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Interfacility Transfer of Pediatric Patients to a Comprehensive Children's Hospital

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Abstract

Practice Problem: Secondary transfers to pediatric centers have increased by 25% due to the regionalization of specialty care. Low pediatric volume and the lack of access to pediatric subspecialty confounds the need for transfer requests to comprehensive children's hospitals. Referring hospitals rely on pediatric teams to determine the level of service and mode of transportation decisions due to a lack of comfort in caring for and managing pediatric patients.

PICOT: This project was guided by the following PICOT: In pediatric patients transferring from other healthcare facilities to a comprehensive children's hospital (P), does the implementation of a nurse-led pediatric illness severity scoring tool (I) versus traditional phone triage (C), increase recognition and notification of ICU level patients (O) in 8-weeks (T)?

Evidence: Triage transport tools have been studied in the pediatric population and are relied on to determine acuity and predict admission needs. Acuity tools allow for consistent resource allocation and improved transfers by removing the subjectiveness of physical findings and converting the assessments into objective metrics needed to make safe transport and admission decisions.

Intervention: A pediatric transport acuity tool was implemented to standardize the reporting framework and was scored to identify high-acuity patients requiring transport for definitive care.

Outcome: Improved identification of ICU-level patients requiring transport to a pediatric hospital from 63% pre-intervention to 97% post-intervention.

Conclusion: This project increased recognition of ICU-level pediatric patients through use of the TRAP tool and also identified a broader impact, which is exposing referring hospitals to a triage tool that assists outside providers in identifying acutely ill pediatric patients.

Interfacility Transfer of Pediatric Patients to a Comprehensive Children's Hospital

In the last decade, there has been a progressive shift to regionalized specialty care in efforts to consolidate expertise and maintain competencies of low-volume, high-risk subspecialties. Regionalized healthcare systems have centralized specialty care to improve outcomes in specific populations (Leroux et al., 2020). One of the biggest specialty shifts has occurred in pediatrics. In the United States, 27% of the population consists of children (Emergency Medical Services for Children, n.d.). For every one children's hospital, there are 20 general community hospitals to service a region (Casimir, 2019).

While pediatric experts tend to work out of a central comprehensive institution, this does not mean that pediatric patients travel to these locations. Most pediatric patients seek care at the nearest emergency department (ED); however, 90% of this patient population access an ED that does not have pediatric specialists (Emergency Medical Services for Children, n.d.). In regionalized multicenter studies, pediatric admissions have decreased, partially due to better outpatient access, yet secondary transfers to pediatric centers have increased by 25%. Regionalized pediatric hospitals carry the responsibility and the burden to triage and coordinate care for their surrounding community hospitals as they are relied upon to provide definitive care for the community hospitals that do not have the expertise or ability to manage pediatric patients (Gausche-Hill, 2020). This project aimed to establish the best evidence-based practices surrounding secondary transfers of pediatric patients from community EDs to comprehensive children's hospitals while ensuring safe, timely, and efficient care.

Significance of the Practice Problem

There are approximately 5.3 million pediatric hospitalizations annually in the United States, with 350,000 of those hospitalizations transferred in from an outside facility (Reid & Fang, 2022). Although regionalization of pediatric care serves to improve patient outcomes, it has subsequently caused community hospitals to lose the ability to manage basic pediatric care. What started out to centralize uncommon specialties, like pediatric cancer or rare diseases, regionalization of pediatric care has evolved to transferring common, low-acuity illnesses (Casmir, 2019; Leroux et al., 2020). Due to the sheer number of community hospitals compared to pediatric hospitals, most general ED's have lost confidence in treating pediatric patients with seeing less than 15 children per day on average. Eighty-three percent of all pediatric ED visits occur in a community hospital, yet only 30% of children have access to a pediatric-ready ED. Literature has shown that as EDs lose their ability to definitively care for children from loss of pediatric specialists or services, the rate of secondary transfers to a primary pediatric facility increases. This includes the transfer of low-acuity common illnesses that have been historically treated at general hospitals like respiratory infections, orthopedic injuries, and abdominal pain (França & McManus, 2017; Michelson et al., 2019). ED's that lack pediatric readiness have an increased risk for poor transfer outcomes, which is detrimental to the pediatric population (Hamline & Rosenthal, 2020). Contributing factors to poorly prepared community hospitals receiving pediatric patients include a lack of training and the minimal provision for educational resources to help maintain competency (Gausche-Hill et al., 2015).

Regional pediatric hospitals carry the responsibility and the burden to triage and coordinate care for their surrounding community hospitals as they are relied upon to provide definitive care for the community hospitals that do not have the expertise or ability to manage pediatric patients (Gausche-Hill, 2020). As pediatric care becomes more specialized, the need for fast, efficient transport to pediatric tertiary and quaternary centers has become increasingly necessary. Community hospitals have a varying range of expertise regarding assessing, stabilizing, and identifying children who need a higher level of care, which can make it challenging for a pediatric center to identify who needs definitive care over those who require a reevaluation (Schmidt et al., 2022). This can lead to several inefficiencies including delays in care and reduced availability to accommodate children who need definitive care due to suboptimal utilization of patient transfers (França & McManus, 2017).

Low pediatric volume and the lack of access to pediatric subspecialty confounds the need for transfer requests, as literature has shown an overall decrease in pediatric admissions by nearly ten percent and an increase in pediatric interfacility transfers increasing by 25 percent in the last decade (França & McManus, 2017; Lieng et al., 2021). Emergency Medical Treatment and Active Labor Act (EMTALA) regulates the level of transportation as being the responsibility of the sending physician. However, many referring physicians rely on the pediatric teams to make the level of service and mode of transportation decisions due to a lack of comfort in caring for pediatric patients (Lee et al., 2018).

Transitions of care are often associated with adverse events due to poor information exchange. Sending physicians are responsible for providing enough patient data to ensure safe continuity of care, though often the provider may not know or cannot accurately relay pertinent information to ensure a safe transition (The Joint Commission, 2017). Community physicians who are not accustomed to a standardized transfer of care report specific to children may leave out pertinent information needed for the transport team to send the correct team composition and equipment (Page-Goertz et al., 2018). Communication failures in handoff reports are the cause of upwards of 60% of reported sentinel events and 84% of treatment delays (American Academy of Pediatrics, 2016). Incomplete transfer information can result in duplicative labor and testing as well as inaccurate level admissions in up to 12% of transfers (Usher et al., 2016). Since there is no current national systemic intervention to reduce pediatric specialist consults without transferring for a direct consult (Mohr et al., 2016), it is imperative that communications between hospitals are thorough and accurate to prepare for a means of safe transport. Nearly seven percent of all children and 10% of all children transported for respiratory disease experienced clinical deterioration within a transport cohort coming from a community hospital to a pediatric destination (Cecil et al., 2022). Each transfer a pediatric hospital receives can create a $4,000 cost for transport efforts, and each interfacility transfer can cost between $2800 to $5500 per patient. Unnecessary transfers, which are defined as patients who are discharged from the pediatric emergency room or have less than a 12-hour stay without specialty consults, generate nearly $500,000 in wasted resources annually in the United States (Gattu et al., 2017). It is difficult to estimate the cost of redundant tests and the family frustration because of secondary transfers, as literature on indirect costs is lacking (Richard et al., 2020). Studies have shown an association between racial, ethnic, and payor source differences in relation to in-hospital mortality (White et al., 2020).

Standardized and complete documentation contributes to lower medication errors and near misses (Usher et al., 2016). For pediatric transfers, a standardized and reliable illness severity tool may offer insight into clinical stability, determine definitive disposition, and better triage transport (Monsoor et al., 2022). Transitions of care that utilize a consistent communication framework align with The Joint Commission recommendations, National Patient Safety Goals, and the American Academy of Pediatrics, who all agree that standardization of handoff report supports the best patient outcomes (American Academy of Pediatrics, 2016). The goal of a standardized illness severity tool would be to formalize a consistent and validated tool that could reduce the discrepancy of patient presentation at the outside hospital and improve safe transport with an accurate level of disposition at the accepting pediatric facility.

PICOT Question

This project looked to answer the following PICOT: In pediatric patients transferring from other healthcare facilities to a comprehensive children's hospital (P), does the implementation of a nurse-led pediatric illness severity scoring tool (I) versus traditional phone triage (C), increase recognition and notification of ICU level patients (O) in 8-weeks (T)?

Population

The participants included patient transfer requests from outside hospital EDs to the pediatric hospital. Eligible patients were pediatric ages (0 –15 years) who required transfer for definitive pediatric expertise. Excluded from the participants were patients who did not meet transfer criteria, including patients who were pregnant, met burn center criteria or replant center criteria. Scheduled transfers, in-patient to in-patient transfers, and NICU transfers were not included in this participant data as the level of service is pre-determined.

Intervention

The intervention included the implementation of a validated pediatric acuity scoring tool to predict the severity of illness. The scoring system would identify pediatric patients who would benefit from ICU medical oversight during transport or direct admission to the ICU. The triage nurse would notify the ICU team of any patient who scored over four on the triage assessment tool.

Comparison

The intervention was compared against the current patient transfer intake process in which the RN gathered information from the outside hospital and notified the transport team. The ED physician accepted the patient on behalf of the hospital. There was no formal criteria or tool used to notify the PICU staff other than at the discretion of the ED physician or intake nurse.

Outcome

The outcome reviewed the TRAP tool scores, identification of pediatric patients who met ICU level of care by using a transport-specific illness severity tool, and disposition of the patient (DC, Floor, ICU).

Time Frame

The project spanned over 8 weeks.

Evidence-Based Practice Framework & Change Theory

The evidence-based practice (EBP) model selected for this project was the Johns Hopkins Evidence-Based for Nursing and Healthcare Model (JHEBPM). The JHEBPM, in its latest 2022 iteration, provided a systematic approach to a project that translated evidence into practice. The JHEBPM originated with the practice question. The practice question was discovered through identified knowledge gaps. In the case of pediatric transfers, there was a recognition of pediatric patients in outside hospitals who were found to be clinically sicker upon the transport's team arrival compared to the original report received by the intake nurse. Once the practice problem was identified, the appointed stakeholders conducted an internal and external search of the current literature and synthesized the results. From there, the evidence was translated into clinical practice through recommendations, action plans, and evaluation of results (Melnyk & Fineout-Overholt, 2018). The EBP framework ensured clinical decisions and practice changes were based on relevant evidence that promoted efficacy, efficiency, and effectiveness. These changes helped optimize outcomes, standardize care, and set expectations for the development of healthcare indicators. Professional and regulatory bodies rely on evidence-based indicators to ensure quality healthcare benchmarks are met. Organizations that cultivate ongoing EBP infrastructure support continuous change needed to drive best care (Dang et al., 2022).

Roger's Diffusion of Innovations Theory

The change theory that complemented this organizational EBP change was Roger's Diffusion of Innovations Theory. Roger's theory complemented this organization since it is staffed with early innovators who were engaged and interested in moving toward best practice efforts (Melnyk & Fineout-Overholt, 2018). Roger's theory was guided by three main stages.

The first stage of Roger's theory is knowledge. Knowledge was built when individuals identified the issue and understood the need for innovation. When pediatric transports deviated from the standard flow due to a change in patient status, the cases were reviewed, and knowledge gaps were identified through case review meetings. The second stage of the theory is persuasion. Perceptions of persuasion vary depending on five attributes. Compatibility, simplicity, trialability, observability, and relative advantage were attributes that affected an individual's acceptance to change. The more a team member was invested or involved with certain cases, the more invested the person became in promoting change. The last stage is the decision stage. The individuals decided whether to accept or reject the innovation. Ultimately, the individuals that worked within the system needed to accept the change to drive the change (Orr, 2003).

Evidence Search Strategy

A search strategy was performed within the following databases: CINAHL, ProQuest, PubMed, OVID, and Google Scholar. Key terms included ‘interfacility transfer’ “AND” ‘pediatric’ “AND” assessment tool’ “AND” ‘acuity’ for all databases. Inclusion criteria included academic journal articles from 2017 to the present, children defined as 17 years old and under, and English text. All article titles and abstracts were screened for appropriateness to the subject. Exclusion criteria included adult patients, telemedicine, simulation, and any articles not pertaining to pediatric transfers with risk assessment as well as inter-hospital transfers.

Evidence Search Results

A comprehensive search yielded several articles through the above-mentioned strategy. The initial search strategy yielded 543 articles within the inclusion criteria and specified time range. Eighteen duplicates were removed. Articles were excluded for various reasons. For example, articles that involved telemedicine assessment, neonatal transfers, transport staff configurations, and adult transfers were the main reasons for exclusion. Two articles were identified through other sources and added for consideration. One article included a systematic review with meta-analysis of a triage acuity system, and the other article was included for the quality of study even though it was beyond the 5-year study range. The total number of articles included for review after removing duplicates and exclusion articles was 24. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Figure 1).

The John Hopkins EBP Model was followed to appraise the articles for quality and strength (Dang et al., 2022). Of the 24 articles, 20 articles were quantitative studies, and one was a qualitative study. Two articles were quality improvement articles. One study was a systematic review with a meta-analysis of triage acuity systems. Most articles were retrospective review articles with observational studies. Most of the articles were level III sources. Appendices A, B, and C categorize the studies that were included for primary research and systematic review (see appendices). The overall strength of the articles was Grade B.

Themes with Practice Recommendations

A thorough evaluation was conducted on the articles within the evidence tables. Three themes were identified related to the implementation of a pediatric acuity tool in the setting of an interfacility transfer: pediatric transfers are more frequent due to regionalizing specialty care, patients have a risk of clinical deterioration during transfer, and establishing clinical acuity with objective metrics creates standardized and safer transports. Within the themes, the pros, cons, strengths, and limitations were analyzed.

Regionalization of Pediatric Care

Multiple studies contributed to the literature on the increase of pediatric secondary transfers to the regionalization of pediatric specialties. Pediatric transfers have risen 25% over the last decade because of consolidating pediatric expertise (Casimir, 2019; França & McManus, 2017; Gausche-Hill, 2020; Leroux et al., 2020). Like many specialties, pediatric care is considered a low-volume specialty. Consolidating care maximizes the volume and competency needed for pediatric specialists to stay astute in their respective subspecialties; however, this has resulted in an increase in the number of children needing to be transferred out of an emergency department that is not able to provide definitive care. Children with complex conditions may not have access to pediatric specialists due to the lack of available children's hospitals in the event of an emergency (Casmir, 2019; França & McManus, 2017; Michelson et al., 2019). Hospitals that have low pediatric readiness scores and are uncomfortable taking care of pediatric patients are more likely to transfer their pediatric patients. As a result, upwards of 30% of pediatric transfers may be unnecessary, leading to inappropriate use of resources and costs for the transport team and respective transferring facilities (Gausche-Hill et al., 2015; Gausche-Hill, 2020; Lee et al., 2018; Richard et al., 2020).

Risk of Clinical Deterioration

It is estimated that between seven to 12% of all pediatric interfacility transfers report a change in clinical condition during transport (Cecil et al., 2022; Gallegos et al., 2018). The most common age range for medical interfacility transfer within the literature was between ages one to four, with the most common reason for transfer being respiratory distress (Holt et al., 2020; Richard et al., 2020; Schmidt et al., 2022). Clinical deterioration was partially due to the "sending" facility failing to recognize acuity significance during physical assessment and not transmitting the appropriate information through a standardized handoff, with the most common causes of deterioration being circulatory and respiratory complications (Chaichotijinda et al.,2020; Rosenthal et al., 2016). Despite a lack of a standardized scoring system used during interfacility reports, retrospective studies found that failing systolic blood pressure, abnormal respiratory rate, increased oxygen requirement, and declining mental status were the four variables that were associated with clinical deterioration in the pediatric patient and have shown a higher association of unplanned adverse events (Gallegos et al., 2018; Kandil et al., 2012).

Pediatric Transport Acuity Tool

Standardized handoff templates are widely accepted, as their use has demonstrated a reduction in errors and preventable adverse events. The standardized tool ensures essential findings are reported, and clinical risk factors are identified (Rosenthal et al., 2016; Schmidt et al., 2022). Triage tools have been studied in the pediatric population and are relied on to determine acuity and predict admission needs. Acuity tools allow for consistent resource allocation and improved transfers by removing the subjectiveness of physical findings and converting the assessments into objective metrics (Mansoor et al., 2022; Mathison et al., 2013; Page-Goertz et al., 2018; Sutton et al., 2022; Zachariasse et al., 2019). Evidence has noted that scoring tools are applicable to the transport of critically ill children and consider the physiologic variables known to be associated with the clinical deterioration of the pediatric patient (Gallegos et al., 2018; Holt et al., 2020; Kandil et al., 2012). The Transport Risk Assessment in Pediatrics (TRAP) tool (Appendix D) and the Transport Pediatric Early Warning Score (TPEWS) were two widely studied acuity tools touted for their ease of use, collection of objective findings, and were noted to be good predictors of clinical status. Elevated scores in both the TRAP and TPEWS were associated with the need for intensive care admissions, where every one-point increase in the TRAP score increased PICU admission by 40% (Holt et al., 2020; Holt et al., 2018; Kandil et al., 2012; Leroux et al., 2020; Petrillo-Albarano et al., 2012). Studies support that a TRAP greater than four is consistent for PICU admission (Holt et al., 2018). The TRAP tool has been validated to provide scores that identify pre-transport predictors of hospital mortality through bivariate logistic regression, with the TRAP score being the main independent predictor. The use of an acuity tool like TRAP and TPEWS did not affect outcomes based on the mode of transport (ground vs. flight); however, it was useful in optimizing the dispatch of appropriate transport team members and necessary equipment needed in anticipation of clinical deterioration (Mansoor et al., 2022; Petrillo-Albarano et al., 2012). Literature has supported statistically significant results demonstrating that higher TRAP scores were associated with greater PICU admission (odds ratio of 1.40 $p<0.001$). In addition, pediatric patients with a higher score were less likely to leave the PICU within 24 hours (odds ratio of 0.79 $p<0.001$). Reliability has been established with the repeated use of the validated tool (Kandil et al., 2012) (see Appendix D).

Practice Recommendation

The practice recommendation was the implementation of a nurse-led pediatric illness severity scoring tool (TRAP) to increase the recognition and notification of an ICU-level pediatric patient transferring from an outside healthcare facility to a comprehensive children's hospital. The practice recommendation was scored as a Johns Hopkins Quality Grade of Level II and a SORT Grade B. Outside hospitals, who were not comfortable or confident with taking care of pediatric patients were assisted by the intake RN to provide objective assessment data that was used to identify critically ill children to dispatch the appropriate transport team members and equipment needed to ensure safe transport. This practice change answered the following

PICOT question: "In pediatric patients transferring from other healthcare facilities to a comprehensive children's hospital (P), does the implementation of a nurse-led pediatric illness severity scoring tool (I) versus traditional phone triage(C), increase recognition and notification of ICU level patients (O) in 8-weeks (T)?"

Setting, Stakeholders, and Systems Change

The setting, stakeholders, and systems change for the proposed project were identified. The key stakeholders in the relevant settings supported the project proposal. The systems change analysis was conducted using a SWOT (strengths, weaknesses, opportunities, and threats) analysis prior to implementation. Lastly, the impact of the systems change at a systems level was reviewed, identified, and discussed.

Setting

The setting of the proposed project took place in a large comprehensive pediatric institution located on the west coast. The organization cares for over 100,000 pediatric patients yearly. The hospital has a dedicated pediatric transport team that transports approximately 400 children every month within the county and beyond. The transport team facilitates transfers using three dedicated ambulances and one helicopter stationed on campus. The transport team is dispatched by specially trained emergency department nurses, and medical oversight is provided by the PICU doctors who oversee the medical management of children while in transit.

The culture of the hospital strives to offer the best family-centered care for pediatric patients using evidence-based interventions. The mission and vision of the organization are to promote the health and well-being of children and to be the regional resource for pediatric care.

Stakeholders

There were several stakeholders needed to support the implementation of this project. The identified stakeholders included staff from the emergency department, transport department, PICU, and patient placement. Organizational support moved this project forward.

Upon completion, with evidence of an effective process change, the adoption of this process through policy and protocolization will ensure sustainability at an institutional level.

The project started within the emergency department, where trained emergency nurses fielded transfer requests from outside hospitals. Additional stakeholders in the emergency department involved the emergency physicians, who formally accepted the patient on behalf of the institution within the guidelines of EMTALA. The process required support from administration, ED directors, ED managers, and charge nurses, who assisted with anticipated changes in workload and productivity.

The second stakeholder group was the transport department. The transport department was needed to support as well as engage in the project. Their buy-in was important as they were the team who assisted in validating the findings of the tool reported by the staff at the outside hospital. Lastly, the PICU team needed to support the project, including the PICU fellow, attending physician, and charge nurses who were called upon to manage and obtain beds for the identified PICU-level patients using the proposed project intervention. The PICU team's buy-in was crucial in the successful adoption of this tool. Patient placement coordinators required the knowledge of this project to facilitate expedited in-patient bed placement for identified PICU-level patients during the implementation phase of this evidence-based project.

SWOT Analysis

A SWOT analysis (strengths, weaknesses, opportunities, threats) is available in Appendix E. There are many attributable strengths that can be credited to the validated tool implementation. Strengths included efficient in-patient bed utilization, better identification of critical patients, and timely intensive-care medical management. Weaknesses included the timing of tool implementation against ED surge capacity, staffing changes, and the overall lack of in-patient beds. Opportunities included institutional awareness and staff buy-in. Threats included staff resistance, staffing, and capacity limitations.

Systems Level Change

The proposed project influenced systems change on a micro, meso, and macro level. On a micro level, different units within the organization were affected. The emergency department, PICU department, transport department, and coordinating ancillary staff made decisions based on the triage acuity of the transported patient. The flow and coordination of the patient required the cooperation and situational awareness of each respective unit to successfully carry out the project change. On a meso level, the hospital needed to change how they accepted and received secondary transfers. Administrators and key stakeholder leaders needed to provide additional unit support depending on the number of intake calls, who were identified as PICU level criticality, to support the coordination of care. On a macro level, the process in which referring hospitals called to initiate a secondary transfer needed to adapt to a different cadence in intake questions and transfer team coordination. The process change impacted the way transfers were handled and carried out throughout the region, with the potential of sharing this practice change at a local and national level to further promote EBP-driven change.

Implementation Plan with Timeline and Budget

Three main objectives were identified and monitored during this process change to ensure timely completion of the project. Using the SMART (specific, measurable, attainable, realistic, and timed) format, the following goals were applied to the project.

1. Train the triage RNs and the transport staff on the triage tool with the goal of 90% of the staff trained by the end of week one.
2. Staff will complete the triage tool on 90% of the transfer patients during the first week of implementation.
3. Staff will have identified 90% of the ICU-level patients through the validation tool on all patients admitted to the PICU service for the remainder of the 8-week study.

Implementation Plan

The implementation plan was guided by evidence-based practice and Roger's Diffusion of Innovation Theory model. The practice change of implementing a validated acuity tool for identifying potential ICU-level pediatric patients was supported using high-quality articles through the Johns Hopkins EBP model process.

Roger's Diffusion of Innovation model thrives in an institution that promotes best practice culture (Melnyk & Fineout-Overholt, 2018). The stakeholders, which included the dispatch RNs, transport team, and ICU team members, identified the need to increase recognition and management of acutely ill pediatric patients who required transfer to a pediatric center through monthly morbidity and mortality meetings. The change was supported through the clinical practice council, and project champions were identified to lead the project within their respective departments. The nurses were instructed on how to implement the tool. The rationale and evidence presented during training persuaded the staff to use the tool. The education process included an overview of the TRAP tool, specific elements of the TRAP tool, and a step-by-step form to ensure the TRAP tool is being used in a consistent manner (Appendix F). As the team members became more accustomed to the process and saw how the tool can identify acutely ill children accurately, the more the team accepted and promoted the practice change.

To establish face validity, the TRAP tool was reviewed by five nurses who are considered experts in the field of pediatrics. The selected nurses all have over 10 years of nursing experience and have a working knowledge of pediatric transport triage. The nurses reviewed the TRAP tool for readability, feasibility, consistency, and format. All five experts felt the tool was appropriate and agreed to the construct and usability of the TRAP tool.

In the decision stage, individuals decided whether to accept or reject the innovation. This last stage is supported by the results and statistical significance. This phase was reported back to the teams and stakeholders at the end of NUR7803. Ultimately, the individuals that work within the system need to accept the change to continue to drive the change (Orr, 2003).

Interprofessional collaboration was crucial for this practice change to occur. The use and application of a clinical severity tool required communication and trust between several team members across multiple departments. The intake nurses in the emergency room needed to feel comfortable using the tool and relaying the findings to the transport team and ICU physicians. The transport team needed to trust the validation of the tool and dispatch the appropriate team members and equipment. The ICU team needed to anticipate certain medical oversight and they prepared for the high likelihood of accepting the patient to the ICU services.

Risks with this intervention included the potential loss of confidentiality with regard to the data collected during the implementation phase. However, all data was de-identified and entered into password-protected computers to prevent this risk. The data was reviewed, compiled, and stored in the secured Excel database using an approved de-identified method (first letter of last name and the last three numbers of the patient ID) by the project manager (PM). HIPAA compliance was maintained within the database.

The PM accomplished several duties, including acting as a communicator, planner, organizer, and data analyst to successfully complete this project (Harris et al., 2018). Due to the size of this project, the PM worked with the teams to lead the project and managed any unforeseen issues and needs that developed during this change practice. The PM oversaw the training, implementation, and monitoring of the project. The PM ensured that the stakeholders' expectations were met and that the outcomes met the needs of the patients affected by this project.

Timeline and Budget

The timeline activities spanned three terms that included planning, implementation, and evaluation deadlines. The project was implemented within an 8-week timeframe not including the time needed to complete the analysis and disseminate the findings to relevant stakeholders. The PM (DNP student) was entirely responsible for the planning, implementation, data collection, and analysis of the project. The timeline is found in Appendix G. The budget considered the training of the staff, equipment, and supplies needed for the project. The budget is located in Table 1.

Results

The participants in this project included the triage staff who were trained on the TRAP tool and data entry requirements (Appendix D). The data collected included data on pediatric patients ages 0 to 15 years who were transferred to the pediatric facility from outside hospitals and their dispositions from the institution within the 8-week project timeframe.

Data Collection

The data collected provided insight into the effectiveness of an acuity tool and its impact on the practice problem driving this project. The participants in this project included the triage staff who were trained on the TRAP tool and data entry requirements (Appendix D). The tool served as a visual prompt in the implementation phase to ensure the data collected during this project was reliable and consistent. The data collected during this project included pediatric patients ages 0 to 15 years who were transferred to the pediatric facility from outside hospital EDs during the 8-week project timeframe. The data excluded from the project included chief complaints of isolated extremity fractures, testicular torsions, and foreign body ingestion, as these complaints are isolated in nature and went directly to the OR.

The data points collected included the reason for transfer, which is the diagnosis given by the sending physician. The TRAP tool total score, as well as the individual category scores, were obtained on patients who met the age criteria. The data elements and the permission to use the tool from the original authors are noted in Appendix H. The data elements were entered and stored in a password-protected Excel file. Missing data entries were removed to ensure the integrity of the project results. The TRAP scores were dichotomized as either a low TRAP score (≤4), noted to be associated with lower acuity patients who are either discharged or admitted to a non-ICU unit, and a high TRAP score (>4) associated with PICU level acuity.

The collection of partial patient health information (PHI) was imperative as the TRAP tool is customized to the patient's age. The working diagnosis was collected to monitor any confounding variables that may skew the findings. This data contributed towards final thoughts on the clinical significance this tool had on this specific population. The final dataset included the disposition of the patient, categorized as discharged from ED, admitted to the floor, or admitted to PICU.

The comparison data included a retrospective review of transported patients with similar inclusion profiles. The pre-intervention data was collected over an 8-week timeframe noting the dispositions of each transfer. This contained the traditional triage intake and noted admissions being directly transferred to the PICU versus transferred to the ED then admitted to PICU. The categories of measures for event and outcome variables included TRAP scores and disposition (DC, non-ICU admission, PICU) (see Table 2)

The data set was analyzed using Intellectus Software (Intellectus, 2019). An independent samples t-test was performed to determine the statistical significance of the pre- and post-intervention data sets. A Shapiro-Wilk test determined that the normal distribution assumption was met. The alpha was set at .05 to determine statistical significance. The p-value returned at 0.005, indicating statistical significance (see Appendix J).

While statistical significance is important, those findings alone may not provide enough support to ensure meaningful and sustained impact. Emphasis on clinical significance was relevant when considering the impact of an EBP project within a defined population. Projects that provide clinical significance are impactful to the patient, families, and staff (Kim & Mallory, 2017). Table 3 demonstrates the percentage of patients identified as ICU-level patients versus the total ICU admits for each week. The average identification of ICU-level of care pre-intervention was 63% compared to 97% ICU-level identification after implementation of the TRAP tool. Triage nurses identified a higher percentage of ICU-level of care prior to dispatch in the implementation phase versus the comparison group. During implementation, ICU-level medical care was initiated earlier, meaning specialized care with ICU-level expertise could be started before the patient arrived. In addition, the implementation of the TRAP tool supported nurse-driven early notification to the ICU staff that prompted an ICU bed search supporting optimal bed placement allocation. This project was approved by both the facility and the University of St. Augustine Nursing Program. The outcome focused on answering the stated PICOT question. The results demonstrated the impact of implementing a validated pediatric acuity tool and its ability to accurately identify ICU-level pediatric patients who transfer to a pediatric hospital. This practice change, which was to optimize the care and well-being of the pediatric patient population, was determined to be effective.

Impact

This project addressed the need to better identify high-acuity pediatric patients who required transfer for definitive care. The implementation of a standardized acuity tool provided a structured and objective approach to the triage intake process. The implementation of the TRAP tool reduced the burden the triage nurses assumed when making clinical decisions based on unscripted information. The TRAP tool elicited the collection of relevant information exchange needed to make safe transport dispatch decisions, timely staff notifications, and early coordination of ICU-level of care.

This EBP project produced a practice change that was not only found to be statistically significant but also highlighted important clinical significance by identifying high acuity patients consistently through utilization of the TRAP tool. This project identified a broader impact, which was exposing referring hospitals to a tool to assist their staff in identifying acutely ill pediatric patients as well. This tool could be used to close the gaps that have been identified in recent pediatric readiness surveys and improve the ability to triage sick or injured children who have a need for definitive care in a timely manner.

It was important to consider future implications when implementing a practice change. It is imperative to ensure continuous data review and monitor for variances that may not have been revealed during the 8-week implementation phase. While the project is sustainable, it added additional time and data entry points for every triage. The data will continue to be analyzed and reviewed to ensure the dispatch and transport processes remains relevant. Through continued efforts of the triage nurses, transport team, and medical providers who oversee transport care, it was determined that this intervention was successful and could continue through the institutional process that would adopt this project into standard practice.

To further solidify this practice change, continuous monitoring is required to identify any potential barriers to using the tool. Frequent rounding with the triage staff was required to identify any deviations in the process. Additional framework guidance for the triage nurse if the outside hospital is unable to collect any of the data points needed to tally a score. Another example would be to further streamline certain diagnoses known to require automatic ICU care despite a potentially low TRAP score, such as diabetic ketoacidosis. A list of patients admitted to the ICU who were not triggered by the TRAP score needed to be reviewed for trends. These trends will need to be considered when refining or reevaluating the process change.

Limitations

There were several notable limitations to this EBP project. One limitation is that this acuity tool was implemented at a single institution and was carried out for a short 8-week period. Second, several entries (150 out of 641) needed to be removed because the outside hospital was unable to collect a blood pressure, leaving incomplete TRAP scores.

Dissemination

The results of this project were shared through multiple forums within the practicum site as well as the academic community. At the institutional level, the relevant stakeholders, those in leadership, as well as any interested associates, were invited to hear the results of this project through a virtual presentation. This project was presented to the current DNP cohort and faculty at the University of Saint Augustine through an oral poster presentation. The final manuscript was also submitted for publication to the school's Scholarship and Open Access Repository (SOAR). Professional societies such as the American Academy of Pediatrics and Emergency Nurses Association would be appropriate forums worth consideration if this project were to be submitted for publication or presentation.

Conclusion

Pediatric transfers have become a necessity due to the regionalization of specialty care. As pediatric care becomes more specialized, the need for fast, efficient, and accurate triaging to transport to pediatric centers has become increasingly necessary. The use of a validated acuity tool in the setting of pediatric secondary transfers increased the early identification of ICU-level patients, ensured an adequate transport team response, and provided an early notification to the appropriate ICU team members, thereby reducing delay to definitive ICU-level care. The TRAP tool is a structured handoff report that collected pertinent patient findings that informed the triage and transport staff to prepare and intervene for high acuity patients at risk for clinical deterioration or untoward outcomes. This evidence-based project required support from multiple stakeholders using a multidisciplinary approach. The JHEBP framework and Roger's Diffusions of Innovation Change Theory guided and supported the adoption and implementation of this change project in the clinical setting. The findings were analyzed using appropriate statistical computations and found to be statistically significant. Clinical significance was also impactful as this tool was simple enough for outside hospitals, not proficient in pediatric care, calculate a TRAP tool score and identify pediatric patients at risk for clinical deterioration. The results were disseminated to stakeholders with an emphasis of formally adopting this evidence-based practice change at the conclusion of this project. Additionally, this practice change has been presented across multiple platforms in hopes of sharing knowledge amongst similar academic and clinical settings.

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Table 1

Implementation EBP Project Budget

Expenses		Revenue	
Indirect- Included in regular operating costs			
Salary and benefits x 1 hour for training, variable staff.	$ $5500	Funded by the organization	$5500.
Supplies – office	$300		$300.
Estimate Total Expenses	$8,400	Estimate Total Revenue	$8400
Net Balance			$0.

Table 2

Descriptive Variable Information

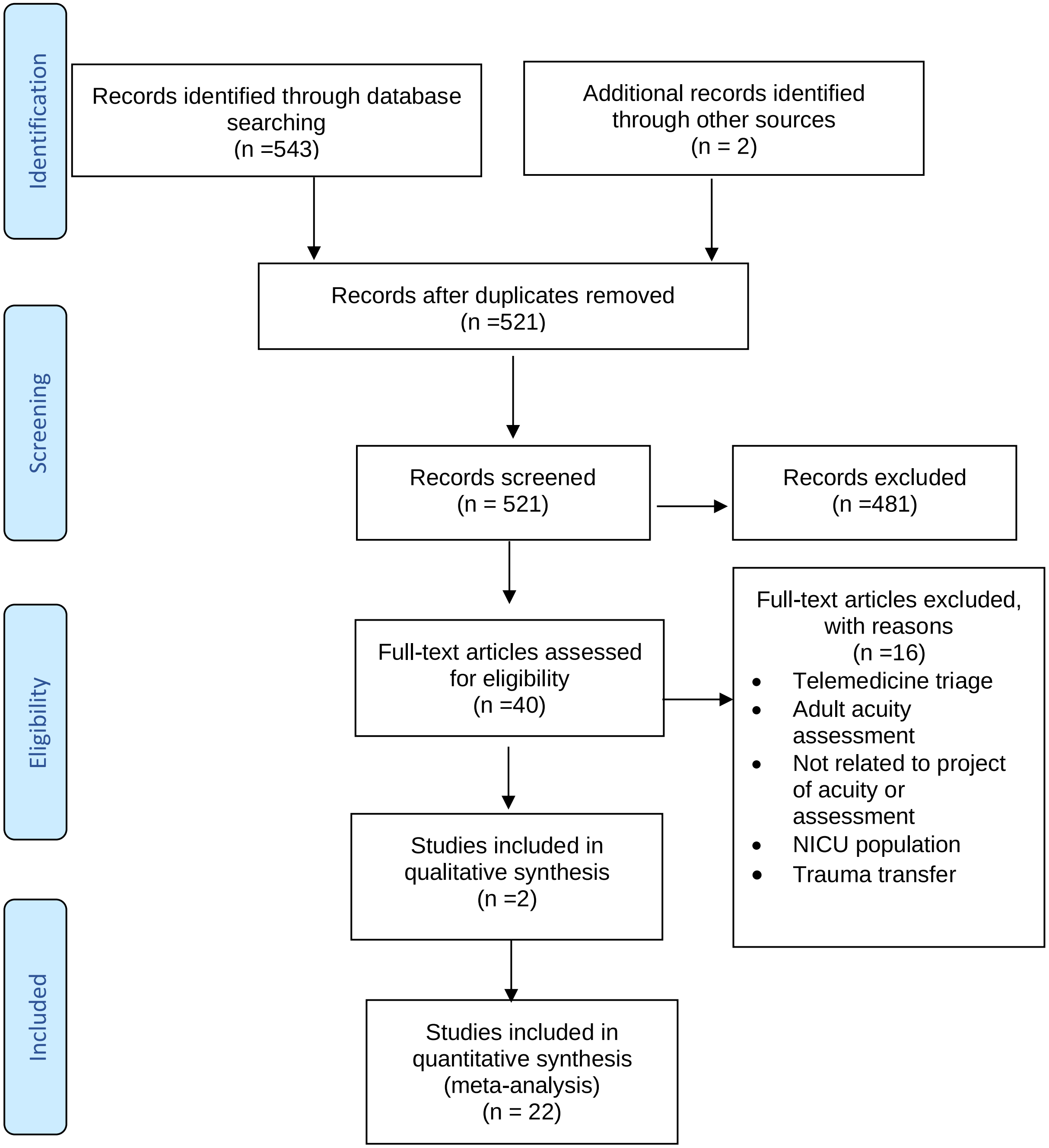
	Variable Name	Variable Description	Data Source	Possible Range of Values	Level of Measurement	Time Frame
Population Patients who are transferred	Chief complaint	Reason for transfer	Electronic Intake worksheet	Inclusion chief complaints	Nominal (Category scale)	Pre/post 8 weeks
Event Project Intervention	TRAP score	Acuity measurement tool	Electronic Intake worksheet	"High" TRAP> 4 "Low" TRAP≤ 4	Nominal (Category scale)	8 weeks
Outcome	Disposition	Disposition of patient	Disposition data from EHR	Discharged Non-ICU Unit PICU	Ordinal (meaningful order)	Pre/post 8 weeks

Table 3

Comparison of average ICU-level recognition percentage at triage per week

Week	Pre-Intervention Percentage	Post-Intervention Percentage
1	26%	100%
2	44%	89%
3	48%	83%
4	68%	100%
5	92%	100%
6	63%	86%
7	78%	100%
8	92%	100%

Figure 1 *PRISMA Literature Search Strategy Diagram*



Appendix A

Summary of Primary Research Evidence

Citation	Design Level Quality Grade	Sample/ Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Cecil, et al. (2022)	Single Cohort Study III/B	Children under 18, between 2016-2019 n=1988	Descriptive statistics were reported for all variables. Children who did not deteriorate were compared with children who experienced deterioration	Not mentioned	Deterioration occurred in 135 (6.8%) children overall and in 10.1% of children with respiratory complaints. Deterioration was associated with ≥ 2 complex chronic conditions	Deterioration was experienced by 7% of children admitted to a general unit, with the majority having respiratory complaints. Transport teams should consider the potential for increased risk of deterioration among children with respiratory disease, multiple complex chronic conditions, and a nasal cannula or nebulizer therapy
Chaichotjinda, et al. (2020)	Prospective Observational Study III/B	122 pediatric transports-1mo to 20 yrs to PICU	Categories of adverse events	Not mentioned	Physiologic deterioration was the main adverse events in our study, account for more than half of all the events, whereas equipment-related complications account for one-third of the events. We found that 40% of adverse events occurred due to deterioration of diseases, which might be difficult to prevent, but 60% occurred due to ineffective communication	The most common physiologic deterioration was circulatory complications (44%). Respiratory complications were the second most common cause

França & McManus (2020)	Retrospective Cross Sectional Study III/B	57,930 encounters 621 acute care hospitals	Interhospital transfers increased nearly 25% from 2006-2011	Not mentioned	Although pediatric admissions decreased by 9.3% (from 545 330 to 494 645), interhospital transfers increased by 24.6% (from 64 285 to 80 101). The largest change in transfer rate was among children with common conditions, such as abdominal pain and asthma.	Pediatric care is regionalized and dependent on referral centers. Informal network of interfacility transfers is important
Gallegos et al. (2018)	Critical Appraisal V/B	A total of 758 articles were found. Of these, the 198 cohort studies provided the bulk of the evidence used for this issue, which includes outcomes data of patients transported by pediatric critical care transport teams.	process of interfacility transfer, the required services, the role of the emergency clinician, the role of the pediatric transport team, and the commonly used diagnostic studies and treatment needed during interfacility transfers of pediatric patients.	Not mentioned	Pediatric transport teams are essential for the initial stabilization and ongoing critical care needs of pediatric patients during interfacility transfers. This specialty relies on the acquisition of accurate information during triage, the preparation of adequate equipment, composition of appropriate personnel, and the determination of the appropriate transport modality to provide the safest transport environment.	one in eight transports results in hemodynamic instability, hypoxia- However, there is some evidence that newer scoring tools may be applicable to the transport of critically ill children. Despite the lack of a standardized scoring system, it is apparent that certain clinical factors have a higher association with in-hospital mortality and incidence of major/unplanned events. Orr et al. evaluated multiple physiologic variables and, after univariate and stepwise logistical regression analysis, found that 4 variables were significantly associated with death and adverse events: systolic blood pressure, respiratory rate, oxygen

						requirement, and altered mental status
Holt et al. (2020)	Retrospective III B	n= 300	Evaluate TRAP scoring during transport	Not mentioned	significant differences between TRAP1-TRAP2 (P < 0.01) and TRAP1-TRAP3 (P < 0.01), but not between TRAP2-TRAP3 (P = 0.67). The most significant improvements of ΔTRAP1-TRAP2 scores were seen in septic shock	Most common reason for transfer was respiratory. TRAP not validated for serial assessments. TRAP scoring allows for rapid assessments on objective clinical findings only (unlike Pediatric Risk of Mortality III). The TRAP scoring also allows subtle changes to be measured (unlike Canadian Pediatric Triage and Acuity Scale), without trying to predict the risk of critical events (unlike Transport Pediatric Early Warning Scores).
Holt et al. (2018)	Retrospective III B	N=209 patients from 37 OSH under 18 yrs	Comparing PRISM, PedCTAS TPEWS, and TRAP scores	Not mentioned	Patients were more likely to be admitted to pediatric intensive care unit (PICU) with PedCTAS ¼ 1; p < 0.0001), TPEWS ¼ 3 in one category or total score 6 p < 0.0001), and TRAP 4 p < 0.0001). PRISM scores were not predictive for PICU admissions.	Elevated PedCTAS, TPEWS, and TRAP scores are strongly associated with PICU admission within the interfacility transport setting. The TPEWS and TRAP scoring systems are rapid, easy to use, and good predictors for patients requiring PICU admissions and may be helpful adjuvants to clinical decisions on disposition.
Joseph et al. (2022)	Retrospective Cohort Study III B	n=3,394 eligible patients 1,186 removed neonatal cases	Does transport method change LOS or outcome	Not mentioned	Helicopter transport was not associated with a difference in in-hospital mortality- but was associated with a statistically significant reduction in median hospital days	Mode did not change LOS or outcome. Severity tools should not be used to indicate mode of transport

Kandil et al. (2012)	Retrospective Chart Review/ Observational Study III B	n=269	To determine the feasibility of calculating a TRAP score and whether a higher score correlates with Pediatric Intensive Care Unit (PICU) admission.	Not mentioned	TRAP scores were associated with PICU admission	The TRAP score is a novel objective pediatric transport assessment tool where an elevated score is associated with PICU admission for greater than 24 hours. This score may assist with the triage decisions for transported pediatric patients. This translated to a 40% increase in odds of PICU admission for every point increase in the TRAP score
Leroux et al. (2020)	Retrospective Observational Cohort Study III B	Patients 16 and under within a 5 year period n=872 pediatric patients with 95 requiring secondary transfers within 5 years	CTAS Score and destination determination	Not mentioned	(10.9%) patients were subsequently transferred to the pediatric specialty center	Higher acuity patients, based on the CTAS score, also had a significantly higher percentage of secondary transfer to specialized pediatric care
Lieng et al. (2021)	Cross Sectional Study III B	n=135,388 encounters in 54 hospitals patients under 18 yrs	Which hospitals are more likely to transfer pediatric patients	Not mentioned	EDs with a high pediatric readiness score (>70) had lower adjusted odds of transfer than EDs with a low pediatric readiness score (≤ 70).	The less comfortable and prepared an OSH is, the more likely they are to transfer the patient. Transfers may not be necessary and could be transferring d/t lack of preparedness to assess and care for children
Mansoor et al. (2022)	Cross Sectional quantitative survey IIIC	137 North American pediatric transport programs- 55 responses	The objective of this study was to ascertain the breadth of severity of illness scoring	Not mentioned	(24%) use a severity of illness scoring tool within their practice. A variety of tools were used including: Transport Risk Index of Physiologic	Among the programs that use a scoring tool, there is variability in its application. There is no universally accepted or performed severity of illness scoring tool for

			tool application among North American pediatric critical care transport teams.		Stability, Children's Hospital Medical Center Cincinnati, Canadian Triage and Acuity Score, Transport Risk Assessment in Pediatrics, Pediatric Early Warning Scores, Levels of Acuity, Transport Pediatric Early Warning Scores, and an unspecified tool. The timing of scoring, team personnel who applied the score, and the frequency of analysis varied between transport programs.	pediatric interfacility transport. The utilization of a standardized and validated severity of illness tool during transport may enhance objectivity and improve precision related to patient diagnosis and disposition
Michelson et al. (2019)	Longitudinal Study III B	207M ED visits for children under 15 yrs	Which facilities are most likely to transfer children	Not mentioned	Despite decreasing capability, centers with higher annual pediatric volume and urban centers provided more definitive in-patient care and had fewer inter-ED transfers than lower-volume and rural centers	Hospital provision of definitive acute pediatric care decreased, and ED visits to the hospitals least likely to provide definitive care increased. Systems improvements are needed to support hospital-based acute care of children
Page-Goertz et al. (2018)	Retrospective Case Study III C	n=564 pediatric transports (excluding NICU and psych)	The use of bedside PEWS	Not mentioned	Children transferred to the PICU had higher scores 6 (3–10) than children transferred to a ward 3 (1–6) or the emergency department 2 (1–3) ($p < 0.001$).	Organizations were unfamiliar with the BedsidePEWS scoring, its component measures or the standard definitions used. Converting subjective assessments of perfusion and work of breathing from the referral charting into the BedsidePEWS score required arbitrary definitions and could introduce error. There is

						a potential for selection bias inherent to our study, as well as all transport studies, in that it is likely that referring physicians perceived patients referred for transport as sicker than those who are not transported.
Petrillo-Albarano et al. (2012)	Retrospective Chart Review III B	n=100	TPEWS to help assess a child's condition at the referring facility and to establish a more systematic approach to triage and dispatch	Not mentioned	A significant difference in TPEWS at traige and TPEWS and bedside was noted (P = 0.0001). Odds of going to PICU were 83x higher for TPEWS ref of 5 or greater then less than 5	TPEWS appears to be a helpful additional assessment tool. Transport PEWS may function as a tool for assessing severity of illness, hence optimizing transport dispatch and patient disposition TPEWS >6 suggets PICU
Rahiman et al. (2014)	Retrospective Cohort Study III C	n=769 Transports	Compare two models, the Pediatric Risk of Mortality (PRISM) and the Pediatric Index of Mortality (PIM)	Not mentioned	Pediatric Index of Mortality-2 did not change significantly	Did not support the need for different timeframes for Pediatric Index of -Mortality-2 data collection in transported and direct PICU admission
Richard et al. (2020)	Retrospective Cohort Analysis III C	n=551,974	What is the reason for unnecessary transfers	Not mentioned	Age, race and weekends increases risk of unnecessary transfers	Ages 1 to 4 years were associated with higher rates of transfer
Rosenthal et al. (2016)	Qualitative Study III C	n=44 referring MDs and n=36 accepting MDs	Barriers and facilitators to transfer communication	Not mentioned	3 major categories: streamlined transfer process, quality handoff and 2-way communication, and positive relationships between physicians across facilities.	Failure to transmit information can lead to potential harm-Standardized handoffs are proven to reduce medical errors and preventable adverse events. A standardized handoff tool might also clarify expectations for

						the components of a verbal handoff and thus alleviate conflicts that arise from the perceived disrespect that occurs when physicians ask questions to gather additional information
Schmidt et al. (2022)	Retrospective Chart Review III B	n=738 under 18 years	TRAP and TPEWS scores would predict the risk of clinical deterioration in transported patients admitted to general pediatric wards.	Not mentioned	statistically significant difference in scores for ward admissions between those who had RRT activation and those who did not	We found that the most common reason for transport was respiratory distress (48%) TRAP and T-PEWS can be used to predict the risk of clinical deterioration in transported patients
Schmidt et al. (2020)	Retrospective Chart Review III B	n=423 qualifying patients	Predict clinical deterioration using illness severity scores	Not mentioned	Despite this small sample size, there was a statistically significant difference detected- patients admitted to PICU had higher TRAP scores	Patients who were admitted to PICU had a significantly higher TRAP scores and TPEWS scores and can be used to predict risk of clinical deterioration in transported patients
Steffen et al. (2018)	Retrospective Chart Review III B	n= 2237	Use of Pediatric Transport Triage Tool (PT3)	Not mentioned	Fewer calls using a transport nurse were noted after PT3 implementation (33.9% vs 30%, P = 0.05)	The PT3 represents an objective triage tool to reduce variability in transport planning. The PT3 decreased resource utilization and was not associated with adverse outcomes. Standardization of care has been shown to enhance quality of care and resource utilization in the ICU
White et al. (2020)	Retrospective Cohort Study III B	758 Articles,	Describe interfacility transfers	Not mentioned	13% transfer rate, often children with complex diseases are	Reveals a need to standardize aspects of the transfer process,

		198 Cohort studies (n= 551,974)	among children with complex diseases			transferred and subsequently discharged	including standardizing scripts for provider and staff handoff and ensuring that all hospitals that care for patients with specific conditions have adequate resources to provide short term care as well as access to regional specialty centers when needed

Legend:
LOS: Length of Stay
OSH: Outside Hospitals
PedCTAS: Canadian Pediatric Triage and Acuity Scale
PRISM: Pediatric Risk of Mortality
PT3: Pediatric Transport Triage Tool
TRAP: Transport Risk Assessment in Pediatrics
TPEWS: Transport Pediatric Early Warning Scores

Appendix B

Summary of Systematic Review

Citation	Quality Grade	Question	Search Strategy	Inclusion/Exclusion	Data Extraction and Analysis	Key Findings	Usefulness Recommendations Implications
Zachariasse et al. (2019)	II/A	To assess and compare the performance of triage systems for identifying high and low-urgency patients in the emergency department	Systematic review and meta-analysis. EMBASE, Medline OvidSP, Cochrane Central, Web of science and CINAHL databases from 1980 to 2016 with the final update in December 2018.	Inclusion: Studies that evaluated an emergency medical triage system, assessed validity using any reference standard as proxy for true patient urgency and were written in English. Exclusion: Studies conducted in low(er) income countries, based on case scenarios or involving less than 100 patients.	Two reviewers independently extracted data from each of the included studies 12,684 papers: Sixty-six eligible studies evaluated 33 different triage systems. Comparisons were restricted to the three triage systems that had at least multiple evaluations using the same reference standard (CTAS/ESI/MTS)	Australasian Triage Scale, the Canadian Triage and Acuity Scale (CTAS), the Emergency Severity Index (ESI) and the Manchester Triage System (MTS)	Study included triage acuity sensitivity/specificity in children. ESI was the best validity for predicting hospital admission in children

Legend:
CTAS: Canadian Triage and Acuity Scale
ESI: Emergency Severity Illness
MTS: Manchester Triage System

Appendix C

Summary of Clinical Practice Guidelines and Scientific Statements

Citation	Level/Quality		Clinical Questions	Recommendation
Mathison, D., Berg, E., & Beaver, M. (2013). Variations in interfacility transport: Approach to call intake, team composition, and mode of transport. *Clinical Pediatric Emergency Medicine*, *14*(3), 193–205. https://doi.org/10.1016/j.cpem.2013.08.004	Guidelines for best practice IV A	American Academy of Pediatrics11 and the Consensus of the Second National Pediatric and Neonatal Interfacility Transport Medicine Leadership Conference	Recommendations for the framework for pediatric transport teams	triage tools may be helpful to make subsequent care decisions based on the acuity level assigned. Standardized tools also allow programs to have more consistency with resource allocation
Sutton, A. G., Smith, H. G., Dawes, M., O'Connor, M., Hayes, A. A., Downs, J. P., & Steiner, M. J. (2022). Systematic improvement in the patient transfer process to a tertiary care children's hospital. Hospital Pediatrics, 12(9), 816–825. https://doi.org/10.1542/hpeds.2021-006390	QI Paper VA	Development of an operational structure	Is there a way to streamline secondary transfers	Prioritizing direct communication led to efficient disposition decisions and progression toward transfer and was effective for multiple service lines. Standardizing communication and creating standardization tools improved transfers

Appendix D

TRAP Tool

		2	1	0			2	1	0
Heart Rate	<12 Months	<90 or >180	90-109 or 151-180	110-150	**SBP**	< 12 Months	<60 or >110	60-69 Or 90-110	70-89
	1-12 Years	<65 or >140	65-79 or 116-140	80-115		1-12 Years	<75 or >130	75-89 Or 116-130	90-115
	>12 Years	<50 or >120	50-59 or 110-120	60-100		>12 Years	<85 or >150	85-101 Or 131-150	100-130
	Resp	Apnea Gasping Intubated	RR ≥ 50 SAT < 90	RR <50 SAT ≥ 90		**Fi02**	≥ 50% or ≥ 4 liters	<50% or <4 liters	Room Air
	Cap Refill	>3 Seconds	2-3 Seconds or IVF bolus	<2 seconds		**Pulses**	Absent	Faint or bounding	Normal
	GCS	<7	7-11	12-15		**Temp**	<35 Or >40	35-35.9 Or 38.1-40	36-38

The TRAP tool has been validated to provide scores that identify pre-transport predictors of hospital mortality. Bivariate logistic regression was completed using the TRAP score as the pain independent predictor. The statistical results demonstrated that higher TRAP scores were associated with greater PICU admission (odds ratio of 1.40 $p<0.001$). In addition, pediatric patients with a higher score were less likely to leave the PICU within 24 hours (odds ratio of 0.79 $p<0.001$). Reliability has been established with the repeated use of the validated tool (Kandil et al., 2012).

Appendix E

SWOT Analysis

Strengths	Weaknesses
-Efficient in-patient bed utilization -Identification of PICU-level patients -Reduced clinical deterioration -Timely intensive care medical management -Improve patient satisfaction -Improve staff satisfaction	-Timing of project initiation during a winter surge -New process change concurrent with multiple other process changes -Lack of priority -No availability to carry out transfers due to surge and lack of beds
Opportunities	**Threats**
-Clinical support -Staff buy-in and engagement -Staff input -Outside hospital education and feedback	-Staff resistance and lack of buy-in -Management prioritizing other projects -Current pediatric surge -Declining transports due to capacity issues

Appendix F

TRAP tool plan

Call comes into the dedicated intake phone. The triage nurse begins the intake form

Initial Intake:
Date:
Time:
Referral Hospital:
Reason for Transfer:
Age of Patient:

The Triage Nurse will prompt the outside hospital for TRAP data points

		2	1	0			2	1	0
Heart Rate	<12 Months	<90 or >180	90-109 or 151-180	110-150	**SBP**	< 12 Months	<60 or >110	60-69 Or 90-110	70-89
	1-12 Years	<65 or >140	65-79 or 116-140	80-115		1-12 Years	<75 or >130	75-89 Or 116-130	90-115
	>12 Years	<50 or >120	50-59 or 110-120	60-100		>12 Years	<85 or >150	85-101 Or 131-150	100-130
	Resp	Apnea Gasping Intubated	RR ³ 50 SAT < 90	RR <50 SAT ³ 90		**Fi02**	³ 50% or ³ 4 liters	<50% or <4 liters	Room Air
	Cap Refill	>3 Seconds	2-3 Seconds or IVF bolus	<2 seconds		**Pulses**	Absent	Faint or bounding	Normal
	GCS	<7	7-11	12-15		**Temp**	<35 Or >40	35-35.9 Or 38.1-40	36-38

The triage nurse will input the reported values given by sending facility and score the findings

TRAP Indicator	Reported Value	Rating (0,1,2)
Heart Rate		
SBP		
Pulses		
Capillary Refill		
Respiratory Rate		
Fi02		
Temperature		
GCS		
	Trap Score Total:	

The triage nurse will notify the appropriate transport teams based off TRAP score

TRAP Score >4	Notify PICU & Transport	Time PICU Notified:
TRAP Score ≤4	Notify Transport	Time Transport Notified:
TRAP Score ≤4 but PICU notification completed	Reason:	

Complete the patient disposition and file in the secured electronic data collection Excel form

Patient Disposition (circle): DC FLOOR PICU OTHER: _______

Patient assigned ID: _______

Appendix G

Project Timeline

Activity	NUR7801								NUR7802								NUR7803							
	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15
Meet with preceptor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Prepare project proposal	X	X	X	X	X	X	X	X																
IRB Process										X	X													
Collect baseline data									X	X	X													
Meet with stakeholders		X	X							X	X	X	X	X	X		X	X	X			X		
Staff Training										X	X													
Meet with staff involved									X	X	X	X	X	X	X	X	X	X						
Implement practice change												X	X	X	X	X	X	X						
Collect ongoing data												X	X	X	X	X	X	X						
Calculate statistical significance																			X	X				
Share results with stakeholders																						X		
Share results with staff involved																						X		

Appendix H

Data Collection Tool (including the permission from the authors)

						TRAP Tool Values											
Date	Time	Sending Facility	ID number	Age	Chief complaint	Heart Rate	SBP	Resp	Cap Refill	GCS	Fi02	Pulses	Temp	TRAP Score	Identified as ICU level patient at intake (yes/no)	Disposition	Comments
			B456...													DC Floor PICU Other	

Date: Jun 6, 2012

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Appendix I

T-Test Results

Two-Tailed Paired Samples t-Test for the Difference Between Pre and Post

Pre		Post				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
0.64	0.24	0.95	0.07	-4.04	.005	1.43

Note. N = 8. Degrees of Freedom for the *t*-statistic = 7. *d* represents Cohen's *d.*