For suspected skin infection
For suspected intra-abdominal infection
Evaluate for sepsis, regardless of fever or ANC

Start antibiotics within 1 hour of arrival

HemOnc BMT Suspected Infection: Emergency Department v6.1

Approval & Citation

Inclusion Criteria

- Any Hematology/Oncology/BMT patient with concern for infection
- Fever (Temp ≥ 38.3°C, or greater than 38°C for more than 1 hour)
- Recent Myelosuppressive chemotherapy with neutropenia (defined as ANC <2000/mm³ or dropping ANC). OR presumed/functional neutropenia as determined by the HemOnc/BMT provider.

Exclusion Criteria

- Benign HematologyCondition
- Sickle Cell Anemia
- Under 1 month old

Summary of Version Changes

- Fever Management
  - No rectal temperatures
  - NSAIDs contraindicated

Signs & Symptoms of Sepsis
- Hypotension (MAP ≤ 5th percentile for age)
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/ new oxygen requirement
- Mental status changes

Communication Specialist: Prompt the HemOnc/BMT Provider for the following information

- **HemOnc:**
  - ANC expected to be low (i.e. should patient be on pathway and receive antibiotics before ANC back)?
  - Which empiric antibiotics should be given (see below)?
  - Remind family to apply EMLA to port
- **BMT:**
  - Is the patient on immunosuppressive therapy?
  - Does the patient have an “Individualized Antibiotic Plan”? If not, which antibiotics should be given.
  - BMT provider available at x74536

Are There Signs & Symptoms of Evolving Sepsis?

- **ED Sepsis Score** of 5 or greater AND provider concern for sepsis / septic shock
- OR Any ill appearing HemOnc/BMT patient
- No Labs *(Do not delay blood cultures if family has not applied EMLA)*
  - Rapid Neutrophil Count
  - Blood cultures: aerobic, anaerobic, fungal from all lumens of central venous catheter
  - Other diagnostic tests as clinically indicated
  - Urinalysis and culture: clean catch NO catheterization
  - Rapid Respiratory Virus PCR
  - Chest X-ray

Administrator Empiric Antimicrobials

**“Do not delay first dose for any diagnostic evaluations with the exception of blood cultures**

- **BMT**
  - Refer to “INDIVIDUALIZED ANTIBIOTIC PLAN” in CIS “Care Plan” folder.
  - If no individualized antibiotic plan present in CIS:
    - Start Meropenem
- **HemOnc**
  - Start Ceftazidime
  - OR, Cefepime for patients with AML, infant ALL, relapsed ALL with recent high dose cytarabine, history of S. viridans, or Ceftazidime allergy
  - OR, Meropenem for patients allergic to non-Ceftazidime 3rd generation cephalosporins
  - Consider history of resistant organisms

Are There Signs & Symptoms of Evolving Sepsis?

- **YES**
  - Suspected intra-abdominal OR perineal infection?
  - Empiric plus Clindamycin1 or Metronidazole2
  - Empiric plus Clindamycin3 or Vancomycin4

- **NO**
  - Skin infection OR severe mucositis?
  - Empiric only

Administrator Additional Site Directed Antibiotics

- Assess labs and clinical status. Monitor VS every 15 min until 60 minutes after completion of empiric antibiotic.

Are There Signs & Symptoms of Evolving Sepsis?

- **YES**
  - ANC > 200 AND well-appearing?
  - Stable for 60 minutes after completion of initial empiric antibiotics & NS boluses. For BMT patients, BMT provider must evaluate patient before they leave the ED Proceed with admission to the Cancer Care Unit

- **NO**

Activate ED Suspected Septic Shock Pathway

- **Off Pathway**
  - Yes
  - Off Pathway

- **Yes**
  - Concern for Severe Skin/Perineal Infection: Consider “Necrotizing Soft Tissue Infection” Powerplan/ED Pathway (for SCh only)

- **Off Pathway**
  - Yes
  - Off Pathway

- **Yes:** Discuss discharge from ED with HemOnc Provider
  - Note: BMT patients will almost always require admission; Discuss with BMT provider x74536

1 For suspected perineal infection
2 For suspected intra-abdominal infection (not required if Meropenem used for empiric coverage)
3 In the setting of mucositis (not required if Cefepime used for empiric coverage)
4 For suspected S. viridans

For questions concerning this pathway, please contact HemOncBMTSuspectedInfection@seattlechildrens.org

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Last Updated: December 2017
Next Expected Review: December 2021
**HemOnc BMT Suspected Infection: Clinic v6.1**

**Inclusion Criteria**
- Any Hematology/Oncology/BMT patient with concern for infection OR
- Fever (Temp ≥ 38.3°C, or greater than 38°C for more than 1 hour) AND
- Recent Myelosuppressive chemotherapy with neutropenia (defined as ANC <200/mm³ or dropping ANC), OR presumed/functional neutropenia as determined by the HemOnc/BMT provider.

**Exclusion Criteria**
- Benign Hematologic Condition
- Sickle Cell Anemia
- Under 1 month old

**Summary of Version Changes**
- HemOnc: Prompt the HemOnc/BMT Provider for the following information
- BMT:
  - Is the patient on immunosuppressive therapy?
  - Does the patient have an "Individualized Antibiotic Plan"? If not, which antibiotics should be given.
  - BMT provider available at x74536

**Communique Specialist:** Prompt the HemOnc/BMT provider for the following information.

**Are There Signs & Symptoms of Evolving Sepsis?**
- Proceed with admission to the Cancer Care Unit
- Consider history of resistant organisms
- Remind family to apply EMLA to port

**Labs** *(Do not delay blood cultures if family has not applied EMLA)*
- Rapid Neutrophil Count
- Blood cultures: aerobic, anaerobic, fungal from all lumens of central venous catheter
- Urinalysis and culture: clean catch NO catheterization
- Rapid Respiratory Virus PCR
- Chest X-ray
- Other diagnostic tests as clinically indicated

**Administer Empiric Antimicrobials** *(Do not delay first dose for any diagnostic evaluations with the exception of blood cultures)*
- Refer to "INDIVIDUALIZED ANTIBIOTIC PLAN" in CIS “Care Plan” folder.
- If no individualized antibiotic plan present in CIS:
  - Start Meropenem
  - Start Ceftazidime
  - OR, Cefepime for patients with AML, infant ALL, relapsed ALL with recent high dose cytarabine, history of S. viridans, or Ceftazidime allergy
  - OR, Meropenem for patients allergic to non-Ceftazidime 3rd generation cephalosporins
  - Consider history of resistant organisms

**BMT**
- Start Meropenem
- OR, Cefepime
  - For patients allergic to non-Ceftazidime 3rd generation cephalosporins
  - Consider history of resistant organisms

**Empiric**
- Clindamycin
- Gentamicin
- Vancomycin
- Amikacin
- Cefepime
- Ceftazidime
- Meropenem

**Assess labs and clinical status. Monitor VS every 15 min until 60 minutes after completion of initial antibiotic dose.**

**Evaluate for Signs & Symptoms of Evolving Sepsis**
- ANC < 200 AND well-appearing?
  - No: Stable for 60 minutes after completion of initial empiric antibiotics & NS boluses.
  - Yes: Discuss discharge from clinic with HemOnc Provider

**Sepsis Management during RRT**
- Refer to **ED Septic Shock Pathway Algorithm** for guidance

**Concern for Necrotizing Soft Tissue Infection? Call Code Blue**
- Yes: Discuss discharge from clinic with HemOnc Provider

**Empiric antimicrobials PLUS Gentamicin AND Vancomycin for recurrent or refractory hypotension despite 40cc/kg IV fluid resuscitation OR sooner if signs of severe sepsis**
- Rapid fluid resuscitation (Each 20ml/kg NS bolus over 20 minutes or less)

**Off Pathway**
- Call RRT for signs of sepsis that require ICU presence within 30 minutes
- Call code blue for imminent cardiac or pulmonary failure or neurologic emergency
- Do not delay blood cultures if family has not applied EMLA

---

**HemOnc BMT Suspected Infection**

**Approval & Citation**

**Summary of Version Changes**

**Signs & Symptoms of Sepsis**
- Hypotension
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/new oxygen requirement
- Mental status changes

**For questions concerning this pathway, please contact**
HemOncBMTSuspectedInfection@seattlechildrens.org

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Last Updated: December 2017
Next Expected Review: December 2021
HemOnc BMT Suspected Infection: Inpatient v6.1

Approval & Citation

Summary of Version Changes

Signs & Symptoms of Sepsis
- Hypotension (MAP ≤ 5th percentile for age)
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/ new oxygen requirement
- Mental status changes

![Image](https://seattlechildrens.org)

Yes, initiate team huddle

Off Pathway

![Image](https://seattlechildrens.org)

Yes

Activate Inpatient New Septic Shock Pathway and call RRT

Do not delay fluid resuscitation!

Off Pathway

![Image](https://seattlechildrens.org)

Yes, discuss continuing antibiotics with fellow/attending/hospitalist

Off Pathway if antibiotics discontinued

Are There Signs & Symptoms of Evolving Sepsis?

- CBC with diff
- Blood cultures: aerobic, anaerobic, fungal from all lumens of central venous catheter
- Other diagnostic tests as clinically indicated
- Urinalysis and culture: clean catch NO catheterization
- Rapid Respiratory Virus PCR
- Chest X-ray

Administer Empiric Antimicrobials
**Do not delay first dose for any diagnostic evaluations with the exception of blood cultures**

- BMT
  - Refer to INDIVIDUALIZED ANTIBIOTIC PLAN in CIS “Care Plan” folder.
  - Or if no individualized antibiotic plan present in CIS:
    - Start Meropenem

- HemOnc
  - Start Ceftazidime
  - OR, Cefepime for patients with AML, infant ALL, relapsed ALL with recent high dose cytarabine, history of S. viridans, or Ceftazidime allergy
  - OR, Meropenem for patients allergic to non-Ceftazidime 3rd generation cephalosporins
  - Consider history of resistant organisms

- Clindamycin

- Vancomycin

- Meropenem

- Do not delay first dose for any diagnostic evaluations

Administer Additional Site Directed Antibiotics

Suspected intra-abdominal OR perineal infection?

Empiric plus Clindamycin1 or Metronidazole2

Empiric only

Skin infection OR severe mucositis?

Empiric plus Clindamycin3 or Vancomycin4

Assess labs and clinical status. Monitor VS every 15 min until 60 minutes after completion of empiric antibiotic.

Are There Signs & Symptoms of Evolving Sepsis?

ANC > 200 AND well-appearing?

Yes

No

Guidance for ongoing Infectious disease management:
- **BMT**: See MEROPENEM DE-ESCALATION POLICY & FHCRC Standard Practice
- **HemOnc**: MANAGEMENT OF SUSPECTED INFECTION OR FEVER AND NEUTROPENIA IN PEDIATRIC ONCOLOGY PATIENTS (for SCH only)

For questions concerning this pathway, please contact HemOncBMTSuspectedInfection@seattlechildrens.org

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Last Updated: December 2017
Next Expected Review: December 2021
Criterial for presumed or functional neutropenia

In addition to recent chemotherapy with neutropenia, the referring hem/onc or BMT provider may request that the following patients receive antibiotics regardless of ANC and therefore antibiotics administration should not be delayed while awaiting ANC results. Note: this determination should be made only by the referring hem/onc or BMT provider.

- Any patient between 7 and 14 days from the start of any inpatient chemo regimen, OR start of any outpatient cyclophosphamide-containing regimen (ie any ALL patient in second half of DI, and HR ALL in consolidation),
- Any ALL patient (new diagnosis or relapsed) in induction or any ALL patient in delayed intensification (DI) between day 8 and 29
- Any infant ALL patient on therapy.
- Any AML patient on therapy
- Any patient with relapsed leukemia (ALL, AML, JMML, CML) at any time during therapy
- Any newly diagnosed oncology patient at presentation
- Any BMT patient undergoing conditioning or on immunosuppressive therapy. Patients with active graft versus host disease (GVHD) who are also on prednisone are particularly at risk.

Inclusion and Exclusion Criteria

**Inclusion Criteria**
- Any Hematology/Oncology/BMT patient with concern for infection OR
- Fever (Temp ≥ 38.3°C, or greater than 38°C for more than 1 hour) AND
- Recent Myelosuppressive chemotherapy with neutropenia (defined as ANC <200mm³ or dropping ANC), OR presumed/functional neutropenia as determined by the HemOnc/BMT provider.

**Exclusion Criteria**
- Benign Hematology Condition
- Sickle Cell Anemia
- Under 1 month old
Key Recommendations for the ED

- For patients with fever and neutropenia or ill appearance, the goal is to **administer** antibiotics **WITHIN ONE HOUR OF ED ADMISSION**.
- When family notices child is febrile, they will call the HemOnc fellow, BMT provider or clinical team.
- The HemOnc/ BMT provider will call the Communication Specialist (CS) nurse and will direct whether or not patient should be put on pathway. CS nurse will complete the standardized template and place “HemOnc BMT Suspected Infection ON PATHWAY” on FirstNet.
- If the family has not applied EMLA prior to arrival, **DO NOT** apply LMX before accessing line. Fever is an emergency in these patients. It is not safe to wait. Families will be counseled about this in clinic.
- If the patient is on pathway, they must get empiric antibiotics as soon as line is accessed and blood is drawn for culture. Order the first dose of empiric antibiotics (Ceftazidime, Cefepime or Meropenem) when the patient arrives. **DO NOT WAIT** for ANC result or call the fellow again before giving the first dose of antibiotics.
- The Rapid Neutrophil Count should be ordered for these patients (as indicated in the orderset). You do **NOT** need a CBC with diff also. The Rapid Neutrophil Count **includes**: Hematocrit, Platelets, White Blood Cell Count, and Absolute Neutrophil Count.
- Patients with presumed or evolving severe sepsis or refractory hypotension despite 40ml/kg NS require addition of gentamicin and vancomycin **AND a PICU consult**.
- Patients will stay in the ED for one hour after administration of empiric antibiotics and fluid boluses in order to allow time for assessment of possible clinical deterioration. Prior to admission to the HemOnc/BMT unit, a patient must demonstrate resolution of any hypotension as detailed in the hypotension/MAP slide attached.
- For BMT patients, BMT provider must evaluate patient before they leave the ED.
<table>
<thead>
<tr>
<th>Age</th>
<th>Critical Hypotension (MAP ≤ 1% for age)</th>
<th>Hypotension (MAP ≤ 5% for age)</th>
<th>Resuscitation Goal (Minimum MAP ≥ 10% for age)</th>
<th>Normotension (Median for Age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 days</td>
<td>32</td>
<td>≤ 39</td>
<td>≥ 42</td>
<td>57</td>
</tr>
<tr>
<td>30-90 days</td>
<td>37</td>
<td>≤ 44</td>
<td>≥ 47</td>
<td>62</td>
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<td>91 days-1 year</td>
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<td>≤ 48</td>
<td>≥ 52</td>
<td>68</td>
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<td>&gt;1-2 years</td>
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<td>≤ 48</td>
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<td>≤ 50</td>
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<td>&gt;4-6 years</td>
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<td>≥ 56</td>
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<td>&gt;13 years</td>
<td>48</td>
<td>≤ 57</td>
<td>≥ 61</td>
<td>76</td>
</tr>
</tbody>
</table>

Resolution of hypotension = Two blood pressure measurements obtained 15 minutes apart with MAP >10 %ile
Individualized Antibiotic Plan can be accessed directly from the Patient Summary page.

Or the IAP is found in the Care Plan Folder from "Documents and Notes".

Instructions for finding the “Individualized Antibiotic Plan”
Sepsis Score

Pediatric Sepsis Score: Adapted from the Pediatric septic shock collaborative patient identification tool. Currently validated for ED use only

One point is given for presence of each concerning symptom:
- High risk condition (immunocompromised/central line)
- Vital sign abnormalities based on age:
  - Temperature
  - Hypotension
  - Tachycardia
  - Tachypnea
- Abnormal capillary refill
- Abnormal mental status
- Abnormal pulse
- Abnormal skin exam
CSW HemOnc BMT Suspected Infection Approval & Citation

Approved by the CSW HemOnc BMT Suspected Infection for December 14, 2016 go-live

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Please cite as:
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Summary of Version Changes

**Version 1.0 (8/29/2012):** Go live for Emergency Department Fever & Neutropenia pathway

**Version 2.0 (8/23/2013):** Go Live for Heme/Onc Suspected Infection Pathway in ED, Heme/Onc Clinic and Heme/Onc Inpatient Unit

**Version 3.0 (10/7/2015):** Updated each phase to coincide with the new septic shock pathway that was also implemented on October 7, 2015.

**Version 4.0 (12/14/2016):** Updated each phase to coincide with the New Septic Shock pathway that was also updated on December 14, 2016. Revision of Septic Shock Score Trigger; Inclusion of BMT in Hem/Onc Suspected Infection pathway (renamed Hem/Onc BMT Suspected Infection - HOBSI)

**Version 5.0 (2/28/2017):** Added recommendation to the inpatient phase to initiate a team huddle if there are signs and symptoms of evolving sepsis.

**Version 6.0 (5/22/17):** Updated Fever definition (Fever (temperature GREATER THAN OR EQUAL TO 38.3 C, or GREATER THAN 38 C for more than 1 hour)

**Version 6.1 (12/26/2017):** Updated Management of Suspected Infection or Fever and Neutropenia in Ped. Onc patients link

- Return to ED Phase
- Return to Clinic Phase
- Return to Inpatient Phase


