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**Current Evidence for Pediatric Triage Pain Protocols in the Emergency Department**

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### Abstract

Only 50% of pediatric patients presenting with significant pain receive any form of analgesia while in the emergency department (ED). The American College of Emergency Physicians endorses the use of triage protocols to improve the speed and consistency of analgesia in the ED. However, given the unique needs of the pediatric population insufficient evidence exists, if any, to support the use of triage protocols for their treatment in the ED. After a review of the literature it is concluded that triage pain protocols are a safe and effective method for providing pediatric analgesia in the ED. However, the variability in protocol design and use across facilities raises concern for the potential success or failure of protocol use related to individualized implementation practices. In addition, the review identified a sample bias in the overall literature, with the vast majority of data originating from urban academic centers, and only 1.03% originating from a rural setting. Further research is needed to identify the causative factors leading to this bias.

*Keywords:* emergency, pain, pediatric, triage, protocol, pathway, algorithm

### **Introduction**

For any nurse practitioner (NP) working in an emergency department (ED) it will come as no surprise that pain is the most common symptom prompting emergency department visits nationwide (Todd, 2017). What NPs may not be aware of is that, despite the commonality of this suffering, it is well established that pain is often significantly undertreated in the emergency setting (Carter, Sendziuk, Elliott, & Braunack-Mayer, 2015; Johnson, 2007). For the pediatric population this problem is even greater; as literature shows that pediatric pain levels are consistently underestimated by ED staff, and only 50% of children with significant pain receive any form of analgesia while in the ED (Brudvik, Moutte, Baste, & Morken, 2016).

What can emergency departments do to address this untreated suffering? The College of Emergency Physicians and the Emergency Nurses Association both endorse the use of standardized triage protocols to affect improved patient comfort, and to safely reduce the time to initiation of pain treatment in the ED (American College of Emergency Physicians, 2016).

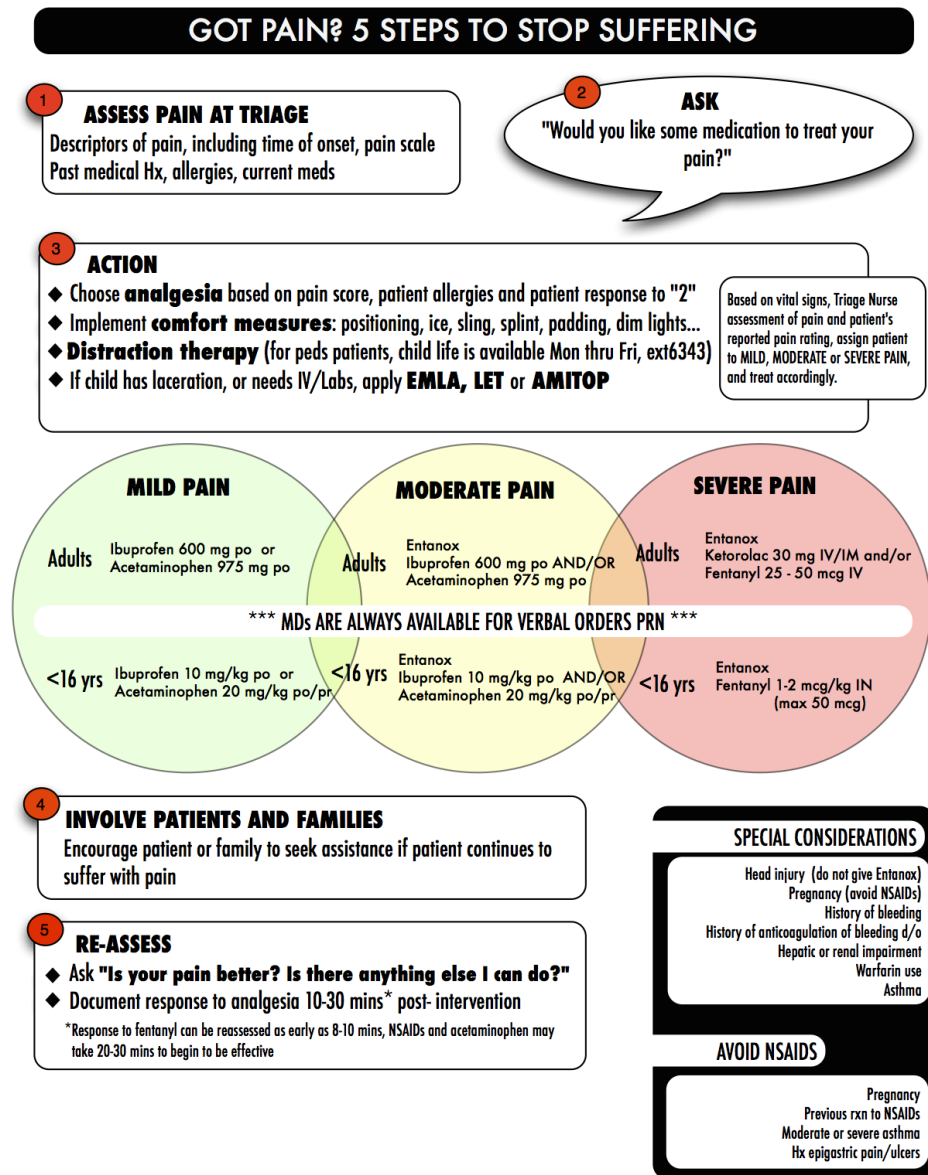


Figure 1. Example of emergency department triage pain protocol (Saint John Regional Hospital, 2013)

Given, however, that pediatric populations face even greater challenges in pain assessment and treatment, what evidence exists in the literature, if any, to support the efficacy of triage protocols for the treatment of pediatric pain in the ED. A review of the literature was conducted in order to ascertain the current state of evidence regarding this subject.

## Methods

The guiding PICO question for this review was: Can pediatric patients presenting to an emergency department with complaints of pain (P) have improved effectiveness of symptom management (O) by the use of triage protocols (I), as compared to a non-triage-protocolized pain management (C)?

Using this guide, searches were performed during November 2017 of the Cumulative Index to Nursing and Allied Health Literature (CINHAL), Pub Med, and Cochrane databases. Key root terms used in various combinations were, “triage”, “protocol”, “rural”, “emergency”, “department”, “pediatrics”, “child”, “pain”, “management”, “treatment”, “algorithm”, and “guideline”. Results were confined to articles published in English within the previous 10 years. All abstracts of articles with titles pertaining to pediatric pain and/ or emergency medicine were reviewed. Full articles were read if the abstract stated relevance to improvement in pain management through use of process change or quality goals. In addition, any reference to further literature cited in an article, which applied to the guiding PICO question, were sought out and reviewed as well. Over 300 abstracts were evaluated, and eleven articles were selected for inclusion in this review of the literature. These include one retrospective analysis, one multi-facility staff survey, one prospective cross-sectional study, two pre- and post-intervention studies, three quality improvement projects, and three systematic reviews (See Appendix A for Evidence Evaluation Table).

## Results

Barksdale, Hackman, Williams, and Gratton (2016) conducted a retrospective analysis of 23,409 patients, over a 27-month period, presenting to an urban safety net facility; defined as a healthcare facility which provides services to patients regardless of the patient’s ability to pay

(Institute of Medicine, 2000). The researchers analyzed the effect of implementing a triage pain management protocol in the ED. Patients were included if they presented with one or more of six conditions. These included: back pain, dental pain, extremity trauma, sore throat, ear pain, or pain from abscess. Patients were started on oral analgesics, which included acetaminophen and/or ibuprofen and then progressed to oral opioid analgesics, such as oxycodone, if needed. Results showed a 34 percent decrease in the time to analgesia administration, post intervention. Interestingly this study found that time to analgesia decreased even when there was no documentation of protocol use; suggesting that staff awareness of pain management increased simply by nature of the intervention being discussed and educated on.

Goh, Choo, Lee, and Tham (2007) initiated a quality improvement project in a 1,000-bed hospital in Singapore. The average daily census of this ED is around 350 patients. The intervention studied was the use of intramuscular ketorolac at triage on patients presenting with limb injuries and a pain score of equal to or greater than 5 out of 10. The goal of the study was to decrease time from registration to analgesia. The outcomes report an overall decrease in time to analgesia administration with no adverse effects found.

Habich and Letizia (2015) conducted a quality improvement project located at a level two trauma center in a suburb, outside Chicago, Illinois. The goal of this project was to improve the consistent use and documentation of pain scales among staff in the ED. This was accomplished via a 40 minute online based educational training. Key topics covered in the training included: selection of appropriate pain scales, assessment of pediatric pain, strategies for overcoming barriers, non-pharmacologic pain management, family and patient education, and intervention outcomes measurements. Results found that staff usage and appropriateness of pain scale selection improved post intervention, however, further interventions were needed to improve the

actual treatment of patient's pain.

Heilman, Tanski, Burns, Lin, and Ma (2016) conducted a quality improvement project at the Oregon Health and Science Center Hospital ED. Over 400 patient charts were reviewed before, during, and after three separate improvement cycles aimed at decreasing median time to analgesia administration for patients with confirmed long bone fractures. Cycle one focused on increasing nurses access to order and administer analgesics by use of triage-initiated protocols for suspected fractures. Cycle two focused on improving documentation to better reflect the actual practices occurring in the ED. Primarily this cycle used daily huddles, monthly emails, and a printed poster located in the triage stations to remind staff to document both interventions and refusals of offered analgesics. Cycle three focused on physician acceptance of standardized analgesia selection. This was accomplished via surveys of senior medical staff to determine existing practice patterns. These patterns were then organized into standard order sets. These order sets were then disseminated to staff via email and staff meetings. After the three cycles, median time to administration of analgesia was reduced by 31 percent. Heilman, Tanski, Burns, Lin, and Ma state that key lessons learned in this project included conducting multiple cycles, to address unforeseen problems such as nurses initially reluctant to administer analgesia for fear of affecting patient *nothing per os* (NPO) times. Additionally, authors stated the importance of weekly staff updates to address issues and encourage adherence to the new workflow.

Krauss, Calligaris, Green, and Barbi (2016) performed a systematic review to determine effective interventions for pediatric pain management in the ED. Interventions such as distraction, physical comfort, and pharmacologic interventions are all discussed. Several suggested algorithms are presented for management of various pain levels and standing triage pain management orders are recommended. No list of included articles or sources is provided by



the authors. The review has 118 references cited, however there were no indications of study locations.

Taylor, Taylor, Jao, Goh, and Ward (2013) participated in a pre- and post-intervention study conducted at an Australian tertiary adult and pediatric ED, with 18,000 annual pediatric visits. The intervention was a triage nurse-initiated analgesia protocol. This protocol allowed nurses to administer oral and topical analgesics to patients presenting with pain scores of four out of 10 or greater without needing a physician to first assess the patient. In total, 102 patient charts were reviewed, and 48-hour post ED discharge follow-up interviews were conducted with families presenting to the ED with children 5-17 years of age in pain. This study concluded that nurse-initiated triage protocols reduced time to analgesia, increased patient satisfaction, and reported no adverse effects.

Thomas et al. (2015) utilized the survey method to focus on the triage nurses' perception of pediatric pain control in the ED. Paper-based surveys were administered to all triage nurses in three separate hospitals from across Canada. The participating hospitals were, Stollery Children's Hospital, IWK Health Center, and Children's Hospital of Eastern Ontario. All three hospitals are tertiary academic centers located in urban environments. Questions centered around adequacy of triage pain control, acceptable time to analgesia, feasibility of administering pain control in triage, and nurse comfort with administering various forms of analgesia, such as ibuprofen, acetaminophen, morphine, or oxycodone. The results demonstrated wide variations in practices and opinions, however, in general adult nurses reported longer acceptable wait times and greater discomfort with administering medications to children as compared with pediatric nurses. Thomas et al. concluded that pediatric patients may benefit from receiving care at facilities with dedicated pediatric triage nurses.

Weingarten, Kircher, Drendel, Newton, and Ali (2014) performed a prospective cross-sectional survey of 100 pediatric ED patients presenting to a Canadian tertiary hospital. The survey asked questions related to pediatric pain levels and the pediatric patient's perception of pain management while in the ED. Ninety-two percent of children reported they were satisfied with their pain management, four percent reported they were unhappy with their pain management, and three percent reported they were very unhappy with their pain management. Children reported improved satisfaction with more rapid administration of pain medication. Additionally, patients and families reported improved satisfaction of pain management related to provider communication skills. High quality provider communication included asking the patient about the quality of their pain and allowing the patient and family to select pain control from several options; as opposed to simply being told which pain intervention they would be receiving.

Wente (2013) conducted a systematic review of 14 studies focused on non-pharmacologic management of pain in the emergency department, specifically for pediatric patients. Articles ranged in geography from the Southwestern United States to Central Canada. All articles which listed specific locations took place in academic centers. Wente (2013) concluded that various distraction techniques, such as bubbles, interactive toys, or videos, as well as the use of sucrose solution all had inconsistent results in effectively decreasing pain. Parental comfort holding techniques did show a consistent decrease in anxiety and pain experienced before, during, and after uncomfortable procedures. Wente (2013) concludes that the non-pharmacologic interventions studied can be initiated by nurses without the need for provider orders, may provide benefit to some patients, and require little cost to implement.

Wiler, et al. (2010) conducted a systematic review which included 52 individual articles.

Article locations included: 36 urban, 4 suburban, 2 rural, 2 community centers, 3 not stated, and 5 others. Articles included under 'other' were individual case studies, or studies of specific patient diagnosis, and not specific to a location. Wiler et al. (2010) presented the current state of literature in regard to optimization of ED front-end operations. Optimization techniques studied included, both adult and pediatric triage protocols, immediate bedding, fast track concepts, and communication tools: such as kiosks, tracking systems, and wireless communications. Findings included that there is much mixed data. Commonly reported drawbacks to triage protocolization included over and under ordering of interventions, such as analgesics, x-rays, and labs by triage nurses as compared with provider preferences. Concerns surrounding this include possible needless exposure of patients to procedures and radiation. Identified benefits to triage protocolization included decreased time to medication administration, decreased patient length of stay, increased patient satisfaction, and increased staff satisfaction.

Williams, et al. (2012) conducted a pre- and post-intervention study related to implementation of an abdominal pain guideline for emergency nurses at an Australian, urban center, hospital. By use of a standardized triage guideline for treatment of abdominal pain the goal of the study was to increase the consistency of pain documentation at time of triage, and to reduce time to analgesia for patients with abdominal pain to less than 30 minutes from time of presentation. Chart audits and staff surveys were used for the analysis. Authors found no statistical improvement in time to analgesia administration post implementation. However, consistency of pain documentation, and staff reported competence with pain management did improve. Williams, et al. noted that although time to analgesia did not improve statistically during their study, this measure did have a marked improvement immediately prior to the commencement of their study. This improvement is hypothesized to be attributable to a national

survey which was released indicating that pediatric pain management in Australian ED's was inadequate.

### **Discussion**

This review of the literature included 11 articles, encompassing data from 194 individual studies. Clinically significant data for decreasing time to analgesia using pediatric triage pain protocols was evident (Barksdale, Hackman, Williams, and Gratton, 2016; Goh, Choo, Lee, and Tham, 2007; Heilman, Tanski, Burns, Lin, and Ma, 2016; Taylor, Taylor, Jao, Goh, and Ward, 2013; Wiler, et al., 2010), and improved patient satisfaction (Taylor, Taylor, Jao, Goh, and Ward, 2013; Weingarten, Kircher, Drendel, Newton, and Ali, 2014). Other important findings of addressing pain assessment and treatment, included decreased patient length of stay and improved staff satisfaction (Wiler, et al., 2010). One study identified over/ under utilization of protocols by triage nurses as compared to provider preferences; however, this concern was mainly related to x-ray exposure via protocols which included imaging for possible fractures, and did not relate to pain control (Wiler, et al., 2010). Aside from this, no studies reported any adverse effects from the initiation of pain management protocols (See Appendix B for Study Outcomes Matrix).

Based on this pool of data it is reasonable to conclude that triage-based pain protocols are a safe and effective way to provided fast and effective analgesia to pediatric patients presenting to the emergency department. Currently, however, there is no commonly accepted format for creating treatment protocols. As such, each institution in this review produced their own individual protocols. Because of this, it is likely that the success or failure of any protocol implementation is dependent upon the expertise and capabilities of the institution implementing

it. Further research is needed to determine potential aspects of protocol creation which could predict the likely success or failure of their implementation.

In addition, during this review of the literature, it was observed that of the 194 individual studies represented, only two (1.03%) were identified as originating from rural environments, with the great majority of studies (91.75%), coming from urban based academic centers. This represents a sample bias in the current literature related to underrepresentation of the rural community. Further research is needed to determine if patient presentations, treatment practices, resources, staff perceptions, and other aspects of emergency care are generalizable between the rural environment and urban academic centers. Additional research is also needed to determine what barriers exist prohibiting the academic community from conducting more rural based studies, as well as what barriers may exist discouraging rural medical professionals from publishing studies related to their patients and environment. If these barriers are identified, and overcome, a more complete and balanced set of evidence may come to exist in the literature.

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Appendix A

Evidence Evaluation Table

Evidence Evaluation Table									
Reference	Location(s)	Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables Studied	Measurement	Data Analysis	Findings	Appraisal: Worth to Practice
Barksdale, Aaron Nathan, Jeff Lee Hackman, Karen Williams, Matt Christopher Gratton (2016). ED triage pain protocol reduces time to receiving analgesics in patients with painful conditions. <i>American Journal of Emergency Medicine</i> . Retrieved from: <a href="https://www.ncbi.nlm.nih.gov/pubmed/27683766">https://www.ncbi.nlm.nih.gov/pubmed/27683766</a>	Urban safety net facility	none	retrospective analysis	23,409 patients over a 27 month period presenting to a safety net facility ED	pre and post triage protocol intervention for pain control	time to analgesia administration	a predictive model using linear regression	triage protocol decreased admin time by 34% (60min). Although overall reduction in time was seen post implementation with our w/ without protocol use suggesting project increased RN awareness of pain control.	John's Hopkins Non-Research: Level VB
Goh, H.K., S.E. Choo, I. Lee, K.Y. Tham (2007). Emergency department triage nurse initiated pain management. <i>Hong Kong Journal of Emergency Medicine</i> . Retrieved from: <a href="https://www.researchgate.net/profile/Kum_Ying_Tham/publication/228500776_Emergency_Department_Triage_Nurse_Initiated_Pain_Management/links/5712121208baee3456d0692/Emergency-Department-Triage-Nurse-Initiated-Pain-Management.pdf">https://www.researchgate.net/profile/Kum_Ying_Tham/publication/228500776_Emergency_Department_Triage_Nurse_Initiated_Pain_Management/links/5712121208baee3456d0692/Emergency-Department-Triage-Nurse-Initiated-Pain-Management.pdf</a>	Urban Singapore	none	quality improvement initiative	1,000 bed Singapore hospital ED with average daily ED census of 350 patients	administration of IM ketorolac by triage nurse compared with physician consultation prior to administration	time from registration and triage to administration of IM ketorolac	SPSS v13, two-tailed t test for continuous variables with CI 95% and P<0.05	Triage protocol decreased admin time of analgesia without any reported adverse affects	John's Hopkins Non-Research: Level VB
Habich, Michele and Marlo Letizia (2015). Pediatric pain assessment in the emergency department: A nursing evidence-based practice protocol. <i>Pediatric Nursing</i> . Retrieved from: <a href="https://www.ncbi.nlm.nih.gov/pubmed/26470469">https://www.ncbi.nlm.nih.gov/pubmed/26470469</a>	Suburb west of Chicago	none	quality improvement project	100 ED staff nurses and 60 patient charts at a Community Hospital near Chicago which is also a Level II trauma center	staff education on pain assessment, proper pain scale, documentation of pain characteristics and frequency of pain documentation	frequency, appropriate pain scale selection, and documentation of pain characteristics for pediatric patients in ED	percentages of desired documentation compared with incomplete or inaccurate documentation	computer driven nurse education programs can significantly improve the documentation of pain for pediatric patients in the ED, however more improvement is needed to raise level of pain intervention for patients	John's Hopkins Non-Research: Level VB
Heilman, James A., Mary Tanski, Beeth Burns, Amber Lan, John Ma (2016). Decreasing time to pain relief for emergency department patients with extremity fractures. <i>BMJ</i> . Retrieved from: <a href="http://bmjopen.bmj.com/content/bmjopen-2016-020922.full.pdf">http://bmjopen.bmj.com/content/bmjopen-2016-020922.full.pdf</a>	Level 1 trauma center with 50,000 visits annually	none	quality improvement cycles	Approximately 402, 202 pre and 200 post intervention, patient charts at an academic ED	time to analgesia administration for adults and pediatric patients presenting to ED with longbone fractures	Median monthly time to analgesia administration generated by chart-based data report for CMS reporting	run chart	By implementing three improvement cycles median analgesia admin. Time was reduced by 31 percent. Lessons learned: RN's concern of NPO status affecting med admin, multiple cycles to address unforeseen concerns, and weekly 'standup' meetings to update team on numbers	John's Hopkins Non-Research: Level VB
Krauss, Barnich S., Lorenzo Calligaris, Steven M. Green, and Egidio Barbi (2016). Current concepts in management of pain in children in the emergency department. <i>The Lancet</i> . Retrieved from: <a href="http://www.thelancet.com/journals/lanet/article/PIIS0140-6736(14)61686-X/fulltext">http://www.thelancet.com/journals/lanet/article/PIIS0140-6736(14)61686-X/fulltext</a>	No indication of any study locations, 118 references cited, 0 giving indication of location, words rural/urban/ suburb/ nonrural used 0 times in article or references	none	Systematic Review	Cochrane, Medline, PubMed, and other journals. Also referenced review articles, editorials, and book chapters. Excluded case reports and abstracts, but did review articles referenced in primary articles read	pain, pain management, chronic pain, pain scores, pediatric pain, emergency management	none	Author review	Pharmacologic, physical comfort, distraction, and effective communication are discussed in detail, standing triage nurse protocols are recommended	John's Hopkins Non-Research: Level VB
Taylor S.E., Taylor D.M., Jao K., Goh S., Ward M. (2013). Nurse-initiated analgesia pathway for paediatric patients in the emergency department: A clinical intervention trial. <i>Emergency Medicine Australasia</i> . Retrieved from: <a href="http://onlinelibrary.wiley.com/doi/10.1111/1742-6723.12103/abstract?sessionid=4448789F32DD475F3988CDBE642DB0_0#d02">http://onlinelibrary.wiley.com/doi/10.1111/1742-6723.12103/abstract?sessionid=4448789F32DD475F3988CDBE642DB0_0#d02</a>	Tertiary Australian facility with 18,000 pediatric visits annually	none	Pre and Post Intervention Study	102 patients, 51 pre and 51 post intervention in an Australian tertiary adult/ pediatric ED	percent of patients 5-17 years old who received nurse initiated analgesia, time to analgesia, patient report of receiving 'adequate analgesia' and family satisfaction with pain management while in ED	chart review and parental survey 48 hours post discharge	unknown	nurse initiated analgesia protocols decreased time to analgesia, increased family satisfaction, and reported no adverse affects	John's Hopkins Research: Level IIIB
Thomas, Daina, Janeva Kircher, Amy C. Flint, Eleanor Fitzpatrick, Amanda S. Newton, Rhonda J. Rosebush, Simran Grewal, and Samina Ali (2015). Pediatric pain management in the emergency department: The triage nurse's perspective. <i>Journal of Emergency Nursing</i> . Retrieved from: <a href="https://www.ncbi.nlm.nih.gov/pubmed/25837698">https://www.ncbi.nlm.nih.gov/pubmed/25837698</a>	Stollery Children's Hospital, IWK Health Center, and Children's Hospital of Eastern Ontario. Their 2011 census' were 29,197, 28,000, and 65,949 respectively. All hospitals are tertiary academic centers	none	survey	All triage nurses at three separate Canadian pediatric emergency departments	adequacy of triage pain control, acceptable time to analgesia admin., feasibility with administering pain control at triage, comfort with administering tylenol, morphine, morphine, and oxydodone at triage.	responses were scored using a 100mm visual analog scale	Mean, median, standard deviation, and interquartile range were used to describe continuous data and frequencies and proportions were used to describe categorical data. One-way analysis and Kruskal-Wallis tests were used to compare continuous data between hospitals, and X2 or Fischer exact tests were used to compare categorical data between hospitals.	triage practices vary widely across settings and between general and pediatric triage nurses. General triage nurses demonstrated longer acceptable wait times to analgesia and more discomfort with administering pain control to children as compared to pediatric triage nurses.	John's Hopkins Non-Research: Level VA
Weingarten, Laura, Janeva Kircher, Amy L. Drendel, Amanda S. Newton, and Samina Ali (2014). A survey of children's perspectives on pain management in the emergency department. <i>Evevier</i> . Retrieved from: <a href="http://dx.doi.org/10.1016/j.jemermed.2014.01.038">http://dx.doi.org/10.1016/j.jemermed.2014.01.038</a>	tertiary canadian hospital	none	prospective cross-sectional survey	100 pediatric ED patient, convenience sample from a Canadian tertiary pediatric ED	patient demographics, quality of pain, pain scores and satisfaction with pain management	100mm visual analog scale for pain level and total pain quality management questionnaire- modified	IBM software, means, standard deviations, confidence interval of 95 percent, t-tests for continuous data, chi-square and Fischer exact tests for categorical data. P<0.05 statistically significant.	Children report improved satisfaction with pain management with faster administration times and faster medication onset. More importantly families reported increased pain management satisfaction with improved provider communication e.g. asking about quality of pain, and offering pain management options	John's Hopkins Non-Research: Level VB
Wentz, Sarah J. K. and Richtfield (2013). Nonpharmacologic pediatric pain management in emergency departments: A systematic review. <i>Journal of Emergency Nursing</i> . Retrieved from: <a href="https://www.ncbi.nlm.nih.gov/pubmed/23199786">https://www.ncbi.nlm.nih.gov/pubmed/23199786</a>	The review and its reference list used the words "rural", "urban", "suburban", and "nonrural" or "non-rural" zero times. All articles cited were reviewed for location. Articles ranged in geography from the Southwestern United States to Central Canada. All articles which listed specific locations took place in academic centers.	none	systematic Review	14 studies, from literature review search including CINHAL, PubMed, and Cochrane	nonpharmacologic pain management of patients birth to 18yr old presenting to emergency departments	use of nonpharmacologic pain management of patients birth to 18yr old presenting to emergency departments	descriptive explanation of various study results	Distraction had mixed results with some studies finding decrease pain levels and others not. Sucrose also had mixed results. Parent comfort holding showed reduction in pain/ anxiety pre, during and post painful procedures.	John's Hopkins Research: Level IIIB
Wiler Jennifer L., Christopher Gentle, James M. Halfpenny, Alan Heins, Abhi Mehta, Michael G. Mikhal, Diana Fie (2010). Optimizing emergency department front-end operations. <i>Annals of Emergency Medicine</i> . Retrieved from: <a href="http://www.sciencedirect.com/ignacio/verfca.edu/science/article/pii/S019606400905319/via%3Dhub">http://www.sciencedirect.com/ignacio/verfca.edu/science/article/pii/S019606400905319/via%3Dhub</a>	systematic review which included 52 individual articles. Article locations included: 36 urban, 4 suburban, 2 rural, 2 community centers, 3 not stated, and 5 others. Articles included under other were individual case studies, or studies of specific patient diagnosis, and not specific to any location	none	Systematic Review	52 individual articles were included	Immediate bedding, triage protocols, practitioner at triage, fast track, communication tools: tracking systems, kiosks, wireless communications,	systematic review by authors and narrative of the current body of literature	ACEP clinical policy review tool was used to rate individual articles	In regards to triage protocols, current literature is limited to reports of single facilities, and data varies. General findings include over and under ordering of triage nurses with concern for needless exposure to radiation and lab draws. Consistent benefits include decreased LOS, time to treatment, and increased patient satisfaction, and increased staff satisfaction.	John's Hopkins Non-Research: Level VB
Williams, Suzanne, Child & Yih Hih Nxing, Kerri Holzhauser, Donna Bonney, Elizabeth Burmeister, Yuri Gilbaza, Randall Oliver, Kerry Gordon (2012). Improving pain management of abdominal pain in children presenting to the paediatric emergency department: A pre-post interventional study. <i>Evevier</i> . Retrieved from: <a href="https://www.ncbi.nlm.nih.gov/pubmed/22947686">https://www.ncbi.nlm.nih.gov/pubmed/22947686</a>	Australian, urban center, hospital	none	pre and Post Intervention Study	160 charts were selected in total, 80 pre and 80 post at Mater Children's Hospital in Australia	nursing surveys, documentation of pain score and time from triage to admin. Of analgesia	time from triage to analgesia admin	STATA software, non parametric tests for continuous data, and chi square for discrete data.	no significant improvement in pre and post data time to analgesia admin.	John's Hopkins Non-Research: Level VB

**Appendix B**

Study Outcomes Matrix

<b>Study</b>	<b>Decreased time to analgesia</b>	<b>Improved pain scale selection</b>	<b>Improved patient satisfaction</b>	<b>Decreased patient length of stay</b>	<b>Improved staff satisfaction</b>	<b>Adverse affects</b>
Barksdale, Hackman, Williams, and Gratton (2016)	x					none
Goh, Choo, Lee, and Tham (2007 )	x					none
Habich and Letizia (2015)		x				none
Heilman, Tanski, Burns, Lin, and Ma (2016)	x					none
Krauss, Calligaris, Green, and Barbi (2016)	n/a					
Taylor, Taylor, Jao, Goh, and Ward (2013)	x		x			none
Thomas, et al. (2015)	n/a					none
Weingarten, Kircher, Drendel, Newton, and Ali (2014)			x			none
Wente, S. J. (2013)	n/a					none
Wiler, et al. (2010)	x			x	x	over/under utilization compared with provider preference
Williams, et al. (2012)	-					