Stewardship initiative: Current status and road ahead

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Infectious Diseases in India

• Huge burden of infectious diseases
  – Malaria, TB, HIV/AIDS, vector borne diseases, Influenza, other outbreaks
  – Diarrhea, pneumonia
  – Hospital acquired infections

• Sanitation conditions, poor infection control practices, malnutrition

• Close animal human interface
**Antibiotic overuse**

- $12.4$ billion pharmaceutical industry
- Regulations over sale of antibiotics
- Unregulated use of antibiotics: H1 schedule is poorly implemented
- Use of antibiotics in livestock, poultry and agriculture

**Evolution of antibiotic resistance is a consequence of selective pressure**
Socio-economic factors

• Self-medication, previous doctors’ prescriptions and leftover medicines from previous illnesses

• Access to antibiotics without prescription, use of pharmacies and informal healthcare providers as sources of healthcare

• Patients come with preconceived ideas and demand quick relief

• Requesting diagnostic investigations resulting in losing their customers

• Diagnostic uncertainty due to the inability to perform investigations leads physicians to prescribe broad-spectrum antibiotics because of the fear of clinical failure

• Incentives offered by pharmaceutical companies to doctors and pharmacists to prescribe new antibiotics
Tackling Antimicrobial Resistance On Ten Fronts

- Public awareness
- Antibiotics in agriculture and the environment
- Surveillance
- Sanitation and hygiene
- Vaccines and alternatives
- Rapid diagnostics
- Drugs
- Human capital
- Global Innovation Fund
- International coalition for action
Antimicrobial Research and Surveillance Network at ICMR

- Nodal centres are focal points for six pathogenic groups:
  - *Enterobacteriaceae* / sepsis
  - Gram negative non-fermenters
  - Enteric fever organisms
  - Diarrhoeagenic organisms
  - MRSA, Enterococcus
  - Fungal pathogens

- 20 regional centers
- Tertiary care hospitals: Government and private corporate hospitals
- Diversity in capacities
Creeping MICs for Ceftriaxone

Ciprofloxacin MIC in µg/ml

No. of isolates

Ceftrixone MIC in µg/ml

No. of isolates
**Enterobacteriaceae**

- *Klebsiella pneumoniae* (49%) was the most common isolate, followed by *Escherichia coli* (32%) and *Enterobacter* species (10%).

- *Escherichia coli*
  - susceptible to colistin, chloramphenicol, amikacin, imipenem, meropenem, ertapenem
  - intermediately susceptible to piperacillin-tazobactam and cefoperazone-sulbactam.

- *Klebsiella* spp were far more resistant
  - susceptibility to colistin, chloramphenicol, doxycycline, amikacin, imipenem
  - intermediate susceptibility to, meropenem, amikacin, ciprofloxacin and ertapenem.
Over 3 years (2014-2016), there has been no significant change in the susceptibility profile of *P. aeruginosa*

Susceptibility for all antibiotics are >70%, where susceptibility to colistin is ~100% and appears promising

*A. baumannii*: Decrease in susceptibility to Cefepime, Aztreonam, Netilmycin, Cefperazone/Sulbactam and Tetracycline were observed (~5%)

*Carbapenem* susceptibility is decreasing 5 – 10% every year
Gram positives

• MRSA has steadily decreased over the last 3 years from 37% in 2014 to 34% in 2015 and 28% in 2016, 23.5% in 2017
• VRE rates have also shown a declining trend from around 7% in 2015 to about 4% in 2016.
• CoNS emerging as major nosocomial pathogen: S haemolyticus and S epidermidis
• Significant creep in MIC values of VAN, LIN and TIG
• High prevalence of hVISA as revealed by the population analysis profile, highest rates seen in ICU isolates and in 2017, suggesting a cumulative effect of overuse of vancomycin in the hospital setting
• Vancomycin resistance as expected was 3 times higher in E.faecium when compared to E.faecalis
• Overall glycopeptide resistance in Enterococci from <15% to near 30% over the same period.
Antifungal resistance

• Fluconazole resistance was highest *C. tropicalis* and also in *C. albicans*

• *C. tropicalis* against fluconazole (5%), and caspofungin (5.7%)

• Voriconazole resistance was noted in 13.2% of *C. albicans*.

• *C. glabrata* exhibited 11.8% resistance to micafungin, 8.8% to caspofungin followed by 6.1% to posaconazole.

• *C. krusei* had 5.6% resistance to anidulafungin

• Outbreaks of Aspergillus and *C. auris* in hospitals
Antibiotic pressure is major driver of resistance
Use of broad spectrum antibiotics has increased between 2000-2015
- Penicillin consumption remained constant
- Use fluoroquinolones decreased
- Increased use of third generation cephalosporins
  - With increasing quinolone resistance, cephalosporins are used as empiric choices
  - Third generation cephalosporins being substituted for penicillins
  - Lack of widespread availability of narrow spectrum agents like first generation penicillins
Six strategies for combating AMR needed in national antibiotic policies

1. Reduce the need for antibiotics through improved water, sanitation, and immunization

2. Improve hospital infection control and antibiotic stewardship

3. Change incentives that encourage antibiotic overuse and misuse to incentives that encourage antibiotic stewardship

4. Reduce and eventually phase out subtherapeutic antibiotic use in agriculture

5. Educate health professionals, policy makers, and the public on sustainable antibiotic use

6. Ensure political commitment to meet the threat of antibiotic resistance
WHAT IS ANTIBIOTIC STEWARDSHIP?

“Coordinated interventions designed to improve and measure the appropriate use of antimicrobial agents by promoting the selection of the optimal antimicrobial drug regimen including dosing, duration of therapy, and route of administration”

The Society for Healthcare Epidemiology of America (SHEA), The Infectious Diseases Society of America (IDSA) and the Pediatric Infectious Diseases Society (PIDS)
Key objectives of Antimicrobial stewardship

- Prescribers follow local evidence based antibiotic policies
  - Ensure patient receives optimal treatment
  - Protect effectiveness of broad spectrum antibiotics by restricting their use
  - Reduce inappropriate use of antibiotics for self limiting infections such as coughs and colds
  - Ensure health care professionals, patients and public understand the need to use antibiotics prudently
‘AID stewardship model’

Patient with potential infectious problems

DSP
- Performing medical diagnostics
  - Bacterial identification
  - Viral identification
- Starting empiric antimicrobial therapy
- Case audit to optimise therapy

ISP
- Successful management of infectious problem

ASP
- Local resistance pattern
  - Automatic email alert /automatic stop order
  - Antimicrobial order from clinical pharmacy
- Local formulation
  - Antimicrobial order from clinical pharmacy

Integrated system of ASPs, Infection Prevention Stewardship Programs (ISP) and Diagnostic Stewardship Programs (DSP)

Improved Diagnostics Stewardship

- Diagnostics must be appropriate for the individual patient, target all pathogens causing acute infections and detect colonization and/or infection.
- Helping individual physicians in selecting and interpreting diagnostic tests on the appropriate clinical specimens.
- Diagnostic uncertainty, difficult for clinicians to know when to provide and when to withhold antibiotic treatment.
- Time critical results will facilitate early management of life threatening infections.
- Opportunity for including novel comprehensive diagnostic tools (molecular, multiplex, point of care) will provide results much faster personalized therapy, do not replace blood cultures.
Infection Prevention Stewardship Program

- Right infection control measures in order to provide a safe environment for patients and healthcare workers
- Infection management is responsibility of all stakeholders
- Without the proper infection prevention measures, other interventions such as ASPs and DSPs will not yield the optimal effect
- Optimal therapy for individual patients but also for infection control and prevention purposes
- Early detection and close surveillance of MDROs, as well as an adequate rapid reaction to every possible transmission
- Organising units of infection control and prevention and medical microbiology within one single department provides opportunity for maximal collaboration
- Work closely with the internal medicine department and the hospital pharmacy
AMSP workshops

- Four workshops: Delhi, Mumbai, Kolkata, Chennai
- Led by ID physicians
- 30 medical colleges/hospitals both Govt and Private
- More than 150 staff trained
ICMR-AIIMS-CDC Collaboration under GHSA

- Objectives of the collaboration:
  - Strengthen healthcare facility IPC programs based on gaps identified through standardized assessments
  - Implement standardized surveillance of HAIs caused by AMR pathogens
  - Enhance laboratory surveillance of priority AMR pathogens using externally quality-assured data
  - Improve capacity to respond to outbreaks of AMR infections related to healthcare delivery
Next steps

• Improve infection control
• Improve diagnosis
• Strengthen the AMSP: ICMR project being implemented