Policy Record	
Issue Number	
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Policy Title	Policy Number	Policy Issuer	Replacement of Policy Number
Management of Pediatric Sepsis: Outcome Improvement Initiative			
Policy Classification	**Issue Date**	**Effective Date**	**Date of Next Revision**
☐ Corporate Policy (General) ☐ Inter-department Policy ☐ Department Policy			

1. Statement of Purpose

To standardize the care in accordance with best practices and improve the outcomes for children with sepsis or other sepsis-associated organ dysfunction in the Emergency Department (ED) and the inpatient setting of MOH hospitals and outpatient clinic.

This policy is part of the national improvement projects to decrease mortality in children.

2. Applicability

This policy applied to all hospitals providing pediatric services.

3. Definitions

Pediatric sepsis: The presence of suspected or confirmed infection with at least 2 points indicative of organ dysfunction in children (up to 14 years).

Septic shock: A subset of sepsis in patients with manifested cardiovascular dysfunction indicated by at least one of the following (severe hypotension for age, blood lactate exceeding 5 mmol/L, or need for vasoactive medication)

Organ dysfunction: The presence of one or more of variables indicative of organ dysfunction as identified by the novel Phoenix Sepsis Score, which include: respiratory, cardiovascular, coagulation, and/or neurological variables

Resources limited setting: A site where there is a lack of PICU set up such as, but not limited to, the capability of administering vasoactive medication and mechanical ventilation.

4. Equipment

Continuous cardio-respiratory Monitor

Infusion (and/or) syringe pumps

Central venous catheter

Intraosseous vascular access

Mechanical ventilators

Arterial line catheter

5. Policy statements

- Each hospital should adopt the collaborative initiative to implement sepsis management bundles by assessing readiness, mobilizing resources, and monthly reporting measures of compliance and improvement cycles.
- Each hospital should initiate and ensure periodic training for Nurse and medical staff for sepsis screening and management.
- Each Hospital should audit and ensure availability of equipment and medication for sepsis screening and management.
- Systematic screening for timely recognition of septic shock and other sepsis-associated organ dysfunction should be incorporated as part of the routine practice; such as but not limited to ED triage, outpatient clinic and daily clinical round for inpatient.
- Implementation of sepsis bundles should be initiated immediately upon recognition at the first patient encounter, such as in the Emergency Department (ED) or the inpatient setting.
- Sepsis bundles, encompassing early recognition, initial resuscitation, and management algorithms, should be effectively implemented with a focus on the time-sensitive elements.
- All children with sepsis and septic shock should be admitted in Pediatric Intensive Care Unit (PICU with joint care and responsibility between PICU and primary team).
- Appropriate antimicrobial therapy should be administered within (1) hour of recognition for patients with septic shock regardless to the patient location.
- If a Pediatric Intensive Care Unit (PICU) is not available, after initial resuscitation, early referral of cases to the next level healthcare center should be initiated for further management within 3 hours.

6. Procedures

6.1. Sepsis early recognition bundle:

6.1.1. Urgent Screening for Sepsis

6.1.1.1. Identify unwell children with suspected infection promptly. Unwell child could be the one exhibiting signs of serious illness, which may not always be immediately apparent. Key indicators include abnormal behavior, such as lethargy or decreased responsiveness, and abnormal vital signs or physiological signs like pallor, mottling, or cyanosis.

6.1.1.2. Use a validated sepsis screening tool (the Phoenix Sepsis Score) to detect sepsis early.

6.1.1.3. Score 2 or more points on the Phoenix Sepsis Score indicates sepsis, requiring immediate action; healthcare provider should initiate the bundle.

6.1.1.4. Immediate Initiation of Sepsis Management If the child meets criteria for sepsis, initiate the sepsis initial resuscitation and management bundles without delay regardless to the patient location.

6.1.1.5. Emphasize time-sensitive interventions, such as administering intravenous antibiotics, to prevent further deterioration.

6.1.1.6. Critical Management of Septic Shock If the child meets criteria for sepsis and also has cardiovascular dysfunction, they meet the criteria for septic Shock, requiring urgent intervention.

6.1.1.7. Initiate the initial resuscitation and management bundles for septic shock immediately to prevent mortality.

6.1.1.8. Focus on time-sensitive interventions for managing septic shock to ensure optimal patient outcomes.

The Phoenix Sepsis Score

Respiratory, 0-3 points			
0 Points	**1 Point**	**2 Points**	**3 Points**
PaO2:FIO2 ≥400 or SpO2:FIO2 ≥292	PaO2:FIO2 <400 on any respiratory support or SpO2:FIO2 <292 on any respiratory support	PaO2:FIO2 100-200 and IMV or SpO2:FIO2 148-220 and IMV	PaO2:FIO2<100 and IMV or SpO2:FIO2 <148 and IMV
Cardiovascular, 0-6 points			
0 Points	**1 Point each (up to 3)**	**2 Points each (up to 6)**	**3 Points**
No vasoactive medications	1 Vasoactive medication	≥2 Vasoactive medications (	
Lactate <5 mmol/L	Lactate 5-10.9 mmol/L	Lactate ≥11 mmol/L	
Coagulation, 0-2 points			
0 Points	**1 Point each (maximum 2 points)**	**2 Points**	**3 Points**
Platelets ≥100 × 103/µL	Platelets <100 × 103/µL		
International normalized ratio ≤1.3	International normalized ratio >1.3		
D-dimer ≤2 mg/L FEU	D-dimer >2 mg/L FEU		
Fibrinogen ≥100 mg/dL	Fibrinogen <100 mg/dL		
Neurological, 0-2 points			
0 Points	**1 Point each (maximum 2 points)**	**2 Points**	
Glasgow Coma Scale score >10; pupils reactive	Glasgow Coma Scale score ≤10	Fixed pupils bilaterally	

Adapted from: Sanchez-Pinto, L. Nelson, et al. "Development and Validation of the Phoenix Criteria for Pediatric Sepsis and Septic Shock." JAMA (2024).

6.2 Sepsis initial resuscitation bundle:

6.2.1 Obtain intravascular (IV) access and if it is difficult to obtain, establish the IO access.

6.2.2 Obtain blood cultures before initiating antimicrobial therapy in situations where this does not delay antimicrobial administration. If cultures cannot be taken, do not delay antibiotics.

6.2.3 Measure lactate in the blood.

6.2.4 administer broad-spectrum antibiotics with one or more antimicrobials to cover all likely pathogens.

6.2.4.1 The antibiotic administration should follow the time stated in the policy, within (1) hour of recognition of patients with sepsis.

6.2.4.2 Broad-spectrum antibiotics depends on risk factors. For example, Ceftriaxone for community acquired infection, Tazocin to cover hospital acquired infection; vancomycin if MRSA infection is suspected. Clinical judgment of bedside doctor and his assessment of potential infection is a key factor in antibiotic choice.

6.2.4.3 Once the pathogen(s) and sensitivities are available, we recommend narrowing empiric antimicrobial therapy coverage

6.2.5 **Rapidly administering 40-60 mL/kg of crystalloid (0.9% saline or Ringer's Lactate) with 10–20mL/kg per bolus over the first hour for hypotension or lactate >2 mmol/L**. If heart failure is suspected to give **only** 5-10 ml/kg per bolus and evaluate for signs of fluid overload.

6.2.6 The need for fluid administration should be guided by frequent reassessment of clinical markers including heart rate, blood pressure, capillary refill time, level of consciousness, and urine output.

6.2.7 Signs of fluid overload that should limit further fluid bolus therapy may include clinical signs of pulmonary edema or new or worsening hepatomegaly.

6.2.8 Begin vasoactive infusions (Epinephrine and /or Norepinephrine) if hypotensive/hypo-perfused during or after fluid resuscitation to maintain a mean arterial pressure appropriate for age.

6.2.9 Provide oxygen therapy and respiratory support after initial resuscitation if clinically indicated:

6.2.10 Trial of noninvasive mechanical ventilation in children with sepsis-induced pediatric ARDS (PARDS) without a clear indication for intubation and who are responding to initial resuscitation.

6.2.11 Invasive mechanical ventilation in children with:

6.2.11.1 Significant increase in work of breathing.

6.2.11.2 Signs of exhaustion, fatigue, and hypoventilation.

6.2.11.3 Hypoxemia not responding to oxygen therapy.

6.2.11.4 Fluid-refractory, catecholamine-resistant septic shock without respiratory failure

6.2.12 All efforts should be provided to optimize the hemodynamic status before and during administering medication for induction and intubation.

6.3 Sepsis management bundle:

6.3.1 Optimize hemodynamic support and perfusion by:

6.3.1.1 Titrate vasoactive medication including (Epinephrine and /or Norepinephrine)

6.3.1.2 Titrate fluids based on fluid responsiveness indicators and considering precautions for myocardial depression and pulmonary edema (e.g., hepatomegaly and basal lung crackles).

6.3.1.3 Target systolic blood pressure (SBP) above the threshold for hypotension as per PALS guidelines definitions of pediatric hypotension as follows:

6.3.1.3.1 term neonates (aged 0-28 days): SBP less than 60 mm Hg;

6.3.1.3.2 Infants (aged 1-12 months): SBP less than 70 mm Hg;

6.3.1.3.3 Children aged 1-10 years: SBP less than 70 + (age in years X 2);

6.3.1.3.4 Children older than 10 years: SBP less than 90 mm Hg

6.3.1.4 Consider Hydrocortisone for refractory shock.

6.3.1.5 Target normal calcium levels for children with septic shock requiring vasoactive medication.

6.3.1.6 Target mean arterial blood pressure (MAP) at 50th percentile for age or greater.

6.3.1.7 Secure Central Venous Catheters to ensure appropriate and safe vasoactive drug administration.

6.3.1.8 Follow trends in blood lactate levels where persistent elevation in blood lactate may indicate incomplete hemodynamic resuscitation.

6.3.1.9 Utilize advanced hemodynamic monitoring such as central venous oxygen saturation (Scvo2), point-of-care ultrasound and echocardiography to titrate hemodynamic support.

6.3.1.10 Consider adding vasopressin in children with hypotension who require high-dose catecholamines.

6.3.2 Optimize respiratory support**:** In children with sepsis-induced pediatric ARDS, lung protective strategy should be followed as per the guidelines for the management of Pediatric Acute Respiratory Distress Syndrome (PALICC-2); please refer to the educational resources for detailed PALICC-2 guidelines.

6.3.3 All efforts should be made to investigate and control the source of infection.

6.3.4 Appropriate diagnostic testing to identify the site of infection and microbial etiology should be performed.

6.3.5 Advice from specialist teams (e.g., infectious diseases, surgery) should be sought, as appropriate, in order to prioritize interventions needed to achieve source control.

For the surviving sepsis campaign tools and sepsis management algorithm

From the Society of Critical Care Medicine and the European Society of Intensive Care Medicine,2020.

https://www.sccm.org/SurvivingSepsisCampaign/Guidelines/Pediatric-Patients

7 Responsibility

- ED physicians
- PICU physicians
- Medical directors

8 References

8.1 Schlapbach, Luregn J., et al. "International Consensus Criteria for Pediatric Sepsis and Septic Shock." JAMA (2024).

8.2 Sanchez-Pinto, L. Nelson, et al. "Development and Validation of the Phoenix Criteria for Pediatric Sepsis and Septic Shock." JAMA (2024).

8.3 de Castro, Roberta Esteves Vieira, et al. "Surviving sepsis campaign international guidelines for the management of septic shock and sepsis-associated organ dysfunction in children." Pediatric Critical Care Medicine 21.10 (2020): 924-925.

9 Measurements and Reporting through MOH Pediatric Sepsis Outcome Improvement Initiative Site:

Age in month

Gender

Time to 1st fluid bolus (minutes)

Number of fluid bolus (20ml/kg) before starting vasoactive medications

Time to actual administration of antimicrobial therapy (minutes)

Vasoactive medication used (Epinephrine, Norepinephrine, other)

Site of infection (Blood, lung, abdomen, CNS, urine, skin, surgical site, others)

Isolation of infective pathogen (Yes vs. No)

Intubation (Yes vs. No)

Outcome (survival vs. death)

Length of stay in PICU (days)

10 Educational resources

- Surviving Sepsis Campaign website: https://www.sccm.org/SurvivingSepsisCampaign/Guidelines/Pediatric-Patients
- Surviving Sepsis Campaign Releases Children's Sepsis Guidelines https://www.youtube.com/watch?v=JahwutBbUDk
- Dawning of a New Era in Sepsis https://sccm-video.s3.amazonaws.com/CCC50/Main/99004-Zimmerman.mp4
- New Phoenix Pediatric Sepsis Criteria by L. Schlapbach et al | OPENPediatrics https://www.youtube.com/watch?v=f5GYGmIewY8
- Executive Summary of the Second International Guidelines for the Diagnosis and Management of Pediatric Acute Respiratory Distress Syndrome (PALICC-2) https://journals.lww.com/pccmjournal/fulltext/2023/02000/executive_summary_of_the_second_international.8.aspx
- Hasan, Gamal M., et al. "Feasibility and efficacy of sepsis management guidelines in a pediatric intensive care unit in Saudi Arabia: a quality improvement initiative." International Journal for Quality in Health Care 30.8 (2018): 587-593.
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- Paul, Raina, et al. "Bundled Care to Reduce Sepsis Mortality: The Improving Pediatric Sepsis Outcomes (IPSO) Collaborative." *Pediatrics* 152.2 (2023): e2022059938.
- Workman, Jennifer K., et al. "Best practices in pediatric sepsis: building and sustaining an evidence-based pediatric sepsis quality improvement program." Hospital Practice 49.sup1 (2021): 413-421.
- Larsen, Gitte Y., et al. "Development of a quality improvement learning collaborative to improve pediatric sepsis outcomes." Pediatrics 147.1 (2021).

11 Reviewed & approved

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