Host, Syndrome, Bug, Drug:
Introducing 2 Frameworks to Approach Infectious Diseases Cases with an Antimicrobial Stewardship Focus

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Disclosures

No financial disclosures
Antimicrobial Stewardship

“The optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for treatment and prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance”

Objectives

By the end of each part of this presentation, the participants will ...

• Part 1: Framework
  – Understand the Host, Syndrome, Bug, Drug Framework for choosing empiric antimicrobial coverage in infectious diseases
  – Appreciate the use of the Drug, Dosing, De-escalation, Duration Framework for choosing targeted antimicrobial coverage in infectious diseases

• Part 2: Frame of Mind (if time allows)
  – Explore how preauthorization and prospective audit and feedback can be used to assist others in navigating blind spots
PART 1:

FRAMEWORK

a: a basic conceptional structure (as of ideas)
b: a skeletal, openwork, or structural frame
Antimicrobial Stewardship

“The optimal selection, dosage, and duration of antimicrobial treatment that results in the best clinical outcome for treatment and prevention of infection, with minimal toxicity to the patient and minimal impact on subsequent resistance”

How???
Our Case

• 72 year old woman presents to the emergency room with fever, chills, nausea, vomiting, dysuria, and flank pain
• Temp 102.5 F, HR 92, BP 100/72, RR 12, 96% on room air; fatigued but does not appear toxic; flank and suprapubic pain on exam
• UA with packed WBCs and gram negative rods; WBC 20.2, Cr 2.2
Framework 1

For choosing empiric antimicrobial coverage
Framework 1: The Host

*Whom am I treating?*

- Is the patient stable or unstable?
- Is the patient immunocompromised?
- Any antimicrobial allergies?
- Any relevant exposures?
- Any recent procedures?
- What are the comorbidities?
- What medications are being given?
Framework 1: The Host

Whom am I treating?

- Is the patient stable or unstable? – Vital signs stable
- Is the patient immunocompromised? – Relative immunocompromise with poorly controlled diabetes
- Any antimicrobial allergies? – Penicillin (anaphylaxis)
- Any relevant exposures? – No
- Any recent procedures? – No
- What are the comorbidities? – T2DM (A1c 11%), chronic kidney disease (baseline Cr 1.3), coronary artery disease, hypertension, atrial fibrillation
- What medications are being given? Insulin, Lisinopril, metoprolol, dofetilide
Framework 1: The Syndrome

What syndrome am I treating?

• Do the history, physical exam, and tests suggest an infectious syndrome?
• **If the syndrome is not an infection, stop.**
• Otherwise, what is the differential diagnosis for infection? Can it be narrowed down to an organ system?
• Are there any IDSA or other guidelines for this syndrome?
Framework 1: The Syndrome

What syndrome am I treating?

- Do the history, physical exam, and tests suggest an infectious syndrome? – Yes, pyelonephritis
- Are there any IDSA or other guidelines for this syndrome? -- Yes (Guidelines for Antimicrobial Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women by the IDSA)
Framework 1: The Bug

*What organism am I treating?*

- Do I have microbiology results?
- Do I have susceptibility data?
- If not, what tests or procedures are needed to get this information?
- If not, what organisms do I need to cover empirically given the host and syndrome until I have more data?
Framework 1: The Bug

What organism am I treating?

- Do I have microbiology results? – Not yet
- Do I have susceptibility data? – Not yes
- If not, what tests or procedures are needed to get this information? – Urine and blood cultures
- If not, what organisms do I need to cover empirically given the host and syndrome until I have more data? – She has history of ESBL E coli resistant to all cephalosporins
Framework 1: The Drug

*What drug is best for this situation?*

- Given the specifics of this particular host, the syndrome being treated, and any known microbiology and susceptibility data, what empiric course of therapy is appropriate while we await more data or patient response?
- What is the cost of this drug regimen?
- What are the drug side effects?
- What monitoring labs should be followed while on this drug?
Framework 1: The Drug

What drug is best for this situation?

• Given the specifics of this particular host, the syndrome being treated, and any known microbiology and susceptibility data, what empiric course of therapy is appropriate while we await more data or patient response?
  – Ertapenem (cannot use zosyn with penicillin allergy and it is not preferred with ESBL; would avoid fluoroquinolones with age and dofetilide; would avoid aminoglycosides and Bactrim with renal function)
Framework 1

For choosing empiric antimicrobial coverage.
Our Case

• Her urine and 1 of 2 blood cultures grow a pansusceptible Proteus mirabilis
• She is afebrile and hemodynamically stable within 48 hours
• Her WBC count is trending down as anticipated; 11.8 at 48 hours
• Her renal function has improved with a creatinine of 1.2
Framework 2: Drug

What drug is most appropriate?

• Is the patient responding to the current drug regimen?
• Is the patient tolerating the current drug regimen?
• Given the information we now have on this patient and syndrome, is this the most appropriate therapy?
Framework 2: Drug

What drug is most appropriate?

- Is the patient responding to the current drug regimen? – Yes
- Is the patient tolerating the current drug regimen? – Yes
- Given the information we now have on this patient and syndrome, is this the most appropriate therapy? – Not from an antimicrobial stewardship perspective; ceftriaxone would be more appropriate if she has tolerated cephalosporins in the past
Framework 2: Dosing

What dose is appropriate?

- What is the patient’s creatinine clearance? Is the patient on dialysis?
- Does the patient have liver dysfunction?
- Are there any potentiating or inhibiting drug interactions?
- Is the dose appropriate for the syndrome and organism being treated?
Framework 2: Dosing

What dose is appropriate?

• What is the patient’s creatinine clearance? – 46
• Does the patient have liver dysfunction? – No
• Are there any potentiating or inhibiting drug interactions? – dofetilide is contraindicated with QT prolonging medications (Bactrim, fluoroquinolones) but not cephalosporins
• Is the dose appropriate for the syndrome and organism being treated? – dose will be ceftriaxone 2 g IV every 24 hours
Framework 2: De-escalation

*Can I narrow the coverage?*

- Are we prescribing the narrowest coverage possible for the syndrome and organisms identified?
- Is it safe to de-escalate coverage to only those organisms recovered in culture?
- Is the oral formulation absorbed as well as the IV formulation of this drug?
Framework 2: De-escalation

*Can I narrow the coverage?*

- Are we prescribing the narrowest coverage possible for the syndrome and organisms identified? – Yes, a 3rd generation cephalosporin is appropriate for this organism

- Is it safe to de-escalate coverage to only those organisms recovered in culture? – Yes

- Is the oral formulation absorbed as well as the IV formulation of this drug? – No. Cefdinir is 25% bioavailable and cefpodoxime is 50% bioavailable.
Framework 2: Duration

*What time course is appropriate?*

- Is there a standard duration of therapy given this patient’s syndrome and organism?
- If not, what tests or procedures will be necessary to determine when to stop?
- Who will see the patient in follow up?
- What monitoring labs are needed?
- Is there a PICC line to be removed?
- If recommending chronic suppression, is it appropriate for this situation?
Framework 2: Duration

What time course is appropriate?

- Is there a standard duration of therapy given this patient’s syndrome and organism?
  - yes, 7-8 days
  - It’s okay to deescalate to a PO regimen to complete the course when the patient is stable. Be sure to keep an eye on the bioavailabilities.
Framework 2

For choosing targeted antimicrobial coverage

Framework 1

For choosing empiric antimicrobial coverage

HOST
SYNDROME
BUG
DRUG

Framework 2

For choosing targeted antimicrobial coverage

DRUG
DE-ESCALATION
DURATION
DOSING
PART 2:

FRAME OF MIND

: mental attitude or outlook
The mind works in mysterious ways …

Faculty and Resident Physicians’ Attitudes, Perceptions, and Knowledge about Antimicrobial Use and Resistance

Lilian Abbo, MD;¹² Ronda Sinkowitz-Cochran, MPH;³ Laura Smith, PharmD;² Ella Ariza-Heredia, MD;¹ Orlando Gómez-Marín, PhD;¹⁴ Arjun Srinivasan, MD;³ Thomas M. Hooton, MD¹

“never useful.” There were 10 multiple-choice questions covering basic to more advanced topics in antimicrobial use and resistance. Each question had only one correct answer, and each respondent had to answer all questions. The total knowledge score was calculated as the percentage of correct answers.

Following approval of the study by the Ethics Boards of JMH and UMMSM, an email was sent to clinical faculty and residents in various departments with a link to the survey. Participation was voluntary.

… reaction to fear and lack of insight
Survey of 609 faculty and resident physicians

- Antibiotics are overused nationally: 94%
- Antibiotics are overused locally: 76%
- Inappropriate antibiotic use causes antimicrobial resistance: 97%
- Inappropriate antibiotic use causes harm to patients: 97%
- Other doctors overprescribe antibiotics: 62%
- I overprescribe antibiotics: 13%
To ensure appropriate use of antibiotics...

Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America

... takes more than just education
Strong recommendation for use of the following in antimicrobial stewardship programs

• Preauthorization =
  a strategy to improve antibiotic use by requiring clinicians to get approval for certain antibiotics before they are prescribed

• Prospective audit and feedback =
  an intervention that engages the provider after an antibiotic is prescribed
# Preauthorization

## Advantages
- Reduces initiation of unnecessary or inappropriate antibiotics
- Optimized empiric choices
- Decreases antibiotic costs
- Prompt review of clinical data/ prior cultures at the time of starting therapy
- Direct control over antibiotic use

## Disadvantages
- Impacts use of restricted agents only
- Addresses empiric use more than downstream use
- Loss of prescriber autonomy
- May delay therapy
- Real-time resource intensive
- Effectiveness depends on the skill of the approver
Prospective Audit and Feedback

**Advantages**

- Can increase visibility of the program and build relationships
- More clinical data is available at the time of recommendations
- Greater flexibility in timing of recommendations
- Provides educational benefit to clinicians
- Prescriber autonomy maintained
- Can address de-escalation of antibiotics and duration of therapy

**Disadvantages**

- Compliance is voluntary
- Typically labor-intensive
- Success depends on delivery method of feedback to providers
- Prescriber reluctance
- May require computerized systems and IT support
- May take longer to achieve reductions in targeted antibiotic use
Setting an example is not the main means of influencing others, it is the ONLY means.

Albert Einstein
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Questions or Comments?

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