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Some questions that you should always consider when an infection is on your differential are:

1. Is there an infection
2. What is it
3. Where is it from
4. Where has it spread
5. Which antibiotics if necessary
6. How long
7. Who has been exposed

Objective 1.
In patients with a suspected infection

a) Determine the correct tools (e.g., swabs, culture/transport medium), techniques, and protocols for cultures,
b) Culture when appropriate (e.g., throat swabs/sore throat guidelines).

The correct tools for culturing in a patient with a suspect infection, should be guided by what is on your differential and how and if culture is necessary.

At the time this episode is being recording we're experiencing an emerging monkeypox outbreak. In suspected cases of monkeypox it's important to swab the lesions and send for testing.

Similarly, if you're concerned about a urinary tract infection, test the urine. Worried about a blood infection, get a blood culture and so on.

It's important to collect cultures prior to starting antimicrobial treatments whenever the patient isn't acutely unwell. Properly performed swab cultures provide useful data to augment diagnostic and therapeutic decision making.

The guidelines for sore throat are a bit more nuanced. First, try and rule out covid-19, can be done with a home covid-19 test kit but be aware of the sensitivity and specificity can vary by kit.

After covid-19 has been ruled out, consider Centor Score throat cultures is necessary if Group A streptococcal pharyngitis is on your differential. A score of 3 or more, get a throat culture. MDCalc has a calculator that will be listed in our resources regarding this. Note that 70-80% of pharyngitis is caused by a viral pathogen.

Age Group A streptococcus (GAS) rare under 3	3-14 years	+1
	15-44 years	0
	≥45 years	-1
Exudate or swelling on tonsils	No 0	Yes +1
Tender/swollen anterior cervical lymph nodes	No 0	Yes +1
Temp >38°C (100.4°F)	No 0	Yes +1
Cough	Cough present	0
	Cough absent	+1

Centor Score	Probability of strep pharyngitis	Recommendation
0	1-2.5%	No further testing or antibiotics.
1	5-10%	
2	11-17%	Optional rapid strep testing and/or culture.
3	28-35%	Consider rapid strep testing and/or culture.
≥4	51-53%	Consider rapid strep testing and/or culture. Empiric antibiotics may be appropriate depending on the specific scenario.

Remember only culture proven GAS should be treated with antibiotics as a part of choosing wisely, but it should be noted cultures are unable to differentiate between acute infection and a carrier state. There is a wide differential for sore throat including: cold, flu, tonsilitis, epiglottitis, peritonsillar abscess, retropharyngeal abscess, gonorrhea, HIV

Objective 2.

When considering treatment of an infection with an antibiotic, do so

a) **Judiciously (e.g., delayed treatment in otitis media with comorbid illness in acute bronchitis),**
b) **Rationally (e.g., cost, guidelines, comorbidity, local resistance patterns).**

Episode 6 on Antibiotics does a fantastic job discussing judicious and rational antibiotic choices.

In otitis media in general, consider observing for 24-48 hours before starting antibiotics if the patient is generally healthy and the infection is mild.

- Generally healthy means >6 months of age, no craniofacial abnormalities, no immunodeficiencies and no chronic cardiac/pulmonary disease.
- Mild infection refers to a temperature <39 degrees without antipyretics, mild pain, ability to sleep, and overall alert and responsive.

Remember that 80-90% of patients have resolution of fever and pain within 2-3 days and complete resolution of symptoms in 7 days WITHOUT antibiotics.

Resources like Spectrum (or now rebranded as FirstLine) and Bugs and Drugs can be useful in determining appropriate antibiotic treatment.

Also consider:

- patient's renal function,
- if they have an allergy or hypersensitivity history,
- if they are pregnant and lactating and
- ability to adhere to regiment.

In elderly patient be aware, fluoroquinolones can cause CNS effects (anxiety, depression), tendinopathy and peripheral neuropathy)

"Also be mindful, majority of antibiotics are prescribed in the outpatient setting, commonly for respiratory tract infections, acute otitis media, urinary tract infections, and skin and mucosal conditions[1,2,3] Up to half of outpatient antibiotic prescriptions might be inappropriate and at least 30% reported unnecessary" - DynaMEd

Objective 3.
Treat infections empirically when appropriate (e.g., in life threatening sepsis without culture report or confirmed diagnosis, candida vaginitis post-antibiotic use).

If patients come in complaining of increased white, thick, curdy vaginal discharge associated with pruritus, dysuria, and burning after recent antibiotic use, you can empirically treat with antifungal like fluconazole

Febrile neutropenia is fever with single oral temperature of ≥38.3°C or ≥38.0°C sustained over one-hour, and an absolute neutrophil count <500 cells/microL. If you suspect febrile neutropenia and they are stable choose piptazo monotherapy. If they're unstable: piptazo, vanco and gentamicin, then treat like sepsis.

In life threatening sepsis, initiate antibiotic therapy (same as above) regardless of if culture results are back. Collecting cultures prior to antibiotic therapy is not required in this circumstance. Start broad and narrow your antibiotic choice after cultures are back

Bites are another area where empirical antibiotics can be considered. All bites from cats and bites to the face or hands should be given prophylactic antibiotics because they are prone to infection.

Clenched fist injuries or human bites on hands during fights should also be given prophylactic antibiotics. Remember to
1) copiously irrigate the bite area and
2) only face wounds should receive primary wound closure, bites on other areas of the body should remain open.

(Might be worthwhile to consider discussing some key points from Surviving Sepsis guidelines here: https://www.sccm.org/Clinical-Resources/Guidelines/Guidelines/Surviving-Sepsis-Guidelines-2021#Recommendations)

We have included a link to the surviving sepsis guidelines, which is a long list of recommendations, but the basics are this

- don't use qSOFA, instead use SIRS, NEWS or MEWS as your screening tool
- get blood cultures, and any other cultures you can depending on suspected source
- start antibiotics within an hour
- get a lactate for prognostication
- resuscitate with at least 30mL/kg of crystalloid in first three hours (low evidence and a point of controversy)
- Target a MAP of >65mmHg
- Get there with Norepinephrine as first line pressor, add vasopressin next if still not there and lastly can add dobutamine or switching to epinephrine if cardiac dysfunction

After you've done all this, the rest is details and well outside the scope of this episode. Check out the surviving sepsis recommendations if you want more.

Objective 4.
Look for infection as a possible cause in a patient with an ill- defined problem (e.g., confusion in the elderly, failure to thrive, unexplained pain [necrotizing fasciitis, abdominal pain in children with pneumonia]).

Atypical presentations are often found in the extremes of age, children and elderly.

In pediatric patients, infections can cause changes in growth, of which the earliest sign can be not following growth curves and presenting as failure to thrive.

Delirium or confusion or altered LOC in elderly can be caused by an underlying infection, often have to rule UTI's as part of delirium workup.

Anytime a patient presents with pain, keep infection on your differential, because pain can also be a symptom of an underlying infection, for example necrotizing fasciitis can present as pain out of proportion and beyond borders of erythema.

A presenting complaint of abdominal pain in children can be a presentation of a pneumonia Infections are also important to consider in presenting complaints of diarrhea and rashes

Objective 5.
When a patient returns after an original diagnosis of a simple infection and is deteriorating or not responding to treatment, think about and look for more complex infection. (i.e., When a patient returns complaining they are not getting better, don't assume the infection is just slow to resolve).

When a patient isn't responding the appropriate treatment for an infection there are a few things to consider

1) Is this the wrong diagnosis, is something other than infection causing this presentation? Is there a host-inflammatory response or toxin induced presentation?
2) Is the initial treatment for the wrong bug?
3) Is the initial treatment at adequate dosing and being admistered correctly? Ask about adherence to medications
4) If it's the right drug at the right amount, is there adequate activity of drug at site of infection. Consider impaired blood flow to infection site. And in cases of abscesses, necrotic tissue and infected prosthetics, antibiotics alone will not be sufficient to clear the infection. Always think about appropriate source control. This may occur at the time of diagnosis if required or this may need to be considered when an infection is failing to improve (i.e. is there a new complication that requires source control?).
5) Is there a new infection imposed onto a previous infection, for example an opportunistic bacterial infection after a viral illness.

Objective 6.
When treating infections with antibiotics use other therapies when appropriate (e.g., aggressive fluid resuscitation in septic shock, incision and drainage abscess, pain relief).

For septic shock it's important to maintain respiratory support through supplemental oxygen or intubation if indicated. For maintaining their blood consider, consider aggressive fluid

resuscitation +/- norepinephrine +/- hydrocortisone IV (if not responsive to the first two) and admission to ICU.

If appropriate consider surgery to help source control, for example to drain abscess, remove infected hardware, irrigation and debridement and/or remove necrotic tissue

Don't forget to provide pain management, infections can be very painful, looking at you necrotizing fasciitis

Sources

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Show Notes

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