Early Recognition of Pediatric Sepsis: Literature Review

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Pediatric sepsis is an emergent and life-threatening condition that is the leading cause of childhood death worldwide (Harley et al., 2022). It requires quick recognition and effective early treatment pathways to improve outcomes, including reducing the morbidity and mortality rate (Harley et al., 2022). A literature review summarizes research articles and analyzes the gaps in that research to improve the focus of future projects. This literature review aims to identify research on best practice triage systems and recognition of the early signs of pediatric sepsis, as well as locate the gaps in research for future studies. Triage interventions, including pediatric triangle assessment, febrile infant risk score screenings, and physician-in-triage, will be evaluated to highlight the challenges of recognizing sepsis in children in its early stages. This review will emphasize the importance of education in the early recognition of pediatric sepsis and will aim to inform best practices that can be implemented in clinical settings to improve patient care.

The Accuracy of the Pediatric Assessment Triangle in Assessing Triage of Critically Ill Patients in Emergency Pediatric Department.

Pediatric sepsis screenings in the Emergency room are essential for the timely assessment of critically ill pediatric patients. This study aimed to determine the effectiveness of the Pediatric Assessment Triangle (PAT) in triaging these critically ill patients and compare the effectiveness against the current Pediatric Early Warning Signs (PEWS) screening (Ma et al., 2021). This research article details research that was performed on 1608 children at a hospital in China. Of

those, 74 children fit the criteria for critically ill (Ma et al., 2021). These children were assessed by the triage nurse using the PAT screening and PEWS screening at the same time, and the results were studied to determine which screening had a faster assessment time and sensitivity and better acceptance by the nurses (Ma et al., 2021).

Key Points

The researchers aimed to study how effective the Pediatric Assessment Triangle was against current methods of screening for pediatric sepsis (Ma et al., 2021). The PAT assesses the consciousness (lethargy, ability to interact, and ability to be consoled), breathing (presence of stridor, wheezes, or grunting), and color of the patient (cyanosis, paleness, or mottling), and triggers positive for a sepsis screening if any of these areas are abnormal (Ma et al., 2021). The screening was compared to the PEWS screening for assessment time, sensitivity of testing, and nurse acceptance (Ma et al., 2021). The PEWS score has a sensitivity of 97.0%, a specificity of 78.3%, and scored well in assessing respiratory, circulatory, and neurological disorders (Ma et al., 2021). They also evaluated the consciousness breath blood pressure pulse (CRBP) tool and pediatric critical illness score (PCIS) (Ma et al., 2021). They found that the CRBP varied too widely as the vital sign parameters changed based on the patient's age, the vital signs parameters were not consistent nationwide, and that the screening for triggers for sepsis inappropriately when the client was crying as crying would alter the vitals (Ma et al., 2021). The PCIS score was useful in assessing patients with electrolyte imbalance disorders but was ineffective in non-electrolyte imbalance conditions (Ma et al., 2021). Therefore, the PEWS score was used to be tested against the PAT (Ma et al., 2021). A nurse using the PAT and a nurse using the PEWS

screening were present for the triage of the patients and timed their assessments (Ma et al., 2021). They then filled out the study form with the data (Ma et al., 2021). It was found that the PAT screening only took around 30-40 seconds to complete and had a sensitivity of 93.24% and specificity of 99.15% (Ma et al., 2021). It was found that the PAT was quicker than the PEWS, needed fewer tools, and did not rely on vital signs or laboratory testing making it easier to use and screen children rapidly (Ma et al., 2021). It was also found that the staff was more willing to use the PAT screening and that 84.9% of physicians preferred the PAT over PEWS (Ma et al., 2021).

Assumptions

The researchers stated that PAT is a rapid sepsis assessment tool that is useful in identifying critically ill patients (Ma et al., 2021). Pediatric sepsis and critical illness are major concerns, and the current methods of assessment do not meet the needs of these patients (Ma et al., 2021). Current methods miss major factors such as how the patient is presenting and focus solely on vital signs or laboratory values for assessment, which can miss markers for sepsis and take extra time (Ma et al., 2021). Triaging tools such as PAT that are quick, easy to use, and do not need extra tools or personnel may be better at assessing and catching critical illness and should be more widely accepted by medical staff (Ma et al., 2021).

Deficit/Conclusion

The researchers' main line of reasoning for studying the PAT is acceptable as it was to determine if it was a better screening tool to screen for critically ill patients (Ma et al., 2021).

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Pediatric sepsis screenings are essential for assessing patients who need rapid care to prevent irreversible complications (Ma et al., 2021). Screening tools that can accurately assess for critical signs and can be used easily are necessary for nurses triaging patients (Ma et al., 2021). Nurses' acceptance of the screening tool and ease of use allow for better triaging and patient outcomes (Ma et al., 2021). Further research into the screening of pediatric sepsis is needed to determine what factors can key nurses and providers into critical changes a patient may be experiencing and allow for better tools for these assessments.

Febrile Infants Risk Score at Triage (FIRST) for the Early Identification of Serious Bacterial Infections

The Febrile Infants Risk Score at Triage (FIRST) tool is an assessment set used to determine how at-risk infants are for having serious infections, such as meningitis, urinary tract infections, and bacteremia (Chong et al., 2023). These infections place the infant at high risk for developing sepsis and therefore must be identified early. This study aimed to create and determine if the FIRST screening is useful in identifying these infections upon presentation at the hospital using demographic data, vital signs, and triage data (Chong et al., 2023). It also looked at additional data to determine a FIRST+ score, a more in-depth screening that can be used after lab data is available (Chong et al., 2023). The research looked at 1,002 infants under 3 months old, of which 224 were determined to have a serious bacterial infection and used the data to create the FIRST score as well as internally validate the tool (Chong et al., 2023).

Key Points

This research focused on 1,002 infants under 3 months old in a pediatric hospital in Singapore who presented to the hospital with a fever of 38˚C or higher (Chong et al., 2023). The initial FIRST score used demographic data including age, gestation at birth, and gender, as well as vital sign data, and triage information (Chong et al., 2023). After reviewing the score, additional data including comorbidities, fever duration, GBS status, and laboratory values were used to determine a FIRST+ score (Chong et al., 2023). A score was derived from the data to determine the infant's risk for a serious bacterial infection, which showed that infants tended to be older, male, and presented with higher fevers and heart rates than their counterparts, and they additionally had higher inflammation lab values (Chong et al., 2023). Of the 1,002 infants studied, 224 infants had a serious bacterial infection (Chong et al., 2023). Using these data values, the FIRST score was derived and tested. It was found that the FIRST score had a sensitivity of 93.2%, specificity of 29.9%, and classified 75% of infants at risk for infection when using a 15% threshold (Chong et al., 2023). The FIRST+ score had a sensitivity of 81.8%, specificity of 65.6%, and classified 45% of infants at risk for infection (Chong et al., 2023). The study found that by using a slightly lower threshold, around 10%, the FIRST tool performed well at identifying infants at risk for serious infections who should be monitored and have inflammation markers drawn to determine a FIRST+ score (Chong et al., 2023).

Assumptions

The creators of the FIRST screening stated that serious bacterial infections (SBIs) are a major cause of unnecessary costs to the hospital and invasive testing on newborns (Chong et al., 2023). They assume that physicians perform aggressive testing such as lumbar punctures for cerebral

spinal fluid out of fear of missing an SBI (Chong et al., 2023). They state that the FIRST and FIRST+ screenings will limit how many invasive procedures are done and in turn reduce costs to the hospital (Chong et al., 2023). The FIRST and FIRST+ tools are easy to use and are effective at determining the risk of an infant having an SBI (Chong et al., 2023).

Deficit/Conclusion

The authors' main line of reasoning is acceptable, as the aim was to create and determine the efficacy of a screening tool for infants at risk for sepsis and decrease invasive testing when not necessary (Chong et al., 2023). These tools are necessary for nurses to triage infants appropriately, as serious infections and potential sepsis can be missed without such screenings. These tools also allow nurses to use specific order sets, such as sepsis protocols, to quickly triage the patient, determine necessary lab work, and inform the physician of the patient's risk status (Chong et al., 2023). Further research into the ease of use of the FIRST screening is necessary to determine if it is an effective and quick tool. Additionally, external validation is needed to determine if the data used in the FIRST screen is useful in areas outside of the tested hospital.

Causal Association of Physician-in-Triage with Improved Pediatric Sepsis Care: A Single-Center, Emergency Department Experience

The initial triage of pediatric sepsis patients is a difficult task that can cause patients with severe infections to be missed, or lead to patients without infections screening positive due to the triage nurse's scope of practice requiring them to screen a child positive even when the data may be skewed. One research study aimed to determine how physician presence in triage could

improve the screening for and treatment of sepsis in pediatric patients. The researchers studied 226 patients at a pediatric Emergency Department (ED) and looked at whether having an attending level pediatric physician-in-triage (P-PIT) improved recognition of patients with possible septic infections and their subsequent treatment speed (Moorthy et al., 2023).

Key Points

This study looked at how effective pediatric physician-in-triage (P-PIT) assessments were at recognizing possible sepsis infections in pediatric patients (Moorthy et al., 2023). The P-PIT performed a quick exam upon presentation to the ED to determine the need for lab work such as blood cultures (Moorthy et al., 2023). They measured the time taken to recognize sepsis and the time to antibiotic administration versus the typical nurse triage protocol times (Moorthy et al., 2023). They also assessed secondary outcome data, such as length of hospital stay, length of intensive care, and discharge disposition (Moorthy et al., 2023). The Bradford-Hill Criteria, which determines if epidemiologic associations are causal, was used to determine if the P-PIT workflow effectively recognizes pediatric sepsis. Of the 226 patients identified as having sepsis during the studied period, 100 were assessed by the P-PIT, and 126 were assessed by the triage nurse prior to the implementation of the P-PIT (Moorthy et al., 2023). The researchers found that the time to recognize sepsis went from 2.10 hours prior to the P-PIT to 1.15 hours after the implementation of P-PIT, and the time to antibiotic administration decreased from 3.10 hours to 1.63 hours respectively (Moorthy et al., 2023). Secondary data was mostly non-substantial, though the mortality rate was noted to be higher in the group assessed by the P-PIT than the nurse group (Moorthy et al., 2023). The Bradford-Hill Criteria was also met as the time to

recognize sepsis increased when the P-PIT was paused and an improvement to the time when the P-PIT was reimplemented (Moorthy et al., 2023).

Assumptions

The researchers state that the P-PIT improves the early recognition of pediatric sepsis and the care received (Moorthy et al., 2023). They determined that the P-PIT was causal to the quick treatment of these patients and that patients generally benefit from having a physician perform an examination in triage (Moorthy et al., 2023). They also stated that having a physician-in-triage benefits the hospital's quality metrics and may decrease wait times and the number of patients who leave without being seen (Moorthy et al., 2023). Further research is needed to determine if a PIT reduces wait times, patient satisfaction rates, and the recognition of other illnesses.

Deficit/Conclusion

The researchers' line of reasoning is acceptable as it is to determine if a higher level of triage is useful in reducing the time taken to recognize sepsis, initiate treatment, and improve outcomes (Moorthy et al., 2023). This research was limited as it studied the times of triage and treatment in patients diagnosed with sepsis, so further research is needed to determine the efficacy of recognizing patients at risk for sepsis by the P-PIT. It also had limitations as the pre-P-PIT data was collected prior to the COVID-19 pandemic, and the post-P-PIT data was collected during this time (Moorthy et al., 2023). Further research is also needed to determine if non-attending level physicians were able to maintain these times, as well as whether a PIT is useful in recognizing other potential illnesses or sepsis in adults (Moorthy et al., 2023). This tool is useful

for nurses as it decreases the workload of the triage nurse, increases the recognition of pediatric sepsis, and allows the triage nurse to begin initial lab work prior to the patient being roomed as the physician is present to provide orders (Moorthy et al., 2023).

Conclusion

Pediatric sepsis is a major concern as it is the leading cause of death in children globally (Harley et al., 2022). Early recognition and treatment of sepsis and severe bacterial infections that can cause septic infections is necessary to reduce the morbidity and mortality of children (Harley et al., 2022). The three articles summarized in this literature review detail screening tools that can improve the recognition of pediatric sepsis in triage. The screenings include the pediatric assessment triangle (PAT), the febrile infant risk score at triage (FIRST), and the pediatric physician in triage (P-PIT). These screenings showed that screening tools increased early recognition of sepsis, provided quicker treatment, led to better patient outcomes, and increased nurse and provider satisfaction (Chong et al., 2023; Ma et al., 2021; Moorthy et al., 2023). These research studies show that patient outcomes are directly impacted by early interventions in pediatric sepsis, with reduced lengths of stay and mortality (Chong et al., 2023; Ma et al., 2021; Moorthy et al., 2023). Nursing practice is also greatly impacted, as quicker triaging of patients allows for faster treatment, decreased workload with provider interaction, increased nurse satisfaction, and the potential to develop the nursing role to better treat pediatric sepsis (Chong et al., 2023; Ma et al., 2021; Moorthy et al., 2023). Evidence-based practice is additionally impacted as this research provides insight into the areas needing further research, will help develop evidence-based interventions for sepsis protocols, and improves the quality of care given to pediatric patients. Research in pediatric sepsis triaging and treatment plans contributes to how

pediatric sepsis is handled in healthcare and increases the understanding of how to reduce the mortality rates worldwide, leading to healthier children.

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