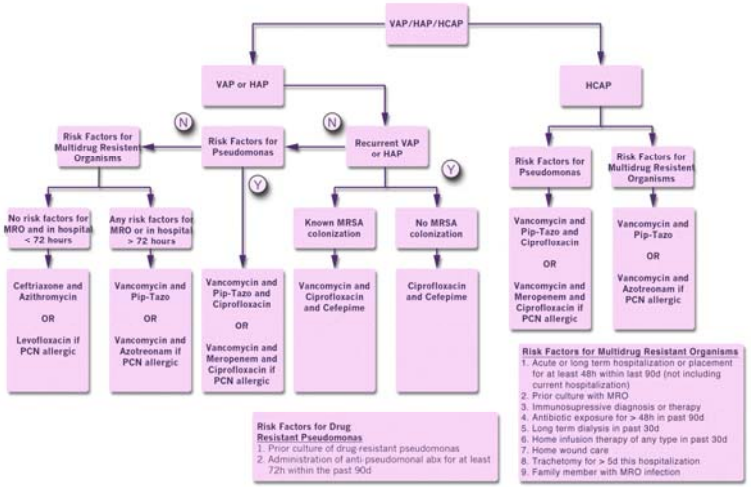
Health Care Pneumonia

Pneumonia manifesting within the health care system is associated with more aggressive and multidrug resistant pathogens. Practically speaking, the choice of therapy is guided by classification of the clinical entity: 1) **ventilator acquired pneumonia** (VAP); 2) **hospital acquired pneumonia** (HAP); 3) **healthcare associated pneumonia** (HCAP)

All health care pneumonias should meet 3 or more of the following diagnostic criteria:

1. **Core temperature > 38.2 C or < 36.0 C**
2. **WBC > 12 or < 4**
3. **Acute change in sputum character**
4. **Acute change in CXR appearance consistent with new infection**
5. **Increasing oxygen requirements or problems with ventilation**

- **VAP** is characterized by the diagnostic criteria above and invasive mechanical ventilation for > 48 hours (this does not include non-invasive positive pressure ventilation; e.g. Bi-PAP)
- **HAP** is characterized by the diagnostic criteria above; the patient should have been hospitalized for at least 48 hours and sx should have manifested after admission
- **HCAP** is characterized by the diagnostic criteria above and ANY of the following conditions: **1)** acute care hospitalization for > 2 days duration within the last 90 days; **2)** residence in a nursing home or long term care center; **3)** receipt of antibiotics, chemotherapy or wound care within the last 30 days; **4)** attendance at a hospital or hemodialysis center within the last 30 days.



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Common Hospital Infections

Uncomplicated Bacteremia

Uncomplicated bacteremia is defined herein as a bacterial bloodstream infection not related to the placement of a intravenous catheter and not associated with metastatic foci of infx such as endocarditis

There is no high-grade evidence for the mgt of transient bacteremia (although there are IDSA guidelines for tx of catheter-related bloodstream infx, PNA, intra-abdominal infx, pyelonephritis, and SSTIs)

In general every bacteremic patient deserves the following strategic approach:

- Microbe and sensitivity verification
- Source identification (portal of entry?) and control (i.e. demonstrated clearance)
- Surveillance for metastatic foci of infection (spine, heart, psoas, other)
- Establishing duration of therapy

A systematic review and meta-analysis attempted to determine the **optimal duration of tx** — 24 trials met the inclusion criteria; 1 focused on bacteremia, the others on syndromes associated with bacteremia — there was no difference in rates of clinical cure, microbio cure, or survival between **short-duration (5-7d)** and **long-duration (7-21d)** therapy — *Havey, Crit Care, 2011*

Shorter courses of treatment have shown a ***higher incidence of failure*** for **S. aureus**; this highlights the importance of considering **S. aureus** separately from other pathogens; pts without endocarditis, no implanted prostheses, that defervesce within 72h, and have negative follow-up cultures 2-4d after initial set may be candidates for short duration tx (i.e. **2 wks**); all others likely require **4-6 wks** (e.g. for endocarditis) and even **8 wks** (e.g. for osteo, mediastinitis, or deep abscess) — *IDSA Guidelines for tx of MRSA infx, 2011*

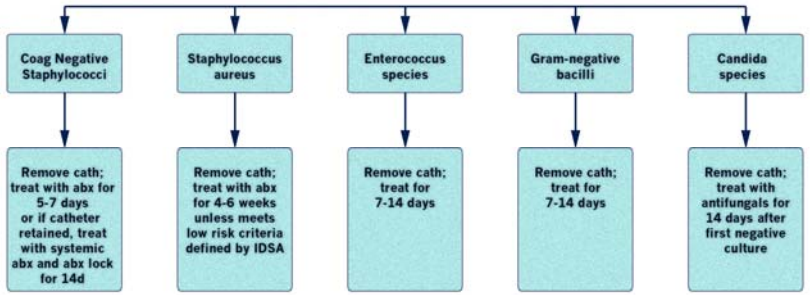
Catheter Associated Bacteremia

Central line-assoc bloodstream infections (CLABSI) originate from a central line without another recognizable focus of infection. Catheter-related bloodstream infections are a type of CLABSI where the catheter tips grow the same specimen identified in the blood.

When suspected, **blood cultures** should be drawn from **two different anatomic sites** (one peripheral). Two of the **three diagnostic criteria** should be met:

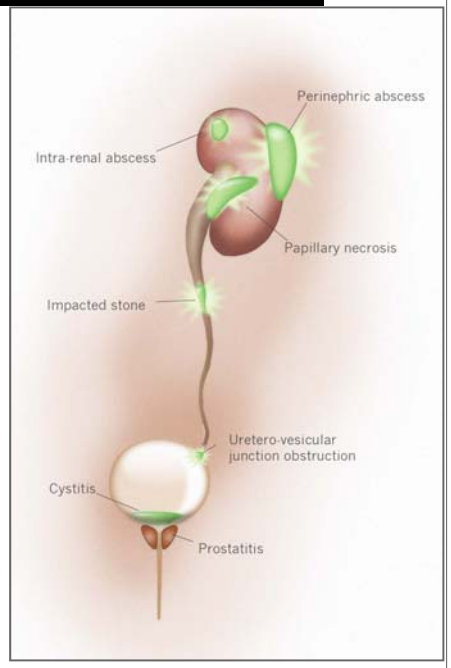
- Culture of cath tip and peripheral blood grow same organism (cath tip with > 100 cfu)
- Blood drawn from cath lumen should grow 3x amount of peripheral blood
- Growth from cath tip should be detected 2 hrs before peripheral blood when drawn simultaneously

Removal of the line is the most important intervention in treatment. A highly selected, low risk, non-neutropenic population of pts may be suitable for "treating through" — particularly with **coag-negative staph**. There should be no hypotension, organ failure, immunosuppression, infection at insertion site, foreign bodies or hardware, or evidence of sepsis, and culture clearance within 72h. Line salvage is NOT appropriate with S. aureus, GNR, enterococci, fungi, and mycobacteria. ***ID should be involved.*** Ideally, try not to replace a central line until cultures are clear for 72 hours.



Urinary Tract Infections

Operationally, urinary tract infections (UTIs) can be broken into four categories: **1) uncomplicated cystitis, 2) pyelonephritis, 3) complicated upper UTIs, 4) catheter-associated UTIs**



Uncomplicated UTIs (cystitis) are typically caused by GNRs (80% E coli), enterococci, and S. saprophyticus

MDR flora tend to be common in hospitalized and immunosuppressed pts, and those with urologic abnormalities or recurrent UTIs requing antibiotics — cover appropriately in these settings

Typically **defined as 1)** 10+ WBC/hpf on UA, **2)** 10^5 cfu of single bacterial specimen on Ucx, **3)** clinical sx.

In men with fever or recurrence, consider **prostatitis** and **pyelonephritis** in ddx — *Gupta, Annals, 2012.*

Empiric management is typically **TMP-SMX** or a **fluoroquinolone**; nitrofurantoin and beta-lactams are not preferred since they do not achieve reliable tissue concentrations for possibility of occult prostatitis; **duration of therapy** is typically **7 to 14 days** in men (7d is likely sufficient but this has not been validated)

Pyelonephritis is inflammation of the renal parenchyma typically caused by ascending bladder infection; clinical manifestations include flank pain, fever, chills, nausea, vomiting, and pain radiating to groin.

Imaging is not routinely required, but **should be considered** in the following circumstances: 1) history of urolithiasis, 2) a urine pH > 7, 3) renal insufficiency. Often failure to defervesce or improve clinically is a reason, although this is not well validated. After 1, 2, 3, and 4 days, 38%, 65%, 82%, and 90% patients typically defervesce — *Nieuwkoop et al, Clin Inf Dis, 2010.*

Empiric therapy may include a **quinolone** (not moxi) x 7d, or extended-spectrum **PCN** or **cephalosporin** x **7-14d**; consider empirically covering SNF pts with **vancomycin** for enterococcus.

Complicated upper UTIs represent pyelonephritis with nephrolithiasis, obstruction, or abscess. Conditions that predispose to complications include history of urolithiasis, voiding disorders, stents, indwelling catheters, duplicated collecting systems, and vesicoureteral reflux. In patients with these conditions that don't respond within 72h, it may be prudent to image and seek consultation with ID and/or Urology.

Catheter associated UTIs can be associated with indwelling urethral, suprapubic, or surgically engineered collection systems (including standard plastic catheters).

Defined as 1) signs/symptoms of infection and **2)** at least 10^3 cfu of one or more bacterial species in urine; pyuria alone without systemic symptoms of infection is not a reliable indicator of UTI in a catheterized pt

Treatment duration is **7d** for patients that promptly respond and **14d** for those with delayed response

Important pearls:

- Generally best not to treat **asymptomatic bacteriuria** unless it is a pregnant patient or a patient awaiting an invasive procedure
- The **absence of pyuria** in a symptomatic patient suggests a diagnosis other than UTI
- The differential for "sterile" pyuria includes: 1) presence of an intracellular or atypical organism (*Chlamydia trachomatis, Ureaplasma urealyticum, Mycoplasma genitalium, Mycoplasm hominis, Mycobacterium tuberculosis*); 2) urolithiasis; 3) intra-abdominal infections; 4) malignancy; 5) acute interstitial nephritis; 6) papillary necrosis
- Hyperparathyroidism, gout, Proteus infections, and RTA are often associated with stone formation; when UTIs appear, they are often secondary to stone formation and obstruction

C Difficile Enteritis

Clostridium difficile is typically an antibiotic associated colitis although community acquired disease is now becoming more common (attributed to a more virulent strain termed NAP1/BI/027). Symptoms can appears up to **3wks following last antibiotics exposure**. **Risk factors** for infx include **abx or chemotherapeutic agents in last 12wks, recent bowel preps, prior C diff, or IBD**. — *Kelly, JHM, 2011*

Do **NOT** test formed stool or asymptomatic patients; an estimated 5% of population are carriers (and even up to 25% of hospitalized populations); presence of the toxin in the absence of symptoms does not confirm infection; also do **NOT** test serially for clearance

Test of choice at VA for diagnosis is **C Diff enzyme immunoassay** (EIA) for toxins A and B. Sensitivity reported to range between 63% and 94%; (specificity ~90%). The PCR for toxin gene is also sensitive. Stool cultures and cell cytotoxin assays have excellent sensitivity (94-100%) but are generally not practical. ***Up to 20% of critically ill patients have ileus and no diarrhea.***

Treatment is to stop offending antibiotics and give **7-10d** of **metronidazole** or oral **vancomycin**; recent data suggest vancoymcin is superior for severe disease (**see table**). **Oral** metronidazole is preferred over parenteral unless ileus prevents gut transit. ***Do not use anti-peristaltic agents to control diarrhea.***

Failure to respond to therapy in 5-7d should prompt escalation in therapy; it may be appropriate to consult ID or GI. Follow lactate and amy. ***Get CT scan for severe complicated disease or failure to respond to therapy. Get surgical consult early if course deteriorates, or for severe or complicated disease. Also engage surgery for megacolon or risk of perforation since a total colectomy may be indicated.***

Recurrent infx is seldom due to resistance to vanc or metronidazole; it is acceptable to treat with the same regimen a second time; half are due to a different strain while others are due to original persisting strain

Presentation	Severity	Treatment (based on IDSA, SHEA, ACG guidelines)
Initial episode	**Mild-moderate** (diarrhea/cramping)	Metronidazole, 500mg PO Q8h x 10-14d
Initial episode	**Severe** (WBC > 15K, alb < 3 g/dL, >10 episodes/day)	Vancomycin, 125mg PO Q6h x 10-14d
Initial episode	**Complicated** (WBC > 35K multi-organ dysf(x), HoTN, fever, AMS, high lactate)	Vanc, 500mg PO/PNGT Q 6h + metro 500mg IV Q8 x 10-14d
Initial episode	**Severe/complicated with ileus or megacolon**	Same as above with inclusion of vancomycin retention enemas (500mg in 500ml Q6h)
First recurrence		Tx regimen based on severity, as in initial episode (do not change tx)
Second recurrence		Vancomycin taper; 125mg PO Q6h x 2wks, then 125mg PO Q12h x 1wk, then 125mg PO QD x 1wk, then 125mg PO QOD x 2-8wks

Osteomyelitis

Diagnosis of osteomyelitis (particularly diabetic foot osteo) can be challenging; suspect when an ulcer over a bony prominence fails to heal. Many cases of osteo are polymicrobial.

Plain films have a pooled **sensitivity of 0.54 and specificity of 0.68 (+LR 2.3 and –LR 0.63).** They may show loss of cortex, marrow radiolucency, new bone formation, bone sclerosis, and a periosteal reaction.

MRI has a much better sensitivity (pooled **sensitivity 0.77-1.0 and specificity 0.40—1.0; +LR 3.8 and –LR 0.14**). Films show low signal intensity on T1 and high signal on T2 images.

If an MRI is not possible, alternatives incl 1) **three-phase bone scan** and 2) **radiolabled leukocyte scan**.

Extremely specific tests are 1) the ability to **probe directly to bone (+LR 9.2**), and 2) a **surgically obtained bone biopsy**. **Bone biopsy is generally necessary** to guide long-duration; abx therapy is required when the radiology is nondiagnostic, hardware insertion is planned, alternative cultures are non-informative, empiric tx appears to be failing, or the abx regimen has a high toxicity rate or potential to select resistant organisms.

Definitive treatment often requires **surgical debridement**. However, surgery might not be feasible if 1) there is no surgical target, 2) there would be unacceptable loss of function, 3) the patient cannot tolerate surgery, 4) there is significant limb ischemia that would thwart healing. Surgery may be preferable if 1) the patient is septic, 2) an extended course of therapy is problematic, 3) surgery is required for another reasons, 4) there is no realistic goal of limb preservation.

The **choice of abx** should be based upon **bone culture**. If empiric therapy is necessary, always select a regimen that covers S aureus. Traditionally, therapy has been at least **4 wks** but is based upon weak data.