

## FEVER: SYNOPSIS

### OBJECTIVES

- To determine which patients are at high risk of developing sepsis.
- To assess patient with fever.
- To initiate empiric therapy.

### WHICH PATIENTS ARE HIGH-RISK FOR SEPSIS

- Neonates
- Transplant recipients
  - Bone marrow
  - Solid organ
- Oncology patients
  - Undergoing therapy, mucositis, central line
  - Most chemotherapy: nadir ~ 10 days after rx
- Asplenic patients, including sickle cell

### DEFINITION OF FEVER

- 38.0
  - Neonates (< 12 months)
  - Any immunocompromised patient
    - Including transplant patients, patients with immunodeficiencies, oncology patients (sustained  $\geq 38$  x 1 hour)
- 38.5
  - All other patients
- These are general guidelines, individual patients/services may have different parameters

### WHAT ETIOLOGIES CAUSE FEVER?

- Infectious
- Inflammatory
- Oncologic
- Other: CNS dysfunction, drug fever
- Life-threatening conditions

### INFECTIOUS

- Systemic
  - Bacteremia, sepsis, meningitis, endocarditis
- Respiratory
  - URI, sinusitis, otitis media, pharyngitis, pneumonia, bronchiolitis
- Abdominal
  - Urinary tract infection, abscess (liver, kidney, pelvis)
- Bone/joint infection
- Hardware infection
  - Central line, VP shunt, G-tube

## INFLAMMATORY

- Kawasaki disease
- Juvenile inflammatory arthritis
- Lupus
- Inflammatory bowel disease
- Henoch-Schonlein purpura

## ONCOLOGIC

- Leukemia
- Lymphoma
- Neuroblastoma
- Sarcoma

## OTHERS

- CNS dysfunction
- Drug fever

## LIFE-THREATENING CONDITIONS

- Sepsis, febrile neutropenia
  - Vital sign instability, poor-perfusion, may have altered mental status, disseminated intravascular coagulation
- Hemophagocytic lymphohistiocytosis
  - Splenomegaly, bicytopenia, elevated ferritin, elevated triglycerides, low fibrinogen, hemophagocytosis, low/absent NK cell function, elevated soluble IL2 receptor
- Malignant hyperthermia
  - Following administration of inhaled anesthetics or depolarizing neuromuscular blockers (succinylcholine), at-risk patients include those with myopathy
  - Muscle rigidity, rhabdomyolysis, acidosis, tachycardia

## ASSESSMENT

- Vital signs
- Repeat physical exam
  - Overall appearance (sick, toxic)
  - Central/peripheral lines
  - Incisions/wounds
  - VP shunt/tracheostomy/gastrostomy tube
  - Oral mucosa/perineal area for neutropenic patients
  - Perfusion
- Call for help if concerning vital signs/exam
  - Fellow or attending
  - Rapid response team (RRT)/PICU

## LABORATORY EVALUATION

- What would you do if the patient has hardware (VP shunt, tracheostomy, gastrostomy tube) or central line?
  - CBC with differential
  - Blood culture
  - CSF (tap VP shunt)

- What would you do if the patient has a high risk for sepsis?
  - Immunocompromised
  - Transplant recipient
  - Oncology patient
  
  - CBC with differential
  - Blood culture
  - Urinalysis and urine culture
  
- What would you do for an infant < 2 months of age?
  - CBC with differential
  - Blood culture
  - Catheterized urinalysis and urine culture
  - Lumbar puncture
  
- Who needs a urinalysis and urine culture?
  - Circumcised males < 6 months
  - Uncircumcised males < 1 year
  - Females < 2 years
  - Immunocompromised patients
  - Patients with history of UTI/pyelonephritis
- Who needs a lumbar puncture?
  - Neonates ≤ 2 months
  - Ill-appearing
  - Altered mental status
  
- What tests do you send?
  - Gram stain and culture
  - Cell count and differential
  - Protein and glucose
  - Extra tube for additional studies
    - Enteroviral PCR, HSV PCR, CA encephalitis project
  
- Consider CRP, ESR
- Consider PT/PTT, fibrinogen
- Consider chest x-ray
- Consider nasopharyngeal DFA
- For immunosuppressed patients consider:
  - Viral PCR studies (ie CMV, EBV, HHV6)
  - Additional imaging (ie ultrasound, CT scan)

#### TREATMENT FOR NON-HIGH RISK PATIENTS

- May not need empiric antibiotics
- Consider the following issues:
  - Is patient clinically stable?
  - Are the screening laboratory studies suggestive of infection?

#### TREATMENT FOR PATIENTS WITH CENTRAL LINES

- Ceftriaxone
- Vancomycin

## TREATMENT FOR NEONATES ≤ 2 MONTHS

- If < 28 days old
  - Ampicillin **AND** cefotaxime **OR**
  - Ampicillin **AND** gentamicin
    - Consider acyclovir
- If 29-60 days old
  - Ceftriaxone ± Ampicillin **OR** Vancomycin
  - Until CSF results are known (cell count, protein, glucose), initiate therapy with meningitic dosing regimen

## TREATMENT FOR FEBRILE NEUTROPENIA

- Broad-spectrum antibiotics with *Pseudomonas* coverage
  - Ex: use ceftazidime or piperacillin-tazobactam
- Consider double coverage for possible resistant *Pseudomonas*
  - Ex: add amikacin or tobramycin
- Consider gram-positive coverage (central line, skin infections)
  - Ex: add vancomycin
- Consider anaerobic coverage (mucositis, typhlitis)
  - Ex: use piperacillin-tazobactam or add clindamycin

## TAKE-HOME POINTS

- Infections are the most common cause of fever in children
- During assessment of a child with fever, pay close attention to vital sign changes, overall appearance, and potential sites of infection
- Closely monitor for clinical decompensation after antibiotic administration, particularly in patients at high-risk of developing sepsis

## REFERENCES

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