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 ≥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

INFECTIONOUS
- 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-Schönlein 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


Palazzi EL. Approach to the child with fever of unknown origin. *UpToDate*. 2011
