

# INTRO TO CARPENTER



Charlie Burns

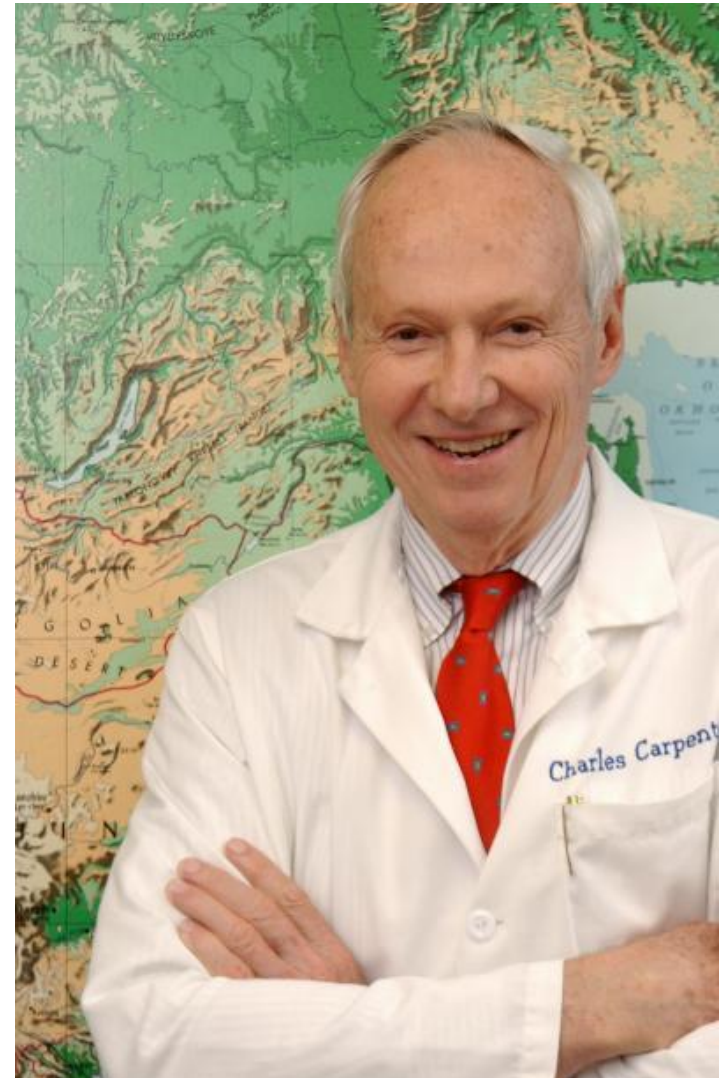
# Overview

- Dr Carpenter
- Approach to a patient
- The Patient info you need
- Common infections
- The HIV patient
- Allergies
- Back Up Plans
- Helpful tools
- (Not necessarily in the above order)

# Dr Charles Carpenter

- After completing his residency at Johns Hopkins Hospital, he began his career in international health in Kolkata, India, during a Cholera epidemic and became the director of the division of allergy and infectious diseases at Hopkins.
- He moved to Ohio in 1973, where he served as the department of medicine chair until 1986, and was a leading figure in the department of ID here, continuing his passion for international health.
- He is currently the department of medicine chair at Brown.

\*All credit to Nate Summers on this slide



# Approach to patient

- Host Factors
  - HIV, immunosuppressed, DM, ESRD
- Environment
  - Where is the patient. What season, where from
- Source
  - Where is the infection coming from
- Common Bugs
  - What bugs would you expect given the above
- Suspect resistance?
  - Hx of resistance, Hospital contact, recent abx?
- Anything weird
  - Just get back from Africa and hemorrhaging?



# Info you need to gather

- Great History and physical
  - This will give you incite as to what to expect
- Social History is key
  - Pets, travel, job, TB risk factors, IVDU
- Recent Abx
  - What was it, how long (+did patient take it), how long ago was it
- Prior infections
  - Within reason



# Portal

## [-] Lab Results REC

- ALCOHOL
- AMI DIAGNOSTIC PROFILE
- AMYLASE
- APTT
- APTT,HEPARIN THERAPY
- BACT CULT, STOOL
- BACT CULT, URINE
- BASIC METABOLIC PANEL
- BLOOD CULTURE, BACTERIAL
- BNP
- C-REACTIVE PROTEIN
- CALCIUM
- CALCIUM, IONIZED
- CALCIUM,URINE 24HR
- CBC
- CBC AND DIFFERENTIAL
- CELL COUNT AND DIFF, FLUID
- CITRATE,URINE 24HR
- CLOST.DIFF.TOXIN
- COAGULATION SCREEN
- COMPREHENSIVE PANEL
- CREATINE KINASE
- CRYSTAL EXAM

Result Comparison

Tests	Results				
<input checked="" type="checkbox"/> BLOOD CULTURE, BACTERIAL	[comment].	[comment].	[comment].	[comment].	[comment].

- You Can also find this in EMR, but not great for cultures outside of current admission

# Cellulitis

- Host:
  - Why do they have it?
    - Skin disease, injury, IVDU, DM etc
- Source
  - Is it True Cellulitis?
    - Venous stasis, allergy, CHF, edema, burn?
- Environment
  - Where is the patient coming from?
    - Home, SNF, LTAC, Hospitalized, Homeless?
- Resistance
  - MRSA risk factors?, Pseudomonas?
- Weird:
  - Animal Bite, hiking, woods, tick born illness, IVDU, etc
- Bugs:
  - Staph, Strep

# Diagnostic Clues

- Strep
  - More rapid onset
  - Rapid response to beta-lactams
  - No purulence



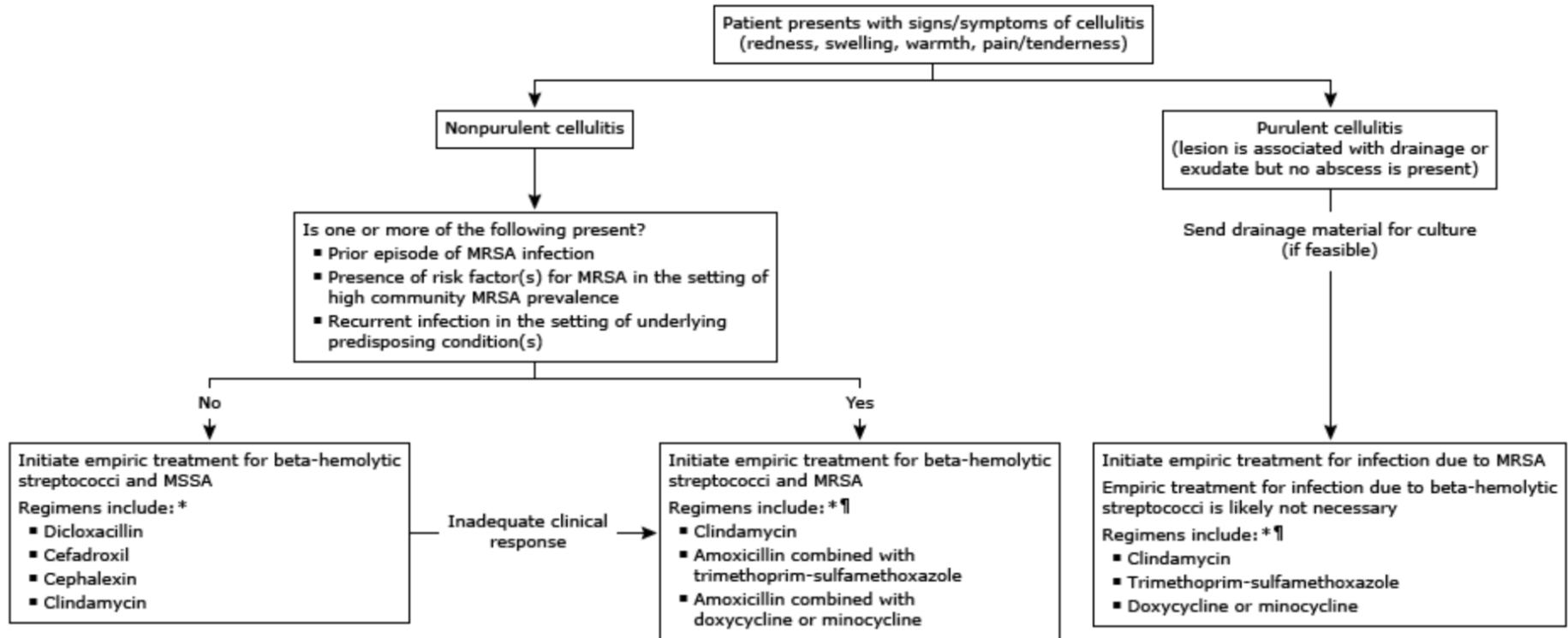
- Staph
  - Often purulent
  - May form abscesses
  - Often multiple



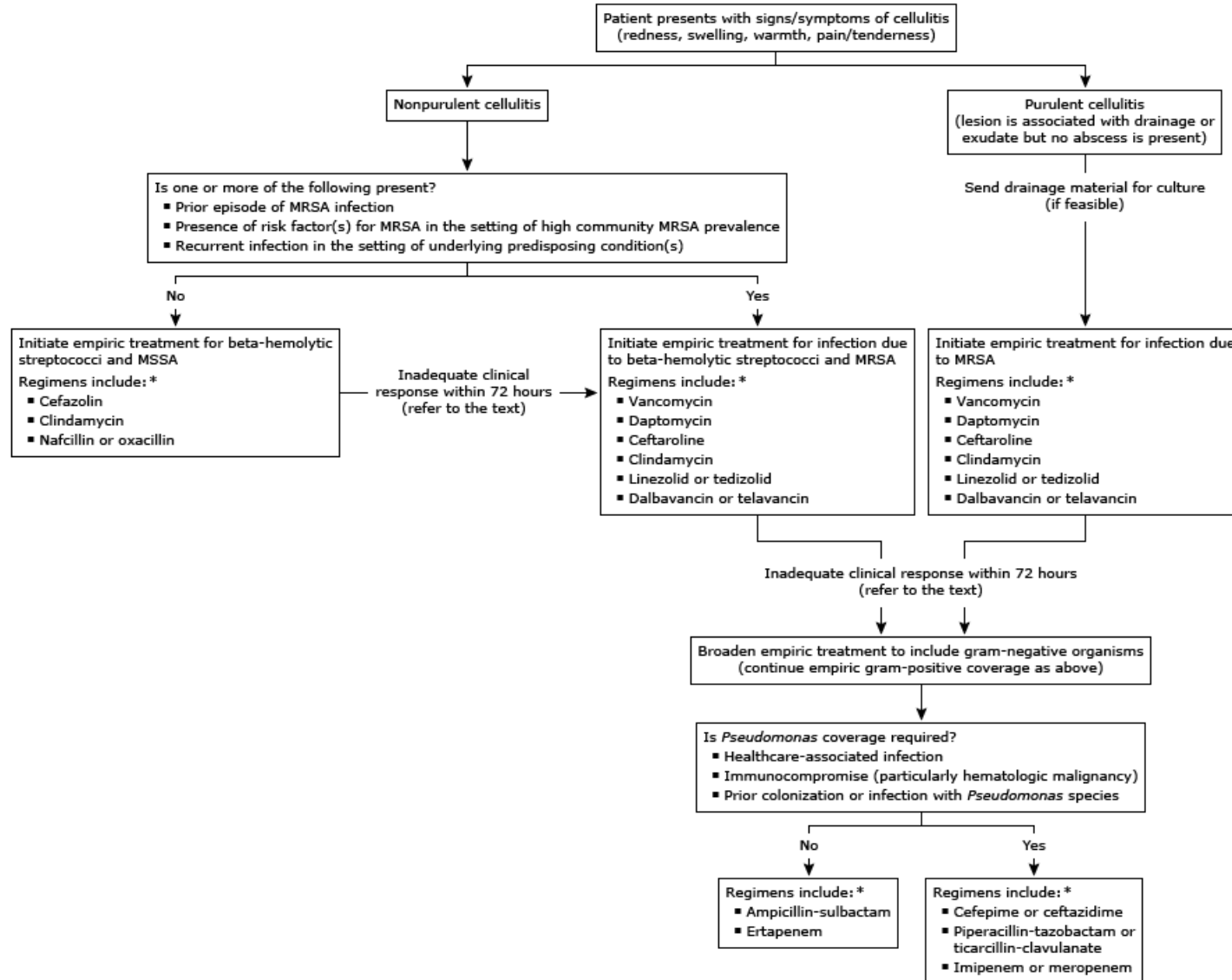
Thanks Nate!



# Treatment: outpatient



# Treatment: inpatient



# Endocarditis

- Host:
  - Why do they have it?
    - IVDU, underlying infection, heart valve disease, prosthetic valve?
- Source
  - Where is the infection coming from
    - Skin, GI, abscess, GU etc
- Environment
  - Any reason to expect Resistance
  - MRSA, VRE?
- Bugs:
  - *Staph. aureus*, *Strep pyogenes*, *Strep viridans*, *Enterococcus*, *Staph Epidermidis*, HACEK

# Duke's Criteria

- Modified Duke Criteria

- Major

- Sustained bacteremia by an organism classic for IE (or 1 BCx or serology positive for *Coxiella*)
    - Endocardial involvement documented by either echocardiogram or new valvular regurgitation

- Minor

- Predisposing condition (prior IE, RHD, IVDU, HD, PPM, bicuspid AV)
    - Fever
    - Vascular phenomena (septic/pulmonary emboli, mycotic aneurysms, ICH, Janeway lesions)
    - Immune phenomena (+RF, glomerulonephritis, Osler's nodes, Roth spots)
    - Positive BCx not meeting major criteria

- Definitive (2 major or 1 major + 3 minor or 5 minor)

- Possible (1 major + 1 minor or 3 minor)

Classic organisms: *Strep viridans*, *Strep. bovis*, HACEK, or *Staph. aureus* or *Enterococcus* w/out primary focus

# Side Note: Staph

- Always take Staphylococcal bacteremia seriously
  - Repeat blood cultures x2 before starting empiric treatment
  - *Staph aureus* is sticky and loves to hide in places. Examine the Pt for metastatic spread (spine, sternoclavicular joints, etc.)
    - Image if concerning physical exam findings
  - IDSA guidelines recommend at least 2 weeks of IV therapy for *Staph* bacteremia
  - Will Require ID Consult!!!! (They may self consult if they hear of it)

# Warning Signs

- EKG: Prolonged QR or new changes
  - Possible abscess/tissue destruction affecting conduction system
- New harsh murmur/reduced EF
  - Possible Valve destruction by infection
- Abscess on Echo
- Hemodynamically unstable

ANY OF THE ABOVE CALL CT SURGERY

# Endocarditis Treatment

- Will require ID consult
- Target organism (if known)
  - Otherwise cover staph, strep, enterococcus
- Empiric Therapy
  - Vanc is probably ok
  - May want to add Zosyn (penicillin for strep)



# Pneumonia

- Host:
  - Concerning findings
    - Elderly, AMS, dysphagia, DM, ESRD, immunosuppressed
- Source
  - What kind of pneumonia
    - CAP, HCAP, HAP, VAP, Aspiration?
- Environment
  - Where is the patient coming from?
    - Home, SNF, LTAC, Hospitalized, Homeless, HD, air conditioners
- Resistance
  - MRSA risk factors?, Pseudomonas?
- Weird:
  - TB, Fungal, anthrax, viral, legionella
- Bugs:
  - *Strep pneumoniae*, *H. influenza*, *M. catarrhalis*, *Chlamydia pneumoniae*, *Mycoplasma pneumoniae*, *Staph aureus*, *Legionella pneumophila*



# Admit or No?

- CURB-65
  - Confusion
  - BUN>19
  - RR>30
  - BP<90/60
  - Age>65
- Score >1 should generally be treated inpatient
- Other issues
  - Social Support
  - Co Morbid Conditions
  - Ability to tolerate PO
  - NH resident

# What Kind

## ➤ HCAP:

- Hospitalization for 2+ days w/ in past 90 days
- HD w/ in 30 days
- NH or LTAC w/ in 30 days
- IV therapy (chemo, Abx) w/in 30 days
- Wound care w/ in 30 days
- Family member w/ MDR pathogen

## ➤ CAP

- Community Acquired

## ➤ HAP

- Occurs 48 hours or more after admit (and not present/brewing at time of admission)

## ➤ VAP

- 48-72 hours post intubate

## ➤ Aspiration

- Dysphagia key

Think carefully your choice of type has implications in terms of billing, inpatient criteria, severity score, and reimbursement

# Treatment

- CAP – Ceftriaxone and Azithromycin
- HCAP – Fluoroquinolone
- HAP – MRSA, PSA
- VAP – MRSA, PSA
- Aspiration – Cover gram negatives/positives
- Neutropenic: Vanc/Zosyn + Azithro!

# Follow up



2 Weeks Later



# Follow up



2 Weeks Later



- If clinically responding, no need to repeat CXR before 7-12 weeks

# Pyelonephritis / UTI

- Host:
  - Concerning findings
    - Male/Female, Age, Comorbidities
- Source
  - How did they get it?
    - Recent Urologic procedure, catheterization, “spontaneous”, Sexual
    - Is it really a “UTI”: PID, STD, GI infection/abscess, Seeding from elsewhere
- Environment
  - Where is the patient coming from?
    - Home, SNF, able to care for self, can tolerate PO
- Resistance
  - Hx of resistant organisms? MDR, XDR
  - Other common issues: ESBL, MRSA, Pseudomonas
- Weird:
  - Fungal
- Bugs:
  - Ecoli, enterococcus, staph, other GI/GU flora

# Complicated or Not

## Factors suggesting complicated urinary tract infection

<b>Patient demographics</b>
Pregnancy
Male gender*
Advanced age
<b>Comorbidities</b>
Diabetes mellitus
Immunosuppression
Renal failure
Renal transplantation
History of urinary tract infection in childhood
<b>Infection characteristics</b>
Hospital-acquired infection
Uropathogen broadly resistant to antimicrobials
Symptoms for seven or more days before seeking care
Recent antimicrobial use
Recent urinary tract instrumentation
<b>Functional or anatomic abnormality of the urinary tract</b>
Urinary tract obstruction
Prostatic hypertrophy
Urethral stricture
Presence of an indwelling urethral catheter, stent, nephrostomy tube or urinary diversion

\* Although urinary tract infections in men have traditionally been considered complicated because they generally occur in the elderly in the setting of urologic abnormalities, a small number of acute uncomplicated urinary tract infections do occur in healthy men between 15 and 50 years of age.

# Concerning Findings

- Inability to tolerate PO
  - Should admit
- Multi-drug resistant organism
  - Contact precautions, consider abx closely
- Urinary tract obstruction (stone etc)
  - Needs to be relieved by IR or Urology
- Abscess
  - Check kidneys with US, needs to be drained



# Treatment

- Not Complicated
  - Likely short course of orals
  - Avoid Cipro (high resistance) or at least follow up
  - Check your antibiogram
- Complicated
  - May need IV depending on clinical situation
  - One of the only “sepsis” you can treat with PO
  - Probably need to narrow based on sensitivity

# “UA shows Bacteria but here for HTN”

- Should you treat?
  - NO!!!!!!!!!!!!!!!!!!!!\*

# “UA shows Bacteria but here for HTN”

- Should you treat?
  - NO!!!!!!!!!!!!!!!!!!!!\*
- \* Those who you do treat:
  - Pregnant women
  - About to have Urologic Procedure
  - Kidney transplant recipients (in the first 3 months)

# Meningitis

- Host:
  - Concerning findings
    - Immune status, Age, surgical hx, cancer hx
- Source
  - How did they get it?
    - Spontaneous, Seeded from elsewhere, IVDU, Neurologic procedure
      - Is it true infection or could it be cancer?
- Environment
  - Where is the patient coming from?
    - Home, SNF, able to care for self, can tolerate PO
- Resistance
  - Really an issue if associated with Neurologic Procedure, IVDU etc
- Weird:
  - Fungal, MRSA,
- Bugs:
  - *Neisseria meningitidis*, *Strep. pneumoniae*, *H. flu*, *Listeria monocytogenes*, enteroviruses, arboviruses, TB, *Cryptococcus neoformans*

# LP Analysis

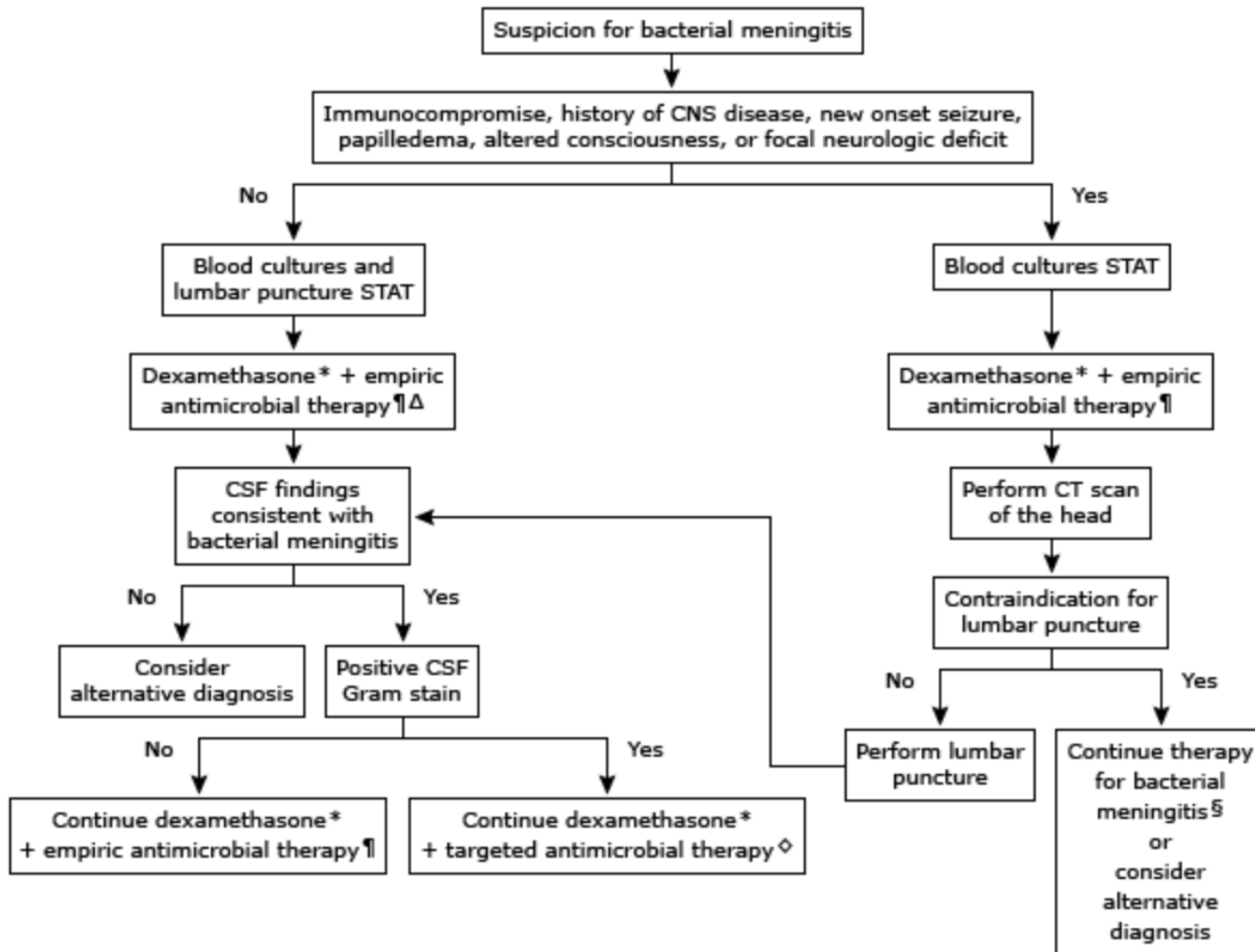
Typical cerebrospinal fluid findings in central nervous system infections\*

	Glucose (mg/dL)		Protein (mg/dL)		Total white blood cell count (cells/microL)		
	<10 <sup>†</sup>	10 to 40 <sup>Δ</sup>	100 to 500 <sup>◇</sup>	50 to 300 <sup>§</sup>	>1000	100 to 1000	5 to 100
<b>More common</b>	Bacterial meningitis	Bacterial meningitis	Bacterial meningitis	Viral meningitis Nervous system Lyme disease (neuroborreliosis) Neurosyphilis TB meningitis <sup>¥</sup>	Bacterial meningitis	Bacterial or viral meningitis TB meningitis	Early bacterial meningitis Viral meningitis Neurosyphilis TB meningitis
<b>Less common</b>	TB meningitis Fungal meningitis	Neurosyphilis Some viral infections (such as mumps and LCMV)			Some cases of mumps and LCMV	Encephalitis	Encephalitis

# LP Analysis Simplified

	Bacterial	Fungal	Viral
Pressure	Elevated	Varies	normal
Glucose	Low	Low-normal	Normal
Protein	Elevated	Slightly up	Normal/slight up
WBC	Hi (N)	Varies (L)	Normal (L)

# Treatment



# Treatment

- Ceftriaxone
- Vancomycin
- +/- Ampicillin
- +/- Acyclovir
- Dexamethasone
  - For Strep pneumo it reduces neurologic deficits and possibly mortality
  - Usually want to start this empirically unless you have good reason not to



# Virus

- Influenza
- Encephalitis
- Meningitis
- RSV
- HSV
- VZV
- Many more...

# Fungal infections

- Candida
- Aspergillus
- Histo
- And more..

# Special Bacteria

- MRSA: Vanc, Linezolid, Daptomycin, Ceftaroline, doxycycline, bactrim, clindamycin
- Pseudomonas: Zosyn, Meropenem, fluoroquinolone
- ESBL: carbapenems
- VRE: dapto, linezolid
- MDR

# Sepsis Criteria\*

## SIRS Criteria (need $\geq 2$ )

T  $>38^{\circ}\text{C}$  or  $< 36$

HR  $> 90$

RR  $> 20$

WBC  $>12$ ,  $<4$ , or  $>10\%$   
bands

## qSOFA (2 is high risk)

Altered Mental Status  
(GCS $<15$ )

RR $>22$

Low BP (SBP below 100)

# Sepsis Order set

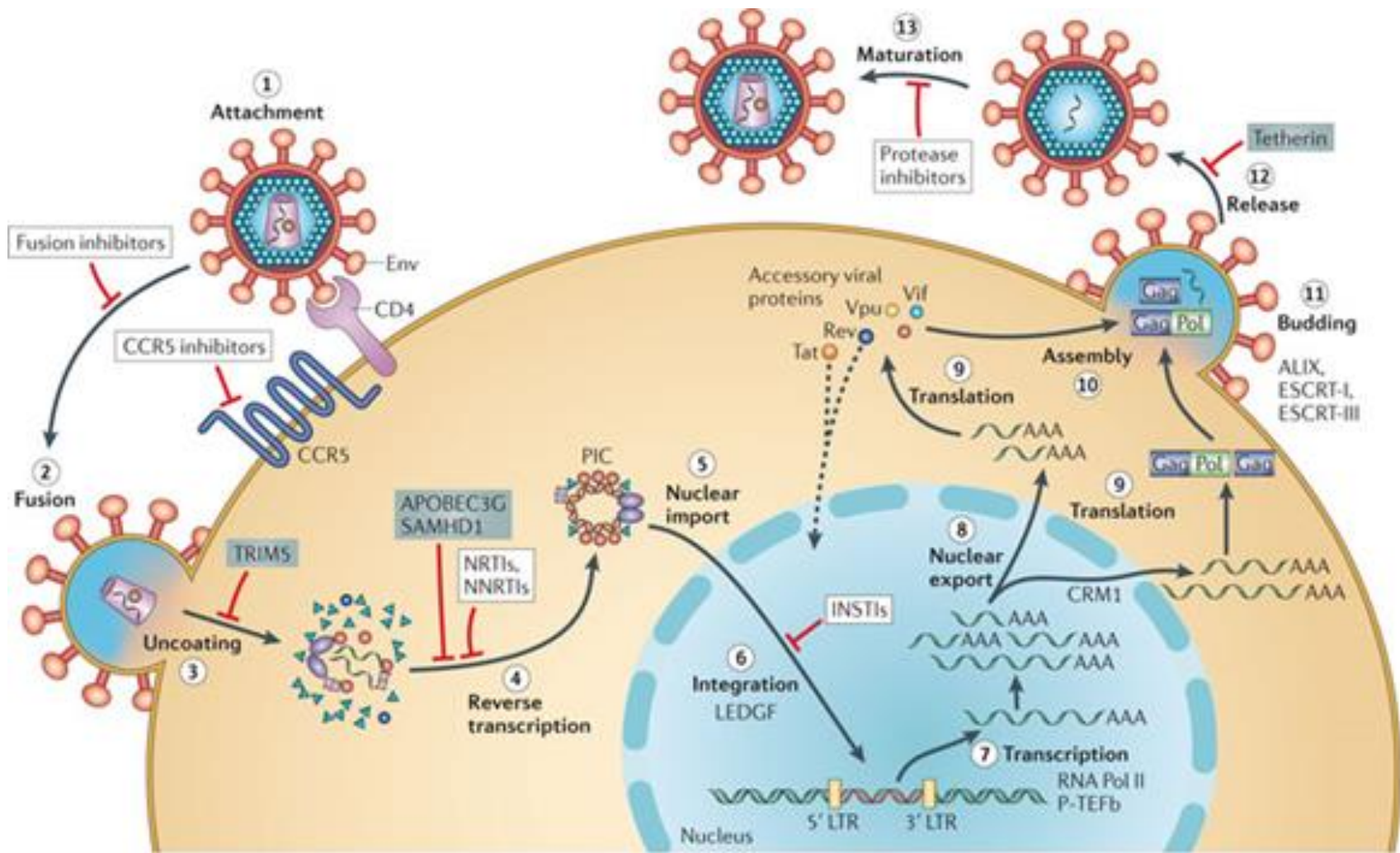
- Made by Antibiotic Stewardship team
- Very helpful and easy if you're stuck
- FYI: based off UH antibiogram
  - So some things may seem strange but its all ID approved!
- Remember to think!
  - You're a doctor so make sure what you order makes sense

# A word on documentation

- Check the pocket card on appropriate terms
- What you type has several implications
- Make sure your diagnoses make sense
  - CLABSI, HAP, VAP, etc all ding the hospital so before you label it that make sure it is the correct diagnosis. (ie make sure there is not a chance that they came in with it brewing and it showed itself later)
  - If a patient comes in with the above make sure you document that they came in with it and didn't get it here
  - Affects severity score so if someone has severe sepsis label it as such (not just bacteremia)

# HIV patients

- Key information to find
  - Primary ID doc
  - Most recent viral load + CD4
    - Note the weird way CD4 is recorded
    - CD4 nadir and when it was
  - HAART
    - And were they taking it
    - In general continue it on admission
  - Prophylaxis / what are they on
  - Opportunistic infections
    - What did they have and when
- How do I get this info?
  - EMR, Portal
  - SIU: ask for data packet
  - Call primary ID physician





# How to order HAART

- Like any other med...but...
  - You cannot order a combo pill inpatient...
  - Order each component separately
  - Careful of this on d/c order the combo pill not all separately
  - Opt 2: ask pharmacy really really nicely and sometimes they will make an exception and get the combo pill put in

# HAART

Drug/Class	Common/Important Side Effects
Didanosine	Pancreatitis
Indinavir	Crystal nephropathy
Nevirapine	Liver failure
Abacavir	Hypersensitivity syndrome
NRTI's	Lactic acidosis
NNRTI's	Stevens-Johnson Syndrome

# HIV ppx Guidelines

Pathogen	CD4 Count	Prophylaxis
TB	Any	Screen for and treat for latent TB if positive
Coccidioidomycosis	<250	Screen in endemic areas; fluconazole if positive
PCP	<200	TMP-SMX
Histoplasmosis	<150	Itraconazole in hyperendemic areas (not USA)
Toxoplasma	<100	TMP-SMX
Cryptococcus	<100	None
MAC	<50	Azithromycin

# Common things are common!

- Don't overlook common infection in HIV pts
  - Pneumonia may be just strep pneumo!
- However:
  - Consider OIs depending on the situation

# Allergies

P: “Doc I’m allergic to penicillin”

D: “What happens when you take it”

P: “I don’t know they just told me not to”



# Allergies

- Is it real?
  - “My throat closes up” – YES!
  - “I get swelling” – Maybe? Need to know more
  - “Itchy” – Probably not, find out more
  - “Nausea” - nope

# Allergies

- Key things to find out
  - What was the reaction and do we have it documented
  - How serious is the reaction
    - Ie if PCN is only option pt can deal with itching
  - Has patient had this medication/class before
    - Check EMR have they had X or a similar family?
  - Note history of EBV and amoxicillin
    - But difficult to prove this
  - Is it the nature of the med
    - Do you expect the “allergy” as a common effect of the abx
    - Ex: Red man syndrome, GI upset, etc

# OK so it's real

- Allergy to PCN
- Cephalosporin (5-10% Cross reactivity)
- Carbapenem (2-5%)
- Monobactam (0%)
  
- Think of severity of reaction
  - Itchy: may risk trying cephalosporin
  - SOB: don't risk it and go to monobactam
- Overall weight risk/benefits and discuss w/pt



# No Other Options?

- Are you sure?
  - Lots of old meds not used recently
  - Several “ID controlled” abx you can use
- Call Allergy!
  - Confirm allergy and desensitize if needed

# Back up plans

- What are you missing
  - Should you broaden abx
  - Beware gaps in coverage: Ertapenem no PSA
- Re-culture
  - Is there unexpected resistance
- Do you need to switch classes
  - IE PCN to Carbapenem?
- Is really an infection?
  - All that is SIRS is not ID

# Tips/Tools

- Choosing an antibiotic with all things equal
  - Think of ease of use for pt
- Up To Date
  - Great for dosing
- Sanford Guide
  - Best 20 bucks you'll ever spend
- Antibiotogram
  - Specific resistances at your hospital
- Call your friendly pharm D
  - Help with dosing, other abx suggestions to add
- Call your friendly Microlab
  - May help with resistance panels (they know more than they release)

# Always Remember

- If its an infectious disease it probably has a metal band named after it!
  - Anthrax, Leprosy, Septic Shock, Pestilence, Black Death, Dengue Fever
  
- Thanks!