Pre-hospital pain assessment of pediatric trauma

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Final Approval of Thesis

Master of Science in Nursing

Pre-hospital Pain Assessment of Pediatric Trauma

Submitted by

Janet Lynn Moore

In partial fulfillment of the requirements for the degree of
Master of Science in Nursing

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Pre-hospital Pain Assessment of Pediatric Trauma

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2006
DEDICATION

For Ryan, who became my husband somewhere in the middle of all this fun we call graduate school. Thank you, Ry… because of your support and love through it all, I’ll finally be a “master nurse.”

For Mom, Dad, Darren and John, who put up with me dressing up as a nurse for Halloween at the age of 4 and sustained my dreams ever since, thank you.
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CHAPTER I

Introduction

Unintentional injury is the leading cause of both morbidity and mortality for children under the age of 14 years (American College of Surgeons, 2004). Although pre-hospital and hospital care have decreased the mortality rates dramatically, multiple traumas continue be a primary problem in childhood. As such, it is critical that emergency medical professionals in both hospital and pre-hospital settings have the knowledge and clinical skills to handle the needs of trauma victims, including those of children.

Assessment and evaluation of the trauma victim, especially in the area of pain control, is a major concern with health care auditing agencies. In controlled settings such as the hospital, assessment and evaluation of pain management often fails to meet American Academy of Pediatric standards of practice, but is improving with education and research findings (Zempsky, Cravero and the Committee on Pediatric Emergency Medicine and Section on Anesthesiology and Pain Medicine, 2004). However, protocols in out of hospital settings, especially relating to pediatric patients, fail to exist or do not specify standards of care regarding pain control. Pain should be evaluated and interventions taken to improve quality of life and care for the injured child.

Statement of Problem

The incidence of unintentional traumatic injuries with children is high. Traumatic injuries related to children include those injuries sustained related to motor vehicle accidents, pedestrian injuries, bicycle injuries, fires, poisonings, and home accidents. Traumatic injuries are the leading cause of death for school-aged children and
adolescents in the United States (American College of Surgeons, 2004). In addition, more than 25% of children in America today are predicted to have experienced a serious traumatic event prior to the age of 16 years. Children exposed to traumatic events are at risk of developing traumatic stress that can cause long-term harm interfering with their ability to concentrate and learn by delaying normal brain and body development (Pynoos & Fairbank, 2003).

Traumatic injuries continue to occur to pediatric patients. Unintentional traumatic injuries often cause pain in those who are injured. As health care professionals, the care we provide to these children needs to be both timely and specific to children and their unique needs. A standardized approach to the early management of pain should be required for children who enter into the emergency medical system as lack of pain management or inadequate sedation and pain control has negative implications for pediatric patients including increased heart rate, respirations, blood pressure, anxiety and discomfort (Zempsky et al., 2004). Therefore, advanced practice nurses need to be in the forefront of assessing documented practices in pre-hospital emergency care in order to facilitate the overall well-being of children who are victims of traumatic injury.

**Statement of Purpose**

The purpose of this study is to analyze and determine the use of pain management practices in pre-hospital settings over the past 3 years. Although outside the scope of the current study, findings will support the ultimate goal to facilitate early pain management for children with traumatic injury by the development of educational programs for emergency personnel.
As stated by the American Academy of Pediatrics clinical report on the relief of pain and anxiety for children entering emergency medical systems (Zempsky et al., 2004), development of protocols for pain assessment and management specifically for pre-hospital providers, along with educational initiatives, can improve pain management in the pre-hospital setting. The American Academy of Pediatrics further advocates that no evidence exists to support claims that pain management can mask symptoms or cloud mental status that would make adequate assessment and diagnosis difficult.

**Theoretical Framework**

The theory that will be used as a guide for this study is Neuman’s Systems Model (Neuman, 1995). This model attempts to create a structure that depicts both parts and subparts as well as their interrelationship for the whole of the client as a complete system (Neuman, 1995). Neuman depicts an individual as numerous systems being constantly bombarded by environmental stressors. Nurses have the ultimate responsibility to help a patient, in this study a child, obtain maximum level of functioning in a given situation despite various stressors they may be experiencing.

Neuman’s model portrays a client as a core circle surrounded by numerous concentric circles representing lines of defense or buffers. These lines of defense minimize stress and attempt to maintain homeostasis in the individual between their central core and the outside environment. However, when stressful situations such as a traumatic injury arise, external stimuli such as pain place undesired and unexpected stress on the client from the environment. Flexible lines of defense then are altered, affecting the child’s homeostasis as evidenced by the physical signs and symptoms of pain.
Neuman’s model looks at five variables of an individual, including physiological, psychological, sociocultural, developmental and spiritual aspects. Assessment of the client attempts to determine where lines of defense are being altered and how the client can best be brought back to their normal state of health. The nurse organizes data to create problem lists, and formulates both short and long term plans for dealing with client problems or disruption in health status. Professional nurses also are encouraged to utilize three degrees of prevention (primary, secondary, and tertiary) in working to facilitate the health and wellness of clients. Neuman’s model serves as a guide for this study with regards to secondary level of prevention. Training provided to emergency medical personnel can help instruct them on proper means of screening traumatically injured children for pain and utilizing proper interventions to decrease the pain. The theoretical framework with regards to traumatically injured children in the pre-hospital setting will be further expanded on in Chapter II.

**Research Questions**

The study focuses on documentation of pain interventions in traumatically injured children in the pre-hospital setting through a 3 year retrospective chart review. The research questions for this project are:

1. What are the documented pain assessment practices of emergency medical personnel caring for pediatric trauma victims?
2. What are the documented practices of pain interventions of emergency medical personnel caring for pediatric trauma victims?

**Definitions of Variables**
The following terms are identified and defined for the purpose of the research study:

Conceptual/Operational Definitions


Operational Definition of Assessment Practices – documentation of pain in terms of alterations in heart rate, respiratory rate or behavior such as verbalization of pain or crying.

Conceptual Definition of Pain Intervention – attempt at intercession of an environmental force altering a system’s stability (Neuman, 1995).

Operational Definition of Pain Intervention – documented method attempting to reduce discomfort such as medication or diversion.

Conceptual Definition of Pediatric Trauma – dealing with the development, care, and diseases of children who have an injury to living tissue caused by an extrinsic agent.

Operational Definition of Pediatric Trauma – children under the age of 16 years (as established by the County Emergency Medical Board) who suffer from acute injuries involving moving vehicles (such as motor vehicles, motorcycles, other vehicles [i.e. all terrain vehicle or ATV]), pedestrians struck by a vehicle, bicycle accidents, falls, burns, drowning, industrial accidents, sporting accidents, acts of violence (gunshot wounds, stabbings, assaults, or abuse), or other miscellaneous unintentional injuries not specified above.

Significance to Nursing
Traumatic injury continues to be a major area of interest in the world of pediatric health care both in acute and primary care in terms of prevention and in order to facilitate quality care of the child to produce optimal outcomes. Whether a component of a disease process, the result of acute injury, or a product of a diagnostic or therapeutic procedure, pain should be relieved and stress decreased to increase comfort levels and speed up the recovery process. Control of pain and stress for children who enter into the emergency medical system, from the pre-hospital arena to the emergency department and beyond into pediatric intensive care units, pediatric floors, or other environments for medical care, is a vital component of all care.

Nurses are on the forefront providing comprehensive care including pain assessment and interventions to decrease pain at all steps along the way. Advanced practice nurses would benefit from the current research by gaining an understanding of the issues of documentation and assessment of pain management practices in the pre-hospital setting. This knowledge would assist advanced practice nurses in developing educational programs and policies on both documentation and pain management in the pre-hospital setting for traumatically injured children. Early pain management would assist all health care providers to stabilize the child in order to prevent delayed pain management which can result in long term morbidity and potential death.
Assumptions

An assumption made in this specific study is that emergency medical personnel see pain as a priority and manage pain appropriately within their scope of practice. Another assumption is that pain control is an important part of comprehensive care and should be assessed, evaluated, and reassessed after appropriate intervention by all health care professionals at regular intervals. It also is assumed that only those things documented were done for the children.

Summary

In summation, pain evaluation and assessment in the pre-hospital setting is of concern among health care professionals since pain control can decrease morbidity and mortality. If pain is well-controlled from the beginning, utilizing a variety of pharmacological and non-pharmacological interventions, higher pain control and comfort levels will result for the patient (Zempsky et al., 2004). Additionally, the long-term consequences of traumatic stress may be avoided or reduced (Pynoos & Fairbank, 2003). By looking at current documented data and trends in pain management among emergency medical personnel providing care for pediatric trauma victims, advanced practice nurses can analyze what improvements can be made, and work with emergency medical personnel to ensure the most successful outcome for the child.
CHAPTER II
Theoretical Framework and Literature Review

This chapter includes the theoretical framework used to guide the study and will provide a review of relevant literature related to the concepts of pain assessment and pain control in pediatric trauma victims. The concepts relevant from Neuman’s systems model will first be explored as the theoretical framework guiding the research. The chapter then will continue with an in-depth literature review on pain assessment in the trauma setting and pain control in pediatric clients. Also included in this chapter will be information on the negative effects of pain, the necessity for adequate pain control beginning in the pre-hospital setting, and discussion about treatment of pediatric victims in general.

Nursing Theoretical Framework

Neuman’s Systems Model (1995) considers a person as an open system consisting of one’s central core, which is comprised of the basic physiological functions essential to human life such as breathing, eating, and sleeping. Neuman believes that an individual is constantly interacting with numerous systems which are being constantly bombarded by environmental stressors. Neuman states that all people have lines of defense such as maintaining a healthy lifestyle by obtaining adequate rest. These lines of defense surround them, attempting to protect them from environmental stress. These lines attempt to keep them in their usual state of wellness, thus maintaining homeostasis in the individual. An individual also has flexible lines of resistance, which help to stabilize the person in order to assist the individual in returning to their usual state of wellness following a reaction to an environmental stressor. Health is considered to be present
when one’s lines of defense maintain stability between one’s own system (body) and the environment.

A nurse’s goal is to conserve their patient’s energy, thus keeping the system in balance, and if necessary, facilitate change toward keeping the system in optimal wellness. Neuman (1995) promotes that nurses must discover factors and systems which may cause imbalance that impact their patients. Once this discovery of factors and systems is known, nurses must then negotiate with the patient and the impacting systems to be accountable for the health management of the individual (Fawcett, 2000).

Neuman (1995) advocates that nursing intervention then is to prevent imbalances from occurring through three types of interventions - primary, secondary and tertiary. Primary intervention relates to reducing risk factors through assessment of the patients and intervention once a stressor is identified. Secondary intervention is prioritizing interventions and treatment. Tertiary prevention pertains to supporting the individual in their return to wellness.

This study specifically relates to the secondary level of prevention where education to pre-hospital providers can assist in screening traumatically injured children who are in pain and intervening to reduce the pain earlier using appropriate measures. In this case, the stressor (trauma) has already occurred and the action to prioritize the intervention of pain management (and documentation) would prevent the state of stress from worsening, thus supporting the child’s lines of resistance.

Utilizing developmentally appropriate measures for assessment and treatment of the child’s injury can assist in making the child feel more comfortable in order to reinforce the child’s lines of defense to their proper places. Involvement of family
members when possible also may decrease anxiety by the sight of a familiar face. For example, when feasible, pre-hospital providers can be encouraged to allow parents to ride along with their child in a transport vehicle. When the child’s pain is attended to, the child’s flexible lines of resistance would assist their physiologic status to stabilize through the pain management with an improvement in their overall condition and homeostasis. Likewise, pain control can be utilized to keep the child comfortable in the attempt to speed up the recovery process.

The basic structure Neuman describes in her theory is useful when considering children who have had traumatic injuries (Figure 1). Children have many characteristics of energy to utilize as coping mechanisms, such as imagination, but are often dependent on parents or health care providers to provide resources such as pain medications and ice packs. When a traumatic injury occurs to a child, the flexible lines of defense are altered, such as relying on health care providers instead of parental figures, which takes the child out of one’s comfort zone. In addition, penetration of the child’s lines of resistance will often manifest as pain through interruption of homeostasis in the child’s body and mind. The environmental stressors of strange people, forms of transportation, and things such as emergency medical personnel, ambulances, and hospitals, disrupt a child’s state of normalcy in an unexpected and often scary manner.
Figure 1. Neuman’s System’s Model Relating to Pre-hospital Pain Assessment of Pediatric Trauma.

**Areas of Assessment Data**
1. Physiologic
2. Psychologic
3. Sociocultural
4. Developmental*
5. Spiritual

*Extremely important with children

**Degrees of Prevention**
**Primary:** education to first responders, parents, health care professionals on pain assessment and control
**Secondary:** early assessment of traumatically injured children in pain
**Tertiary:** interventions, including medication, to help reduce pain and reassessment of situation

Interpretation by Janet Moore RN, BSN
**Review of Research**

The purpose of the research is to identify and analyze documentation of pain assessment and intervention of pre-hospital care of children over the past 3 years in order to discover factors in the current pre-hospital health care system which can cause imbalance to the pediatric patient. Numerous articles were reviewed regarding the quality of pain control in the pre-hospital setting as well as interventions appropriate for pediatric patients which could be applied in trauma situations. The following studies are analyzed for content and integrity of research and methods.

**Pain assessment**

Ricard-Hibon, Chollet, Saada, Loridant and Marty (1999) looked at a quality control program for the management of acute pain in out-of-hospital medicine and found that numerous patients who were requesting analgesia did not receive it prior to arriving at the hospital. At the initial part of this specific study, physician preferences were the sole determinant of whether or not a patient received analgesia as well as what type they received. After analysis of inadequate pain control among adults who were critically injured but were still expressing meaningful pain as determined by researchers, a new pain control protocol was implemented encouraging use of opioids. Both Verbal Rating Scales (VRS) and Visual Analogue Scale (VAS) scores dramatically improved. The study also looked at adverse effects of opioid administration and found that they were rare and minor in the studied population. Conclusions of the study indicated that programs focusing on pain treatment and implementation of pain protocols, specifically using intravenous morphine, could dramatically improve pre-hospital pain management.
Ricard-Hibon, et al. (1997) performed a research study evaluating acute pain in the pre-hospital setting and evaluated pain intensity utilizing two scales, the VRS and VAS. Data also were obtained on the demand for analgesics by patients and the relief obtained after the pain control intervention. After analyzing 255 patients over the age of 10 years in a 3 month period, scores from the VRS were significantly correlated with care provider VAS scores (p<.001). Overall, pain scores were significantly improved when subjects were provided pain treatment, indicating that analgesia does make a difference in both subjective and objective reports of pain. The researchers acknowledged that oftentimes even if pain is correctly evaluated, it is not adequately treated. The researchers offered suggestions to assess the reasons for such inadequacies and promoted the use of pain control primarily using opioids for optimal pain relief.

The quality of pain assessment in preclinical care of acutely ill patients was studied by Hofmann-Keifer et al. (1998). The researchers evaluated the quality of pain assessment in pre-hospital emergency settings through assessment of information on the patient’s chart. A total of 462 patients were included in the study, yet inclusion criteria was not specified beyond “patients with painful diseases or injuries” brought to a specific hospital. A chart review then was performed analyzing the diagnosis of the patient and documented form of analgesia given in transport by emergency teams. Upon analysis of the patients’ charts, 28% of patients had documentation of receiving external measures to control pain, such as splinting of extremities to reduce fractures. Another 36.5% were treated with some form of analgesics, most commonly opioids. However, in 35.3% of cases, there was no documentation of the patients receiving analgesia prior to arriving at the hospital. Immediately after arriving at the hospital, patients also were evaluated by
hospital emergency personnel using a VAS at four predefined time periods in the process of treatment. It was noted by the researchers that during the pre-hospital period patients suffer from severe pain that needs to be controlled properly.

An Australian study by Lord and Parsell (2003) also focused on the measurement of pain. In this prospective, observational research, 262 patients were studied using the VAS to score pain severity en route to the hospital and again upon arrival to the emergency room. A survey also was administered to paramedics participating in the study to identify attitudes, beliefs, and values relating to pain measurement. It was noted that 134 (51.1% of the sample) did not have documentation of receiving analgesia prior to arriving to the hospital. Among those not receiving analgesia, higher pain scores resulted in the majority of subjects with only 46 patients (17.6%) indicating a decrease in their pain scores between the two places. The paramedic self evaluation tool also demonstrated several attitudinal measures that influenced the administration of analgesia, such as personal values and beliefs regarding the medications. It was suggested by researchers that regular audits be performed looking at the actual data of pre-hospital pain control for assurance and quality control purposes, and that education on the importance of pain control be provided and standardized among paramedics.

Luger et al. (2003) attempted to evaluate the quality of pain assessment by emergency medical services (EMS) through conducting a prospective study during a 1 year observation period in which pain ratings of a convenience sample of 51 adult emergency patients were documented at three different intervals during an emergency call. Using both the VAS and the verbal pain scale (VPS), separate ratings between the patient and the emergency provider were compared. It was demonstrated that with most
patients, pain intensity was significantly underestimated by EMS providers (p = .0001), indicating a need for improvement to increase pain control in emergency victims.

Yet another study focused on an educational intervention and rating scale, the VPS, to improve the assessment of pain and administration of analgesia for trauma patients in the emergency department. Silka, Roth, Moreno, Merrill, and Geiderman’s (2004) study featured a prospective and observational study of analgesic administration to trauma patients for a 9-week period following an educational intervention and introduction of the VPS. This research included patients who were over 12 years, had a Glasgow Coma Scale score greater than 8, and did not require intubation. Staff was blinded from the study which looked at 150 trauma victims. Overall, pain scores were documented for 73% of the patients in the emergency room. Fifty-three percent of patients received analgesia in the emergency room (95% confidence interval = 45% - 61%). Among patients who had pain scores documented, 60% received analgesia, a significant improvement over the mere 33% of patients receiving analgesia without a pain score documented. Conclusions from this study indicated that taking the time to assess and document a patient’s pain results in higher analgesia administration rates, and thus better pain control.

There are countless pain assessment tools in the realm of pediatrics specific to age, developmental status, and varying situations. Beyond the previously discussed VAS and VRS, the Faces, Legs, Activity, Cry, and Consolability (FLACC) pain scale often is used to measure changes in scores in response to analgesics especially in children under the age of 3 years who may be unable to verbalize their pain (Merkel, Voepel-Lewis,
Shayevitz & Malviya, 1997). The FLACC scores each of the previously mentioned areas 0-2 points, for a total FLACC score of 0-10.

Manworren and Hynan’s (2003) research looked at pediatric nurses who used the FLACC pain scale to assess pain in 147 children under 3 years who were hospitalized in a children’s medical center’s pediatric intensive care unit, post anesthesia care unit, surgical/trauma unit, hematology/oncology unit, or infant unit. In this specific study, FLACC scores were completed prior to analgesia, at predicted onset of analgesia, and at predicted peak of analgesia. Findings stated that FLACC scores were significantly higher for post analgesic scores and that a significant difference also was realized in pain scores for children who received opioids as compared to those who received non-opioids. Based on a reliability of moderate interrater agreement at 0.54, researchers concluded that the FLACC is an appropriate tool for assessing pain in pre-verbal children, but also notes that a nurse’s clinical judgment should be used above any scoring method in determining whether or not a child requires pain control.

An alternate pain assessment tool also was utilized in the Children’s Hospital of Philadelphia’s research study which employed the faces pain scale (a series of grinning to frowning faces) and asked children 5 to 17 years, along with their parents, to validate pain after a traffic-related injury. Data were obtained from a total of 276 parent/child dyads and stated that in general, parent reports of a child’s pain was comparable to the child’s report. The researchers also demonstrated that pain was clinically most significant initially after injury, and showed that pain assessment tools tailored towards developmental levels of children are feasible. Since pain is not necessarily correlated with injury severity, the researchers emphasized that assessment of pain in all children
with traumatic injuries and interventions when appropriate are a necessity (Baxt, Kassam-Adams, Nance, Vivarelli-O’Neill, & Winston, 2004).

Pre-hospital analgesia

While many of the previously discussed studies talked about various methods of pain assessment and their effect on pain control and analgesia, McEachin, McDermott, and Swor’s (2002) research looked at patients with a specific injury and whether or not they received any pain medication prior to arrival at a hospital. This study featured a 4 month retrospective study of patients with a final hospital diagnosis of hip or lower-extremity fracture who were transported by EMS to a single suburban community hospital. Based on demographic data, patients were excluded from the study if they had ankle fractures, multiple traumatic injuries, no fractures, or who were under the age of 18 years. Of 124 patients who met inclusion criteria, only 22 (18.3%) received pre-hospital analgesia. Among patients who received analgesia en route to the hospital, analysis demonstrated that they were significantly younger (64.0 versus 77.3 years, p<.001) and more likely to have a lower extremity fracture as compared to a hip fracture (31.8% versus 10.7%, p<.004). Upon arrival to the emergency room, 113 (91.1%) of patients received analgesia, demonstrating an obvious lack of pain control in the field.

A similar study was completed by DeVellis, Thomas, and Wedel (1998) which evaluated analgesia administration to adult patients who were air-transported with fractures to an urban academic Level I trauma center, and compared the delay in administration of analgesia upon arrival to the emergency room for patients who had received medication en route. The study was a retrospective descriptive analysis of both flight and hospital records, and included consecutive adults transported during the 2 year
study period. Descriptive analysis was performed in addition to chi square and nonparametric methods used to compare patients. This study had findings contrary to many other research studies and indicated that 98 patients (75.4%) received intra-transport pain control (specifically fentanyl) and that 20 of these 98 (20.4%) patients subsequently received no analgesia in the receiving emergency department. Among patients who did receive repeat analgesia in the receiving emergency department (n = 78, 79.6%), significant delays were reported in analgesia administration, with only 62.8% of patients receiving pain medication within 1 hour of arrival. The researchers made an important point based on their data analysis that suggested further investigation of whether or not clinical specific practice differences reflect true differences in analgesia needs, overmedication by pre-hospital providers, or undermedication by emergency department staff. Despite the differing results this study obtained, conclusions were similar to other studies in emphasizing the need for future research in the area of pain management.

**Pediatric pain control**

While few research studies focused specifically on pain control for the pediatric population, Shriner’s Burn Institute attempted to discuss major priorities in emergency management of pediatric victims who were severely burned. Although this article was not specifically research-oriented, it emphasized that during initial assessment and treatment as well as throughout the transport phase to a hospital, resuscitative measures focusing on airway, breathing, and circulation should be the only priorities placed before pain control, fluid resuscitation, and urine output. Although burns were the qualifying
criteria for these traumas, similar guidelines should be kept in mind for any child trauma victim (Mlcak, Cortiella, Desai & Herndon, 1998).

Spedding, Harley, Dunn and McKinney (1999) compared pre-hospital parental administration of pain relief with that of emergency department staff and included children under the age of 17 years who had been diagnosed with a burn, a head injury or a limb problem. An anonymous prospective questionnaire was given to parents with children fitting inclusion criteria over a period of 28 days. Of 276 surveys obtained, 203 children (74%) did not receive pain relief prior to arrival at the hospital. Numerous reasons were ascertained from parents as to why they did not provide pain control of any sort prior to taking their child to the hospital, including thinking medication would be harmful, not having proper medications nearby, and assuming pain control was a hospital responsibility.

Reducing pain and suffering is a large part of the nursing role in caring for critically injured children, but numerous questions exist as to what nurses look at in determining whether or not a child should get pain medication. Coffman et al.(1997) analyzed 24 pediatric intensive care nurses who conducted 112 assessments of 25 critically ill children looking at indicators that were used for administration of analgesia. Pain indicators selected most frequently by nurses included primarily cardiovascular and respiratory changes such as increased heart rate, respiratory rate, and blood pressure, followed by behavioral indicators including irritability, fussiness, crying, and verbalization of pain. Although both behavioral and vital sign indicators should be taken into account, it is maintained that vital signs are slower to change in a child as compared to an adult and that perhaps behavioral indicators should be looked at first and foremost.
However, the researchers demonstrated the need for ongoing pain assessment for critically ill children, and emphasized the need for numerous indicators especially taking into account the child’s decreased ability to communicate pain.

The American Academy of Pediatrics (AAP) provides a lengthy clinical report with recommendations aimed at relieving pain and anxiety in pediatric patients introduced to the emergency medical system. The AAP emphasizes that only until recent times has pain management been emphasized with clinical staff and overall acknowledges that the “development of pain assessment and management specifically for pre-hospital providers, along with educational initiatives, can improve pain management in the field” (Zempsky et al., p. 1349, 2004). Guidelines written by the AAP also provide suggestions for alternative systems of pain control that can easily be utilized by medical professionals outside of the hospital setting in caring for a sick or injured child. A few of these suggestions for alternative forms of pain control include distraction, music, and imagery.

Data concerning the importance of pain control for traumatically injured children have increased over the years but has continued to be a major issue with education towards medical personnel and the general public continually emphasized. Mazurek’s (1991) classic article published in the Journal of Post Anesthesia Nursing discusses the importance of pain control and encourages health care professionals, specifically physicians and nurses, to direct their efforts towards furthering the education of first responders and the lay person in proper management of pediatric victims.

Evans (2001) writes on the physiology of pain in preterm infants that adequate management of pain is essential to prevent permanent structural changes in the nervous
system which may occur from repeated exposure to painful stimuli. It is likely that the same structural changes would occur to traumatically injured children who experience pain, resulting in physiological and psychological stressors and imbalance in the homeostasis of the child.

Summary

In summation, Neuman’s Systems Model is the conceptual framework for the research study as it helps to explain how traumatic injuries can alter a child’s health and well-being through the disruption of the child’s lines of resistance disrupting the body’s homeostasis. Nurses need to promote health education in the pre-hospital setting to promote conservation of the child’s energy to enhance an optimal return to wellness.

As the literature review has demonstrated, numerous studies have looked at the concepts of pain scales, pediatric pain assessment, and pre-hospital care in general. Most studies demonstrated a lack of documented pain assessment and documented pain control prior to arriving at the hospital and sometimes even in the emergency department. Various pain scales have been utilized aimed at properly assessing pain in children who may not be able to verbalize their needs and have confirmed success. Numerous other studies in adults with similar pain scales also have found consistent results. Current trends in practice, education, and standardization of pain control protocols, and methods for increased pain control can be implemented into practice, thus improving the overall care for pediatric patients.
CHAPTER III

Methods

The purpose of the study is to evaluate documented pain management in pre-hospital emergency care for pediatric patients. This study is part of a larger study being conducted at a local hospital. The purpose of the overall research is to identify and analyze documented pain assessment and management practices of emergency medical personnel in a local county over the past 3 years, determine local standards of care, and subsequently design, implement, and evaluate a Pediatric Pain Management education series for emergency medical personnel through a Northwest Ohio County Emergency Medical Service board. The purpose of the current substudy is to evaluate the documented pain management provided to traumatically injured pediatric patients in the pre-hospital setting.

The design of this study, its sample size, as well as criteria for inclusion and exclusion are described in this chapter. Materials for the study, data collection procedures, limitations, and data analysis also are discussed. This chapter concludes with a summary of the contents.

Design

The research design for this study is descriptive. Pre-existing, de-identified data from a retrospective chart review were provided from the larger study.

Data Collection and Materials

This study is part of a larger study from a 3 year retrospective chart review. Data were collected using a data collection tool (Appendix A) in order to gather consistent information. Researchers who reviewed charts received identical training from the
hospital on what to look for when auditing the forms and gathered all information relevant toward pain management, including: patient age, gender, mechanism of injury, transport location (from what location to what location), selected vital signs (heart rate and respiratory rate), whether or not pain was documented (if yes, how it was documented), any pain interventions (pharmacologic or nonpharmacologic), and whether or not anything was given to the child prior to EMS arrival (Appendix A).

Because the tool was used solely for data collection purposes for this particular study, reliability measures are not applicable. Face validity was established by the research team who were experts in the field of pediatric trauma and included registered nurses, a trauma program coordinator, a pediatric emergency room physician, and the director of the county emergency medical system. The data collected were considered relevant towards the issue of pain management in children.

Sample

Inclusion criteria for this study were charts of children between the ages of 1 day and 16 years who were traumatically injured and were transported by a county emergency medical system. The age criteria was defined by the County EMS board as to how they qualify pediatric clients and was utilized for the current study. Qualifying injuries for the current study included accidents involving moving vehicles (such as motor vehicles, motorcycles, other vehicles [i.e., all terrain vehicle or ATV]), pedestrians struck by a vehicle, bicycle accidents, falls, burns, drownings, industrial accidents, sporting accidents, acts of violence (gunshot wounds, stabbings, assaults, or abuse), or other miscellaneous unintentional injuries.
Data were excluded if found to involve anyone 16 years and older or if the child did not have a qualifying traumatic event. Charts also were excluded if they were outside the 3 years of analysis.

**Protection of Human Rights**

Institutional Review Board approval was obtained by Promedica Health System on behalf of The Toledo Hospital/Toledo Children’s Hospital and was obtained from the Medical University of Ohio. Only pre-existing, de-identified patient data were utilized for the purposes of the study and the data were analyzed in aggregate to decrease the likelihood of a breach of confidentiality and anonymity. The researcher had no contact with the subjects. A waiver of consent for data collection was approved for this retrospective chart review.

**Control for Threats to Internal and External Validity**

A threat to the validity of this research is the subjectivity of human experience. What one health care professional views as pain, another may dismiss entirely. Therefore, the care provided to these traumatically injured children is entirely variable to the individual providing care and the knowledge level of pain assessment in children. This ambiguity is also a threat to internal validity since experience and knowledge vary in emergency medical personnel and may consequently alter the care they provide.

Another threat to validity is that researchers are relying solely on documentation as to whether or not assessment and interventions for pain were provided. The data may be incorrect simply because something was not documented at the time of the incident, therefore, the data collectors did not obtain the correct information. Current emergency medical personnel documentation forms do not have a designated location to chart a pain
assessment or any provided interventions, therefore, documentation is entirely reliant on the provider. Subsequent implications are affected by these limitations because it is unknown if documentation is truly representative of the care provided.

**Data Analysis**

Pre-existing, de-identified information was entered into a computerized database, **SPSS** Version 13.0 (SPSS for Windows, 2004). Descriptive statistics were used to identify documentation of pain assessment and management.

**Summary**

In summation, this chapter introduces the methodology used for this descriptive study with the purpose of describing documentation of pain assessment and management of pain for children with traumatic injuries. Specific data collection processes were described. Threats to both internal and external validity were examined and a description of data analysis was presented.
CHAPTER IV

Findings

This chapter describes the results obtained in this study. Quantitative findings of the research will be discussed to answer the research questions. The chapter will conclude with a summary of its contents.

Sample

All charts were reviewed that included children utilizing Emergency Medical Services for a traumatic injury within the county in a 3 year time period. The sample for this study included 696 charts of children who ranged in age from 0-15 years. Nearly two-thirds of the sample (n=457) were males, while the other one-third (n=230) were female. The remaining 1.5% (n=9) did not have a gender documented.

Most traumatic injuries to children in this sample involved falls (n=198, 28.4%). The second most traumatic injury to children were those struck by a vehicle (n=126, 18.1%). Moving vehicle accidents included injuries involving automobiles, motorcycles, and other vehicles such as all-terrain vehicles (n=117, 16.8%). Sport-related injuries were third in frequency with 11.2% of the injuries (n=78). The remainder of traumatic injuries to children included burns and bicycle related injuries (both n=47, 6.8%), acts of violence such as assaults, gunshot wounds and stabbings (n=34, 4.9%), other traumatic injuries (n=26, 3.7%) and drowning (n=23, 3.3%).

A majority of traumatic incidents to children occurred on a road/street (n=280, 42%), followed by in their residence (n=240, 34.5%). The remainder of traumas to pediatric patients occurred at schools (n=61, 8.8%), recreational sites (n=56, 8.0%), and public buildings or places (n=51, 7.3%). A few incidents occurred at undocumented
locations (n=4, 0.6%), medical facilities (n=2, 0.3%), farms (n=1, 0.1%) and industrial sites (n=1, 0.1%).

With regard to vital signs, only heart rate was consistently documented. Among those children who had a heart rate documented, 84.7% had heart rates appropriate for their age (n= 546), while 14.4% (n=93) had heart rates higher than average for their age (Colyar, 2003).

**Findings**

All data were evaluated for normality prior to statistical analysis in addition to assessment for skewness and kurtosis and no problems were found. Descriptive statistics of frequency were used to describe the data.

Research Question 1: What are the documented pain assessment practices of emergency medical personnel caring for pediatric trauma victims?

Pain was documented in 64.1% of the subjects (n=446), undocumented in 18.7% of the subjects (n=130) and addressed but not assessed in the remaining 17.2% (n=120). In cases where pain was addressed but not assessed, emergency medical personnel indicated on charts a patient/family verbalization of no pain or designated that they could not assess pain.

Only one chart indicated usage of a standardized pain assessment tool, documented in the narrative portion of charting as there was no designated spot on the current documentation form for the scoring of pain. Emergency medical personnel utilized various other measures of assessment in determining whether or not traumatically injured pediatric patients had pain. Examples of assessment measures included documentation of patient or parent verbalization of pain, a subjective form of assessment,
or utilized objective measures such as vital signs or behavioral indicators such as crying, to determine the child’s pain.

Research Question 2: What are the documented practices of pain interventions of emergency medical personnel caring for pediatric trauma victims?

Among the subjects who had documentation of pain (n= 446), there were no documented pain interventions provided to 85% (n=379) of the children whose charts were reviewed. Between all subjects, a pain intervention of any sort was utilized in only 13.4% (n=93) of cases, while the remaining 86.6% (n= 603) received no documented intervention for pain.

Pain interventions were divided into two categories, pharmacologic and nonpharmacologic. Pain interventions of any type were provided to only 15% (n=67) of the children whose charts were reviewed. Twelve reviewed charts demonstrated children whose pain was treated using medicinal interventions, most involving narcotics, specifically morphine sulfate (n=11, 2.4%). Among charts of children who had pain documented and received non-pharmacologic interventions, traction/splinting was most common (n=34, 7.6%), followed by cooling mechanisms such as saline flushes and ice (n=15, 3.3%). Diversion and distraction was documented in only one chart which had a pain intervention documented (n=1, 0.2%).
Summary

In summation, the findings included that 696 charts were reviewed. Five hundred and sixty six of the charts (81.3%) documented or addressed pain in some manner, while only 15% of these had any intervention for pain of any kind documented. Very few approaches to pain management utilizing pharmacologic or non-pharmacologic means were attempted by emergency medical personnel en route to the hospital with traumatically injured pediatric patients.
CHAPTER V

Discussion

The final chapter will discuss the findings and conclusions in relation to the literature as well as Neuman’s Systems Model. Implications for nursing practice, education and administration are discussed and recommendations are given for future research.

Discussion

Research Question 1: What are the documented pain assessment practices of emergency medical personnel caring for pediatric trauma victims?

Although not statistically analyzed, the most common forms of pain assessment in the current study included subjective measures such as patient/parent verbalization of pain and objective measures such as vital signs, specifically heart rate, or behavioral indicators such as crying. Similar results were obtained during Coffman et al.’s (1997) study which identified the pain indicators most frequently used by pediatric intensive care unit nurses were cardiovascular changes such as increased heart rate, respiratory rate, and blood pressure; behavioral indicators such as irritability, fussiness, and crying; and neuromuscular responses such as tenseness or rigidity, squirming, and drawing legs up towards the chest. Despite the obvious difference in location of practice, health care professionals appear to be utilizing similar measures to assess pain in pediatric patients.

In the current study, pre-hospital providers utilized both the child and the parent verbalizations of pain regarding the child and documented as such. Similarly, Baxt et al. (2004) concluded that that parent’s report of a child’s pain is comparable to child report of pain and should be regarded as such. Thus, parent report of a child’s pain should be
taken into account when a child is not able to provide self-report due to age, developmental level, or injury.

Research Question 2: What are the documented practices of pain interventions of emergency medical personnel caring for pediatric trauma victims?

The research question pertaining to current pain assessment practices demonstrates that most pre-hospital providers are assessing (81%) and documenting pain in traumatically injured children in some form. Although the literature (Ricard-Hibon et al., 1997, 1999; Manworren and Hynan, 2003; Baxt et al., 2004) mention several methods of pain assessment appropriate for children including Verbal Rating Scales (VRS), Visual Analogue Scales (VAS); Faces, Legs, Activity, Cry and Consolability (FLACC) pain scale, and Faces pain scale. Only one chart in the current study identified use of a standardized assessment tool, the VRS, which was utilized by one care provider in their narrative charting.

With regards to pain interventions in this specific study, very few interventions were documented or provided for the traumatically injured children. The current study found that in 81% of the charts reviewed, pain was mentioned or assessed. However, in only 15% of these cases was any form of pain management documented. Similarly, Ricard-Hibon et al.’s (1999) study found that in the adult population, amidst documented requests for analgesia, inadequate pain control was provided in the pre-hospital setting. In the adult study, the lack of pain management was found to be related to the emergency room physician on duty at the time of injury. However, within their study, implementation of modified pain protocols encouraging the use of opioids dramatically
increased rates of patients who received pain medication prior to arrival at the emergency department.

Hoffman-Keifer et al.’s (1998) study found that in chart reviews of pre-hospital emergency care, 36.5% of patients with painful injuries received analgesia, most commonly opioids. However, another 35% of patients received no form of analgesia. The findings of the current study were consistent with the most common use of a pharmacologic analgesia, morphine sulfate. However, only 2.4% of children with documented pain in the current study received opioid analgesia.

In terms of nonpharmacologic measures used to reduce pain, Hoffman-Keifer et al. (1998) found in their chart reviews that approximately 28% of patients had documentation of receiving external measures, such as splinting an extremity, to help control pain. The current study found that only 11.1% of children who had documented pain had documentation of using nonpharmacological methods to decrease pain. Although not studied, perhaps the beliefs about pain management by emergency personnel in the current study were similar to those found in the Lord and Parsell’s (2003) study which identified that attitudes of care providers can alter their perception of another person’s pain and influence the interventions provided.

**Conclusions**

It is concluded from this study that there is a void in documentation which implies a lack of care in providing pain assessment and interventions for traumatically injured pediatric patients. Pre-hospital providers need education to emphasize the importance of assessment, intervention, and subsequent documentation in caring for pediatric trauma victims.
Limitations

One limitation of the study is its generalizability to other populations since this research is specific to children with traumatic injuries. However, since the emergency medical system is a major provider of transports for traumatically injured children, the study should be applicable to other cities comparable in size that provide pediatric transport.

During trauma situations, it is often difficult to assess and evaluate numerous areas when time is limited and the focus is obviously first and foremost on stabilization of the child. Also, with regards to the actual data, pain was oftentimes addressed but unassessed when the health care provider was unable to obtain a pain assessment due to unknown factors. For example, the provider may have determined that treatment should take precedence over pain management or may state that they are unable to assess pain because they are unsure of indicators in children who cannot verbalize needs. Additionally, data were completely dependent on transport documentation and prior collection by the collaborating hospital. Therefore, the assessment and intervention may have been done but not documented.

Implications to Theory

With relation to Neuman’s Systems Model (1995), it is recognized that traumatic injuries disrupt numerous lines of defense in relationship to the child’s physiologic state as well as the child’s emotional and social well-being. When working with pediatric patients, developmental issues also must be taken into account in order to support the child’s lines of resistance. A child cannot always verbalize their pain concerns as an adult would, especially in a situation of high stress. Additionally, a child may be afraid
to verbalize pain in that they may be afraid of getting an injection or additional pain caused during assessment. Health care providers must utilize secondary prevention strategies and recognize the structural damage that occurs with trauma to a child, and must deal with it appropriately for the child’s age and developmental status. Protective mechanisms that children naturally possess through their lines of resistance, such as utilizing their imagination and relying on parental figures, are often disrupted during traumatic situations. The injuries cause an imbalance in the child’s homeostasis and often manifest themselves in terms of pain. Health care providers need to be creative and resourceful in utilizing interventions which facilitate the child’s system to return to a homeostatic state of wellness by keeping the child comfortable while controlling their pain. For example, mechanisms of diversion and distraction have been appropriate means of managing pain for people of all ages and especially children. Yet data from the current study indicate that only 0.2% (n=1) case documented such means of caring for traumatically injured children who had pain.

The five areas of assessment data (psychological, physical, sociocultural, developmental, and spiritual) must be taken into account upon initial contact with the child. Neuman’s model would define the stress that occurs to a traumatically injured child as a threat to their ordinary level of functioning. Their physical integrity may be altered by an injury and their psychological status may be threatened by the occurring pain, and the disruption causes an imbalance in the child’s homeostasis, thus altering their normal coping mechanisms. Their behavior is a direct representation of the way they are feeling. For example, children cry to manifest many feelings, which may or may not include pain in a traumatic situation.
Implications for Advanced Nursing Practice

With regard to advanced practice nurses, those prepared at higher educational levels and with increased clinical experience are prime candidates for educating the public, emergency medical personnel, and other nurses on the importance of pain control. “Inadequate knowledge and inaccurate beliefs, such as overconcern with addiction and respiratory depression... contribute to poorer pain management (Good, 1999, p. 116).” Additionally, the American Academy of Pediatrics advocates that there is “no evidence that pain management masks symptoms or clouds mental status, preventing adequate assessment and diagnosis (Zempsky et al., 2004, p. 1351).” Advanced practice nurses should be on the forefront of disputing such concerns and educating anyone involved with the care of pediatric patients.

There is an increase in advanced practice nurses in acute care settings, including intensive care units and emergency departments where traumatically injured children are likely to first arrive for care. In the future, these advanced practice nurses will be giving orders for medications to the emergency medical personnel prior to arrival at the hospital.

Implications for Education

Nurses have long known that pain management given “early” and as needed will assist in controlling pain, and thus reduce morbidity and mortality as inadequate pain control can have negative implications for pediatric patients (Zempsky et al., 2004). The heart rates of traumatically injured children must be taken into account and understood in context of the situations. A higher than average heart rate for age does not necessarily indicate pain but also could be interpreted as other psychological stressors such as anxiety, or physiologic means such as shock due to loss of blood volume. However, it
should be understood that regardless of the underlying cause, it is the job of pre-hospital health care providers to assess the child and address all needs as deemed appropriate. Additionally, an emphasis should be placed on education of providers who work with children that research has demonstrated that parent’s comments regarding their child’s pain is reliable and should be considered in providing pain control to children (Baxt et al., 2004).

Proper management of pain can help to reduce heart rates and reducing external stressors, thus assisting to reduce rates of morbidity and mortality in childhood, where traumatic injuries are one of the leading causes of death. Morbidity and mortality through other means such as depression, substance abuse, mental health issues, educational impairment, and acting out also can result as long term implications of traumatic stressors experienced as a child and can be reduced through utilization of appropriate early management strategies (Pynoos & Fairbank, 2003).

Pain scales also are being trialed in hospital settings based on age and developmental level in attempt to find the most effective means of assessing pain in the pediatric population. The importance of pain assessment and reassessment in the acute care setting has been driven by health care accreditation agencies and supported by professional nursing and medical groups (Zempsky et al., 2004). Nurses should be also listening to parents and believe parental judgment on a child’s comfort level as they would be the first to notice a change in their child, indicative of pain.

Implications for Administration

In terms of administration, increased support and funding may be necessary to provide the necessary education to emergency medical personnel. The factor of change
will be involved in altering ways of thinking and utilizing new tools for assessment and
documentation of pain in the pediatric client. Personal digital assistant (PDA) or
computer charting often replaces paper documentation in some pre-hospital settings and
may be on the forefront of emergency care. Having a specified area for pain assessment,
documentation of interventions, and follow-up assessment should be incorporated with
the charting to promote reminders of the importance of pain assessment and management.
Nursing leaders should be involved in stressing the importance of pain assessment and
management across the spectrum of pediatric care.

Disparities between the medical model and the emergency medical systems form
of care may also need to be addressed so that emergency medical providers can give
adequate care in terms of pain control to their patients but still operate under the direction
of a physician who may not be at the site of transport. Nursing must also be a major
component of this change as the profession of nursing as a whole has been involved in
much of the research on pain assessment, interventions, and documentation to this point.
The development and initiation of systematic assessment, implementation, and evaluation
of pain management protocols will be a vital part of promoting positive change in the
future.

As demonstrated in the current study and related literature, pain assessment and
interventions for traumatically injured children are lacking. Education is necessary to
provide pre-hospital providers with the tools to properly evaluate and treat pain in
children and incorporate other age and developmentally appropriate interventions.
Various pain scales have demonstrated effectiveness and have increased the rates of
which children’s pain is assessed in other medical situations and can be transferred to the
pre-hospital setting. A combination of medicinal and nonpharmacologic interventions can be utilized to properly manage pain in this clientele.

**Recommendations for Further Research**

The current study focused on analyzing descriptive statistics of data using a retrospective chart review of traumatically injured pediatric patients. Based on the data collected, education can be provided for pre-hospital providers with regards to proper pain management techniques specific to children. A follow-up study then could take place looking at whether or not the education demonstrated effectiveness in terms of increased pain assessment and interventions for traumatically injured children. Additional studies also could take place determining specific pain control practices of pre-hospital providers or looking at long term implications of traumatic stressors, such as increases of depression or substance abuse as indicated by Pynoos & Fairbank (2003). Possible studies also include a replication study of Baxt et al. (2004), focusing on parent and child reports of pain to determine if verbalization of pain is consistently the same as the child reports. Cities that have pediatric specific transport teams also could be a focus of investigation to compare protocols of pain control among such providers in contrast to others which provide care for both adults and children.

The data from this study could be extended towards other settings or disciplines such as the emergency department, critical care units, or other pediatric units where traumatically injured children are likely to be cared for. If educational measures were implemented to pre-hospital providers, a follow-up study after education of EMS personnel may be beneficial to see if educational interventions demonstrated
effectiveness in terms of a change in pain assessment, documentation, or interventions provided to traumatically injured children.

**Summary**

This chapter includes a discussion of the findings, guided by Neuman’s theoretical framework. The discussion concludes that there is a void in documentation of pediatric pain assessment and intervention. The profession of nursing has seen a dramatic increase in technology in the health care arena in recent years and is only expected to increase in the coming decades. The increase in technology should assist in charting of pain assessments and interventions for care. Implications for advanced nursing practice, education, and administration is a recommendation that all nurses support early pain assessment and use of appropriate interventions through educational programs in order to promote optimal outcomes for children who have had traumatic injuries. Recommendations for further research include analysis of documentation of pain assessment and interventions in emergency departments, pediatric critical care units and pediatric floors in order to promote optimal management of children who are in pain.
REFERENCES


Appendix A: Data Collection Tool

Pre-hospital Pain Assessment in Pediatric Trauma Victims
Data Collection Tool

AGE (0-15yrs) ______

GENDER: MALE / FEMALE

MECHANISM OF INJURY
Motor Vehicle Crash / Motorcycle / Pedestrian (struck by: Car – Truck –
Other___________) Bicycle / Other Vehicle ___________ / Fall / Assault / Burn/
Drowning / Gunshot Wound /Sport / Stabbing / Other _____________________

TRANSPORT LOCATION
FROM: Scene (Residence – Farm – Industrial – Public Building/Place –
Recreational Site – Road/Street – School) Medical Facility ____________

TO: Toledo / St. Vincent’s / Other ________________________________

VITAL SIGNS
Heart Rate ______
Respirations ______

DOCUMENTATION OF PAIN: YES / NO
If yes, HOW? _____________________________

INTERVENTION FOR PAIN:
Pharmacologic _______________
Nonpharmacologic _______________

Did parents give anything prior to EMS arrival? YES / NO
If yes, WHAT? __________________________
ABSTRACT

Unintentional traumatic injuries often cause pain in those who are injured. As health care professionals, the care provided to traumatically injured children needs to be both timely and specific to children and their unique needs. Using Neuman’s Systems Theory, this study looked at the documented pain assessment practices and pain interventions of emergency medical personnel caring for pediatric trauma victims in a Midwestern county. A retrospective chart review was performed during a three year period, including the charts of 696 children between the ages of 1 day and 16 years who were traumatically injured and were transported by a county emergency medical system. Overall findings indicated a lack of documentation of pain assessment and interventions to decrease pain, demonstrating a need for additional education and emphasis on the importance of pain assessment, interventions, and documentation to optimize care for traumatically injured children.