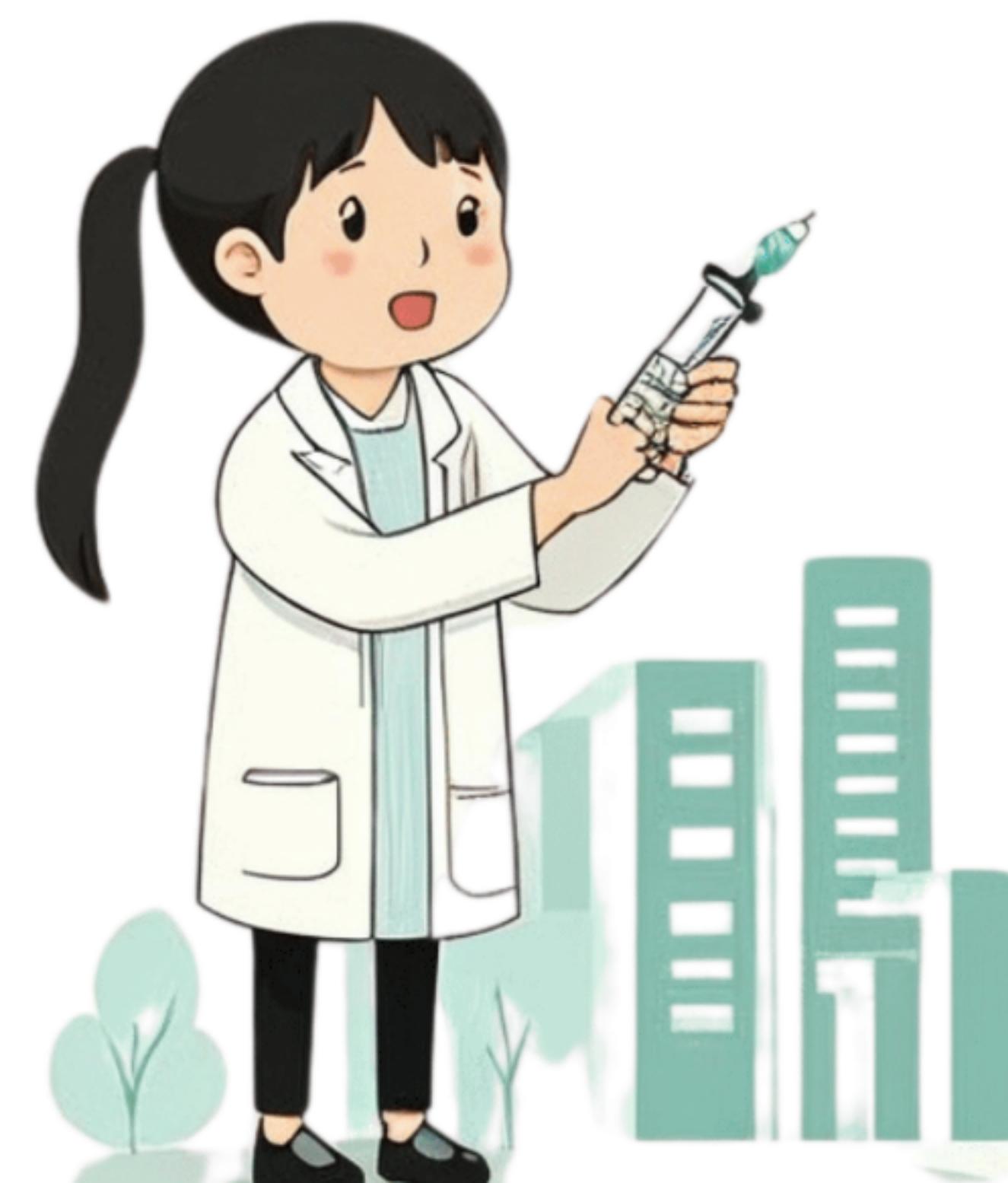


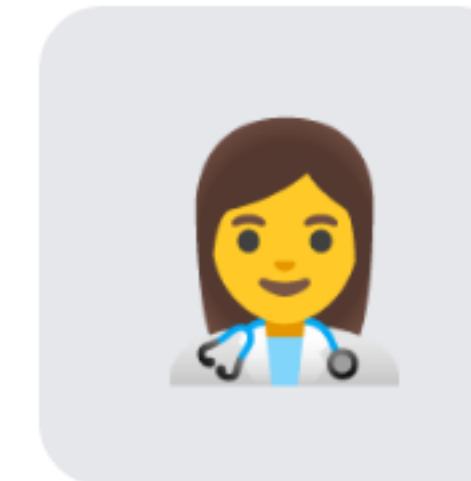
Basics of Antimicrobial Stewardship in Hospitals



Ugwuja Anthony C. →

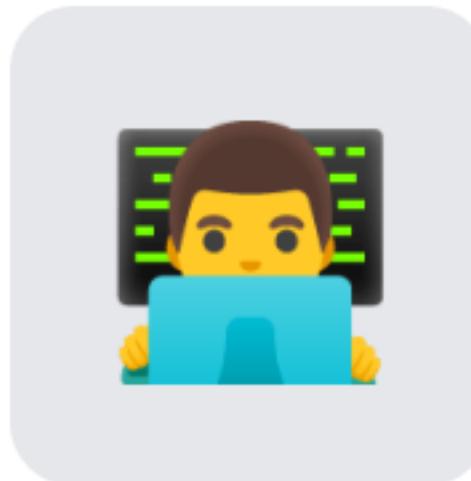


Team Members



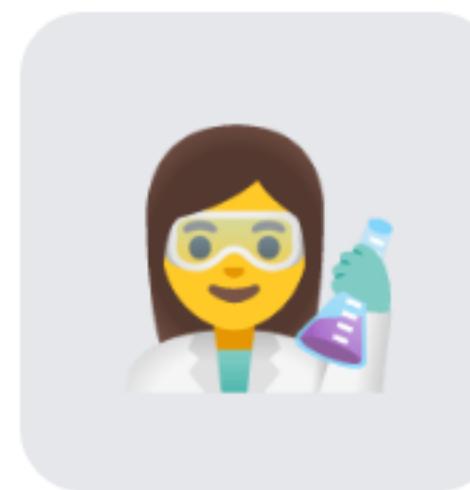
Pharm. Nenzarmwa Makan

Preceptor



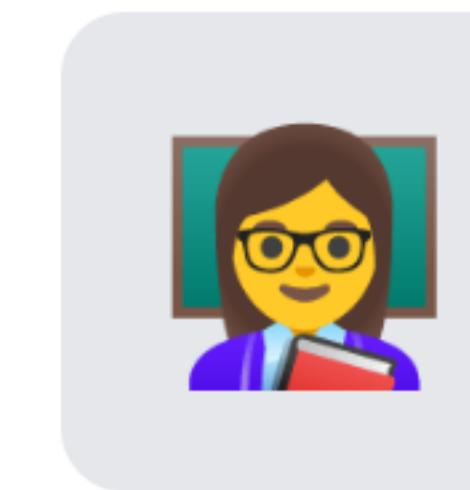
Pharm. Ugwuja Anthony

Presenter



Pharm. Bara'atu Junaidu

Supervisor



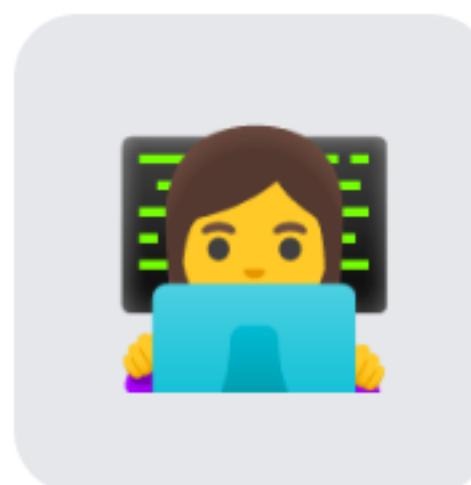
Pharm. Abubakar Hussaini

Supervisor



Pharm. Rita Ohyoma

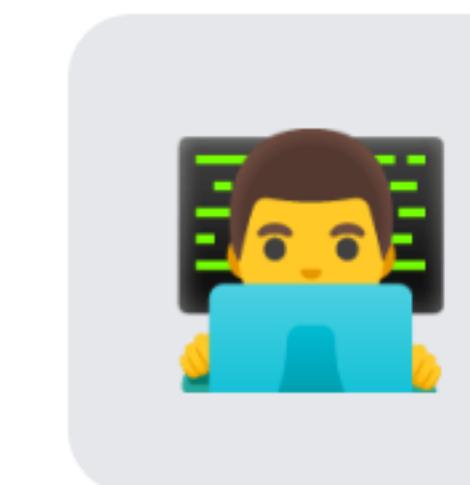
Supervisor



Pharm. Dapan Pankwat

Livinus

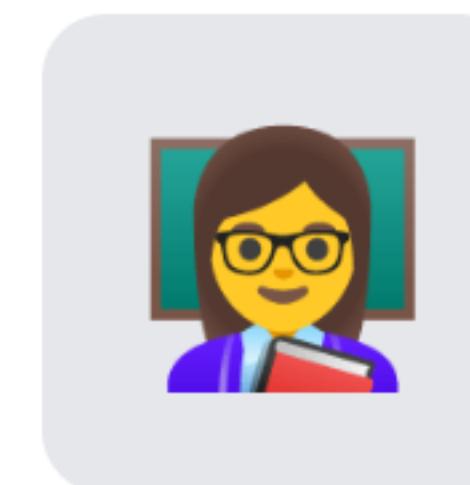
Member



Pharm. Ugwu

Blessing

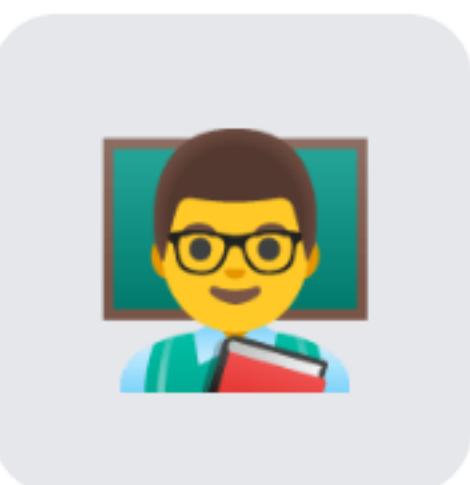
Member



Pharm. Rabiat

Abdulrazzaq

Member



Pharm. Ugwu

Stanley

Member

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INTRODUCTION

What is Antimicrobial?

Antimicrobials are agents that either kill microorganisms (biocidal effect) or inhibit their growth (biostatic effect).

While antimicrobials include agents that act against viruses, fungi, parasites, and bacteria, this presentation focuses on **bacterial infections** and the use of **antibiotics**, which are the most commonly misused and most affected by resistance.

Gram-Positive vs Gram-Negative Bacteria

Bacteria are broadly classified into: **Gram-positive** (e.g. *Staphylococcus aureus*) and **Gram-negative** (e.g. *E. coli*, *Klebsiella*) based on their cell wall structure.

- **Gram-Positive:** Thick peptidoglycan wall, no outer membrane.
- **Gram-Negative:** Thin wall + outer membrane; often more resistant due to efflux pumps & enzymes.

Major Organisms that Pose Serious Threat to Current Antimicrobial Therapies

Gram-Negative Bacteria

Critical urgent threats

**Carbapenem-resistant Enterobacteriaceae (CRE)
(e.g. *K. pneumoniae*, *E. coli*)**

Resistant to nearly all beta-lactams, including carbapenems

Pseudomonas aeruginosa

Often resistant to multiple drug classes

Extended-Spectrum Beta-Lactamases (ESBL)-producing Enterobacteriaceae

Inactivate 3rd-gen cephalosporins

Gram-Positive Bacteria

High Priority

MRSA (Methicillin-resistant *Staphylococcus aureus*)

Resistant to most beta-lactams

VRE (Vancomycin-resistant Enterococci)

Resistant to vancomycin, often multidrug-resistant

Drug-resistant *Streptococcus pneumoniae*

Resistance to penicillin, macrolides

Other Emerging Threats

Neisseria gonorrhoeae

Resistance to fluoroquinolones, cephalosporins, azithromycin

***Salmonella* (including Typhi)**

MDR and extensively drug-resistant (XDR) strains

***Mycobacterium tuberculosis* (MDR-TB, XDR-TB)**

Resistance to rifampicin and isoniazid (MDR); fluoroquinolones and injectable drugs (XDR)



These resistant organisms challenge treatment
and highlight the urgent need for
Antimicrobial Stewardship
to preserve antibiotic effectiveness.

What is Antimicrobial Stewardship (AMS)?





Antimicrobial Stewardship (AMS) is a coordinated program involving healthcare teams (multidisciplinary) that seeks to promote;

- The **appropriate use** of antimicrobials
 - **Improves patient outcomes** through optimized treatment
 - Helps **reduce antimicrobial resistance**
 - Limits the **spread of infections** from multidrug-resistant organisms
- 

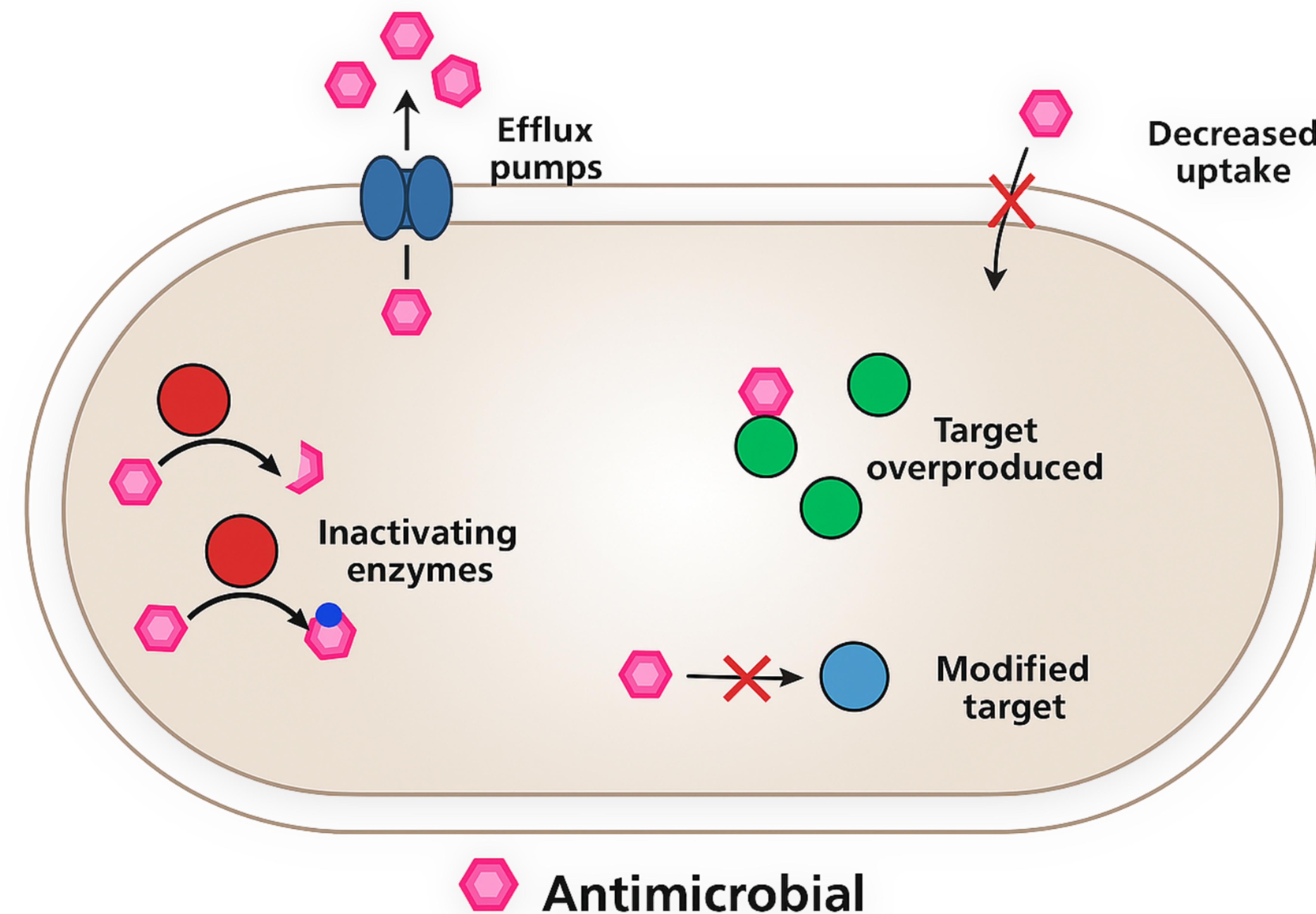
Antimicrobial Resistance (AMR)

- **Antimicrobial Resistance (AMR)** occurs when bacteria, viruses, fungi and parasites no longer respond to antimicrobial medicines (WHO).
- **1.27 million deaths** directly attributed to drug-resistant infections in 2019; **~5 million deaths** associated overall (Murray et al., 2022).
- In **Nigeria alone**, ≈263,000 AMR-related deaths in 2019 surpassing malaria and respiratory infections locally (Murray et al., 2022).

- Resistance mechanism

- ◆ **Efflux pumps:** Bacteria actively expel antimicrobials to lower intracellular concentration.
- ◆ **Decreased uptake:** Reduced drug entry prevents antimicrobial action.
- ◆ **Inactivating enzymes:** Enzymes chemically destroy or modify the drug.
- ◆ **Target overproduction:** Excess target dilutes drug effectiveness.
- ◆ **Modified target:** Mutation alters the drug's binding site.

Antimicrobial Resistance (AMR) cont'd...



Leading Causes of Antimicrobial Resistance (AMR)

- Overuse and Misuse
- Agricultural Use
- Infection Control
- Innovation Gap

Principles of Antimicrobial Stewardship

**Appropriate Use of
Antimicrobials**

**Policy and Guideline
Development**

Multidisciplinary Collaboration

Education and Awareness

**Audit and Feedback
Mechanisms**

Surveillance and Monitoring

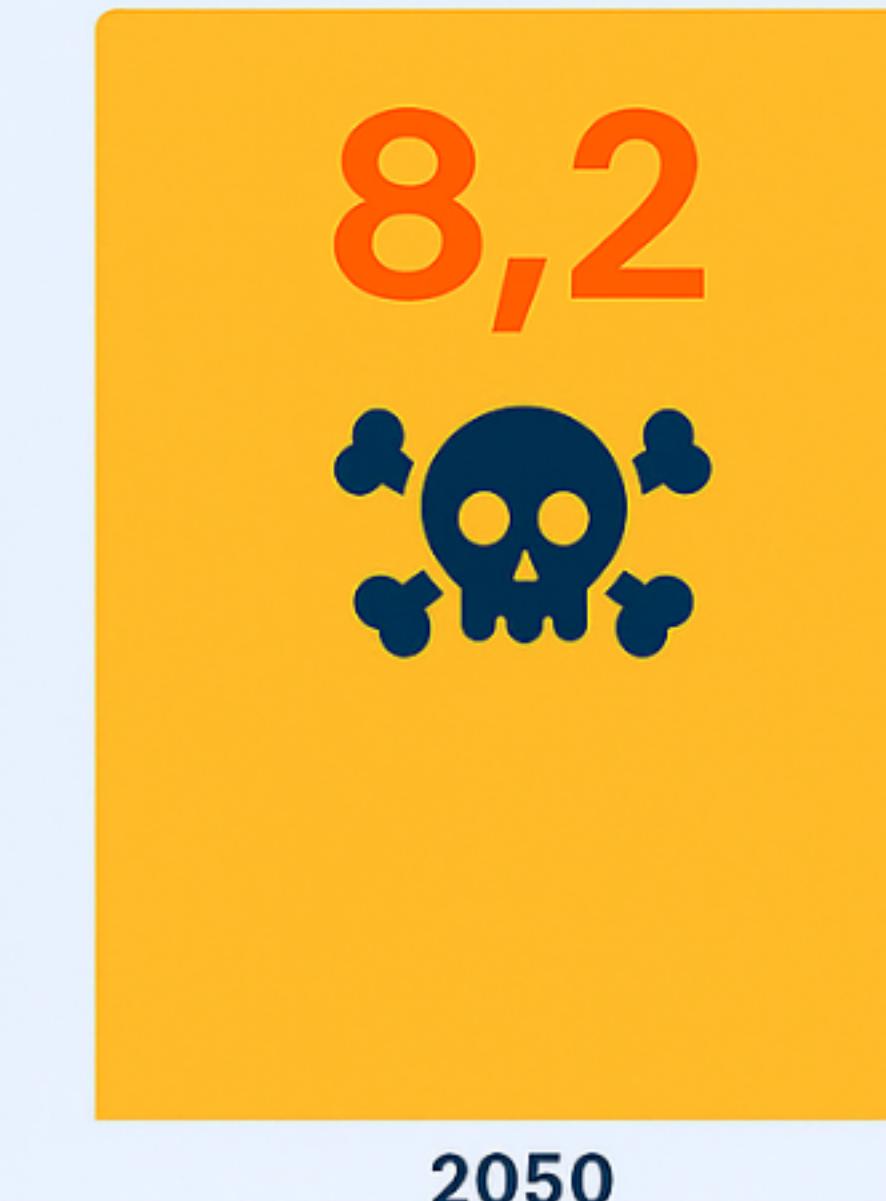
Why AMS Matters in the Hospitals

- 4.7 million deaths as at 2021 associated with bacterial AMR globally
- 8.2 million deaths by 2050 if unaddressed
- 50–70% of hospitalized patients receive antimicrobials (WHO)
- Increasing local AMR rates leading to **hard-to-treat infections**
- **Resource constraints:** ICU beds, lab diagnostics
- **Economic pressure:** Costs of last-line drugs and extended stays
- Alignment with Nigeria AMR National Action

ANTIMICROBIAL RESISTANCE

The next global health crisis?

Millions of related deaths:



ISGlobal

Historical Evolution of Antimicrobial Stewardship Programs (ASPs)

- 1940s: Sir Alexander Fleming warned about emerging antibiotic resistance
- 1996-97: Term "Antimicrobial Stewardship" was coined by McGowan & Gerding; Incorporated into IDSA guidelines.
- 2007: IDSA formally endorse Hospital ASPs as a core strategy.
- 2009 to 13: CDC launched US national stewardship initiatives (Education -> Formal Strategy).
- 2016: WHO and UN General Assembly endorsed global Antimicrobial Stewardship Programs (ASP); WHO issues toolkits.
- Mid-2010s Onwards: Accreditation bodies and governments (e.g., EU 2017) mandate ASPs globally.

Nigeria National Antimicrobial Resistance (AMR) Response

- 2017-22: Launch of 1st National Action Plan (NAP-1.0) on AMR (One Health: Human, Animal and Environment.).
- NAP-1.0 Mid-term Review: ~44% activities completed; Gaps identified (e.g., weak environmental/agricultural involvement).
- Oct 2024: Launch of NAP-2.0 (2024-2028) - Aligns with UN/Global Health Security.
- **NAP-2.0 Priorities:**
 - Strengthen ASPs
 - Enhance AMR Surveillance
 - Promote Research
 - Bolster Health Systems (One Health)

ASP Implementation in Nigeria Hospitals so far

- Only 13% to 35% of Nigerian tertiary hospitals have formal ASP teams/committees (Ohaju-Obodo et al., 2020).
- Critical gaps exist: ~24% have local treatment guidelines and only ~12% enforce mandatory antibiotic review/approval.
- Pharmacists commonly perform ad-hoc stewardship (e.g., prescription review) despite lacking formal ASP programs (Ogunnigbo et al., 2021).
- Key barriers: Insufficient AMS training, shortage of Prof-specialized pharmacists, and weak administrative support.
- Nigeria hospitals show "significant inadequacies" in ASP implementation.

WHO AWaRe Classification for Antimicrobials/Antibiotics

- WHO groups antibiotics into Access, Watch, and Reserve to guide usage.

Access Group

First-line narrow-spectrum

1. Amoxicillin (e.g., Amoxil®)
2. Cotrimoxazole (Septrin®)
3. Nitrofurantoin (Macrodantin®)
4. Cloxacillin (Cloxapen®)
5. Benzylpenicillin (Crystapen®)

Watch Group

Higher resistance potential

1. Co-amoxiclav (Augmentin®)
2. Ciprofloxacin (Ciprotab®)
3. Ceftriaxone (Rocephin®)
4. Azithromycin (Zithromax®)
5. Cefuroxime (Zinnat®)



Classified as Watch due to ESBL risk

Reserve Group

Last-resort agents

1. Meropenem (Meronem®)
2. Colistin (Colimycin®)
3. Linezolid (Zyvox®)
4. Vancomycin (Vancox®)
5. Tigecycline (Tygacil®)



Restricted use (requires consultant approval)

AMS Techniques

Front-End Interventions

Pre-Authorization Strategy



Approval Required Before Prescribing

Who approves:

- Medical Doctor
- Pharmacist

Pros:

- ✓ Immediate control of high-risk drugs
- ✓ Prevents inappropriate use upfront

Cons:

- ✗ May delay therapy in emergencies
- ✗ Adds administrative burden

Back-End Interventions

Audit & Feedback Strategy



Review After Antibiotic Initiation

Who reviews:

- Pharmacist
- Stewardship team

Pros:

- ✓ Prescriber autonomy preserved
- ✓ High educational value

Cons:

- ✗ Labor-intensive
- ✗ Slower impact (48-72h)

Evidence and Outcomes

- Both strategies are core components of ASPs
- **Hybrid models are common:**
- Pre-authorization works well for Reserve drugs
- Audit/feedback is usually practiced on broad-spectrum use
- Studies show reduced resistance and improved prescribing behavior

The “4 Ds” of Antimicrobial Prescribing

- The 4Ds of Antimicrobial Prescribing is simply the appropriate use of antimicrobial with respect to the drug, dose, duration and diagnosis.

1. Right Drug

- Select the most targeted antimicrobial/antibiotic for the infection.
- Avoid broad-spectrum agents unless absolutely necessary.
- Consider local resistance patterns and patient allergies.
- *Example: Use nitrofurantoin for uncomplicated urinary tract infections instead of a fluoroquinolone like ciprofloxacin.*

2. Right Dose

- Tailor the dose to:
- Patient weight
- Renal and hepatic function
- Severity of infection
- Underdosing risks treatment failure; overdosing risks toxicity.
- *Vancomycin dose reduced to once daily in a patient with kidney impairment to prevent toxicity.*

The “4 Ds” of Antimicrobial Prescribing cont’d...

3. Right Duration

- Prescribe for the shortest effective course possible.
- Overly long durations increase risk of resistance and side effects.
- Reassess therapy at 48–72 hours and adjust based on clinical response.
- *Example: Community-acquired pneumonia often requires 5–7 days, not 10+.*

4. De-escalation/Diagnosis

- Once culture and susceptibility results are available:
- Stop unnecessary antibiotics
- Switch from broad-spectrum to narrow-spectrum agents
- De-escalation reduces collateral damage to the microbiome and lowers resistance risk.
- *Example: If vancomycin was started empirically for MRSA, but cultures show MSSA, switch to nafcillin or cefazolin/pvpv.*

The 4 C (Antibiotics) Associated with *Clostridiooides difficile* Infection (CDI)

What is *C. difficile*?



Clostridioides difficile Infection (CDI):

A nosocomial infection caused by *C. difficile*, mostly following some antibiotic exposure, resulting in disruption of normal gut flora and colonic inflammation.

- Gram-positive, spore-forming, obligate anaerobe
- Transmitted via fecal-oral route; spores persist on surfaces for prolonged periods
- Risk factors: broad-spectrum antibiotics, hospitalization, advanced age, immunosuppression

THE 4C Antibiotics Associated with CDI Risk

ANTIBIOTIC	RISK LEVEL
1. Clindamycin	HIGH
2. Cephalosporins	HIGH
3. Co-amoxiclav	HIGH
4. Ciprofloxacin	HIGH

SYMPTOMS of *C. DIFFICILE* INFECTION

WATERY DIARRHEA

(≥3 loose stools in 24 hours)

SYSTEMIC SYMPTOMS

- Fever
- Abdominal pain/cramping

SEVERE COMPLICATIONS

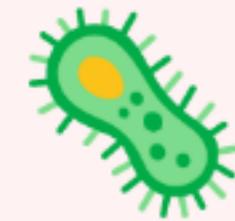
- Pseudomembranous colitis
- Toxic megacolon
- Colonic perforation

PHARMACEUTICAL IMPORTANCE OF AMS

PHARMACEUTICAL IMPORTANCE OF ANTIMICROBIAL STEWARDSHIP



Ensures **rational drug use** and prescribing accuracy



Reduces **antimicrobial resistance** and *C. difficile* infection rates



Promotes **cost-effective therapy** and optimal patient outcomes



Aligns with **global frameworks** (WHO AWaRe categories)

Pharmacist-Led Stewardship Activities

Pharmacist-Led Stewardship Activities cont'd...

Formulary Development

- Leverage AWaRe categories to decide which antibiotics to stock and restrict
- Use local antibiogram data to guide first-line agents
- Example: Nigerian teaching hospitals built an AWaRe-based formulary in partnership with health authorities

Pharmacist-Led Stewardship Activities cont'd...

Drug Audits (Prospective Audit & Feedback)

- Review each prescription's indication, choice, dose, and duration.
- Provide real-time feedback to prescribers
- Track Days of Therapy (DOT), Defined Daily Doses (DDD), and C. difficile rates
- Conduct routine medication chart reviews or AMS rounds to educate clinicians

Pharmacist-Led Stewardship Activities cont'd...

IV-to-Oral Switch

- Identify patients eligible for transition from IV to oral antimicrobial.
- Studies show pharmacy-led protocols can shorten median IV courses(e.g., from 3 to 2 days), reduce costs, and decrease length of stay
- Frees IV lines and beds while maintaining clinical efficacy

Pharmacist-Led Stewardship Activities cont'd...

Education

- Teach medical and nursing staff AMS principles, AWaRe categories, dosing/duration norms, and infection control
- Utilize in-service trainings, case reviews and ward-round presentations
- CDC core elements emphasize pharmacist-led teaching as a stewardship cornerstone

Pharmacist-Led Stewardship Activities cont'd...

Guideline Implementation

- Lead development and rollout of facility-specific antibiotic guidelines and order sets (e.g., pneumonia, sepsis, UTI)
- Embed protocols into electronic order systems and standard treatment guidelines (STGs)
- Ensure guidelines reflect local antibiogram data and national STGs

Pharmacist-Led Stewardship Activities cont'd...

Leadership

- Serve as AMS champions or co-leads of the stewardship program
- Liaise with Pharmacy & Therapeutics committees to drive policy and formulary changes
- Advocate for stewardship culture and interprofessional collaboration

Response Rate (%)

47.0%

Nigerian Hospitals with Active/Pilot AMS Programs

S/n	Hospital Name	Location	Institution Type	AMS Status
1	Univ. Nigeria Teaching Hosp. (UNTH)	Ituku-Ozalla, Enugu	Fed. Teaching	Active
2	Univ. College Hosp. Ibadan (UCH)	Ibadan, Oyo	Fed. Teaching	Active
3	Lagos Univ. Teaching Hosp. (LUTH)	Ikeja, Lagos	Fed. Teaching	Active
4	Univ. Calabar Teaching Hosp. (UCTH)	Calabar, CR	Fed. Teaching	Active
5	Univ. Benin Teaching Hosp. (UBTH)	Benin City, Edo	Fed. Teaching	Active
6	Univ. Ilorin Teaching Hosp. (UIITH)	Ilorin, Kwara	Fed. Teaching	Planned
7	ATB Univ. Teaching Hosp.	Bauchi, Bauchi	Fed. Teaching	Active
8	Usman Danfodiyo Univ. Teaching Hosp.	Sokoto, Sokoto	Fed. Teaching	Active
9	Enugu State Univ. Teaching Hosp.	Enugu, Enugu	State Teaching	Active
10	Benue State Univ. Teaching Hosp.	Makurdi, Benue	State Teaching	Active
11	National Orthopaedic Hosp. Igbobi	Lagos, Lagos	Fed. Specialist	Pilot
12	Fed. Med. Centre, Jalingo	Jalingo, Taraba	Fed. Med. Centre	Active
13	Fed. Med. Centre, Makurdi	Makurdi, Benue	Fed. Med. Centre	Active
14	Taraba State Specialist Hosp.	Jalingo, Taraba	State Specialist	Active
15	State Specialist Hosp. Yola	Yola, Adamawa	State Specialist	Active
16	Dalhatu Araf Specialist Hosp.	Lafia, Nasarawa	State Specialist	Active
17	Plateau State Specialist Hosp.	Jos, Plateau	State Specialist	Active
18	Khalifa Rabiu Paediatric Hosp.	Kano, Kano	State Specialist	Active
19	General Hosp. Gembu	Gembu, Taraba	State General	Active
20	General Hosp. Takum	Takum, Taraba	State General	Active
21	Babcock Univ. Teaching Hosp.	Ilishan-Remo, Ogun	Private Teaching	Active
22	Limi Children's Hosp.	Abuja, FCT	Private Hosp.	Active

Total Hospitals: Federal: 11

22

(50.0%)

State: 9

(40.91%)

Private: 2

(9.09%)

Nigeria Hospitals:

(~3,950)

% Practicing AMS:

(0.56%)

Conclusion

Antimicrobial Stewardship (AMS) is vital for **safe and effective hospital care**. **Pharmacists** are central to its success, helping improve patient outcomes and combat **resistance**. FMC Keffi has much to gain from AMS, and with strong leadership can become a model for stewardship excellence and example to other hospitals in Nigeria.

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Thanks For Listening!

Questions and Discussions