EHA CLINICS

ACADEMY

**A WEBINAR :**

# THE PHARMACISTS' ROLE IN ANTIMICROBIAL RESISTANCE, EDUCATION & STEWARDSHIP

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# Overview

Pharmacists are drug experts

With the menace of anti-microbial resistance, there is need for antimicrobial stewardship

01 The evolving landscape of antimicrobial resistance

02 Pharmacists' pivotal role in antimicrobial stewardship programs

03 Strategies for educating health professionals and the public about antimicrobial resistance

04 Collaborative approaches to combat antimicrobial resistance at local and global level

Ralia, a 32-year-old lady presented to the hospital with symptoms of cough, and was diagnosed with Respiratory Tract Infection. She had been consuming multiple antibiotics as advised by her aunt in the last 2 weeks. Upon successful initiation of appropriate antibiotic therapy by her doctor(after appropriate lab investigations), she was good.

She hurried to the nearest drugstore and purchased the exact antibiotics her doctor had earlier prescribed.

However, her symptoms only got worse as she could hardly contain the breathing difficulty she experienced.

The last resort was to re-visit her Physician. Laboratory investigations confirmed multiple antibiotic resistance. Ralia's case was that of multiple

# WHAT ARE ANTIBIOTICS


- The word “antibiotic” signifies “against life.”
- Technically, an antibiotic (anti-microbial) is any medicine that kills microorganisms or germs.

Generally, antibiotics fight infections. caused by bacteria in humans and animals, through their bacteriostatic and bacteriocidal actions.

# WHAT IS DRUG ABUSE

- Drug abuse is the use of illegal drugs or the use of prescription or over-the-counter drugs for purposes other than those for which they are meant to be used, or in excessive amounts
- Drug misuse is defined as the use of a substance for a purpose not consistent with legal or medical guidelines
- Drug misuse, abuse, overuse, and/or even under-use, this menace comes with many consequences and carries a number of implications on global health.

# STATISTICS

- In Nigeria, studies showed that the prevalence of antibiotic use among hospitalized patients ranged from 62.4 to 78.2%
- At the community level, up to 75% of antibiotic used in both humans and animals are of unproven clinical relevance
- According to the Centers for Disease Control and Prevention, about one-third of antibiotic use in people is not needed nor appropriate. Total inappropriate antibiotic use, inclusive of unnecessary use and inappropriate selection, dosing and duration, may approach 50% of all outpatient antibiotic use.
- An important driver which is prevalent in low and middle-income countries (LMICs) with a high disease burden and inadequate access

# ANTIMICROBIAL RESISTANCE

- One of the biggest challenges with antibiotic abuse is the startling rise of antimicrobial resistance (AMR), as a leading health menace in the 21st century
- AMR happens when bacteria, viruses, fungi, and parasites mutate and become less susceptible to existing treatments.
- Bacterial antimicrobial resistance (AMR)—which occurs when bacteria undergo genetic changes that make them less sensitive to elimination by drugs, causing the drugs used to treat infections become less effective.
- The WHO reported 4.95 million deaths annually, associated with AMR, globally. However, the burden of the drug-rsistant infections weighing heavily on low and middle income countries.

**The Pharmacists' Role in Antimicrobial Resistance Education & Stewardship**

# Clinically Important Examples

**Multi-drug resistant organisms exist, such as:**

01 **Methicillin-resistant Staphylococcus aureus**

02 **Vancomycin-resistant Staphylococcus aureus**

03 **Clostridum spp.**

04 **Neisseria spp.**

# MECHANISMS OF ANTIMICROBIAL RESISTANCE

The problem here isn't about intrinsic resistance because living organisms naturally devise defense mechanisms on first/perceived attack. The issue however, is acquired resistance.

Four main mechanisms of AMR in bacterial cells exist, including:

- **Drug Enzymatic Inactivation:** Production of Beta-lactamase (Gram-negative bacteria) and Penicillin Binding Proteins of Gram-positive bacteria.
- **Decreased antibiotic permeability/efflux**: macrolides and hydrophilic molecules like Tetracycline, and fluoroquinolones.
- **Drug target modification**: Mutation in genes encoding fluoroquinolones of bacterial DNA gyrase and topoisomerase 1V.
- **Global Cell adaptation:** Daptomycin (prevention of DAP-mediated disruption of bacterial cell wall homeostasis.

# KEY ACCELERATORS OF AMR

- **Microbial mutagenic transfer and evolution**
- **Conflicting interests due to financial gains**
- **Anti-microbial abuse/misuse:** Self-medication,Unnecessary drug/ drug not needed,wrong dosing/duration
- **Lack of adequate follow-up**
- **Knowledge gaps about AMR data/statistics and trends**
- **Lack of proper laboratory investigation systems**
- **Agricultural consumption of antibiotics**
- **Poor quality, easily accessible antibiotics**

# KEY ACCELERATORS OF AMR

- Lack of antimicrobial stewardship training
- Misinformation / poor pharmaceutical counselling
- The need for novel antibiotics/slow replacing
- Inadequateunderstanding of the pathogen-drug combination e.g. MRSA, MDRTB, and MDR-GNB

# Impact/Challenges of AMR

Increasingly difficult to treat infections.

Antibiotic resistance has been reportedly estimated to cause around 300 million premature deaths by 2050,

Decreased capacity to fight off infections especially immunocompromised patients in transpants, chemotherapy, dialysis etc.

Limited alternative therapeutic options for AMR infections resulting in significant morbidity and mortality.

High financial impact

AMR has been proposed to cause a loss of up to $100 trillion to the global economy by 2050.

# Recommendations

- Robust surveillance systems, pharmacovigilance, feedback systems for education, and information collation/dissemination, for reforms.
- People enlightenment regarding the use, and likely hazards of antibiotics

1. Self-medication
2. Unnecessary administration/drug not needed
3. Inappropriate (lengthy/brief) dosing/duration

- Inculcation of antimicrobial stewardship as part of the curriculum at the undergraduate and postgraduate levels.
- Antibiotic dispensing reforms: labeling antibiotics as POMs and enforcement of laws against their dispensing by non-pharmacists.
- Regulations against agricultural use of antibiotics; a study in the United States revealed that 80% of the antibiotics sold are put into livestock feed.

# ANTIMICROBIAL STEWARDSHIP

Preserving antibiotics...

# Antimicrobial Stewardship

- It has been reported that MDR bacteria kill around 700,000 people globally in a year.
- Antimicrobial stewardship are concerted clinical intervention designed to enhance the right selection, use, dosing, duration, and route of administration.
- AMS programs aim to preserve antibiotics from abuse and misuse, reduce resistance rates, improve clinical outcomes, prevent local disease spread from MDR microbial agents, and reduce financial impact.

# Goals of Antimicrobial Stewardship

1. To practice the 5 D’s of antimicrobial therapy
2. To prevent antimicrobial overuse, misuse, and abuse in inpatients, outpatients, the community, and the agriculture industry
3. To reduce antibiotic-related adverse effects, for example, C.difficile
4. To minimize resistance and preserve antibiotics
5. To reduce healthcare-associated costs

The Pharmacists' Role in Antimicrobial Resistance Education & Stewardship

# 5 D’s of Anti-microbial therapy

Right
**Drug**

Right
**Dose**

Correct
**Drug Route**

Correct
**Duration**

Tmely
**De-escalation**
to

pathogen-directed

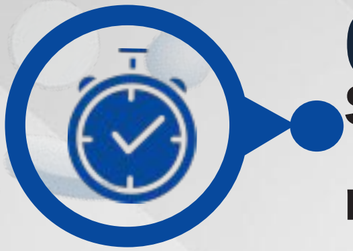
# Antibiotic De-escalation

Antibiotic de-escalation (a critical part of AMS) is a convergent approach where multiple antibiotics for empirical therapy are stopped within 48- 72 hours of initiation, on the grounds of culture results.

This is common for patients under intensive care (increased use of an antibiotic increases resistance to that class of antibiotic) or battling sepsis.

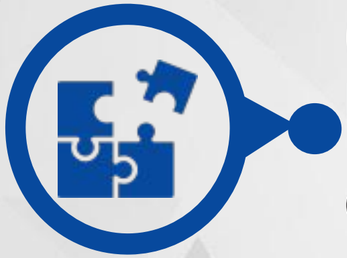
In ADE, broad-spectrum exposure is narrowed to decrease the empiric antibiotic load.

# Benefits of antibiotic De-escalation



**01**

**Stoppage of antimicrobial actions for pathogens unidentified in test results**



**02**

**Decrease in adverse drug events, dose dumping, drug interactions etc.**

**03**

**Reduction in hospital stay, and improved clinical outcomes**

**04**

**Protection of patient's microbiome due to streamlined therapy. It also allows for precise TDM.**

# Antibiotic De-escalation

(contd.)

**Unintended drawbacks include:**

- Extension of antimicrobial course
- Undue exploitation/inadvertent misuse of broad-spectrum antibiotics

**Recommendations:**

- Automatic/ rapid diagnostic tests
- Sequential ADE or switching

# Antibiotic De-escalation: Pivotal and companion Antibiotics

Pivotal antibiotics are critical to the therapy, which is typically a beta-lactam antibiotic (with Gram-negative activity).

Companion antibiotics broaden the spectrum of the pivotal antibiotic, such as anti-MRSA drugs e.g daptomycin.

For patients with positive cultures, it is suggested to perform ADE within 24h of culture results, and previous studies reported ADE is common in patients with microbiological established infections.

However, for negative results, alternative non-infectious

# Elements of Hospital Antibiotic Stewardship Programs

- Hospital Leadership Commitment: Dedicate necessary human, financial, information and technology resources.
- Accountability: Appoint a leader or co-leaders, such as a physician and pharmacist, responsible for program management and outcomes.

- Pharmacy Expertise (previously “Drug Expertise”): Appoint a pharmacist, ideally as the co-leader of the stewardship program, to help lead implementation efforts to improve antibiotic use.

- Action: Implement interventions, such as prospective audit and

# Elements of Hospital Antibiotic Stewardship Programs

- Tracking: Monitor antibiotic prescribing, impact of interventions, and other important outcomes, like C. difficile infections and resistance patterns.

- Reporting: Regularly report information on antibiotic use and resistance, to prescribers, pharmacists, nurses, and hospital leadership.
- Education: Educate prescribers, pharmacists, nurses, and patients about adverse reactions from antibiotics, antibiotic resistance, and optimal prescribing.

**The Pharmacists' Role in Antimicrobial Resistance Education & Stewardship**

# Pharmacists in Health care

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**Medication Dispensing/Review**: Pharmacists ensure antibiotics' conformity to guidelines, and review patients' medication profiles to identify potential drug interactions, allergies, and duplications.

**Education and Counseling:** Pharmacists educate patients about compliance and the consequences of non-compliance. They explain potential adverse effects and when to seek medical attention if adverse reactions occur.

**Collaboration with Health Care Providers:** These collaborations guarantee that antibiotics are prescribed only when necessary. They can recommend alternative treatments or narrow-spectrum antibiotics when appropriate, contributing to the overall goal of antibiotic stewardship.

**Monitoring and Surveillance:** Pharmacists play a role in monitoring and reporting antibiotic usage patterns within health care facilities, helping to identify trends and

# Role of Community Pharmacists

- Availability of Pharmacists on the premises of practice
- Pharmacists must  undergo continuous quality improvement
- Medication reconciliation to identify discrepancies in medication regimens, and provide patient education regarding proper dosages and adherence
- Monitor patient response to medications
- Educating Pharmacy assistants on AMR and potential hazards.
- Guide patients in antibiotic selection.
- The pharmacist should be wary of the unregulated use of antibiotics by livestock rearers.
- The Pharmacist should frown at “mixing” antibiotics/polypharmacy.
- Pharmacists should embrace an antibiotic-preserve approach, and encourage members of the team to do likewise.

# Role of Pharmacists in Educating Health Professionals

- Pharmacists should study the trend of frequently prescribed antibiotics, and provision of current and effective trends in antibiotics prevention patterns to the physicians: the pharmacist must be a lifelong learner.
- Pharmacists should vet every prescription containing antibiotics, provide relevant information on potential interactions, optimal duration, specific pharmacovigilance reports, and therapeutic drug monitoring
- The pharmacist should assist the physician where necessary to design patient-specific antibiotic choices based on past drug history and/or info gathered from pharmaceutical counseling.
- The Pharmacy unit can organize seminars, and presentations, to educate other members of the healthcare team.
- At all times, the pharmacist should be antibiotic preserving conscious, devising

# Broad interventions

Antibiotics Time out

Prior Authorization

Prospective Audit and Feedback

# AMS Programs

The sustainability of the antibiotic stewardship program weighs heavily on specific pharmaceutical interventions. The goal of the intervention is for continued feedback that fuels AMS. This will require data (antibiotic formulary, lab works, susceptibility patterns) made available to the physician for informed clinical decisions. In turn, the pharmacist becomes a go-to professional.

Antimicrobial Stewardship programs take on a collaborative approach for maximum results. They may present in different formats but the goal is always the same: To preserve the imminent extinction of existing antibiotics.

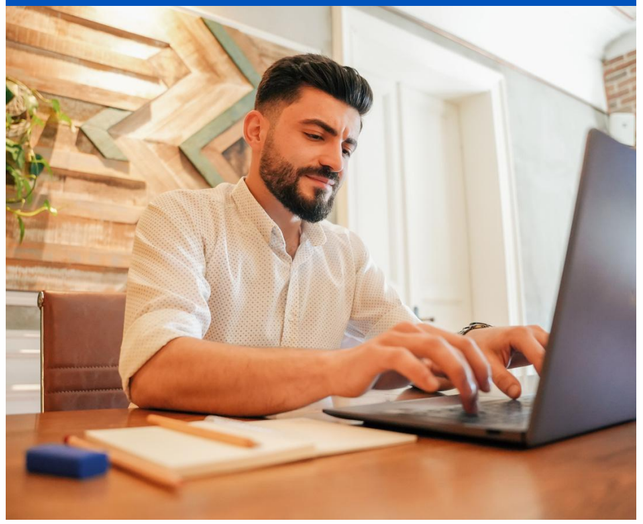
This has become even more necessary with the gapping but comparable decline in the number of new antibiotic molecules and the rate at which older antibiotics

# Practical Pharmaceutical Interventions

## Antimicrobial monitoring #1

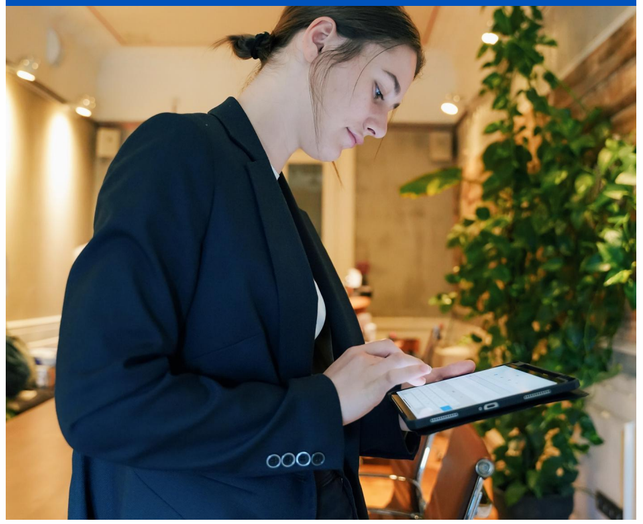
Discontinuation after 48-72 hours of microbial culture and nil growth. Continued therapy for positive microbial growth

## Antimicrobial reassessment #2



Cease taking antibiotic 1-2 days after infection ceases

## Antimicrobial selection #3



Choice of sensitive antibiotic based on lab results, patient’s history, potential drug interaction, adherence

# Practical Pharmaceutical Interventions

## Antimicrobial administration #4

What route of antimicrobial administration? IV, IM, oral etc

## Antimicrobial preservation #5

Avoidance of long course of antibiotics, limiting the use of BS antibiotics.

## Antibiotic Advocacy #6

Insisting on relevant culture and sensitivity tests, prior to antibiotics use.

# Practical Pharmaceutical Interventions

## Exploring Pharmacokinetic/Pharmacokinetic profiles

The PD/PK properties of certain drugs can be optimised to maximise pharmacologic outcomes. Example in S. aureus mediated-resistance in in Vancomycin. Since the antibiotic is reportedly inadequate in obese patients.

Pharmaceutical intervention involves understanding and exploiting vancomcin’s PK/PD

# Collaborative Approaches to Combating

## Antimicrobial Resistance

## Locally

**The Pharmacists' Role in Antimicrobial Resistance Education & Stewardship**

In-Pharmacists' collaborations: Shared learning

Organizing events with practical means of preaching the gospel of AMR and AMS.

Establishing patient-specific AMS records, and record logs.

Right knowledge of the empiric use of antibiotic

Exploring the pill-count system (patients on multiple antibiotics, & chronic infections)

Influence,advocacy, and public enlightenment using the media.

Conducting surveys on prescribing patterns, and susceptibility patterns

Enactment of regulations of antibiotics' sales in patent medicine stores.

Implementing policies that will optimize antibiotic use, and adherence to antibiotic guidelines

Diversification and specialisation: infectious diseases-clinical pharmacists

Organising seminars on current resistance patterns, geographical susceptibility trends

More Pharmacists-directed antibiotic stewardship programs (ASPs) and interventions.

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# Collaborative Approaches to Combating

## Antimicrobial Resistance

## Globally

**The Pharmacists' Role in Antimicrobial Resistance Education & Stewardship**

Global health bodies-sponsored AMR-focused research and AMS advocacy

Global AMR resource banks with rich, updated legion-specific data, (free of cost to health providers).

Exploring programs and initiatives that spurs pharmacists' involvement across all specialties

Pharmacists should champion World Antibiotic Awareness Week (WAAW) observed in November annually

Designing more targetted antimicrobial delivery systems; this will also discourage dose-dumping.

Exploring policies that strictly classes certain antibiotics as strictly **POMs**

Instituting antibiotics order forms, antibiotics time-outs for hospitals systems

Pharmacists should champion World Antibiotic Awareness Week (WAAW) observed in November annually

# Global Collaborative Approaches

## Global Practices

- The CDC reportedly developed an Antibiotic Use (AU) option as a part of the National Healthcare Safety Network(NHSN).

- AU automatically collects data and monthly reports for the duration of therapy data and is later analyzed in aggregate by specific agents and patient care locations.

- The AU module is available to facilities with the capability to submit electronic medication administration records.

- This approach can be adopted on a local level by ensuring healthcare facilities are networked together electronically, to submit periodic inventories of antibiotics dispensed

- This is a big step in antibiotic stewardship as it ensures monitoring and control of the antibiotics logistics chain

# Barriers/Challenges to the AMS program

- Ineffective follow up/ lost to follow up
- Uncontrolled infection sources
- Lack of patient-specific information
- Lack of robust laboratory systems for RDTs
- Poor adherence
- Lack of adequate pharmaceutical care

# Benefits of AMS

80%

REDUCTION IN TREATMENT FAILURE

## Statistics

Fishman demonstrated that infections subject to the guidance of an AMS program exhibited a remarkable 70% improvement in successful treatment outcomes.

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# THANK YOU

for your Attention