CHILD HEALTH BC PROVINCIAL PEDIATRIC SEPSIS RECOGNITION AND MANAGMENT GUIDELINE

September 2023

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Child Health BC Provincial Pediatric Sepsis Recognition and Management Guideline

Site Applicability

This Child Health BC (CHBC) provincial guideline and accompanying toolkit are for use with pediatric patients presenting to emergency departments (EDs), urgent care settings or who are admitted to an inpatient care setting in British Columbia.

The intent of this guideline is to provide recommendations to guide best practice rather than to define standard of care. We acknowledge that variation within and across health authorities will determine the practical application of these guidelines. This document cannot replace clinical observation and judgement in patient treatment and management.

This guideline is NOT intended to provide specific recommendations for patients who are:

- pre-term infants or those cared for in the Neonatal Intensive Care Unit (NICU)
- immunocompromised and/or at high risk for multidrug-resistant pathogens
- followed by oncology

Practice Level/Competencies

This guideline is applicable for all health care providers involved in the care and management of children with suspected or proven sepsis and septic shock.

Children should have equitable access to healthcare, however they are often an underserved population.[1] Interactions with and assessments of children and their families should always be approached from a strengths-based perspective, with a trauma informed lens and with a safety and humility perspective.[1]
Always offer choice to the child and caregiver wherever possible to balance power and establish safety and trust. Health care providers should ensure they have completed the Indigenous Cultural Safety and Cultural Humility education required and/or recommended by their health authority; have an understanding of implicit biases and intersectionality; and have self-reflected on their personal values, assumptions and belief structures.

- Foundational – Conducting focused and comprehensive assessments are foundational level competencies of nurses and medical staff. In areas where various levels of care providers (Licensed Practical Nurse, Care Aide, Student Nurses, Employed Student Nurses) are assigned to patients, care of a deteriorating patient will be assumed by the Registered Nurse.
- Advanced – Pediatric vascular access is an advanced skill that requires additional education, training and certification. Additional education and training is required to initiate and maintain an intraosseous device.

Definitions

Best Practice: practice that has been shown by research and experience to produce optimal results and that is established or proposed as a standard suitable for widespread adoption[2]

British Columbia Pediatric Early Warning System (BC PEWS) Score: Relevant patient assessment findings for cardiovascular, respiratory, behavioural parameters as well as persistent vomiting following surgery and use of bronchodilators every 20 minutes are collected, documented, and summated into a validated tool to produce a score. The score can be used to identify patient physical deterioration at a single point in time or through trend monitoring, to optimize chances for early intervention[3]

CHARLiE (Child Health Advice in Real-time Electronically) is one of the Instant Access Real-Time Virtual Support (RTVS) pathways for healthcare providers for healthcare collaboration in rural and remote communities in BC. The CHARLiE team includes pediatricians, pediatric emergency physicians, and pediatric intensivists who are available 24/7 by Zoom to provide urgent specialized pediatric support to rural healthcare providers presented with urgent problems in children and youth. Zoom at charlie1@rccbc.ca or by phone backup at 236-305-5352

Critical Heart Rate: A heart rate 30 beats per minute above normal rate or bradycardia for age[3-5] (seeAppendix A)

Cultural Humility: acknowledging oneself as a learner when it comes to understanding another's experience and optimal care. Recognizing the power imbalances inherent in health care for Indigenous Peoples and the primacy of western medical knowledge, PHSA staff and health care providers practice cultural humility by respecting and supporting Indigenous wise practices[2]

Implicit bias: refers to the unconscious assumptions, beliefs, attitudes and stereotypes that human brains have about different groups. These learned mental short-cuts affect how we perceive and respond to people [6]

Indigenous Cultural Safety: the process of making spaces, services and organizations safer and more equitable for Indigenous people by considering colonial history and seeking to eliminate structural Racism and Discrimination. Indigenous Cultural Safety is also an 'outcome' based on respectful engagement that recognizes and strives to address power imbalances inherent in the healthcare system; it is when Indigenous people feel safe when receiving care[2]

Inotropic Support: the use of vasoactive medication (e.g. epinephrine or norepinephrine) to support blood pressure and cardiac output in children with septic shock[7]

Intersectionality: This definition has been inspired by Kimberlé Crenshaw's work "Inequities are never the result of single, distinct factors. Rather, they are the outcome of intersections of different social locations, power relations and experiences" [8]

Neonate: 0-28 days of life[9-11]

Pediatric Patient: In emergency departments, health authority-funded health centres and inpatient settings: children up to their 17th birthday (16 years + 364 days) and children receiving ongoing care: Up to a child's 19th birthday (18 years + 364 days)[3]

PEWS Score 2 or higher: A score of 2 or higher should prompt increased awareness, notification, planning, assessment, and resource review [3]

Pre-term: babies born before 37 weeks of pregnancy are completed. There are sub-categories of preterm birth, based on gestational age[12]

Sepsis: life-threatening organ dysfunction caused by a dysregulated host response to infection[13,14]

Septic shock: severe infection leading to cardiovascular dysfunction (including hypotension, need for treatment with a vasoactive medication, or impaired perfusion) [13]

Trauma-Informed Practice: the principles of safety, choice, collaboration, trustworthiness, and empowerment are embedded in the way we work and that create a healthy environment for patients and all staff. A trauma-informed organization realizes and recognizes the impact of trauma, and responds in ways that mitigate re-traumatization and create safe environments to work, learn, and receive care[2]

Need to Know

- If sepsis is not recognized early and managed promptly, it can lead to septic shock, sepsis associated organ dysfunction and death [15]

- Early escalation to a pediatric critical care (onsite or via Patient Transfer Network (PTN)) is essential[16]

- In children with sepsis or septic shock **resuscitation should not be delayed DESPITE blood pressure being within normal range.** Hypotension is a late sign of severe sepsis in a child and indicates that compensatory mechanisms such as tachycardia and vasoconstriction have failed

- Antimicrobials are the primary medical therapy that directly targets the underlying cause of sepsis. There is strong biologic rationale for **rapid intervention with administration** of antimicrobials, ideally within 60 minutes of presentation, in pediatric patients with sepsis[17]

- Excessive fluid resuscitation can be harmful. **This is a change from previous fluid management guidance for pediatric sepsis.** Pediatric consultation should be considered if more than 40mL/kg of fluid is required[15] Fluid should be titrated to clinical response while continually monitoring for signs of fluid overload (i.e. increased work of breathing, crackles on auscultation, hepatomegaly) [15,18]

Pediatric Consultation

There are several ways within British Columbia for clinicians to consult a pediatrician or neonatologist. This is determined by site resources and patient acuity. Options may include:

- Consult local on-call pediatrician/neonatologist through your local operator/on call system
- If local on-call pediatrician/neonatologist is not available, seek pediatrician advice through CHARLiE via Zoom at charlie1@rccbc.ca or CHARLiE via phone backup at 236-305-5352
- Contact a higher level of care referral center to consult with a pediatrician/pediatric intensivist/neonatologist (for term neonatal infants) via PTN (1-866-233-2337)

Nursing & Respiratory Therapist Support from Provincial PICUs

All Health Authorities/Agencies: Nurse-to-Nurse support from BC Children's Hospital (BCCH) PICU is available 24/7 at 604-875-2133. Calls will be directed to the Critical Care Outreach RN, or PICU Charge RN. Respiratory Therapist (RT) support is also available by calling this number where you will be connected with the PICU Charge RT.

For Island Health: Nurse-to-Nurse support from Victoria General Hospital (VGH) PICU is available 24/7 through the PICU Outreach Program. Call 250-727-4186 (local 14186) and ask for the charge nurse.

These support services do not replace PTN. They are intended to support nursing and RT care at the local site. PTN should always be called in cases where transfer to a higher level of care is anticipated.

Guideline

Screening

- Using the **CHBC Provincial Pediatric Sepsis Screening Tool** (see Appendix B) or equivalent electronic health record and **BC Pediatric Early Warning System (BC PEWS)**[3] if utilized at facility, each pediatric patient should be screened for sepsis:

    - ✓ at ED triage or primary assessment;
    - ✓ at inpatient admission or transfer between care areas;
    - ✓ if prompted by PEWS during reassessment of the patient per the frequency identified in the health authority/agency standards, Most Responsible Practitioner (MRP) orders, CTAS guidelines, and/or escalation aid used in your agency[3]

- Vital sign deterioration can be an acute indicator for the progression to septic shock and indicates the need for urgent intervention
- If you suspect a child has sepsis or septic shock immediately notify the MRP and initiate treatment following the **CHBC Provincial Pediatric Sepsis Clinical Care Algorithm** (see Appendix C). Prepare to transfer to higher level of care as required

- Initiate droplet and contact infection control measures (and airborne if indicated) as per health authority or agency guidelines

- Review any parental/caregiver concern such as the child's condition is worsening or they are not behaving as they usually would [13]

Signs of Suspected Sepsis [16,18]

Signs of suspected sepsis include two or more of the following in the context of infection:

- Looks sick or toxic (feels cold to touch, blotchy, blue or pale skin)
- Parental/caregiver concern
- Critical heart rate (see Appendix A)
- Temperature greater than 38° Celsius or less than 36° Celsius
- Altered mental state (drowsy, difficult to wake, irritable or confused)
- Tachypnea, increased work of breathing, cough, grunting, chest pain
- Decreased feeding
- Reduced urine output or other signs of dehydration
- Abdominal pain, distension, vomiting, diarrhea
- Joint pain or swelling, rash or other signs of skin infection

Neonates may present with apnea, jaundice, reduced feeding, reduced urine/stools, irritability, drowsiness or abdominal distention**. All neonates with fever must be treated with antibiotics.**[19]

If the child screens negative for sepsis, continue to monitor and rescreen as per your health authority/agency guidelines and clinical judgment.

BC PEWS will prompt a re-screen for sepsis if ONE of the following are present:

- Critical heart rate
- PEWS score increases by 2
- Temperature greater than 38° Celsius or less than 36° Celsius

Is the child at a high-risk of complications from sepsis?

Children at a high risk include: [16,20]

- Age less than 3 months or born preterm
- Immunocompromised (if patient is neutropenic and/or an oncology patient, follow appropriate health authority or agency guidelines)
- Cardiac, respiratory or neuromuscular disease
- Significant developmental delay
- Indwelling vascular access or medical device
- Recent surgery or hospitalization
- Recent inpatient episode of sepsis (within 6-12 weeks)
- Intravenous recreational drug use

Are there signs of septic shock? [15,18]

The *earlier* signs of septic shock due to poor organ and peripheral perfusion may include:

- Looks sick or toxic
- Altered mental status (increased lethargy or hypotonic)
- Mottled skin or cool extremities
- Tachycardia
- Capillary refill greater than 3 seconds
- A weak thready pulse
- Decreased peripheral pulses
- Temperature greater than 38^{o} Celsius or less than 36^{o} Celsius
- Oxygen saturation less than 92% in children without known cyanotic heart disease
- Decreased urine output or other signs of dehydration

Management of Patients with Sepsis

Health care providers should utilize psychosocial, physical and pharmacological pain management interventions to minimize pain and distress, prevent when possible and promote comfort at every clinical care encounter with pediatric patients [21]. The Pediatric Pain Management National Standard of Canada provides guidelines for managing acute and chronic pediatric pain. BC Children's Hospital has developed a variety of pain assessment and management resources including the Comfort PACT. They can be found on the BC Children's Hospital Pain Management & Comfort web page.

- Assess Heart Rate, Respiratory Rate, Blood Pressure, Temperature, Oxygen Saturation, Capillary Refill and Level of Consciousness. Calculate PEWS score with each set of vital signs. Assessments should take place at a *minimum* q 15 minute interval and before and after each fluid bolus. Adjust frequency of monitoring interval based on clinical findings and/or as directed by MRP
- Evaluate for the presence of septic shock (see below)
- Apply continuous cardiorespiratory monitoring and oxygen saturation monitoring if available at site
- Apply oxygen to maintain saturations above 92% or child's baseline for children with known cyanotic heart disease
- Apply end tidal CO_2 nasal cannula and monitor if available at site and if appropriate
- Perform point of care glucose test
- Secure vascular access to initiate fluid resuscitation and give antibiotics as soon as possible, within the first hour [15] See Early Fluid Resuscitation guidance on page 8

- Obtain blood work as per below guidance. **Ideally collect all applicable cultures (blood, urine, Cerebral Spinal Fluid) prior to antibiotic administration but do not delay antibiotic administration in the unstable patient**
- Consider antipyretics if temperature greater than 38^{o} Celsius
- Consider nothing by mouth (NPO) and if commenced, initiate IV fluids with regular blood sugar monitoring in accordance to your health authority NPO guidelines.
- Assess previous 24 hour input & output. Strictly monitor input & output
- Follow health authority protocols for escalation of care and engage site resources as necessary (i.e. Code Blue)
- Seek pediatric or neonatal consultation
- Seek BCCH PICU nursing/RT support or VGH PICU nursing support as required

Additional Management Guidance for Patients in Septic Shock:

Follow guidance for patients with sepsis AND:

- Secure IV access with as large a catheter as possible (if possible secure 2 access sites)
- If intravenous (IV) access is not secured within 5 minutes or after two failed attempts, consider use of intraosseous (IO) access. In situations where rapid IV access may be difficult, IO access should occur concurrently with IV attempts to minimize delay to vascular access [15]
- Consult PICU/NICU via PTN:
    - considerations of intubation and ventilation
    - selection and initiation of vasoactive medications (e.g. epinephrine or norepinephrine)
    - prior to steroid initiation
    - prior to administration of blood products

Early Fluid Resuscitation

Identification of the source of infection should NEVER delay resuscitation. Ensure signs of fluid overload are absent prior to initiating fluid boluses

- Administer sodium chloride 0.9% at 10-20 mL/kg over 20 to 30 minutes[15]
- Reassess patient at a *minimum* of q 15 minutes including heart rate, respiratory rate, blood pressure, level of consciousness, oxygen saturation, perfusion and PEWS score. Adjust frequency of monitoring interval based on clinical findings and/or as directed by MRP
- If vital signs or mental status remains abnormal, prepare for second bolus and consult pediatrician/neonatologist as outlined previously. No response in heart rate or perfusion after a bolus of fluid may indicate the need for inotropic support

- Excessive fluid resuscitation can be harmful. Pediatric consultation should be considered if a total of more than 40mL/kg of fluid is required
- If clinical improvement is NOT seen by the time the initial bolus is completed and there are no signs of fluid overload, an additional 10-20 mL/kg bolus may be repeated. Fluid should be titrated to clinical response while continually monitoring for signs of fluid overload (e.g. increased work of breathing, crackles on auscultation, hepatomegaly) or signs of cardiogenic shock.[15,18]
- A **maximum** of 60mL/kg within the first hour can be provided if no signs of fluid overload
- Consider other causes of shock unresponsive to fluids if no improvement following fluid boluses (e.g. cardiomyopathy, acute myocarditis and metabolic disorders of the neonate)
  Prevent and treat hypothermia as per your health authority or agency guidelines

Glucose/ Calcium Management

- Check for and correct low glucose (especially common in infants under 6 months)
- Glucose management, if indicated, requires a separate infusion. Infuse separately from the fluid bolus solution if there are two points of IV access
- If glucose is less than or equal to 2.6 mmol/L, give D10NS 5mL/kg (**2mL/kg for neonates**) rapid IV intermittent bolus (ideally over 5 minutes via syringe/bag) and recheck glucose in five minutes [22. 23]
- Initiate maintenance fluids D10NS for infants less than 10kg, and D5NS for children greater than 10kg. Recheck glucose in an hour [23]
- Check for and correct low calcium according to your health authority or agency guidelines[22] Electrolyte disturbance (e.g. hypocalcaemia) is common in critically-ill children with sepsis and can contribute to poor cardiac function[16]

Antibiotic Therapy

Broad spectrum antibiotics should be administered as soon as possible within 1 hour of recognition of septic shock or when there is a high likelihood of sepsis.[15,16] It is recommended to obtain blood cultures before initiating antimicrobial therapy in **situations** where this does not substantially delay antimicrobial administration[15] The common pathogens which may cause sepsis are outlined in Appendix D[24.]

While the intravenous route is preferred, antibiotics can be given interosseous (IO) or intramuscularly (IM) if there is delay in vascular access (i.e. failure to obtain IV access within 5 minutes or after two failed attempts) and antibiotic is appropriate for IM/IO administration.

These guidelines provide recommendations for initial broad spectrum antibiotic coverage for a clinically unwell child with suspected sepsis. **It is important to remember that antibiotic de-escalation is recommended based on results of investigations and clinical course.** Consulting local on-call pediatrician/neonatologist, infectious disease and/or other specialty services may help guide ongoing antimicrobial therapy.

This guideline is not intended to provide specific recommendations for patients who are:

- pre-term infants or those cared for in the Neonatal Intensive Care Unit (NICU)
- immunocompromised and/or at high risk for multidrug-resistant pathogens
- followed by oncology

For these patient populations, it is recommended to contact the local on call pediatrician/neonatologist or BCCH (if they are followed by a BCCH subspecialty service) for antimicrobial recommendations.

Antibiotic Recommendations*		
Age	**Unknown Source** **CNS Infection *Not* Suspected**	**Suspected CNS Infection**
Term neonate less than 29 days of life	All infants under 28 days presenting with suspected sepsis should be treated for suspected CNS infection until proven otherwise ⟹	ampicillin **AND** cefotaxime **AND** acyclovir
29 days of life to 17 years of age less 1 day	cefTRIAXone** **PLUS OR MINUS** vancomycin***	cefTRIAXone ** **AND** vancomycin*** **PLUS OR MINUS** acyclovir

*Consult infectious diseases for antibiotic recommendations for children with allergies or contraindications to recommended antimicrobial therapies

**If ceftriaxone unavailable substitute with cefotaxime

***Consult pharmacy for therapeutic drug monitoring recommendations should duration of vancomycin be greater than 48 hours (sooner in patients with renal impairment)

Antibiotic Dosing Recommendations		
Age	**Unknown Source** **CNS Infection *Not* Suspected**	**Suspected CNS Infection**
Term neonate less than or equal to 7 days of life	All infants under 28 days presenting with suspected sepsis should be treated for suspected CNS infection until proven otherwise	**ampicillin:** 100 mg/kg/dose IV/IM/IO q8h **cefotaxime:** 50 mg/kg/dose IV/IM/IO q12h **acycloviр**: 20 mg/kg/dose IV/IO q8h
Term neonate 8 days – 28 days of life	All infants under 28 days presenting with suspected sepsis should be treated for suspected CNS infection until proven otherwise	**ampicillin:** 75 mg/kg/dose IV/IM/IO q6h **cefotaxime:** 50 mg/kg/dose IV/IM/IO q6h **acyclovir:** 20 mg/kg/dose IV/IO q8h
29 days of life to 17 years of age less 1 day	**cefTRIAXone :** 100 mg/kg/dose IV/IM/IO q24h or 50mg/kg/dose IV/IO q 12 hours (Maximum: 2000 mg/dose) **vancomycin:** 15 mg/kg/dose IV/IO q6h (Maximum: 1500 mg/dose) If ceftriaxone unavailable substitute with cefotaxime: **cefotaxime:** 50 mg/kg/dose IV/IM/IO q6h (Maximum: 2000 mg/dose)	**cefTRIAXone :** 50 mg/kg/dose IV/IM/IO q12h (Maximum: 2000 mg/dose) **vancomycin:** 15 mg/kg/dose IV/IO q6h (Maximum: 1500 mg/dose) May consider 20 mg/kg/dose IV q6H if seriously ill and normal renal function **acyclovir:** 29 days to 3 months of age • acyclovir 20 mg/kg/dose IV/IO q8h Greater than 3 months of age • acyclovir 10 mg/kg/dose IV/IO q8h If ceftriaxone unavailable substitute with cefotaxime: **cefotaxime:** 75 mg/kg/dose IV/IM/IV q6h (Maximum: 2000 mg/dose)

For further antibiotic information, including IM dosing refer to Provincial Health Services Authority BC Children's & Women's Hospital Online Formulary [25] and the BC Children's Hospital Empiric Antimicrobial Guide 10th ED[26] Firstline App (Spectrum) is available and endorsed for use in some health authorities.

Laboratory Investigations

Sepsis is a clinical diagnosis; **laboratory investigations are supportive and should not delay treatment initiation.** Weight based recommendations for volumes collected and blood culture collection bottles to be used for routine pediatric blood cultures can be found in the BC Children's Hospital & BC Women's Hospital Pediatric Blood Culture Guide or use local health authority guidance.

Drawing blood in children can be difficult and may require venous, capillary or arterial draws.

Investigations if Available at Facility or at Higher Level of Care

First Line Lab Investigations in Pediatric Sepsis	
Blood culture	**Prioritize over other blood tests. It is recommended to obtain blood cultures before initiating antimicrobial therapy in situations where this does not substantially delay antimicrobial administration.**[15] Culture sensitivity increases with blood volume. Recommended volume to collect is 1mL/kg max 40mL.[27,28]
Blood gas	Base deficit more than 5.0 mEq/L marker of possible sepsis[16]
Complete blood count	WBC can be normal, high or low in early sepsis.[16] Platelet count less than 100,000 uL in sepsis or disseminated intravascular coagulation (DIC).[16]
Lactate	Do **NOT** attribute increased lactate to difficult venipuncture. Lactate more than 2.0 mmol/L marker of possible sepsis.[16] Repeat lactate (q2h) if greater than 2mmol/L. Lactate greater than 4 mmol/L requires urgent action.[16]
Electrolytes, glucose, urea and creatinine	Include sodium, potassium, chloride, ionized *or* total calcium, magnesium, phosphate, glucose, urea and creatinine. C Reactive Protein: low value does not exclude early sepsis.[16]
Urinalysis, urine culture and sensitivity	Obtain via in and out/indwelling catheter.

Second Line Investigations in Pediatric Sepsis	
Blood group and screen	If indicated.
Liver function tests	Total bilirubin, AST, ALT. Increased bilirubin or alanine aminotransferase (ALT) in sepsis.[16]
Coagulation studies	PT (INR), PTT, fibrinogen if clinical evidence of bleeding or Disseminated Intravascular Coagulation (DIC). Altered values in the context of sepsis with thrombocytopenia indicative of DIC.[16]
Lumbar puncture & cerebrospinal fluid investigations	Recommended for neonates with suspected sepsis as long as clinically stable. For older children, lumbar puncture may be considered if meningitis is suspected and the child is clinically stable (i.e. no signs of increased ICP, coagulopathy or hemodynamic compromise).[16,19] Can do WBC and PCR for meningitis diagnosis on CSF from delayed LP[16] • cell count with differential • gram stain and culture • glucose • protein level Nucleic acid testing (NAT) for HSV and other potential pathogens.
Cultures & Swabs	If diarrhea present, stool for culture and virology if available. Nasopharyngeal Flocked Swab; Respiratory Nucleic Acid Testing (NAT) panel. Culture & Sensitivity of wound that appears infected.
Radiology	Consider Chest x-ray for respiratory distress or signs on examination. Other imaging as directed by the focus of infection e.g. septic joint.[16]
Cardiac	Electrocardiogram 12 Lead. Echocardiogram.

Documentation

- Screen for sepsis using health authority/agency tool adapted from the CHBC Provincial Pediatric Sepsis Screening Tool or equivalent electronic health record
- Document in the health record that a sepsis screen has been completed as per your health authority or agency guidelines
- Document clinical care as per your health authority or agency guidelines

Patient/Caregiver Education

Caregivers are encouraged to be active participants in the care of their child. Caregivers should be provided with the following resource:

- When Your Child Has Sepsis: Information About Sepsis, Care and Recovery

A one page infographic is available for use in clinical spaces or on organizational social media platforms

- Could It Be Sepsis?

Language translations are available for both resources and can be found on the CHBC Pediatric Sepsis webpage.

Sepsis Alliance: Child Focused Resources:

You have Sepsis. Now What? Your guide to what you may see and feel while in hospital

You Can Help Stop Germs From Making You Sick (Text based version for children with neurodiversity)

You Can Help Stop Germs From Making You Sick (Visual based version for children with neurodiversity)

Supplement to above resources for health care providers:

Using Visual and Text Guides When Talking to Patients with Intellectual and Developmental Disabilities

Patient/Caregiver Support Resources

Complex health issues like sepsis can be stressful for families. Consider a referral to social work if available at the facility. Aboriginal and Indigenous children and their families should be offered the opportunity to connect with the Aboriginal or Indigenous Patient Navigator/Liaison (or similar role) if it is available in the health authority/agency. This connection should be offered prior to referral to other individuals and services.[29]

Referrals to other team members and/or community services should be done in a trauma informed way. Referrals should not be made without prior consultation with the child and their caregiver (as appropriate). When discussing referrals with the child and caregiver it is important to use plain language, and to describe provider roles and how that individual or service can support the child's care.[29]

Related Documents

Screening Tool/Algorithm

- Child Health BC Provincial Pediatric Sepsis Screening Tool
- Child Health BC Provincial Pediatric Sepsis Clinical Care Algorithm

Knowledge Translation Materials

- CHBC Provincial Pediatric Sepsis Toolkit for ED and Urgent Care Centers Webinar with Dr. Garth Meckler & Dr. Mark Chilvers
- CHBC Provincial Pediatric Sepsis Toolkit Factsheet
- CHBC Provincial Pediatric Sepsis Toolkit Frequently Asked Questions (FAQ)
- Pediatric Sepsis Toolkit Huddle Facilitator Guide
- Pediatric Sepsis SIM Scenario for ED/Urgent Care Settings
- Pediatric Sepsis SIM Scenario for Inpatient Care Settings

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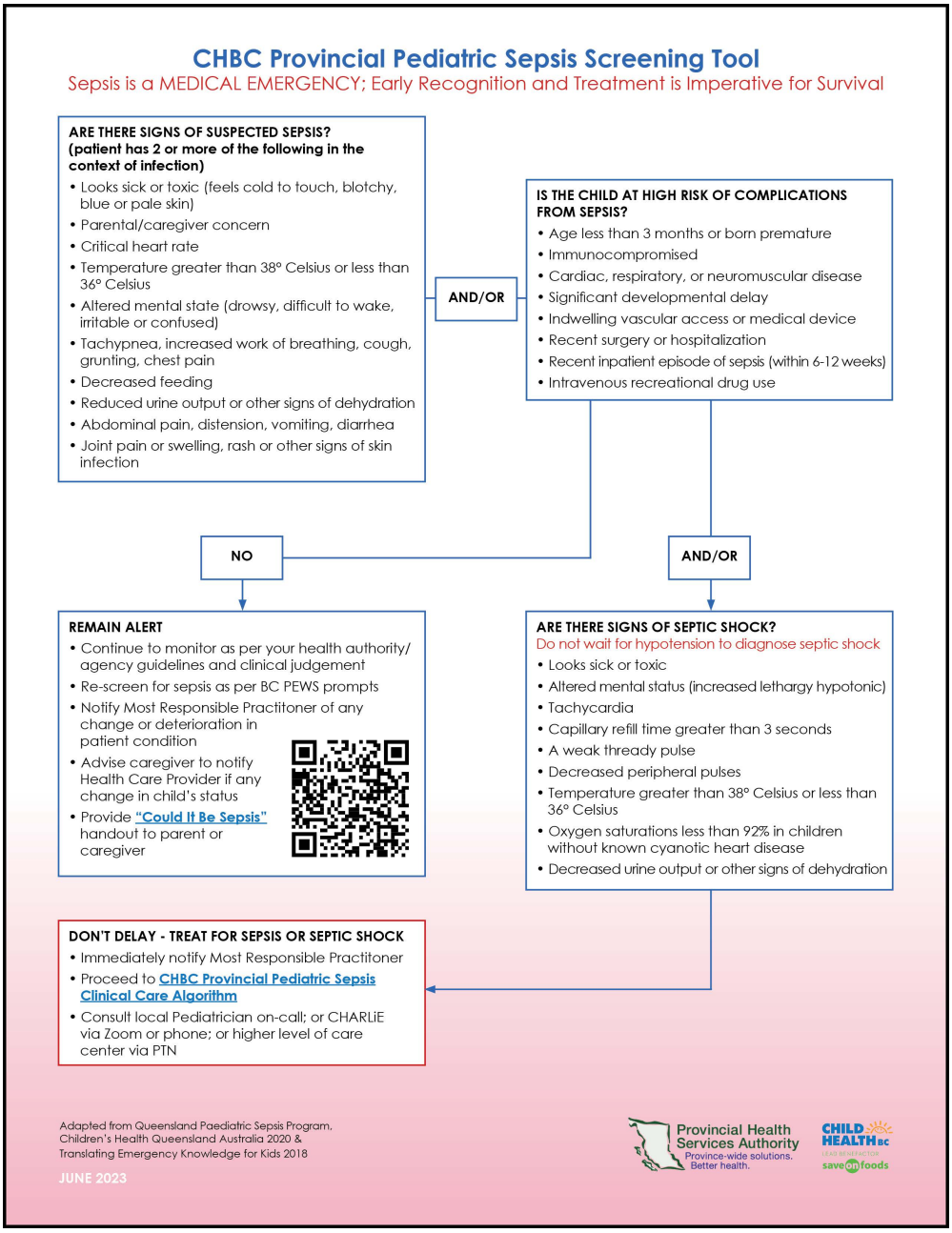
Appendix A

Critical Heart Rate Values based on BC PEWS[3-5]

Heart Rate (Beats per Minute)				
Age	Normal Range	**PEWS Score 2 (Tachycardia)**	**PEWS Score 3 (Bradycardia)**	**PEWS Score 3 (Tachycardia)**
0-2 months	96-162	163-172	Less than or equal to 95	Greater than or equal to 173
3-5 months	112-176	178 - 187	Less than or equal to 111	Greater than or equal to 188
6-8 months	107-171	172 - 181	Less than or equal to 106	Greater than or equal to 182
9-11 months	102-164	165 -174	Less than or equal to 101	Greater than or equal to 175
12-14 months	98-159	160-169	Less than or equal to 97	Greater than or equal to 170
15-17 months	95-156	157-166	Less than or equal to 94	Greater than or equal to 167
18-20 months	91-153	154 - 163	Less than or equal to 90	Greater than or equal to 164
21-23 months	88-150	151 - 160	Less than or equal to 87	Greater than or equal to 161
24 -35 months	86-147	148 - 157	Less than or equal to 85	Greater than or equal to 158
3 years	79-139	140 - 149	Less than or equal to 78	Greater than or equal to 150
4 years	74-135	136 - 145	Less than or equal to 73	Greater than or equal to 146
5 years	69-131	132- 141	Less than or equal to 70	Greater than or equal to 142
6 years	68-128	129 -138	Less than or equal to 67	Greater than or equal to 139
7 years	65-124	125 - 134	Less than or equal to 64	Greater than or equal to 135
8 years	62-121	122 - 131	Less than or equal to 61	Greater than or equal to 132
9 years	60-118	119 - 128	Less than or equal to 59	Greater than or equal to 129
10 years	**58-116**	117 - 126	Less than or equal to 57	Greater than or equal to 127
11 years	**56-114**	115 - 124	Less than or equal to 55	Greater than or equal to 125
12 years	**54-112**	113 - 122	Less than or equal to 53	Greater than or equal to 123
13 years	**51-111**	112 - 121	Less than or equal to 52	Greater than or equal to 122
14 years	**52-109**	110 - 119	Less than or equal to 51	Greater than or equal to 120
15 years	**50-108**	109 - 118	Less than or equal to 49	Greater than or equal to 119
16 years	**49-106**	107 - 116	Less than or equal to 48	Greater than or equal to 117

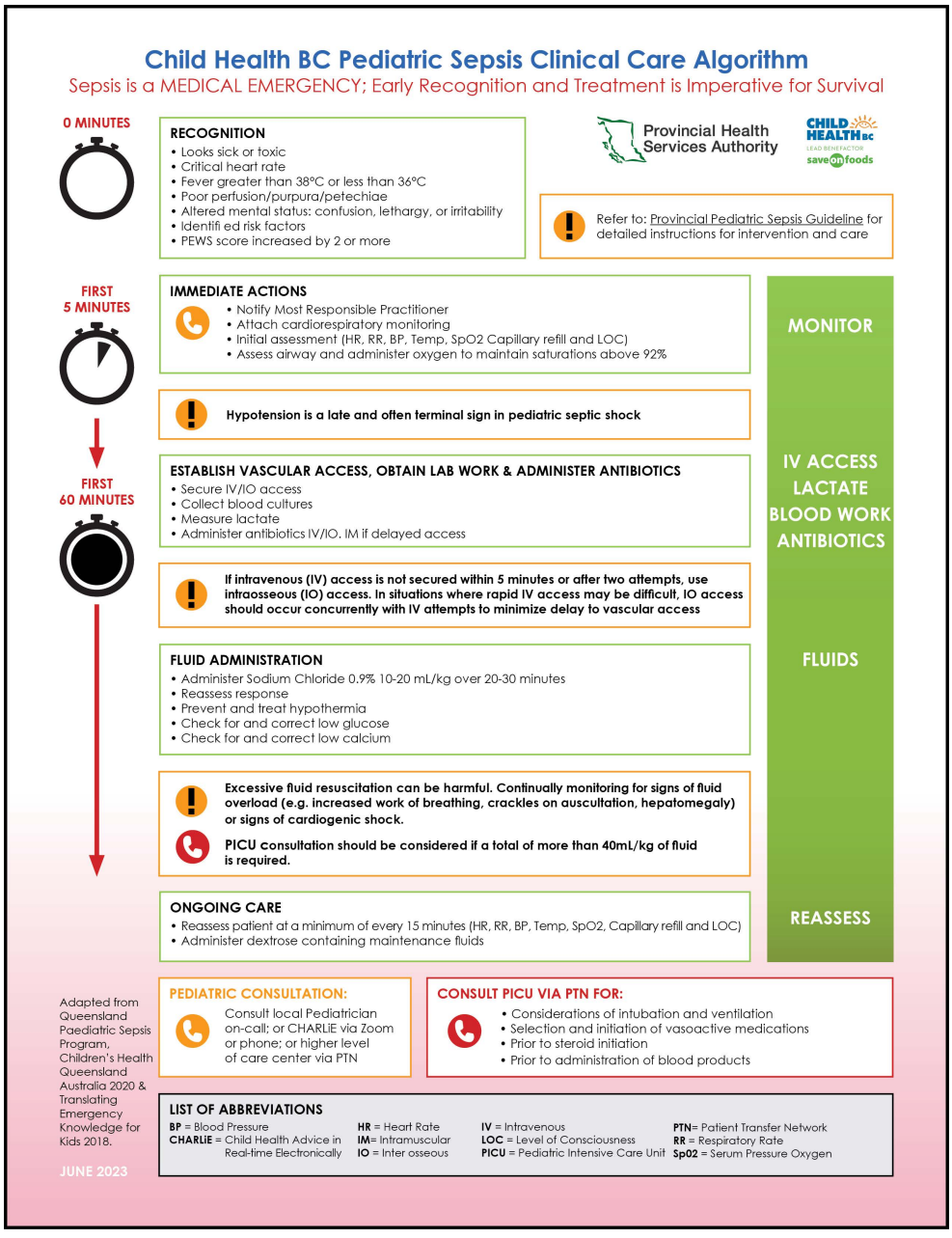
Appendix B

Child Health BC Provincial Pediatric Sepsis Screening Tool



Appendix C

Child Health BC Provincial Pediatric Sepsis Clinical Care Algorithm



Appendix D

Organisms Causing Sepsis

Immunization Status: Routine childhood immunization has been seen to provide a rapid reduction in certain bacterial causes of sepsis.

In **immunized** children the most common **bacterial** pathogens causing sepsis include:

- *Staphylococcus aureus* including methicillin-resistant strains (MRSA)
- *Streptococcus pneumoniae*
- *Streptococcus pyogenes*
- *Escherichia coli*
- *Klebsiella species*

In **unimmunized** children, in addition to the organisms listed above, consider specifically:

- *Haemophilus influenzae* type b
- *Neisseria meningitidis*,
- *Streptococcus pneumoniae*

Specific to infants 3 months of age or younger:

- Coagulase-negative Staphylococcus
- Group B streptococcus
- *Escherichia coli*
- Listeria
- *Syphilis*

Viruses

Viral pathogens may cause sepsis and are challenging to differentiate from bacterial infections. Additionally, there may be secondary bacterial infection. Viruses to consider for all age groups include:

Respiratory viruses:

- *Influenza*
- *Parainfluenza*
- *Adenovirus*
- *Enterovirus*
- *RSV*
- *SARS-CoV-2 (COVID-19)*
- *Human metapneumovirus*
- *Herpes simplex virus*

Note: This list represents common organisms responsible for pediatric and neonatal sepsis.[20] It is not exhaustive and consultation with Infectious Diseases/Medical Microbiology may be needed.

Appendix E

Provincial Pediatric Sepsis Toolkit Development Advisory Group Partners

Organization	Name	Specialty/ Position
Health Quality BC	Sybil Hoiss	Leader, Strategic Initiatives, BC Patient Safety & Quality Council
Health Quality BC	Dr. David Sweet	Sepsis Clinical Lead- BC Patient Safety & Quality Council Critical Care Medicine, Vancouver General Hospital
Centre for International Child Health	Dr. Mark Ansermino	Executive Medical Director Global Health
Centre for International Child Health	Dr. Niranjan "Tex" Kissoon	President, Global Sepsis Alliance
Fraser Health Authority	Dr. Priya Bhangoo	Department Head for Pediatric Emergency, Surrey Memorial Hospital
Fraser Health Authority	Ruth Dueckman	Executive Director, Infection Prevention & Control
Fraser Health Authority	Loraine Jenkins	Executive Director, Clinical Programs and Operations, Maternal Infant Child and Youth, Fraser Health
Fraser Health Authority	Mary Van Osch	Clinical Nurse Specialist, Emergency Network
Interior Health Authority	Dr. Edith Blondel-Hill	Medical Lead, Microbiologist
Interior Health Authority	Dr. Chris Pienaar	Pediatrician, East Kootenay Regional Hospital
Island Health Authority	Dr. Jeff Bishop	PICU Medical Director
Island Health Authority	Dr. Maria Kang	Regional Pediatric Medical Lead
Northern Health Authority	Dr. Natasha Desjardins	Physician
Provincial Health Services Authority	Dr. Laura Sauvé	Pediatric Infectious Diseases Specialist BCCH
Provincial Health Services Authority	Dr. Mark Chilvers	Pediatric Medical Director, Child Health BC
Provincial Health Services Authority	Dr. Meghan Gilley	Pediatric Emergency Medicine, BCCH
Provincial Health Services Authority	Dr. David Goldfarb	Medical Microbiologist, Pathology and Laboratory Medicine, BCCH
Provincial Health Services Authority	Dr. Garth Meckler	Division Head, Pediatric Emergency Medicine BCCH
Provincial Health Services Authority	Kendra Sih	Clinical Pharmacy Specialist, BC Children's Hospital ED
Provincial Health Services Authority	Dr. Peter Skippen	Division Head, Pediatric Intensive Care Unit, BCCH
Provincial Health Services Authority	Dr. Pascal Lavoie	Neonatologist Associate Professor in the Department of Pediatrics, University of British Columbia
Provincial Health Services Authority	Trish Thomson	Child Health BC Regional Coordinator, Interior Health
Provincial Health Services Authority	Melissa Coop	Senior Leader, Provincial Education, Child Health BC
Vancouver Coastal Health Authority	Dr. Derek Murray	Emergency Department, Lions Gate Hospital

Provincial Pediatric Sepsis Toolkit Development Working Group Partners

Health Authority	Name	Position
Fraser Health Authority	Melissa Brown	Clinical Nurse Specialist, Pediatrics
Fraser Health Authority	Kim Duran	Clinical Practice Consultant, Integrated Plan of Care (IPoC) and Advanced Program
Fraser Health Authority	Melissa Lee	Regional ED Network Clinical Nurse Educator - Pediatrics
Fraser Health Authority	Melissa Manchester	RN, CNE, Surrey Memorial Hospital Pediatric ED
Fraser Health Authority	Claire MacLeod	Pediatric Clinical Pharmacist
Fraser Health Authority	Dr. Polya Ninova	Pediatrician, Abbotsford
Fraser Health Authority	Dr. Avash Singh	Pediatrician, Surrey Memorial Hospital
Fraser Health Authority	Jacky Wu	Infection Prevention Control Practitioner
Island Health Authority	Dr. Jennifer Balfour	Pediatrician
Island Health Authority	Dr. Amanda Barclay	PICU Intensivists, Victoria General Hospital
Island Health Authority	Dr. Allon Beck	PICU Intensivists, Victoria General Hospital
Island Health Authority	Dr. Jeffrey Bishop	PICU Intensivists, Victoria General Hospital, Division Head
Island Health Authority	Robyn Candell	Nurse Informaticist, Clinical Informatics
Island Health Authority	Kyle Collins	Pediatric Pharmacist, Victoria General Hospital
Island Health Authority	Sara Heighington	Regional Pediatric Program Lead
Island Health Authority	Melissa Holland	Peds Clinical Nurse Educator, Victoria General Hospital
Island Health Authority	Dr. Ross Hooker	Emergency, Victoria General Hospital
Island Health Authority	Dr. Maria Kang	Regional Pediatric Medical Lead
Island Health Authority	Pamela Kibsey	Division Director, Microbiology / Medical Director, Infection Co, Laboratory Medicine, Pathology & Medical Genetics
Island Health Authority	Dr. Gaby Yang	PICU Physician, Victoria General Hospital
Interior Health Authority	Laura Beresford	Clinical Pharmacy Specialist – Peds/NICU
Interior Health Authority	Piera Calissi	Pharmacist, Regional Antibody Stewardship Program
Interior Health Authority	Nicole Clutton	RN, Urgent and Primary Care Center, Cranbrook
Interior Health Authority	Karli Cohen	ED Clinical Nurse Specialist
Interior Health Authority	Lisa Creelman	Nurse Practitioner, Kamloops
Interior Health Authority	Renee Decosse	Clinical Practice Educator, East Kootenay Regional Hospital
Interior Health Authority	Karli Cohen	ED Clinical Nurse Specialist
Interior Health Authority	Dorrie Fasick	Nursing Informatics Specialist
Interior Health Authority	Kim Ferraro	Regional Practice Leader, Professional Practice Office
Interior Health Authority	Dr. Patrick Goetz	MD, Nicola Valley Hospital
Interior Health Authority	Kaylea Knorr	Clinical Practice Educator- Pediatrics, Kamloops
Interior Health Authority	Kornelia Filipowski	Pediatric Clinical Nurse Specialist
Interior Health Authority	Dr. Trent Smith	Pediatrician & IH Pediatric Medical Director
Northern Health Authority	Jessica Manning	Pharmacist
Northern Health Authority	Dr. Kyle McGivery	ER Physician

Northern Health Authority	Katie Martin	Clinical Nurse Educator - Pediatrics
Northern Health Authority	Tarah Paulsen	Program Specialist, Emergency, Trauma & Transfer Services
Northern Health Authority	Kirsten Klein	Clinical Nurse Educator – Critical Care, Regional Northwest
Provincial Health Services Authority	Erin McFee	Lead Clinical Education and Special Projects
Vancouver Coastal Health Authority	Jennifer Robison	Patient Care Coordinator/Clinical Educator, Emergency Department & Intensive Care Unit, Powell River Hospital
Vancouver Coastal Health Authority	Janice Castillo	Clinical Nurse Educator, Emergency, Richmond Hospital
Vancouver Coastal Health Authority	Alicia L De Leo	Patient Care Supervisor, Sechelt Hospital
Vancouver Coastal Health Authority	Amy Durante	Clinical Nurse Educator, UBC Hospital Emergency Room

Additional Contributing Partners for the Adaption to Inpatient Care Settings

Island health	Dr. Kelly Cox	Pediatrician, Nanaimo General Hospital
Interior Health	Lyndsay Thomson	Patient Care Coordinator, Pediatrics, Kelowna General Hospital
Interior Health	Lesia Rainville	Pediatric Regional Knowledge Coordinator, Professional Practice Office
Interior Health	Krissy Krnasty	Vernon Jubilee Hospital, Pediatrics Educator
Northern Health	Sam Hannon	Interim Clinical Nurse Educator – Pediatrics
PHSA	Ciara McGeough	Professional Practice Leader, Nursing, BC Children's Hospital
PHSA	Siobhan Perrin	Clinical Nurse Educator, BC Children's Hospital
Vancouver Coastal Health Authority	Christie Manlolo	Clinical Nurse Educator, Pediatrics, Lions Gate Hospital

Further Contributing Partners to the Provincial Pediatric Sepsis Toolkit Development

Centre for International Child Health University of British Columbia Action on Sepsis Research Cluster	Stefanie Novakowski	Grants Facilitator
Centre for International Child Health University of British Columbia Action on Sepsis Research Cluster	Teresa Johnson	Program Coordinator
First Nations Health Authority	Laura Schreiber	Clinical Education Manager
First Nations Health Authority	Gary Housty	Acting Executive Director, Nursing
First Nations Health Authority	Dr. Jeffrey Beselt	Emergency Physician, Nursing Operations Team
Fraser Health Authority	Megan Noakes	Clinical Nurse Specialist, Primary Care & Chronic Disease Management
Hamilton Health Services	Lisa Battistella	Librarian, Clinical Practice & Education
Interior Health Authority	Dr. Jill Boulton	Neonatologist, Kelowna General Hospital
Patient Voices Network	H. Roscoe	Patient Partner
Patient Voices Network	Carmen Aguilera	Patient Partner
Patient Voices Network	Jami Brown	Engagement Leader, BC Patient Safety & Quality Council

Provincial Health Services Authority	Vanessa Paquette	Clinical Pharmacy Specialist- Antimicrobial Stewardship
Provincial Health Services Authority	Jason Tan	Clinical Pharmacy Specialist- Neonatology
Provincial Health Services Authority	Pamela Harrison	Health Literacy Information Specialist
Sepsis Canada & UBC Action on Sepsis	Kristine Russell	Patient Advisor

Appendix F

Child Health BC Provincial Pediatric Sepsis Guideline
Summary of Revisions to Include Inpatient Settings

Section (page #)	Current ED/Urgent Care Setting guideline wording	Updated language inclusive of inpatient care setting
Title (pg. 1)	Child Health BC Provincial Pediatric Sepsis Recognition and Management Guideline Emergency Department/Urgent Care Settings	Child Health BC Provincial Pediatric Sepsis Recognition and Management Guideline
Various	Language specific to ED/Urgent Care Settings	Included inpatient care setting language
Screening (pg. 5)	Each pediatric patient should be screened for sepsis at triage or primary-assessment using the **CHBC Provincial Pediatric Sepsis Screening Tool** (see Appendix B) or equivalent electronic health record and **BC Pediatric Early Warning System (BC PEWS)**[3] if utilized at facility	Using the **CHBC Provincial Pediatric Sepsis Screening Tool** (see Appendix B) or equivalent electronic health record and **BC Pediatric Early Warning System (BC PEWS)**[3] if utilized at facility, each pediatric patient should be screened for sepsis: ✓ At ED triage or primary assessment; ✓ At inpatient admission or transfer between care areas; ✓ If prompted by PEWS during reassessment of the patient per the frequency identified in the health authority/agency standards, Most Responsible Practitioner (MRP) orders, CTAS guidelines, and/or escalation aid used in your agency[3]
Management (pg. 8)	Current ED/Urgent Care guideline did not include language to support escalation of care in inpatient settings	Added: Follow health authority protocols for escalation of care and engage site resources as necessary (i.e. Code Blue)
Glucose/Calcium Management (pg. 9)	If glucose is less than or equal to 2.6 mmol/L, give D10NS 5mL/kg rapid IV push (2mL/kg for neonates) and recheck glucose in five minutes	Added literature reference and language inclusive of inpatient settings where IV push may be out of scope: If glucose is less than or equal to 2.6 mmol/L, give D10NS 5mL/kg (**2mL/kg for neonates**) rapid IV intermittent bolus (ideally over 5 minutes via syringe/bag) and recheck glucose in five minutes

Child Health BC would like to acknowledge the following organizations for their assistance with the development of the toolkit, including permitting us to utilize or adapt their materials for use within British Columbia. Hamilton Health Services and the following partners:

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