Critically important antimicrobials: use and AMR trends in health sector in Kerala.

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HOD Infectious Diseases

MCH Thiruvananthanapuram
Nightmare bacteria and Blackwaters of Kerala
# WHO 2017

## ANTIBIOTICS GUIDANCE

### ACCESS
- AMOXICILLIN
- AMIKACIN
- CHLORAMPHENICOL
- AMOXICILLIN + CLAVULANIC ACID
- AMPICILLIN
- BENZATHINE BENZYL Penicillin G
- BENZYL Penicillin G
- CEPHALOSPORINS (WITH OR WITHOUT BETA-LACTAMASE INHIBITOR)
- CLINDAMYCIN
- DOXYCYCLINE
- GENTAMICIN
- METRONIDAZOLE
- NITROFURANTOIN
- SULFAMETHOXAZOLE + TRIMETHOPRIM

### WATCH
- QUINOLONES
- FLUOROQUINOLONES
- 3RD GENERATION CEPHALOSPORINS (WITH OR WITHOUT BETA-LACTAMASE INHIBITOR)
- MACROLIDES
- GLYCOPEPTIDES
- ANTIPSEUDOMONAL
- PENICILLINS + BETA-LACTAMASE INHIBITOR
- CARBAPENEMS
- PENEMS

### RESERVE
- AZTREONAM
- FOSFOMYCIN (IV)
- 4TH GENERATION CEPHALOSPORINS
- OXAZOLIDINONES
- 5TH GENERATION CEPHALOSPORINS
- TIGECYCLINE
- POLYMYXINS
- DAPTOMYCIN
### CRITICALLY IMPORTANT ANTIMICROBIALS

<table>
<thead>
<tr>
<th>Antimicrobial class</th>
<th>Criterion (Yes = 1)</th>
<th>C1</th>
<th>C2</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
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<td><strong>CRITICALLY IMPORTANT</strong></td>
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<td>Penicillins (natural, aminopenicillins, and antipseudomonal)</td>
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<td>Drugs used solely to treat tuberculosis or other mycobacterial diseases</td>
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<td>Sulfonamides, dhydrofolate reductase inhibitors and combinations</td>
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<td><strong>IMPORTANT ANTIMICROBIALS</strong></td>
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### Criteria

- **C1**: Criterion 1
  - The antimicrobial class is the sole, or one of limited available therapies, to treat serious bacterial infections in people.

- **C2**: Criterion 2
  - The antimicrobial class is used to treat infections in people caused by either: (1) bacteria that may be transmitted to humans from nonhuman sources, or (2) bacteria that may acquire resistance genes from nonhuman sources.

- **P1**: Prioritization criterion 1
  - High absolute number of people, or high proportion of use in patients with serious infections in health care settings affected by bacterial diseases for which the antimicrobial class is the sole or one of few alternatives to treat serious infections in humans.

- **P2**: Prioritization criterion 2
  - High frequency of use of the antimicrobial class for any indication in human medicine, or else high proportion of use in patients with serious infections in health care settings, since use may favour selection of resistance in both settings.

- **P3**: Prioritization criterion 3
  - The antimicrobial class is used to treat infections in people for which there is evidence of transmission of resistant bacteria or resistance genes from non-human sources.
6 pathogens for AMR surveillance

1. Acinetobacter spp
2. E. coli
3. Klebsiella spp
4. Pseudomonas aeruginosa
5. Staphylococcus aureus
6. Enterococcus spp
% of ESBL producers (India)

- Acinetobacter spp: 65%
- E. coli: 61%
- Klebsiella spp: 62%
- Pseud. aeruginosa: 65%

Graph displaying the percentage of ESBL producers for different bacterial species from January to December.
Carbapenem resistance

**Carbepenem resistance (India)**
- **Acinetobacter spp**: 70
- **E. coli**: 12
- **Klebsiella spp**: 51
- **Pseud. aeruginosa**: 42

![Graph showing carbapenem resistance for different bacteria over months from January to December.](image)
Six bacteria are the most deadly antibiotic-resistant bacteria, identified as urgent or serious threats by CDC:

- CRE (carbapenem-resistant Enterobacteriaceae)
- MRSA (methicillin-resistant *Staphylococcus aureus*)
- ESBL-producing Enterobacteriaceae (extended-spectrum β-lactamases),
- VRE (vancomycin-resistant enterococci),
- *Pseudomonas aeruginosa*, carbapenem resistant
- CRAB - carbapenem resistant *Acinetobacter baumanii*
ESBL production

% ESBL producers  Kerala 2017  % ESBL producers  Kerala 2018
% ESBL producers  India

- Acinetobacter spp
- E. coli
- Klebsiella spp
- Pseudomonas aeruginosa
Carbapenem resistance in India
A drowning man will clutch at a straw.

- Thomas More
Genome Note

Genome sequence of a multidrug-resistant *Klebsiella pneumoniae* ST78 with high colistin resistance isolated from a patient in India

Merin Paul a, Lekshmi Narendrakumar a, Arya R. Vasanthakumary b, Iype Joseph a, Sabu Thomas a
*Klebsiella pneumoniae* is an opportunistic bacterial pathogen known for its high frequency and diversity of antimicrobial resistance (AMR) genes. In addition to being a significant clinical problem in its own right, *K. pneumoniae* is the species within which several new AMR genes were first discovered before spreading to other pathogens (e.g. carbapenem-resistance genes KPC, OXA-48 and NDM-1). Whilst *K. pneumoniae*’s contribution to the overall AMR crisis is impossible to quantify, current evidence suggests it has a wider ecological distribution, significantly more varied DNA composition, greater AMR gene diversity and a higher plasmid burden than other Gram negative opportunists. Hence we propose it plays a key role in disseminating AMR genes from environmental microbes to clinically important pathogens.
• Antibiotic utilization data calculated using ATC/DDD method and DOT.
• The main purpose of the ATC/DDD system is as a tool for presenting drug utilization statistics with the aim of improving drug use.
• Use of the ATC/DDD system allows standardization of drug groups and represents a stable drug utilization metric to enable comparisons of drug use between countries, regions, and other health care settings, and to examine trends in drug use over time and in different settings.
We selected Five ICUs of MCH, Trivandrum. They are:

- MICU
- SSB MICU
- NEUROSURGERY ICU
- NEUROSURGERY TRAUMA ICU
- CCU

Collected the data of WHO RESERVE AND WATCH Antibiotics on a daily basis and calculated the DDD &DDD per 1000 Patient days with the help of Microsoft Excel sheet.
Vancomycin Consumption in Various ICUs of MCH, Trivandrum

- MICU(37.07)
- SSB MICU(48.43)
- NEURO Sx TRAUMA ICU(92.9)
- NEURO SURGERY(54.41)
Consumption of Amikacin

- SSB MICU(28.49)
- MICU(62.91)
- NEUROSURGERY
- TRAUMA ICU(12.8)
- CCU(109)
Levofloxacin

- MICU (75.27%)
- SSB MICU (21.3%)
- CCU (49.54%)

- 51%
- 34%
- 15%
Ceftazidime

WHO WATCH DRUG

MICU(13.48) SSB MICU(21.36) NeuroSX Trauma ICU(14.4) CCU(131.86)
Cefoperazone + Sulbactum

- MICU (30.33)
- SSB MICU (44.87)
- NEURO SX TRAUMA (139.07)
- NEURO SX ICU (275.5)
- CCU (156.6)
Piperacillin-Tazobactum
WHO WATCH DRUG

- MICU(266.53)
- SSB MICU(208.82)
- NEURO SX TRAUMA(134.69)
- NEURO SX ICU(99.1)
- CCU(101.3)
Meropenem
WHO RESERVE DRUG

- MICU(133.13)
- SSB MICU(272.03)
- NEURO Sx TRAUMA ICU(197)
- CCU(123.58)
COLISTIN

- MICU(60.67)
- SSB MICU(4.73)
- Neuro SX Trauma ICU(28.84)
- CCU(230.18)

- 71% of patients are in MICU
- 19% of patients are in Neuro SX Trauma ICU
- 9% of patients are in SSB MICU
- 1% of patients are in CCU
TIGECYCLINE
WHO RESERVE DRUG

- SSB MICU(29.92)
- NeuroSX Trauma ICU(25.6)
- CCU(54.95)
TEICOPLANIN WHO RESERVE DRUG

- SSB MICU (19.94)
- Neuro Sx Trauma ICU (4.8)

81%

19%
Low hanging fruit model for Antibiotic stewardship was implemented

- a. Antibiotic prescription for inpatients have to be put under a bracket.
- b. If WHO reserve antibiotics are prescribed, need for the same has to be documented in the case sheet.
- c. If de-escalation is not practiced based on susceptibility report, the reason for the same has to be documented in the case sheet.
- d. Double anaerobic coverage is redundant. If double anaerobic coverage is given, reason for the same has to be documented in the case sheet.
– e. If antibiotics are continued for more than 7 days, reason for the same has to be documented in the case sheet.
– f. If surgical prophylaxis is continued for more than 48 hours reason for the same has to be documented in the case sheet.
– g. If more than two antibiotics are prescribed, reason for the same has to be documented in the case sheet.
THANK YOU
If you can’t fly, then **run**.
If you can’t run, then **walk**.
If you can’t walk, then **crawl**, but by all means, **keep moving**.

- Martin Luther King Jr.