in prehospital settings
- C. Purpose of the curriculum

II. Understanding Pediatric Pain

- A. Developmental differences in pain perception
- B. Common causes of pain in pediatric patients
- C. Assessment of pediatric pain

III. Pharmacology of Pain Management in Children

- A. Principles of pharmacokinetics and pharmacodynamics in pediatrics
- B. Safe and effective analgesic agents for pediatric patients

I. Introduction

- A. Importance of accurate dosing in pediatric pain management
- B. Overview of common acute/emergent pain medications used in children
- C. Purpose of discussing side effects and nursing implications

II. Dosing Guidelines for Acute/Emergent Pain Medications in Children

A. Non-Opioid Analgesics

1. Acetaminophen (oral and rectal)
2. Ibuprofen (oral)
3. Ketorolac (intravenous and intramuscular)

B. Opioid Analgesics

1. Morphine (intravenous and intramuscular)
2. Fentanyl (intravenous and intranasal)
3. Hydromorphone (intravenous)
4. Oxycodone (oral)

III. Side Effects to Assess for in Pediatric Patients

A. Non-Opioid Analgesics

1. Acetaminophen: hepatotoxicity, allergic reactions
2. Ibuprofen: gastrointestinal bleeding, renal impairment
3. Ketorolac: gastrointestinal bleeding, renal impairment, increased bleeding risk

B. Opioid Analgesics

1. Respiratory depression
2. Sedation
3. Nausea and vomiting

4. Constipation

5. Pruritus

6. Hypotension

IV. Nursing Implications

A. Assessment

1. Pain assessment using age-appropriate tools

2. Vital signs monitoring, especially respiratory rate

3. Assessment for allergies and previous adverse reactions to medications

B. Administration

1. Calculation of appropriate dosages based on weight or body surface area

2. Selection of the most suitable route of administration

3. Dilution and preparation of intravenous medications as per institutional protocols

C. Monitoring and Evaluation

1. Continuous monitoring for signs of effectiveness and adverse reactions

2. Regular reassessment of pain intensity and response to treatment

3. Documentation of medication administration, pain assessment findings, and patient response

C. Dosage calculation and administration considerations

IV. Prehospital Pain Management Protocols

A. Overview of existing protocols and guidelines

B. Adaptation of protocols for pediatric patients

C. Importance of interdisciplinary collaboration

V. Practical Skills and Techniques

A. Non-pharmacological pain management strategies

B. Pharmacological interventions: administration routes and techniques

C. Monitoring and reassessment of pain relief effectiveness

VI. Communication and Family-Centered Care

A. Effective communication strategies with pediatric patients and their families

B. Addressing concerns and misconceptions about pain management

C. Involving families in decision-making processes

VII. Ethical and Legal Considerations

A. Ethical dilemmas in pediatric pain management

B. Legal implications of pain management in prehospital settings

C. Informed consent and documentation requirements

VIII. Case Studies and Simulation Exercises

A. Application of knowledge and skills in simulated scenarios

B. Debriefing and reflective practice

C. Learning from real-life cases and experiences

IX. Evaluation and Assessment

A. Objective assessment of learning outcomes

B. Feedback mechanisms for continuous improvement

C. Long-term impact assessment on practice

X. Conclusion

A. Summary of key learnings

B. Future directions in pediatric prehospital pain management

C. Commitment to improving patient care through education and training

Appendix C: Final Presented Curriculum (See Attached PowerPoint Presentation)

Medicating Children in Pain—A Joint Exercise between Emergency Personnel

Barbara Drejza, NREMT, Student Nurse

Table of Contents

- Purpose of Exercise
- Brief Review of Literature
- Prehospital Recommendations
- Emergency Department Guidelines and Recommendations
- Integration of Topics into Practice
- Questions

Purpose of Exercise

Purpose of Exercise

- 6 million children transported by ambulance (air & ground) to hospitals each year
 - 13% of all transported patients in the US.
- Uneven ratio between pediatric patient encounters and adult patient encounters for prehospital staff.
- Statistics show that children (<14 years of age for this exercise's purpose) are not adequately medicated for pain prehospitally and in the emergency room. What could be causing this?
 - Lack of Confidence
 - Lack of information
 - Scant Guidelines
 - Societal Perceptions regarding pain medication
- Purpose of Exercise: Educate ED staff and prehospital providers regarding pediatric analgesia with “teach-back” to demonstrate shared cooperation and competency.

Background & Literature Review

Background–Southern Arizona EMS

- Southern Arizona EMS (SAEMS) Council–Makes decisions regarding “Specialty Triage Destinations” for specific patient populations. Examples:
 - Burn patients
 - STEMIs
 - Critical Pediatric Patients
- University of Arizona EMS Physicians Group–writes guidelines for patient care prehospitally and provides “on-line” medical direction for EMS groups.
 - Composed of 9 EMS physicians for Tucson Area
 - Provides medical direction and guidelines for Tucson Fire Department (TFD), Northwest Fire Department (NWFD), Golder Ranch Fire Department (GRFD), American Medical Response (AMR), University of Arizona EMS (UAEMS).

Background–Southern Arizona EMS

- EMS Administrative Guidelines (AGs): Written by EMS Physicians group with purpose of defining the scope of practice of BLS (EMTs) and ALS (Paramedic) providers in directed EMS groups (TFD, NWFD, GFRD, AMR, UAEMS).
- Only the following pediatric guidelines exist: seizures (new guideline), neonatal resuscitation, pediatric bradycardia/tachycardia, pediatric respiratory.
 - List of meds included: midazolam, epinephrine, atropine, duoneb, methylprednisolone, magnesium sulfate, adenosine, amiodarone, fluids.
- Pain Control guideline: Not specified for pediatric population. But there are pros and cons:
 - Pros: medications are weight-based, use of age-appropriate pain scale, AG does not differentiate between traumatic complaint and medical complaint.
 - Cons: Not specified for pediatric population, limited medications included in guideline

Literature Review

- 3 articles surrounding medications used for pain.
 - 2 systematic reviews with ranked efficacy of medications
 - One prehospital-specific, another for efficacy of medications throughout stay in hospital
 - 1 clinical protocol developed by World Health Organization for analgesia
- Medications Significantly Deemed Effective by Studies:
 - Study 1 (prehospital only): ketamine, methoxyflurane, morphine, fentanyl
 - Study 2 (inpatient stay): Paracetamol, ketorolac, tramadol, hydromorphone, morphine, fentanyl
 - Study 3 (WHO protocol): 3 Steps by objective pain assessment
 - Step 1: Non-opioid Medications NSAIDS, NSAID-adjacent medications (ex: Tylenol), ± adjuvants
 - Step 2: Weak Opioids (hydromorphone, codeine, tramadol) ± NSAIDS and/or adjuvants
 - Step 3: Strong Opioids ± NSAIDS and/or adjuvants

Literature Review

- 2 articles detailing ED nurse perceptions (qualitative studies) in interacting with children in pain and how it informs the care they provide.
 - Study 1 Findings: EMS handoffs feel inadequate in standardization, transfer process, communication, clinical records.
 - Study 2 Findings: nurses feel very emotional with children in intense pain, feel inadequately prepared to handle high pain reports.
- 1 article aimed at answering main investigative question: Are children with acute pain medicated adequately in a prehospital setting?
 - Randomized Control Trial
 - Findings: Neither children with traumatic complaints or medical complaints were medicated adequately for pain.
 - Traumatic complaints are generally medicated better than medical complaints
 - Children most often ($p < 0.05$) complained of 6-8/10 pain post-medication.

Prehospital Recommendations

Medication Administration Review

- Acetaminophen- 650mg PO Q4-6hours (mild-moderate)
- Ibuprofen- 400-600mg PO Q6-8hours (mild-moderate)
- Toradol/Ketoralac- 30mg IV Q6 hours (moderate), can upgrade to 60mg (total dose)
- Methoxyflurane–Licensed for use in Europe, not used commonly in US.
- Hydromorphone– 0.2mg IV Once (moderate-severe)
- Morphine–0.1-0.2mg/kg IV Q4hours, max 8mg IV per dose (severe)
- Fentanyl–1.5mcgs/kg IN Once
- Ketamine– 1mg/kg IN for pts less than 50kg, otherwise 0.2mg IV Once: let's discuss administration of IV push ketamine

Overall message: treat pain in children aggressively, monitor your ABCs!

Operational Implementations

- Handtevy Pediatric Dosing App
 - Imagetrend–Documentation and Patient Information recording application that is provided for free by the state of Arizona.
- Obtain weight by height or weight from parent/guardian for dosing–Broselow Tape
 - With 4-person fire crew and 2-person medic crew, 1 member of team can measure and calculate weight by height while treatments are prepared *en route*.
- Pediatric Pain Scales
 - FLACC
 - Wong Baker Faces Scale
 - Numeric Pain Scale



Wong-Baker FACES® Pain Rating Scale



0

No
Hurt



2

Hurts
Little Bit



4

Hurts
Little More



6

Hurts
Even More



8

Hurts
Whole Lot



10

Hurts
Worst

FLACC Score

CATEGORY	0 POINTS	1 POINT	2 POINTS
Face	Disinterested	Occasional grimace, withdrawn	Frequent frown, clenched jaw
Legs	No position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Normal position	Squirming, tense	Arched, rigid, or jerking
Cry	No crying	Moans or whimpers	Constant crying, screams or sobs
Consolability	Content, relaxed	Distractible	Inconsolable

SCORES ADD UP IN RANGE FROM 0-10

Emergency Department Recommendations

EMS Report Recommendations

- Depending on facility and resources, providing EMS personnel with trauma flow sheets to prepare for an appropriate handoff
- Handtevy Etele with receiving facility
- MIST Handoff-
 - Mechanism
 - Injuries
 - Signs
 - Treatments
- Weigh, re-weigh, account for blood loss/volume loss
- Document timing of medication administration both prehospital and hospital, dose, route, pain trends.

Integration of Practice

Continuing Joint Education Opportunities

- Optional joint training exercises in multiple topics building a sense of community and promoting a stronger continuity of care:

- Mass Casualty Incidents
- STEMI
- Stroke Handoffs
- Cardiac Arrest
 - Drowning Arrest
 - Medical Arrest
 - Traumatic Arrest



- Opportunity for Nurses/Medics to ride with APPs on “Physician 1” to gain greater insight into prehospital care– would have to partner with EMS physicians group.

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UNIVERSITY OF ARIZONA EMERGENCY MEDICAL SERVICES

TO: BARBARA DREJZA
FROM: JOE JANOSKO, CHIEF OF EMS
SUBJECT: UNIVERSITY EMS ADMINISTRATIVE GUIDELINES USE
DATE: 12/11/2024

MEMORANDUM

Good afternoon, Barbara,

Following up on our conversation earlier today, I have confirmed that you are authorized to use the 2024 University EMS Administrative Guidelines for your UA Honors College Thesis paper and associated presentations. They are publicly available online and copyright of the Arizona Board of Regents. They may not be altered or otherwise edited, but simple viewing and reference in a paper as you indicated you plan on doing is authorized.

Please contact me if you or your advisors have any questions at (818) 621-0628 or at uems.chief@arizona.edu.

Yours in Public Safety,

A handwritten signature in black ink, appearing to read "Joseph Janosko". The signature is fluid and cursive, written in a professional style.

Joseph Janosko
Chief of EMS & Executive Director
University of Arizona Emergency Medical Services