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Emergency Nursing Care for a Pediatric Patient with Severe Scrub Typhus Complicated by Hemophagocytic Syndrome and Septic Shock

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Abstract: This article summarizes the nursing management of a pediatric patient with severe scrub typhus complicated by hemophagocytic syndrome (HPS) and septic shock. Key nursing interventions included early recognition and management of septic shock, rational oxygen therapy, fluid resuscitation, administration of vasoactive agents, early and targeted anti-infective therapy, management of hyperpyrexia, care of eschar and edematous skin, strict infection prevention and isolation protocols, and family health education. After 11 days of intensive treatment and nursing care, the patient recovered and was discharged.

Keywords: Scrub typhus; Hemophagocytic syndrome; Septic shock; Pediatric nursing; Critical care

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1. Introduction

Scrub typhus, also known as jungle typhus, is an acute zoonotic infectious disease caused by Orientia tsutsugamushi infection. It is transmitted through the bites of larval mites (chiggers) and can lead to various severe complications that threaten human health [1, 2]. Currently, there are few reports on severe scrub typhus complicated with hemophagocytic syndrome leading to septic shock. On September 30th, 2024, a child with severe scrub typhus complicated by hemophagocytic lymphohistiocytosis (HLH) is admitted, who subsequently developed septic shock. After active treatment and comprehensive nursing care, the child improved and was discharged after 11 days. The case is reported as follows.

2. Case presentation

2.1. Clinical data

The patient was a 3-year-and-1-month-old male child, admitted to the hospital's department due to "fever for 6 days, accompanied by rash and swelling of the left upper eyelid for 3 days" and was suspected to have "fever and reduced incidence of the three systems" on September 30th, 2024.

2.2. Course of treatment and clinical outcome

Upon admission, the child presented with recurrent high fever and generalized rash. Laboratory results indicated elevated inflammatory markers and pancytopenia. Further relevant tests and bone marrow smear examinations were conducted, and empirical antibiotic therapy with ceftriaxone was initiated. On the third day of hospitalization, the interval between fever peaks shortened, prompting a switch to meropenem for broader antimicrobial coverage.

On the morning of the fourth hospital day, the child exhibited signs of shock, including irritability, tachypnea, pallor, and hypotension during a febrile episode. Immediate interventions included intravenous fluid resuscitation with normal saline, electrocardiographic and oxygen saturation monitoring, low-flow nasal cannula oxygen administration, and addition of vancomycin for combination antimicrobial therapy. Initial resuscitation was successful.

Later that night, the child experienced another episode of shock. Aggressive anti-shock measures were implemented, including additional fluid resuscitation with normal saline, albumin infusion to enhance colloid osmotic pressure, norepinephrine for blood pressure support, and initiation of caspofungin for possible fungal infection. Resuscitation was successful.

On the fifth hospital day, metagenomic next-generation sequencing (mNGS) of pathogen DNA confirmed Orientia tsutsugamushi infection. Chest CT revealed pulmonary edema and pleural effusion. Albumin transfusions were administered, and azithromycin was added to the antimicrobial regimen. Following six days of intensive treatment and meticulous nursing care, the child's condition improved significantly. Follow-up tests showed normalization of inflammatory markers, and the patient was discharged. Discharge diagnoses included: severe scrub typhus, hemophagocytic lymphohistiocytosis, septic shock, capillary leak syndrome, hypoalbuminemia, hepatic dysfunction, cholestasis, and hypokalemia.

3. Nursing care

3.1. Early recognition and management of septic shock

The Pediatric Early Warning Score (PEWS) was used to identify the child's condition at an early stage. Pediatric patients often have limited verbal communication skills and poor cooperation during nursing procedures, and the normal ranges for vital signs vary significantly across age groups. This poses a significant challenge for clinical nurses in the early recognition of critically ill children.

PEWS is a simple pediatric scoring system that is intuitive, easy to use, and requires minimal technical expertise. It includes three domains—consciousness, cardiovascular status, and respiratory status—with a total of 11 indicators. Each domain is scored from 0 to 3 points, and the total score reflects the severity of illness; higher scores indicate more severe illness and a higher mortality risk.3 A score of 1–2 suggests relatively stable condition, 3 indicates a potential deterioration, and ≥ 4 indicates a critical condition requiring multidisciplinary intervention and resuscitation.

On the fourth day of hospitalization, this patient had a body temperature of 39°C, presented with irritability, pale lips, tachypnea (45 breaths/min), chills, cold extremities, capillary refill time (CRT) >3 seconds, no palpable dorsalis pedis artery pulses bilaterally, and blood pressure dropped to 76/30 mmHg. The PEWS score was 4.

Immediately, the primary physician and senior nurse were notified for assistance. The primary nurse promptly established two intravenous lines, initiated fluid resuscitation with normal saline, and applied electrocardiographic monitoring and low-flow nasal oxygen therapy.

Following these interventions, the child became less lethargic, skin color improved, respiratory rate decreased to 36 breaths/min, extremities warmed, CRT shortened to 1 second, dorsalis pedis pulses remained slightly weak, and blood pressure increased to 88/55 mmHg. The child also spontaneously voided 100 mL of urine. The PEWS score was reassessed as 1.

Arterial blood gas analysis showed lactate (Lac) level of 1.2 mmol/L, C-reactive protein (CRP) of 48.43 mg/L, serum amyloid A (SAA) >350.00 mg/L, and procalcitonin (PCT) of 3.83 ng/mL. These findings supported the diagnosis of septic shock and sepsis.

3.2. Rational oxygen therapy

After identifying insufficient systemic effective circulating volume and tissue hypoperfusion in pediatric shock, appropriate oxygen therapy should be administered immediately. Priority is given to nasal cannula or mask oxygenation, with non-invasive positive pressure ventilation (NIPPV) initiated if the initial methods are ineffective. Invasive mechanical ventilation may be necessary in severe cases [4]. Upon recognizing shock symptoms in this patient, low-flow oxygen was immediately provided via a dual-lumen nasal cannula. Airway secretions were promptly cleared to maintain airway patency. During oxygen administration, continuous monitoring of the child's lip, mucous membrane, and nail bed color, respiratory rate, and rhythm changes were conducted. The method of oxygen delivery, flow rate, and oxygen saturation were recorded hourly to ensure adequate tissue oxygen supply and organ function protection, thereby securing a critical time window for shock reversal. To prepare for potential deterioration, suction devices, endotracheal intubation kits, and emergency carts were kept bedside.

3.3. Fluid resuscitation

In the treatment of septic shock, fluid resuscitation is an effective intervention that can improve survival rates and outcomes when initiated early [4]. The principle of "crystalloids first, then colloids" and "rapid infusion initially followed by slower rates" is adhered to during fluid resuscitation, with timely assessment of tissue perfusion post-resuscitation [5]. On the fourth day of hospitalization, this patient presented with a temperature of 39°C, high fever, irritability, pale lips, tachypnea (45 breaths/min), chills, cold extremities, CRT > 3 seconds, no palpable dorsalis pedis artery pulses, and blood pressure of 76/30 mmHg. With a PEWS score of 4, two intravenous lines were established. A rapid infusion of 300 ml normal saline at 600 ml/h (20 ml/kg over 30 minutes) was initiated, resulting in a blood pressure of 96/33 mmHg upon recheck. Another 350 ml of normal saline was infused rapidly at 600 ml/h (23 ml/kg), then the blood pressure dropped to 82/31 mmHg. The infusion rate was then adjusted to 150 ml/h, and 50 ml of 20% albumin was administered intravenously, raising the blood pressure to 85/45 mmHg. During rapid fluid administration, close monitoring of heart rate, respiratory status, oxygen saturation, and blood pressure was essential. Regular blood pressure measurements were scheduled, and changes were promptly documented. The child's level of consciousness and pupil size were monitored, along with skin temperature and color at the extremities. Special attention was paid to signs of respiratory distress, coughing, sputum production, cyanosis, or pulmonary rales to prevent acute pulmonary edema. Families were instructed to accurately record 24-hour intake and output, particularly urine output.

3.4. Use of vasopressor agents

According to expert consensus on pediatric septic shock management, if a child still exhibits hypotension and tissue hypoperfusion after fluid resuscitation, vasopressor agents may be considered to increase and maintain perfusion pressure [6]. Early, correct, and rational use of these drugs can significantly reduce mortality in septic shock cases [7].

During the nighttime rescue attempt for this patient, when blood pressure dropped to 73/23 mmHg, a rapid infusion of 300 ml of normal saline at 900 ml/h was administered. Post-infusion, blood pressure ranged from 76–80/23–30 mmHg. Norepinephrine (2 mg + 5% dextrose solution 50 ml) was then infused intravenously at 2 ml/h using an infusion pump. Ten minutes later, blood pressure rose to 87/30 mmHg, and after another 10 minutes, it reached 86/37 mmHg. The norepinephrine infusion rate was adjusted to 4 ml/h, and 10 minutes post-adjustment, blood pressure measured 92/50 mmHg. Subsequently, blood pressure was beginning to stabilize blood pressure was stabilizing which fluctuated between 95–99/45–67 mmHg over time. Continuous electrocardiographic monitoring was set to measure blood pressure, heart rate, respiratory rate, and oxygen saturation every 60 minutes, while also observing peripheral circulation, urine output, and any adverse drug reactions.

Infusing vasopressors through peripheral veins can lead to complications such as extravasation and phlebitis. To minimize these risks, infusions should be administered via large, straight veins with good blood return, avoiding mixing with other medications and using precise micro-infusion pumps to control the flow rate. Nurses must regularly check the infusion speed and dose accuracy, patency of the vascular access, local skin condition at the infusion site, and observe the child's behavior for signs of discomfort or adverse reactions, promptly implementing protective measures and addressing any extravasation immediately.

3.5. Timing of blood culture collection and antibiotic administration

Blood cultures are crucial for guiding antibiotic selection and managing septic shock, adhering strictly to the "blood cultures first" principle by collecting samples before initiating antibiotics [8]. Blood cultures help identify pathogens, enhancing diagnostic precision and treatment efficacy [9]. After diagnosing septic shock, antibiotics should be administered within one hour to positively impact treatment outcomes. When the child presented with high fever, chills, and shock, immediate fluid resuscitation with normal saline was initiated alongside electrocardiographic monitoring and low-flow oxygen therapy to stabilize circulation. Simultaneously, blood cultures were collected according to standard protocols. Laboratory results showed CRP at 48.43 mg/L, SAA > 350.00 mg/L, IL-6 at 132.0 pg/mL, and PCT at 3.83 ng/mL. Broad-spectrum antimicrobial therapy with meropenem and vancomycin was started, followed by dynamic monitoring of procalcitonin levels. Based on subsequent metagenomic sequencing that identified *Orientia tsutsugamushi*, targeted therapy with adding azithromycin following consultation with the pharmacy department. This approach ensured a transition from empirical to precise antimicrobial treatment, optimizing therapeutic effectiveness while minimizing resistance risk.

3.6. Nursing care for high fever

Closely monitor the changes in the child's body temperature. When the body temperature is > 39°C, measure and record the temperature every hour. Recheck the temperature 30 minutes after using drug or physical cooling to evaluate the effect. Closely observe the child's mental state, circulatory condition, and manifestations of chills and shivering. If the body temperature is > 38.5°C, immediately report to the doctor, promptly give physical or drug cooling, and observe the curative effect in time.

3.7. Nursing care for eschar and edematous skin

In wound care, keep the wound clean and dry to reduce the risk of infection. Observe the distribution, appearance, size, shape, and changes of the child's eschar, keep the skin at the eschar site clean and dry, guide the child and family members to avoid forcibly peeling off the eschar or scratching the skin, standardize nail trimming, and strengthen hand hygiene management. Record the child's weight, the tension and color of the skin at the edematous site every day, and timely record the progression trend of the child's edema.

3.8. Disinfection isolation and infection prevention and control measures

Nursing measures such as disinfection and isolation help reduce the incidence of infection and bleeding, thereby improving the prognosis of children [10]. Due to the reduction of three blood cell lines indicated by the blood routine test, the child is at high risk of infection and bleeding, and strict disinfection, isolation, and protection measures are required. The child should be placed in a blood isolation ward for protective isolation to reduce the risk of cross-infection, limit the number of visitors, and prohibit contact with respiratory tract infected persons. The ward should be disinfected with ultraviolet air once a day. Medical staff and family members must strictly perform hand hygiene before and after contacting the child.

3.9. Psychological nursing

The child's condition is critical, and the family members are anxious. In the psychological nursing of the child's family members, a communication model with empathy as the core should be established, patiently listening to the family members' emotional venting, explaining the child's condition and treatment nursing measures in simple terms, guiding the family members to participate in the child's nursing by keeping a nursing diary, and using visual tools (such as temperature curve charts) to display the treatment progress to enhance confidence. By explaining the child's condition to the family members, they can better understand the relevant knowledge of the disease and the child's condition progress, thereby reducing anxiety and better cooperating with condition observation and related treatments.

4. Discussion

This nursing case study has limitations due to the single sample of a critically ill child with scrub typhus complicated by hemophagocytic syndrome leading to septic shock. The effectiveness of its intervention measures may be affected by differences in the child's age, the severity of underlying diseases, and treatment response. In the future, it is necessary to expand the sample size and carry out multicenter studies relying on a multi-hospital vertical management model to further improve the scientificity and universality of the research design.

5. Conclusion

Through comprehensive and meticulous nursing interventions, including early recognition and management of septic shock, targeted anti-infective therapy, meticulous skin care, strict infection control, and family education, the pediatric patient with severe scrub typhus complicated by hemophagocytic syndrome and septic shock achieved successful recovery and was discharged after 11 days of intensive care. This case highlights the critical role of systematic nursing management in improving outcomes for critically ill pediatric patients with complex infections.

Disclosure statement

The authors declare no conflict of interest.

Author contributions

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