

2023

CRITICAL CARE ONCOLOGY SYMPOSIUM

Central Line Infections in 20^{ish} minutes

Or double your infections back!

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v4



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Outline

Governing Literature (e.g. them (IDSA) guidelines, they be old!)

Venous Access Device (“Line”) Anatomy

- No formaldehyde involved

Sources of Infection

Risk Factors

- When to **worry** / who to **worry** about

Microbiology

- Bugs to **worry** about

Diagnosis

- “Oy, that looks ugly! (and red, painful, ...)” (or, *rubor, dolor, (calor, tumor,) deformis ...*)
- Microbiological

Treatment

- “When in doubt, take it out!”
- Removal criteria
- Words of Wisdom from IDSA

Prevention

Definitions

CLABSI central line-associated bloodstream infection—“infection control” version
CRBSI intravascular catheter-related bloodstream infection—the “treatment” version

“line” any venous access device – here we’re only talking about central lines
(ones that reach the SVC)

“CVC” any central line that isn’t tunneled

“port” any totally implantable subcutaneous venous access device
(e.g. that chest lump inferior to the clavicle)

Hickman (plural Hickmen?)

CICC Centrally-inserted (Chest-located, tunneled) central catheter

PICC Peripherally inserted central catheter

My opinion in or preceded by pink text (so there)

Questions in green text

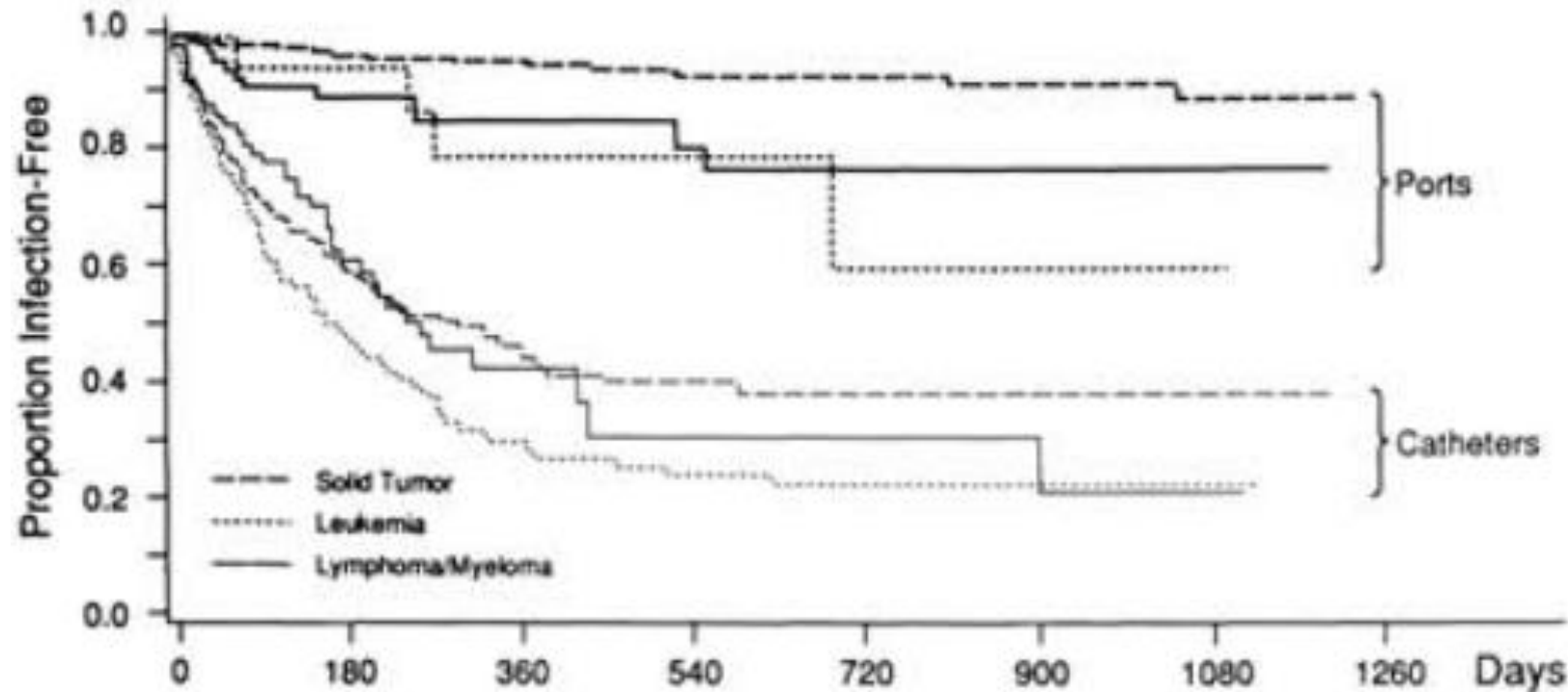
Source of Infections

- Short Term (Uncuffed) Catheters (TLCs, QLCs, ...)
- Skin Flora (crawling along catheter extraluminally) 2:1 to intraluminal
- Long Term Catheters (PICCs, Hickmen, ...)
- Colonization / infection via Hubs (70% of pts w/CRBSI are on TPN)

Table 4. Microbiologic Isolates: First Device-related Bacteremia or Fungemia

Organism	Isolated, n (% total)	
	Catheters	Ports
Gram-positive cocci	100 (29)	19 (65.5)
Coagulase-negative staphylococci	61	17
<i>Staphylococcus aureus</i>	14	2
<i>Streptococcus</i> species	10	—
<i>Enterococcus</i> species	10	—
<i>Micrococcus</i> species	5	—
Gram-positive bacilli	43 (12.5)	2
<i>Bacillus</i> species	23	2
Diphtheroids	15	—
<i>Corynebacterium jeikeium</i>	5	1
Gram-negative bacilli	191 (55)	6 (21)
Enterobacteriaceae	96	3
Water-borne*	72	2
<i>Pseudomonas aeruginosa</i>	23	1
Fungi and mycobacteria	12 (3.5)	1 (3.5)
<i>Candida parapsilosis</i>	5	—
<i>Rhodotorula rubra</i>	1	—
<i>Malassezia furfur</i>	1	—
<i>Candida albicans</i>	1	1
<i>Torulopsis glabrata</i>	1	—
<i>Alternaria</i> species	1	—
<i>Aspergillus niger</i>	1	—
<i>Mycobacterium chelonae</i>	1	—

* Water-borne bacilli include all gram-negative bacilli other than *Enterobacteriaceae* and *Pseudomonas aeruginosa*.



(Selected) Risk Factors

Host Characteristics

- Neutropenia
 - not at time of insertion
- CA / Tx Type: HSCT/Liquids > Solids
- So it is neutropenia or leukemia?
- (Non-Port) Microbial Burden at CVC “exit”

Line Associated

- Type [CVC > PICC > Port]
- CVC: Site [Femoral ?= IJ > SC], Placement Protocol

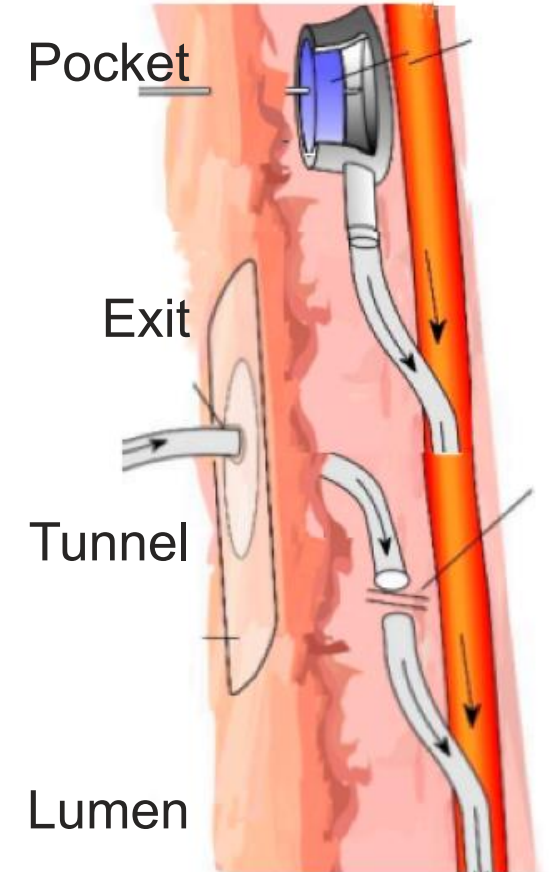
Use

- TPN!
- Blood products?

Bacteremia Generating Procedures (and “situations”)

Thrombosis Infection

Böll, Schalk et al. (2021) Safdar and Maki (2004) Lorente, Henry et al. (2005)
Zakhour, Chaftari et al. (2016) Hanna and Raad (2001)

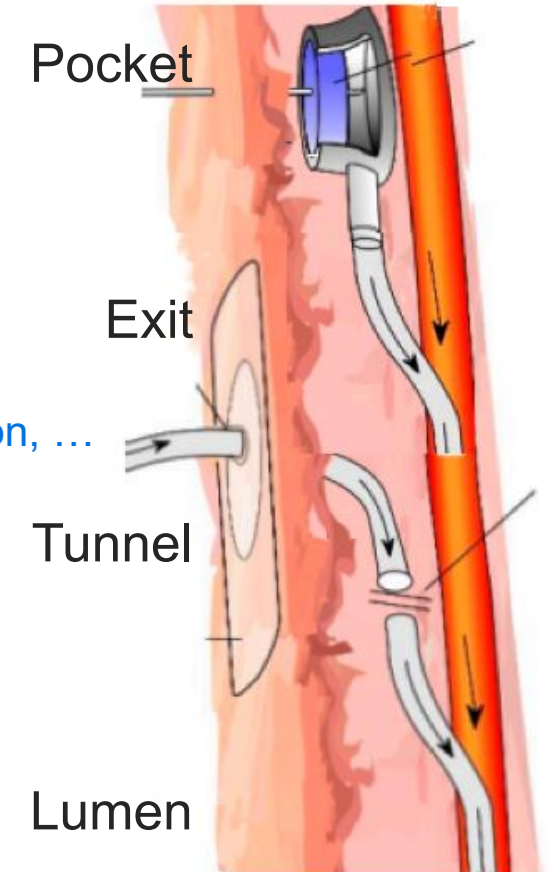


Risk Factors in Practice

Wait, so who do I worry about again?

In *my humble opinion*, this *includes*

- Septic patients; High risk pts (HSCT, Heme, ...)
- Clinically Infected Lines
- Lines placed in inelegant places
- Folks on TPN
- Folks with recurrent bacteremias
 - Solid Tumor World: biliary obstruction, bowel obstruction/tumor perf, urinary obstruction, ...
- Folks s/p bacteremia generating procedures
 - Biliary drain/IEBD placements, surgery on anything below the diaphragm, etc.
 - IVDU

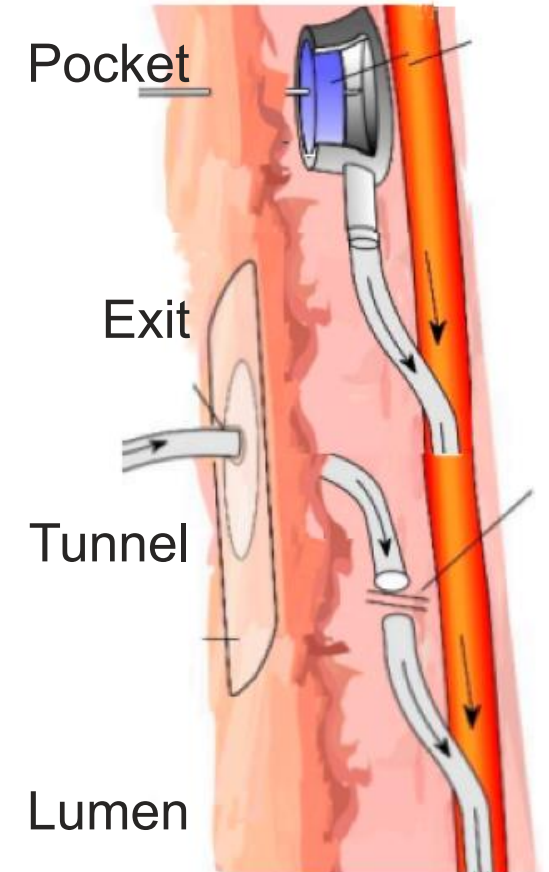


Organisms

Varies, in principle, a lot

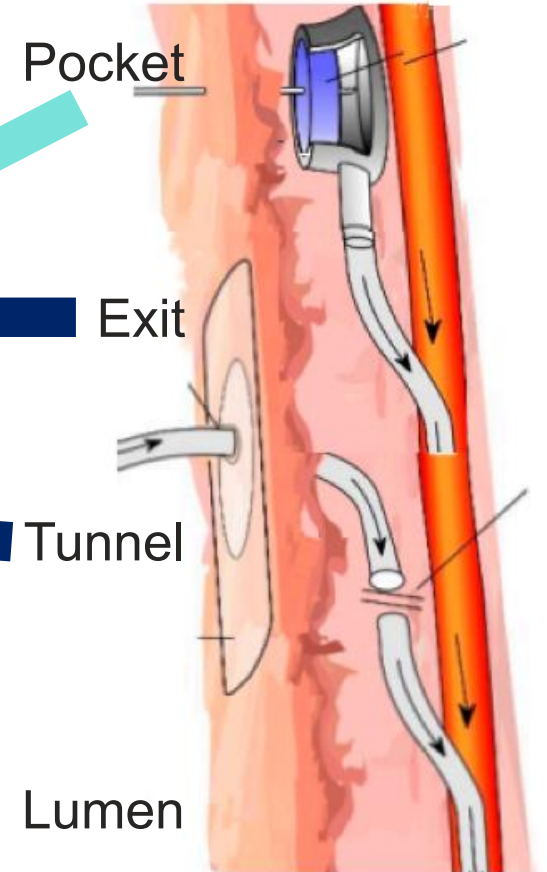
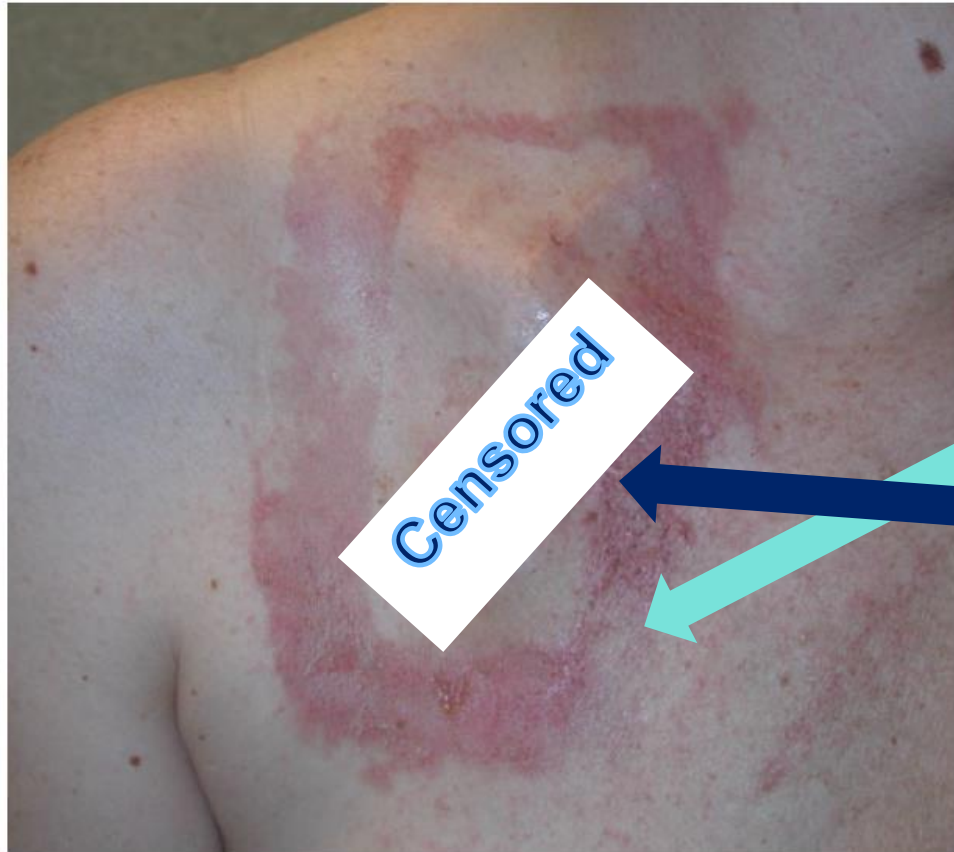
Most Commonly Reported are:

- Coagulase-Negative Staph. (*S. epidermidis* and friends) [Skin]
 - *Staph. aureus* [Skin]
 - Enterococci [GU, GI], Streptococci [Skin, GI]
 - *Enterobacteriaceae* [GI]
 - *Pseudomonas* [outside world]
 - *Candida* [GI]
- Most 60 – 78%
- 20 – 30%
- 2 – 10%



Clinical “Just” Contact Dermatitis

Exam: Appearance, Palpation (inc. tu



Böll, Schalk et al. (2021)
Zakhour, Chaftari et al. (2016)

Walser (2012)

Microbiological Diagnosis

Got Pus?

- Culture it, please

Blood Cultures

Comparative Quantitative Cultures (peripheral vs line)

- Labor intensive, No lab offers this

Differential Time-to-Positivity (DTTP)

- Draw peripheral and line cx at same time
- See how long each takes to turn positive
- If line cx grows 2hrs or more sooner than peripheral bcx = line infection
 - Assumes many things go correctly
 - Same blood volume drawn at same time, same handling of all cxs, etc.
 - **NOT** valid for *S. aureus*, *Candida*

Catheter tip cultures

- ... are not a thing anymore (poor sensitivity)

For Coag Negative Staph (CoNS), repeat bcx BEFORE abx



Treatment Line

If in doubt, take it out!*

Line Removal is the Mainstay of Treatment

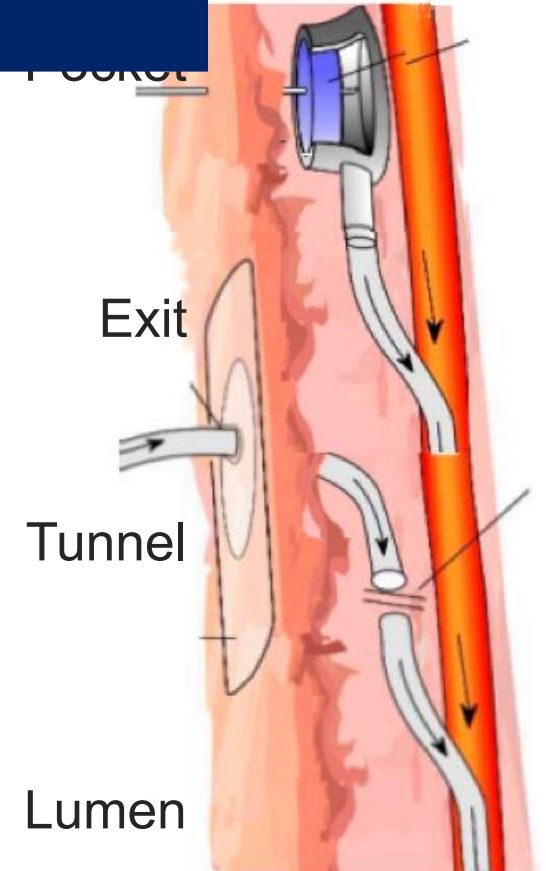
Always* Remove the Line if:

- Patient is Septic / Unstable (and remove *pronto*)
- Tunnel / Pocket Infection
- Any blood cx (not just the line) grows *S. aureus* (MRSA, MSSA, any SA)
- Line-associated Candida infection†

*If you can!

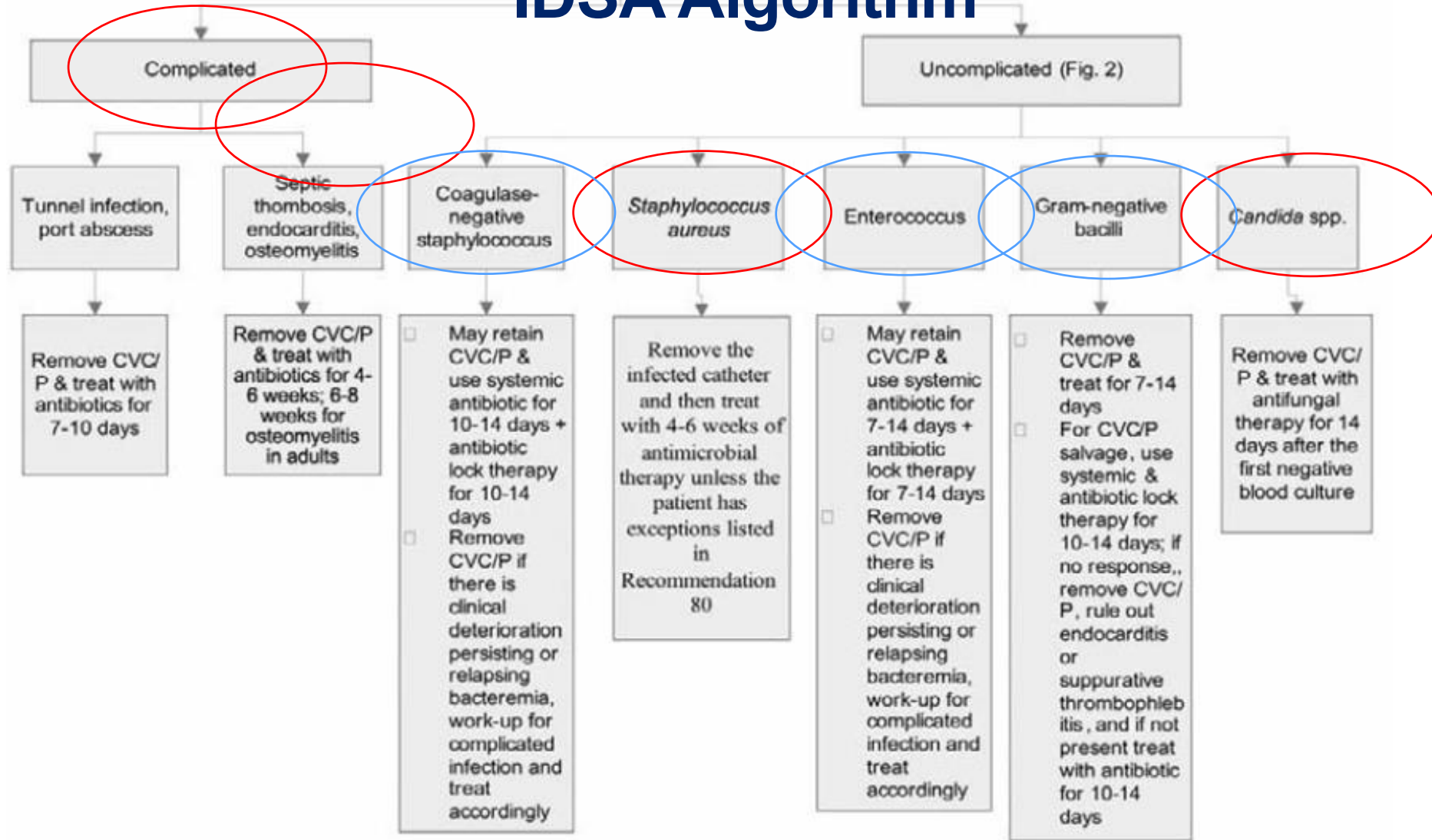
Ensure adequate access

If not an emergency, consider if pt has future line options



SHORT TERM
LONG TERM

Treatment IDSA Algorithm



Treatment

Let's do that again

There is a line infection

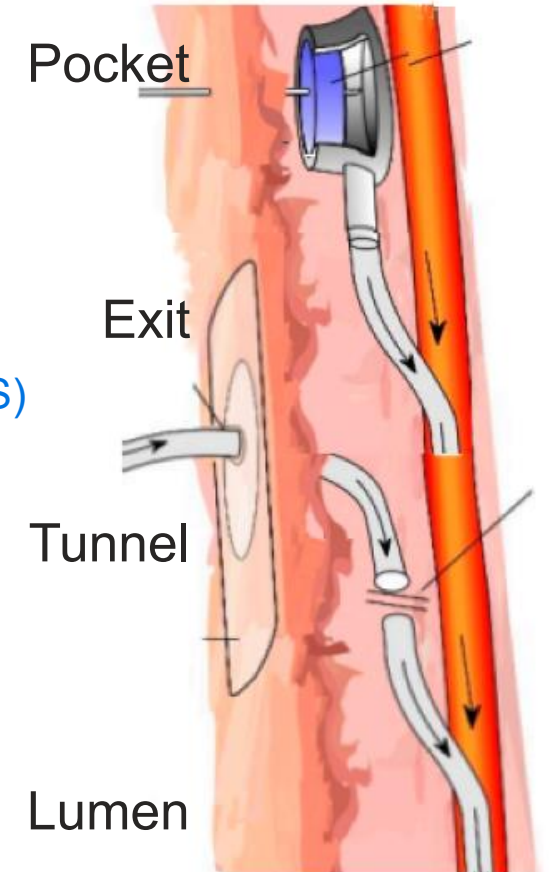
Should I remove the line?

- If unstable, complicated infection, or *S. aureus*, or *Candida* → Yes, yes, yes*
- Short term catheter?
 - Remove the line* – except you could try to salvage if Coag Neg Staph infection (CoNS)
- Long term catheter?
 - Remove the line* except
 - CoNS, Enterococcus – ok to attempt line salvage
 - GNR – Line removal preferred; but can attempt salvage
 - Pseudomonas, Mycobacteria – remove line

Local: Tunnel, Pocket Infxn
Distal: Osteo, endocarditis, ...

Give Antibiotics!

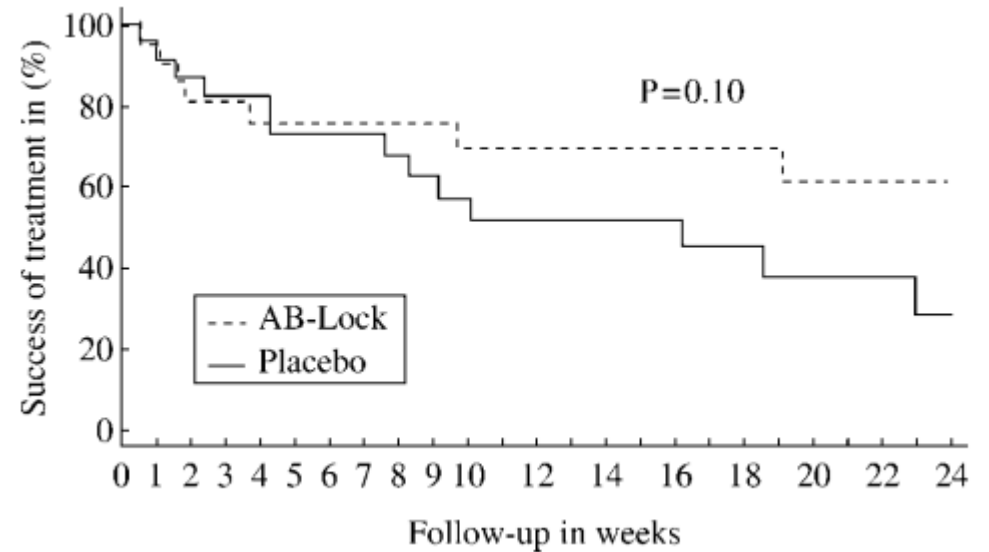
* If you can, etc



1 RCT: Vancomycin (G+) or Ceftazidime (G-)
500mg/L, at least 8hr in line
1' Endpoint: fail to clear or relapse: (p=0.10)
Relapse same strain: 9/23 vs 3/21 (p=0.06)

Retained Line – Salvage

- Antibiotics ± lock therapy
- Abandon (all hope and) Salvage Efforts if:
 - Pt clinically deteriorates, or
 - Unable to clear blood cultures after 72hrs of effective therap

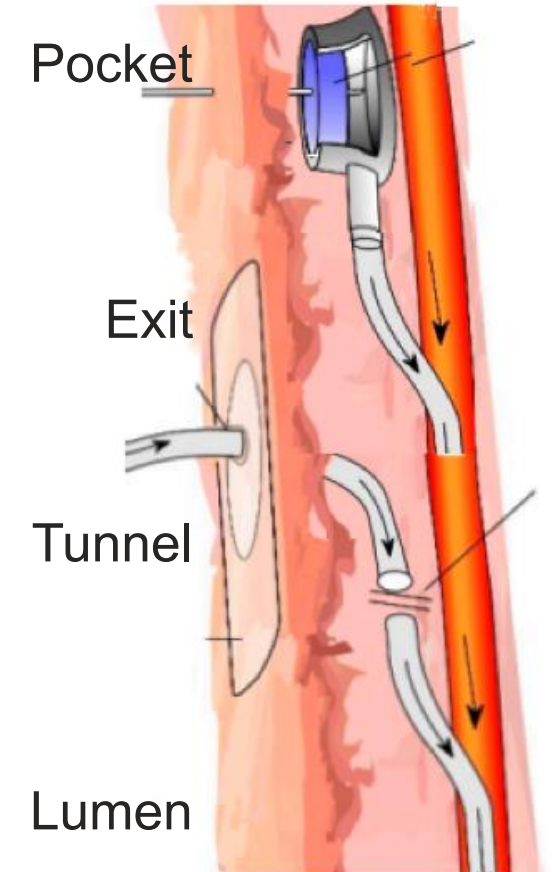


Treatment

Words of Wisdom from the IDSA

Antibiotics

- Empiric Vancomycin if your institution's MRSA rate is "high" or Sick pt
 - (what about all that CoNS?)
- Empiric GNR coverage based on
 - How sick is the patient (sicker→better GNR coverage)
 - Local resistance patterns
- Femoral catheter infections → *Candida* and GNR coverage
- Septic **AND** (TPN, "prolonged antibiotics," heme malignancies, or BMT) → Empiric *Candida* coverage
- Empiric *Candida* coverage = echinocandin (or maybe fluconazole)



C'est tout

Worry about lines when

- Look infected; pt is septic; HSCT/heme pts
- Likely to be bacteremic/fungemic from: TPN, Bile/GI/GU trouble / procedures

When in Doubt, Take It Out (if you can)

Treat

- Empiric Vancomycin if your institution's MRSA rate is "high"
- Empiric GNR coverage based on how ill, local resistance patterns
- Femoral catheter infections → *Candida* and GNR coverage
- Septic **AND** (TPN, "prolonged antibiotics," heme malignancies, or BMT) → Empiric *Candida* coverage
- Empiric *Candida* coverage = echinocandin (or maybe fluconazole)

Thanks!

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(no PHI; can't treat your patient
by email, sorry)

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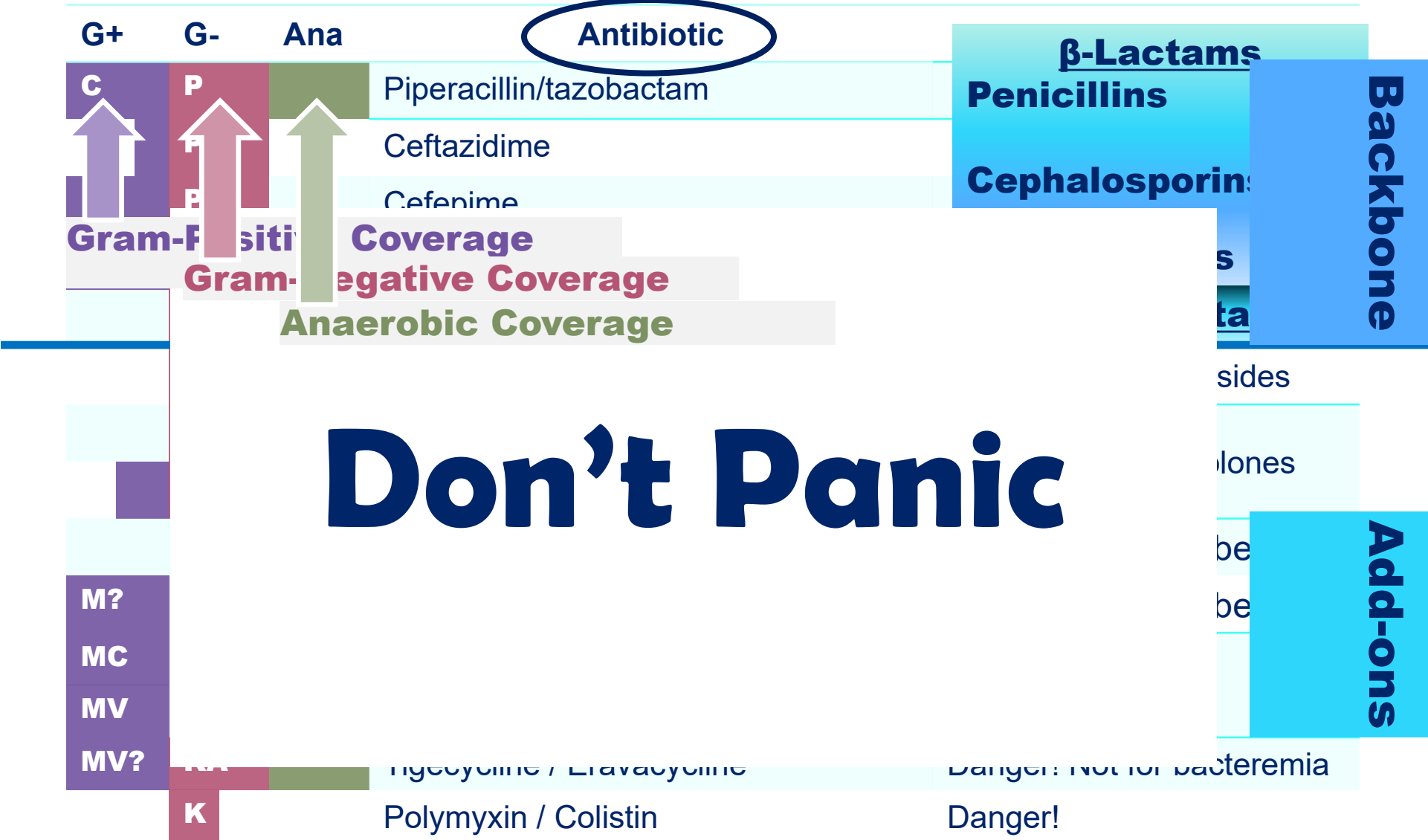
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Do we really have to talk about antibiotics?



M – MRSA **A** – Atypicals
V – VRE **E** – ESβL
K – CRE
C – Enterococcus **P** – Pseudomonas