Evaluating Patients for Infection in the ICU

Clinicians are often contacted regarding changes in clinical status. Numerous clinical conditions can cause fever, leukocytosis, hypotension, changes in mental status, shortness of breath, and other common situations which are brought to clinicians' attention. This guidance is focused on how to evaluate patients for potential infection and when and which microbiologic diagnostic testing is appropriate. These guidelines are arranged by microbiologic diagnostic testing modality and additional guidance is available on the antimicrobial stewardship website regarding evaluation for these various syndromes.

General Comments:

- **Not every change in status in the ICU is due to an infection and microbiologic testing should be reserved for patients where there is significant concern for infection**
    - Testing patients for infection when one is not likely to be present **WILL** result in patient harm due to isolation of contaminants or colonizers resulting in unnecessary antibiotic use
- **Fever and/or change in status in the ICU should be clinically evaluated** and microbiologic testing should be based on clinical assessment and recent testing
- **Reflexively testing based on a single piece of data should be avoided** (i.e. isolated fever, leukocytosis, hypotension)
- **Not all fevers are due to infection.** Consider non-infectious causes, particularly in patients with initially negative infection work up and risk factors for non-infectious fevers (CNS bleeding, new clot, recent receipt of blood products, etc.) See Table 1.

Table 1: Infectious and Non-Infectious Causes of Fever in the ICU

Infectious Causes of Fever	Non-Infectious Causes of Fever
• Meningitis • Sinusitis • CVC or PIV related bloodstream infection • Endocarditis • Pneumonia • Empyema • Cholecystitis or other intra-abdominal infection • *C. difficile* infection • UTI – Catheter-associated or pyelonephritis • Cellulitis • Wound infection (surgical, sacral) • Septic arthritis • Respiratory virus infection	• Intracranial bleeding (SAH, IVH) • CNS tumor or stroke • Aspiration or ARDS • Blood product transfusion • Drug fever • Malignant hyperthermia/neuroleptic malignant syndrome/Serotonin syndrome • Withdrawal – alcohol, opioids, etc. • Seizure • Pancreatitis • Ischemic colitis • Venous thromboembolism/PE • Pulmonary infarction/contusion • Endocrine (thyrotoxicosis, adrenal insufficiency) • Gout • Tumor lysis • Transplant rejection • Inflammatory conditions (vasculitis, etc.)

Blood Cultures:

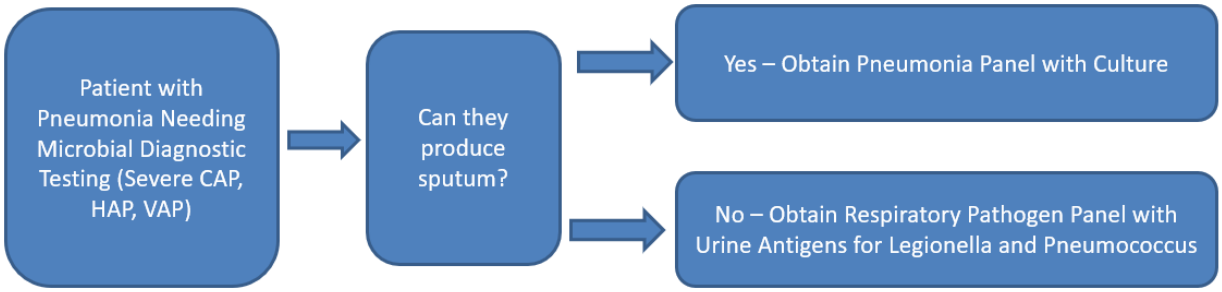
- Do **NOT** reflexively order blood cultures (BCX) when called with a fever or other change in clinical status, evaluate the clinical situation including patient examination (see guidance)
- Review of recent BCX utilization in one NM ICU found 54% of all initial BCX were considered unnecessary
    - The most common inappropriate indication was evaluation of known non-infectious conditions such as cardiac events (arrythmia, arrest, MI), GI bleed, and isolated hypotension without other findings suggestive of infection
    - Other common inappropriate indications included isolated fever or leukocytosis without other signs of infection, continued fever with a known cause without other clinical status changes, aspiration events, and infectious conditions where BCX are not indicated (non-severe CAP, simple UTI, etc.)
- BCX are key to evaluating life threatening infections such as sepsis and septic shock, thus patients who are sick enough to need BCX should be clinically evaluated before they are obtained and the decision to obtain should be individualized based on current NM guidance. (link here)
- Site specific cultures (sputum, urine, etc.) are more likely to provide a definitive pathogen than BCX, and therefore BCX can sometimes be safely avoided. Examples of when BCX are not usually useful:
    - Most forms of UTI, Pneumonia, Intra-abdominal infections, and Skin and Soft Tissue Infection
        - BCX are low yield in these conditions
        - If infection is suspected, consider site specific cultures (UTI=urine, LRTI=sputum, IAI and SSTI = abscess drainage)
- When considering BCX, review recent diagnostic testing. Repeating BCX within 48-72 hours is very low yield and not recommended.
- BCX yield after administration of antibiotics is very low
    - Do not repeat recently performed BCX unless substantial clinical status change has occurred (e.g., new onset septic shock).
    - BCX in patients with BCX already obtained at an outside facility and started on antibiotics are low yield. Unless the patient was not started on appropriate antibiotics do not obtain BCX, follow up on the outside cultures.
    - In patients already on broad spectrum antibiotics who had initially negative BCX carefully consider whether repeating BCX will provide any additional benefit as they are low yield

Sputum Cultures and Pneumonia Panel:

- Pneumonia is a clinical diagnosis based upon BOTH clinical signs/symptoms AND radiographic findings. Microbiologic diagnostic testing only defines the potential etiology of pneumonia and does NOT diagnose pneumonia.
- Respiratory tract microbiologic testing should only be ordered in patients with clinical evidence of pneumonia or other lower respiratory tract infection (LRTI)
    - Patients who do not meet a clinical definition of LRTI should **NOT** have diagnostic testing obtained, as it may result in unnecessary antibiotic use which harms patients
    - LRTI diagnostic testing should only be considered in those who demonstrate clinical evidence of infection (new or worsened symptoms/signs, exam findings, chest

imaging changes, elevated markers of infection [WBC, procalcitonin] and/or changes in oxygenation)

- LRTI diagnostic testing should be limited to patients where it will be most useful (see pneumonia guidelines):
    - See guidelines for Severe CAP, HAP, VAP
    - CAP patients who are started on broad spectrum therapy or who are not improving on guideline-based therapy
- If patients are able to produce sputum, then a sputum culture and pneumonia panel are recommended (restricted to ICU) and should be ordered while other testing is deferred
    - Patients who cannot produce sputum can have other tests (antigens, etc.) ordered, but these are low yield and should be avoided in non-severe CAP



Urine Culture:

- Bacteriuria is very common in hospitalized patients, elderly patients and patients with urinary catheters and indiscriminate urine testing will result in patient harm due to treatment of colonization
- Symptoms should be assessed (if possible) before deciding on urine studies and urine studies should NOT be ordered reflexively for fevers, leukocytosis, or changes in mental status (see guideline)
- Those patients where symptoms are suggestive of UTI should have the UTI panel ordered with all questions answered as appropriate
- Absence of pyuria (<10 WBC/hpf) has an excellent negative predictive value (96-98%) for UTI in immunologically normal patients but having WBC in the urine has a very poor positive predictive value for UTI (<10-15%)
    - Pyuria is useful for ruling out UTI but its presence must be put in the context of symptoms, signs, etc.

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