How the EML book could be used in the hospital setting

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Outline

• Overview of antibiotic use in the local context
• Moments of antibiotic prescribing and how the EML book supports this
• Example of community acquired infection
• HAI
• Summary
Antibiotic use in Kenyan hospitals

Figure 1 Antibiotic prevalence among patients admitted in health facilities
Antibiotics used at a public facility

- Ceftriaxone
- Amoxicillin and enzyme inhibitor
- Ceftazidime
- Benzylpenicillin
- Gentamicin
- Amikacin
- Metronidazole (parenteral)
- Meropenem
- Cefuroxime
- Metronidazole (oral, rectal)

Proportion (%)
Antibiotics used at a private facility

![Bar chart showing the proportion of antibiotics used at a private facility. The most commonly used antibiotic is Amoxicillin and enzyme inhibitor, followed by Meropenem, Metronidazole (parenteral), Cefuroxime, Ceftriaxone, Amikacin, Ceftazidime, Cefazolin, Flucloxacillin, and Ciprofloxacin.]
The Four Moments of Antibiotic Decision-Making

1. Does my patient have an infection that requires antibiotics?

2. Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?

3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?

4. What duration of antibiotic therapy is needed for my patient's diagnosis?
# Community-Acquired Pneumonia

## Definition
An acute illness affecting the lungs usually presenting with cough, sputum production, and rapid and difficult breathing with a new or worsening pulmonary infiltrate on a chest radiograph.

## Most Likely Pathogens

### "Typical" Bacteria:
- *Streptococcus pneumoniae* (most cases)
- *Staphylococcus aureus* (often associated with *Streptococcus pneumoniae*)
- *Haemophilus influenzae* (chronic lung disease, smoking)
- *Moraxella catarrhalis* (chronic lung disease, smoking)
- *Enterobacteriaceae* (severe comorbidities, e.g., chronic lung disease, dementia, stroke)

### "Atypical" Bacteria:
- *Mycoplasma pneumoniae* (more frequent in young adults)
- *Chlamydia pneumoniae* and *pallidum* (more frequent in young adults)
- *Legionella* spp. (chronic lung diseases or other underlying illnesses, travel, exposure to hot tubs)
- *Coxiella burnetii* (rural areas, exposure to livestock)

## Respiratory Viruses:
- *Influenza virus* (A and B)
- *Parainfluenza virus* 1, 2, 3, 4
- *Respiratory syncytial virus* (RSV)
- *Adenovirus* 1-5, 7, 11
- *Metapneumovirus* (Human PIV-6)
- *Rhinovirus* (including SARS-CoV-2)

**Bacteria to consider in Specific Settings:**
- *Burkholderia pseudomallei* (SE Asia, Australia)

## Imaging
- Chest X-ray not necessary in mild cases
- Infiltrate may not always be evident (e.g., dehydration) and non-infectious etiologies may mimic infiltrate (e.g., lung edema, pulmonary embolism)
- Radiologic appearance cannot be used to accurately predict pathogen

## Diagnosis

### Clinical Presentation
- New onset (>2 weeks) or worsening cough with fever (>38.0°C), sputum production, dyspnea, tachypnea, reduced oxygen saturation, crackles on lung auscultation, chest pain/discomfort without alternative explanation
- Extrapulmonary features (e.g., confusion, disorientation) may predominate in elderly, and immunosuppressed patients and fever may be absent.

### Microbiology Tests

#### Mild cases: usually not needed
- Severe cases (to guide antimicrobial treatment): blood cultures, urinary antigens for *L. pneumophila* and *S. pneumoniae*

#### Selected cases (depending on epidemiology and risk factors): sputum rapid molecular test for *M. tuberculosis*, nasopharyngeal swab for influenza viruses and SARS-CoV-2, HIV testing in settings with high HIV prevalence and in case of recurrent and/or severe pneumonia

### Other Laboratory Tests

#### Determines disease severity: blood urea nitrogen (see CURB-65 Scoring System box), blood pH and gases, white blood cell count

#### Differentiate bacterial and viral (taking into account pre-test probability): C-reactive protein and/or procalcitonin

#### Note: tests depend on availability and clinical severity (e.g., blood gases will only be done in severe cases)

## Investigating for Tuberculosis (TB)

- Consider specific investigations for TB in endemic settings especially in high-risk patients (e.g. HIV)
- A rapid molecular test performed on a single sputum specimen is the preferred first line diagnostic test for pulmonary TB and to detect rifampicin resistance
Community-Acquired Pneumonia

**CURB-65 Severity Scoring System**

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms (1 point each)</th>
<th>Score 0-1</th>
<th>Score 2</th>
<th>Score ≥3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of Confusion (New onset)</td>
<td>Consider outpatient treatment</td>
<td>Consider inpatient treatment</td>
<td>Inpatient treatment (consider ICU)</td>
</tr>
<tr>
<td>Urea &gt; 19 mg/dL (or &gt; 7 mmol/L)</td>
<td>-</td>
<td>Consider adding clarithromycin to beta-lactam for atypical coverage</td>
<td>Consider adding clarithromycin</td>
</tr>
<tr>
<td>Respiratory rate &gt; 30/min</td>
<td>-</td>
<td>Perform microbiology tests</td>
<td>Perform microbiology tests</td>
</tr>
<tr>
<td>Systolic BP &lt; 90 mmHg (≤12 kPa) or Diastolic BP &lt; 60 mmHg (≤8 kPa)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Age ≥ 65 years</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Other considerations such as severe comorbid illnesses or inability to maintain oral therapy should be taken into account. CURB-65 has not been externally validated in low-income settings.

*The CURB-65 score, which does not require laboratory values for its calculation, can also be used. The score value interpretation is the same as for CURB-65.

**Treatment**

**Antibiotic Treatment Duration**

- Treat for 5 days
- If severe disease, consider longer treatment and look for complications such as empyema, if patient not clinically stable at day 5

**Severe Cases**

All dosages are for normal renal function

**First Choice**

- **Ceftiraxone 2 g q24h IV (1 g q24h IM)**
  - *A larger volume would be painful to give as intramuscular injection*
  - OR
- **Ceftriaxone 2 g q48h IV/IM**

**Second Choice**

- **Ampicillin ± clavulanic acid 1 g/250 mg q6h IV**
  - A higher dose can be considered: 1 g/200 mg q8h
  - OR
- **Ampicillin + clavulanic acid 6/5 mg+125 mg q6h ORAL**
- **Clarithromycin 500 mg q12h ORAL**

**Mild to Moderate Cases**

All dosages are for normal renal function

**First Choice**

- **Ampicillin 1 g q8h ORAL**
- **Phenoxymethylpenicillin 500 mg (800-1000 IU) q6h ORAL**

**Second Choice**

- **Ampicillin + clavulanic acid 675 mg+125 mg q6h ORAL**
  - OR
- **Doxycycline 100 mg q12h ORAL**
- **Clarithromycin 500 mg q12h ORAL**

Clarithromycin has excellent oral bioavailability and the intravenous route should be reserved for patients with impaired gastrointestinal function.
Hospital acquired infections

- Hospital acquired infections require more specific antibiograms even though guidance given for newer antibiotics for which a clear plan of introduction and stewardship is required.

- A good knowledge of resistance patterns and where possible of the resistance mechanisms
## Example of Ceftazidime-Avibactam

<table>
<thead>
<tr>
<th>Type of beta-lactamase</th>
<th>ESBL&lt;sup&gt;a&lt;/sup&gt;</th>
<th>KPC&lt;sup&gt;b&lt;/sup&gt;</th>
<th>NDM, VIM, IMP&lt;sup&gt;b&lt;/sup&gt;</th>
<th>AmpC</th>
<th>OXA-48&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Expected activity against non-fermenters&lt;sup&gt;c&lt;/sup&gt;</th>
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<tbody>
<tr>
<td><strong>Ambler class&lt;sup&gt;d&lt;/sup&gt;</strong></td>
<td></td>
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<tr>
<td>Serine-beta-lactamases</td>
<td><strong>A</strong></td>
<td><strong>A</strong></td>
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<tr>
<td>Metallo-beta-lactamases</td>
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<td>Cephalosporinase</td>
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<td><strong>C</strong></td>
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<tr>
<td>Oxacillinase</td>
<td></td>
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<td></td>
<td><strong>D</strong></td>
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</tr>
<tr>
<td><strong>Ceftazidime-avibactam</strong></td>
<td><strong>+</strong></td>
<td><strong>+</strong></td>
<td><strong>-</strong></td>
<td><strong>+</strong></td>
<td><strong>+</strong></td>
<td><img src="image" alt="? Acinetobacter baumannii" /></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td><img src="image" alt="+ Pseudomonas aeruginosa" /></td>
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Summary

• Guidance on management of community acquired infections:
  • Covers common pathogens
  • When to treat, when not to treat, what samples to take, what antibiotic, duration
  • In keeping with what we see in our local setting:
    • UTI - E.coli, susceptible to Nitrofurantoin (Lower - UTI) susceptible to Amikacin (upper UTI)
    • Streptococcus pneumonia’s, maintaining low penicillin MICs
    • Low prevalence of community acquired MRSA, so SSTIs can largely be managed with penicillins

• Pointers on reserve drugs and HAI
• Local guidelines may already exist - the handbook would serve as a resource to fill any gaps
Thank you