Infection Prevention & AMR: Evidence Based Practices in Clinical Care

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Outline

- Introduction
- Antimicrobial Resistance (AMR)
- AMR and Mortality
- Causes of AMR
- Infection Prevention and Control
- IPC & AMR
- Infection Prevention in Healthcare Settings
- Evidence Based Practices in Clinical Care
- Summary

INTRODUCTION

Antimicrobial Resistance (AMR)

Plate 1: Antimicrobial susceptibility test outcome of two isolates (Wikipedia, unknown)

Antimicrobial Resistance (AMR)

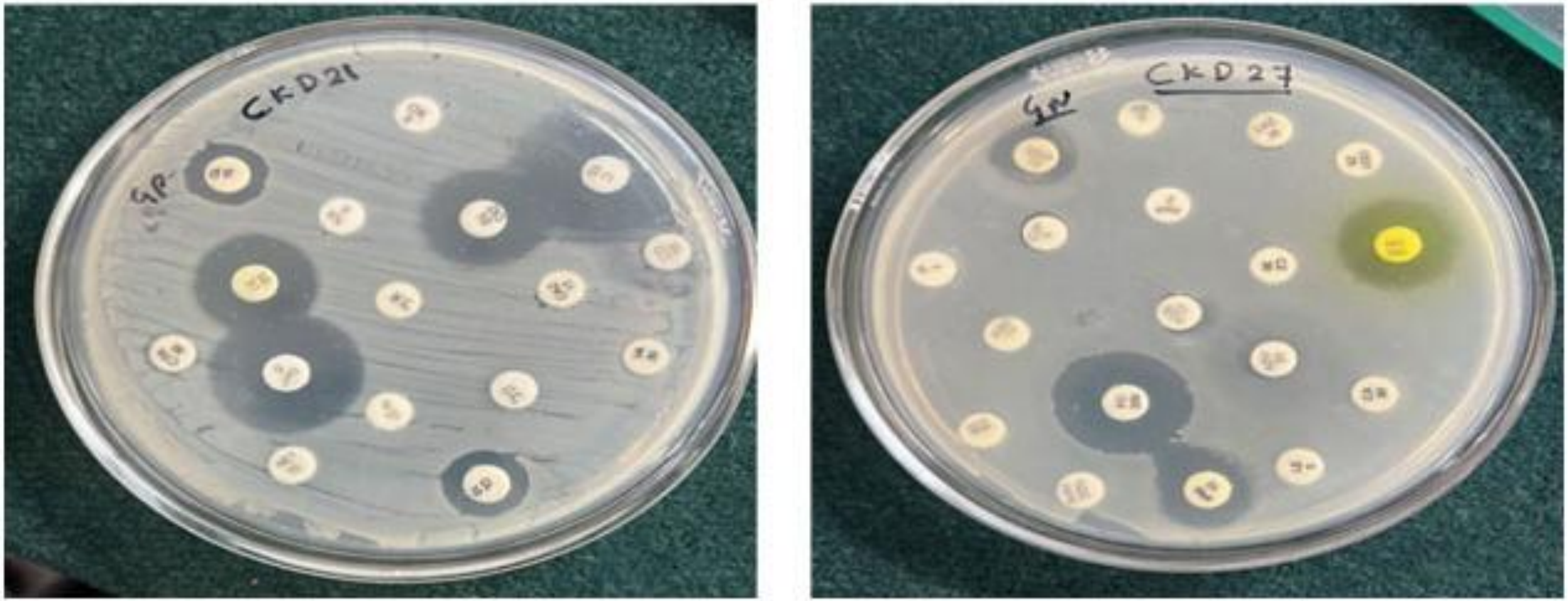
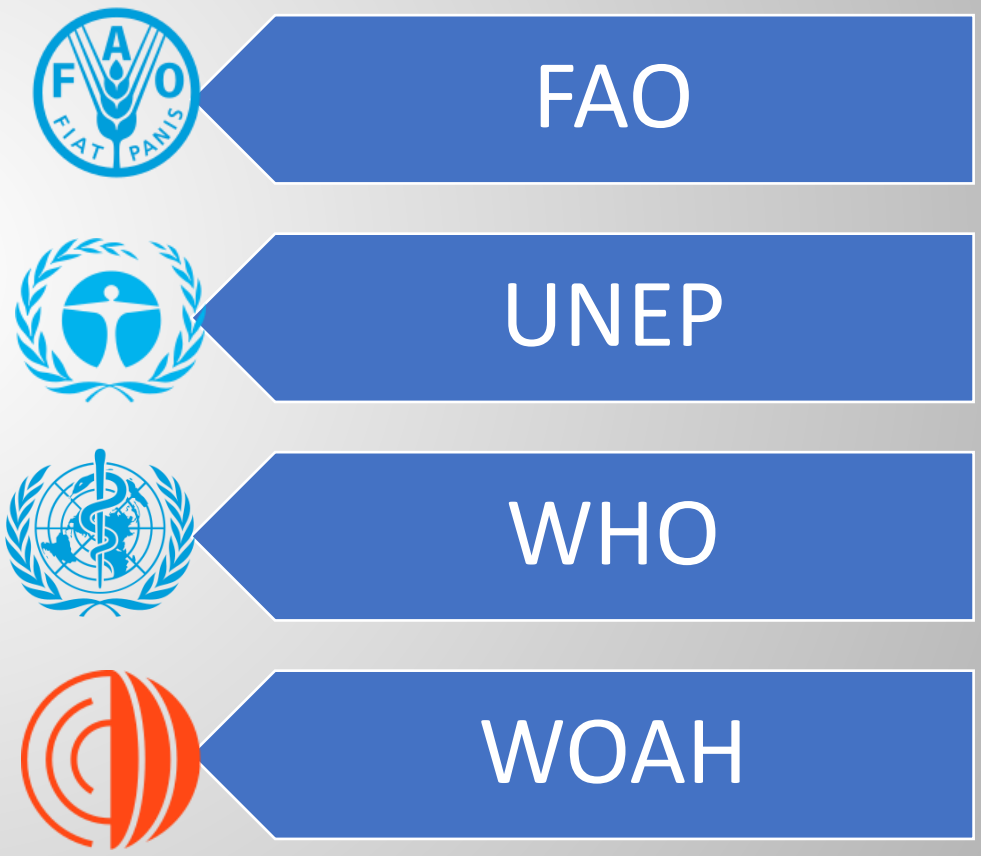


Plate 2: Antimicrobial susceptibility outcome of two isolates (Srilaxmi and Munjam, 2023)

Antimicrobial Resistance (AMR)

- Ability of microorganisms to withstand the action of antimicrobial agents
- Renders antibiotics ineffective
- Often develop rapidly following the introduction of the drug
- In 2024, UNGA political declaration on AMR
- Aimed at accelerating global action against AMR
- Classified as WHO as a “critical priority” issue



Antimicrobial Resistance (AMR)

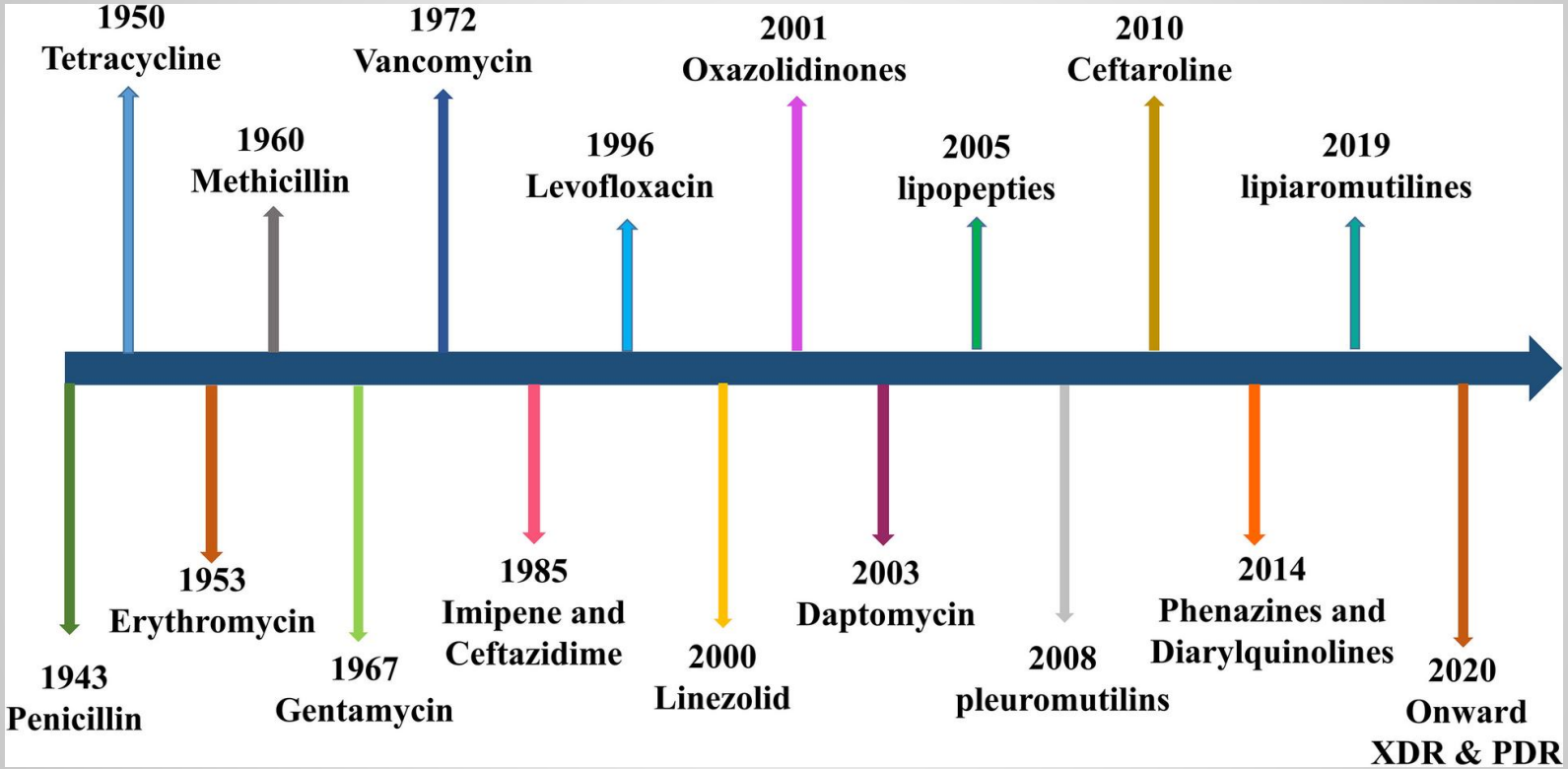


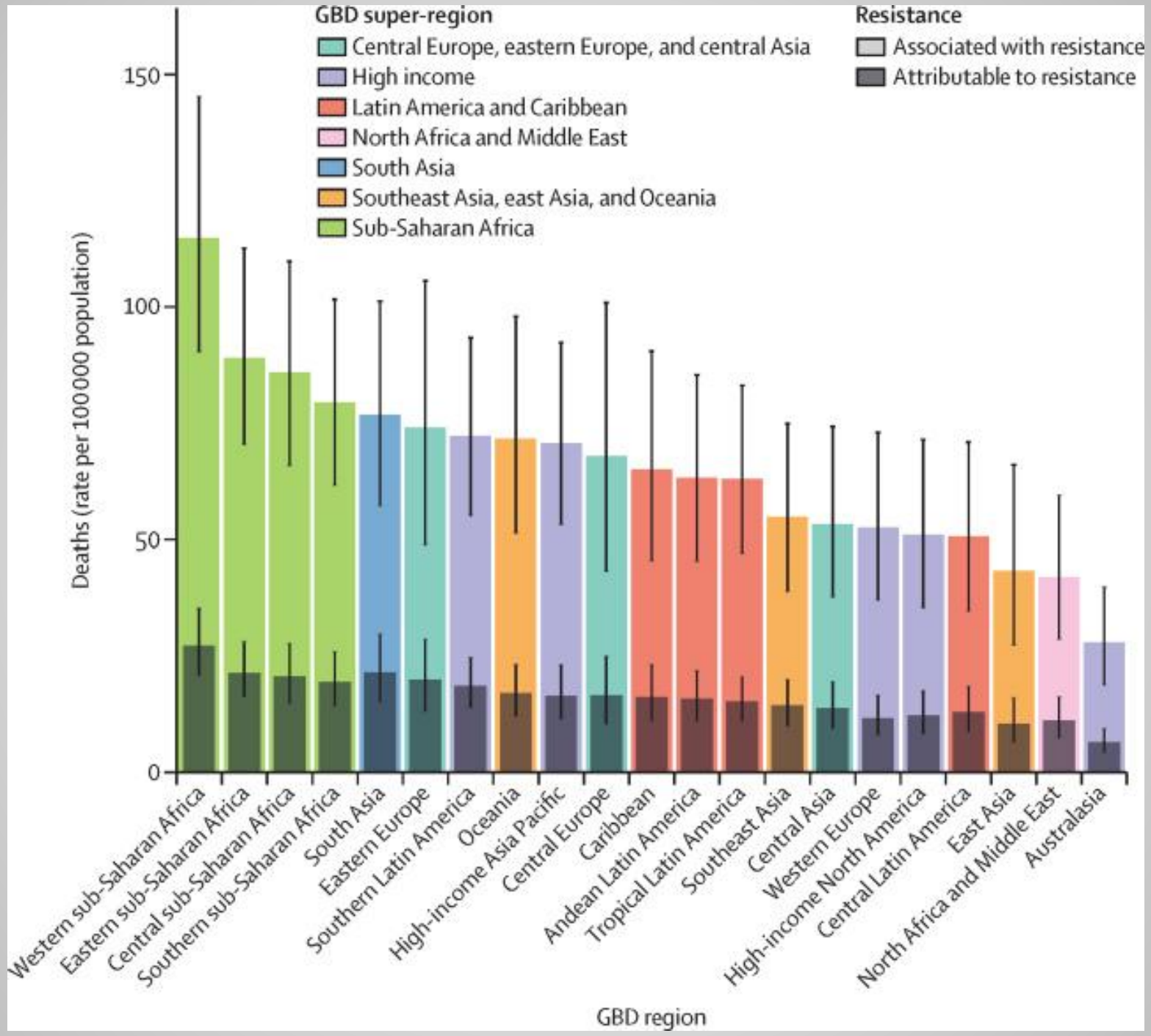
Figure 1: Timeline for the Development of Antimicrobial Resistance (Aslam et al., 2024)

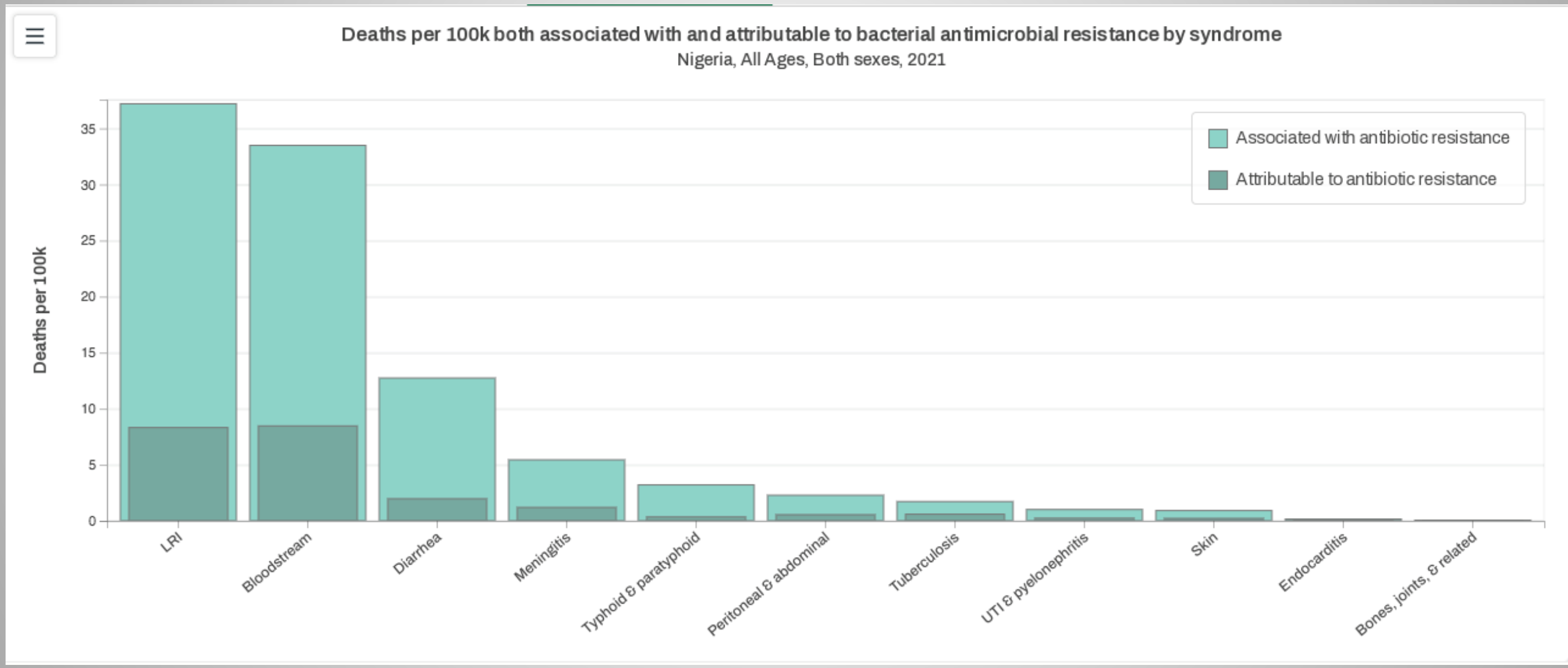
Is antimicrobial resistance a major contributor to mortality in Nigeria?

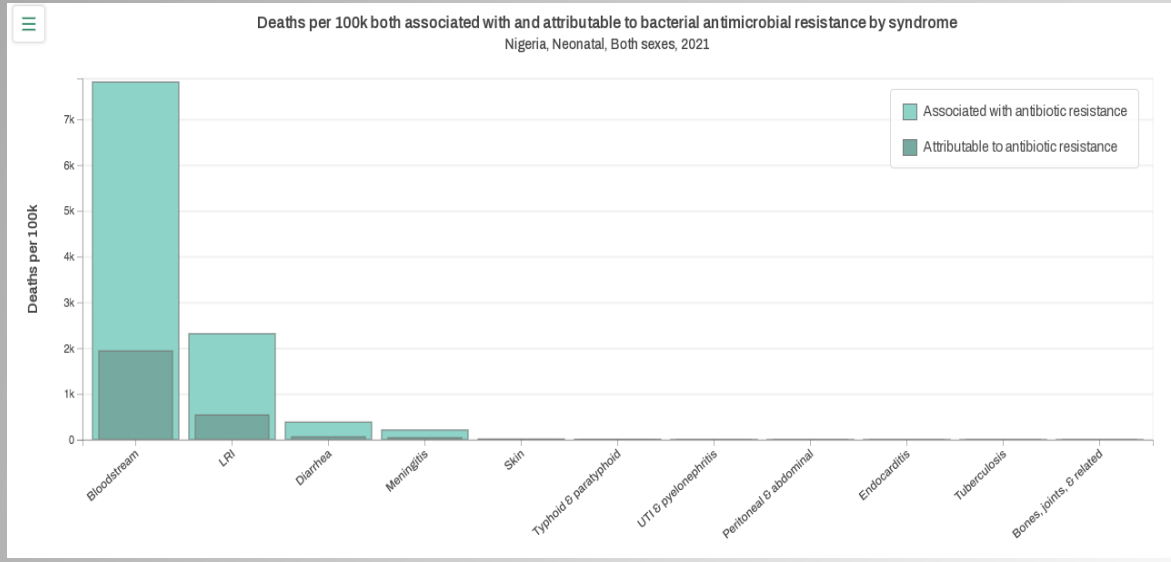
mentimeter.com :

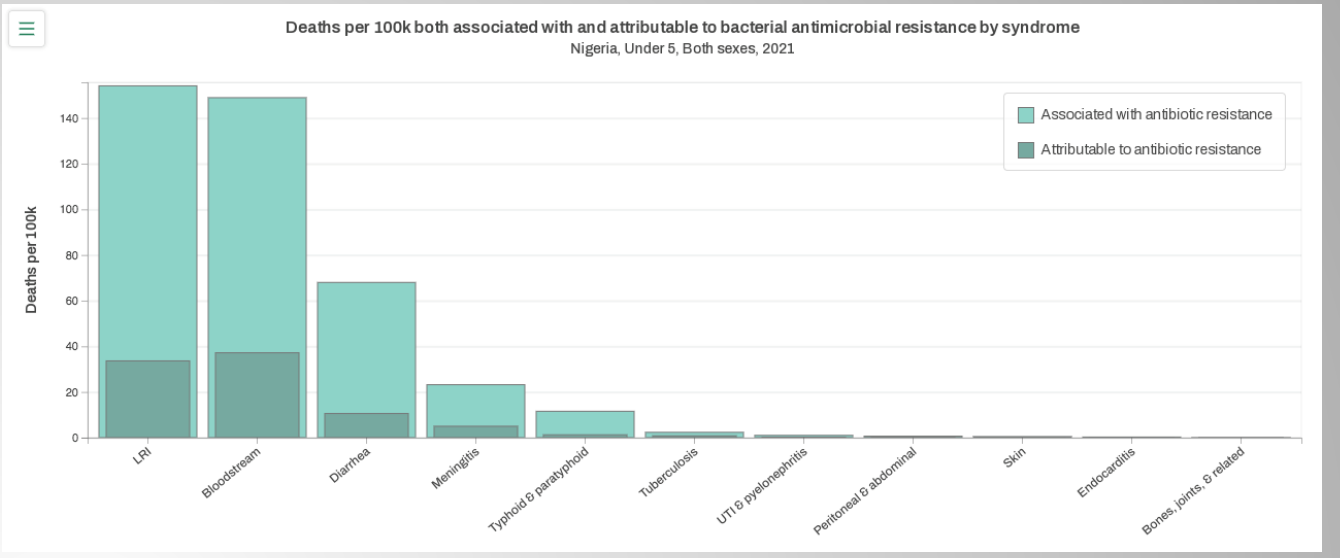
AMR and Mortality

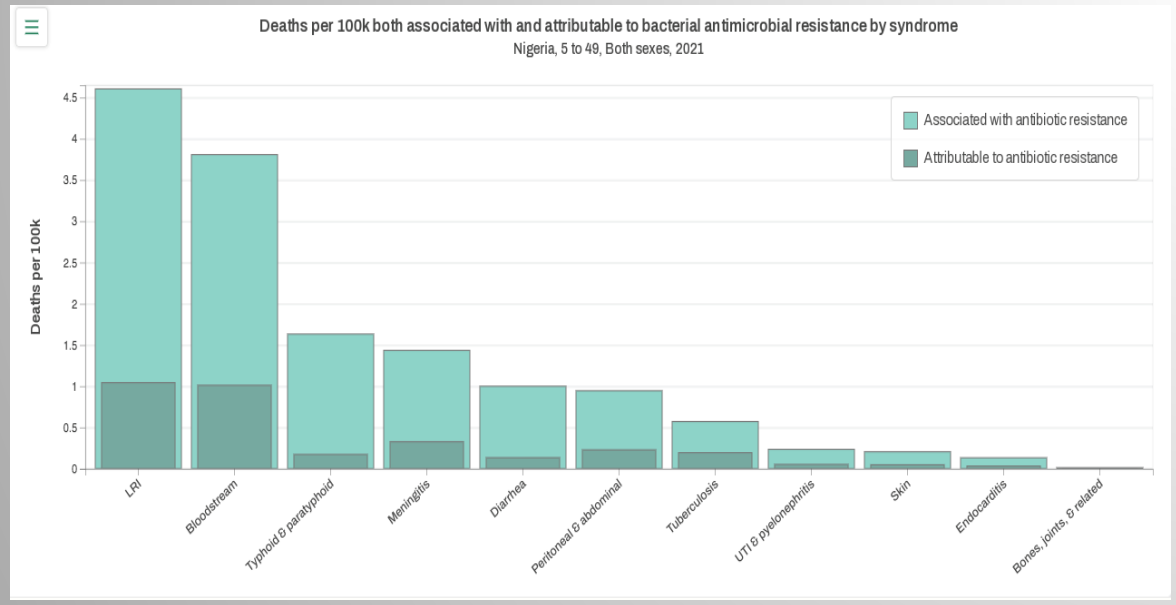
- About 7.1 million deaths linked to bacterial AMR in 2021
- Highest mortality rates in sub-Saharan Africa
- About 263,400 deaths in Nigeria annually
- Projected to increase to 10 million deaths and 2 million deaths globally and in Africa respectively in 2050
- Projected to lead to annual global GDP losses of $3.4 trillion within the next 10 years
- Projected to push 24 million people to extreme poverty in this timeframe too

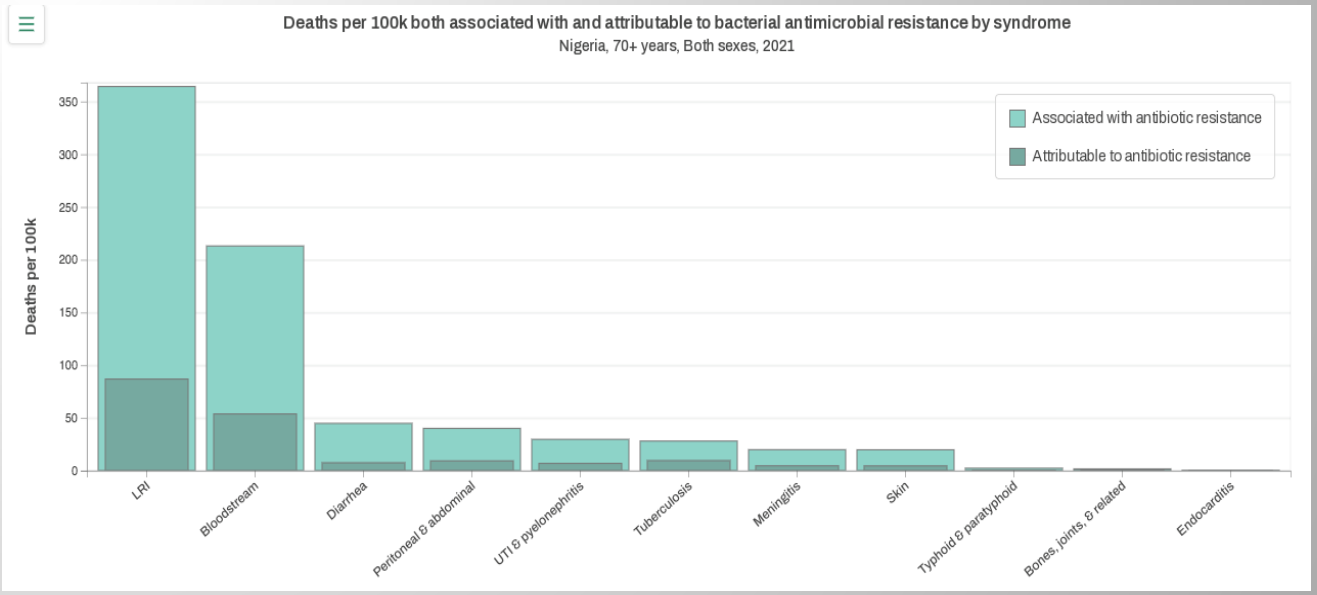

GBD super-region
Central Europe, eastern Europe, and central Asia
High income
Latin America and Caribbean
North Africa and Middle East
South Asia
Southeast Asia, east Asia, and Oceania
Sub-Saharan Africa
Resistance
Associated with resistance
Attributable to resistance
Deaths (rate per 100 000 population)
150
100
50
0
Western sub-Saharan Africa
Eastern sub-Saharan Africa
Central sub-Saharan Africa
Southern sub-Saharan Africa
South Asia
Eastern Europe
Southern Latin America
Oceania
High-income Asia Pacific
Central Europe
Caribbean
Andean Latin America
Tropical Latin America
Southeast Asia
Central Asia
Western Europe
High-income North America
Central Latin America
East Asia
North Africa and Middle East
Australasia
GBD region


Deaths per 100k both associated with and attributable to bacterial antimicrobial resistance by syndrome
Nigeria, All Ages, Both sexes, 2021
Deaths per 100k
0
5
10
15
20
25
30
35
Associated with antibiotic resistance
Attributable to antibiotic resistance
LRI
Bloodstream
Diarrhea
Meningitis
Typhoid & paratyphoid
Peritoneal & abdominal
Tuberculosis
UTI & pyelonephritis
Skin
Endocarditis
Bones, joints, & related


Deaths per 100k both associated with and attributable to bacterial antimicrobial resistance by syndrome
Nigeria, Neonatal, Both sexes, 2021
Deaths per 100k
Associated with antibiotic resistance
Attributable to antibiotic resistance
Bloodstream
LRI
Diarrhea
Meningitis
Skin
Typhoid & paratyphoid
UTI & pyelonephritis
Peritoneal & abdominal
Endocarditis
Tuberculosis
Bones, joints, & related


Deaths per 100k both associated with and attributable to bacterial antimicrobial resistance by syndrome
Nigeria, Under 5, Both sexes, 2021
Deaths per 100k
Associated with antibiotic resistance
Attributable to antibiotic resistance
LRI
Bloodstream
Diarrhea
Meningitis
Typhoid & paratyphoid
Tuberculosis
UTI & pyelonephritis
Peritoneal & abdominal
Skin
Endocarditis
Bones, joints, & related


Deaths per 100k both associated with and attributable to bacterial antimicrobial resistance by syndrome
Nigeria, 5 to 49, Both sexes, 2021
Deaths per 100k
Associated with antibiotic resistance
Attributable to antibiotic resistance
LRI
Bloodstream
Typhoid & paratyphoid
Meningitis
Diarrhea
Peritoneal & abdominal
Tuberculosis
UTI & pyelonephritis
Skin
Endocarditis
Bones, joints, & related


Deaths per 100k both associated with and attributable to bacterial antimicrobial resistance by syndrome
Nigeria, 70+ years, Both sexes, 2021
Deaths per 100k
Associated with antibiotic resistance
Attributable to antibiotic resistance
LRI
Bloodstream
Diarrhea
Peritoneal & abdominal
UTI & pyelonephritis
Tuberculosis
Meningitis
Skin
Typhoid & paratyphoid
Bones, joints, & related
Endocarditis

Is antimicrobial resistance a major contributor to mortality in Nigeria?

Causes of AMR

Antimicrobial Resistance (AMR)

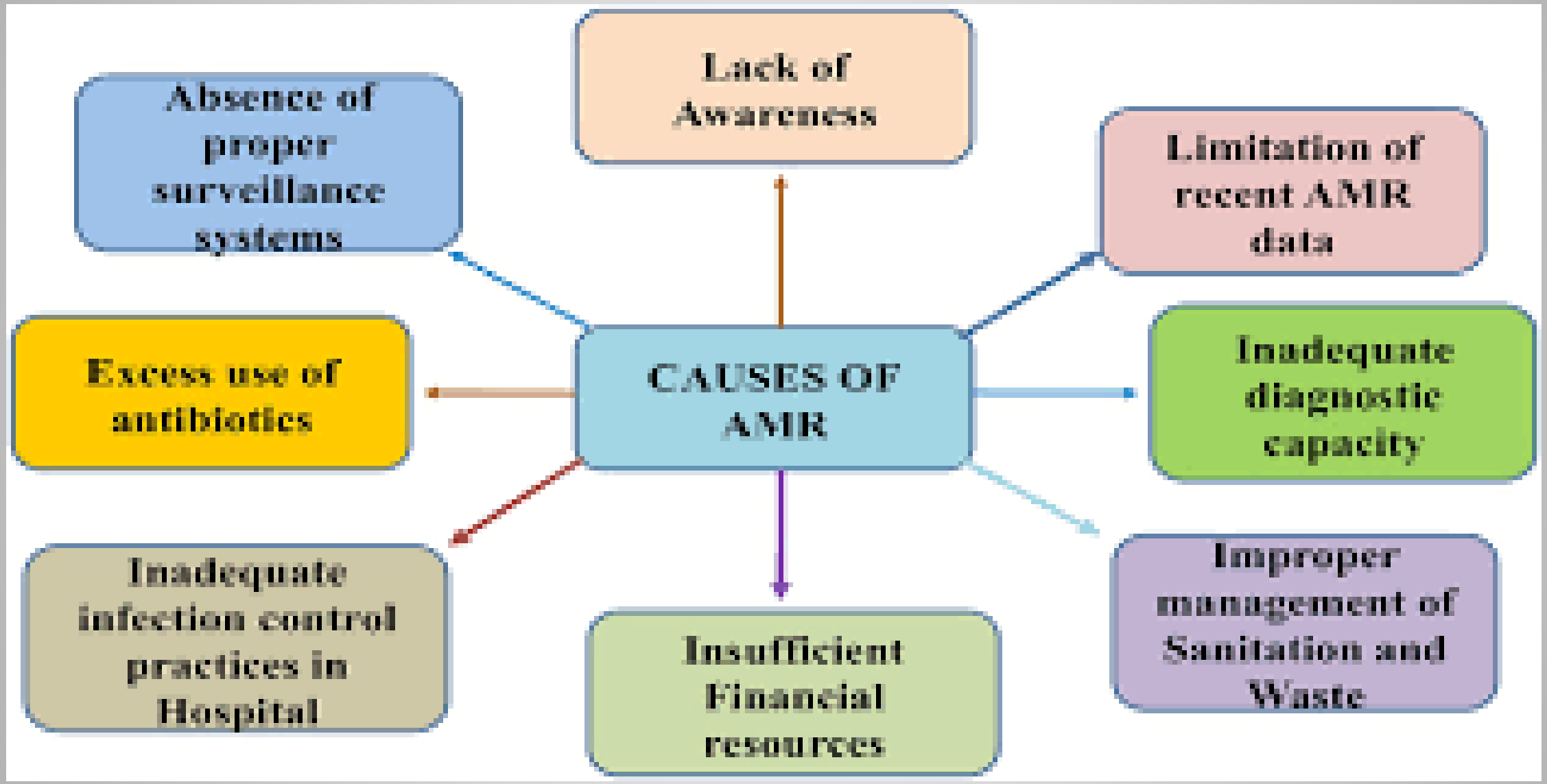
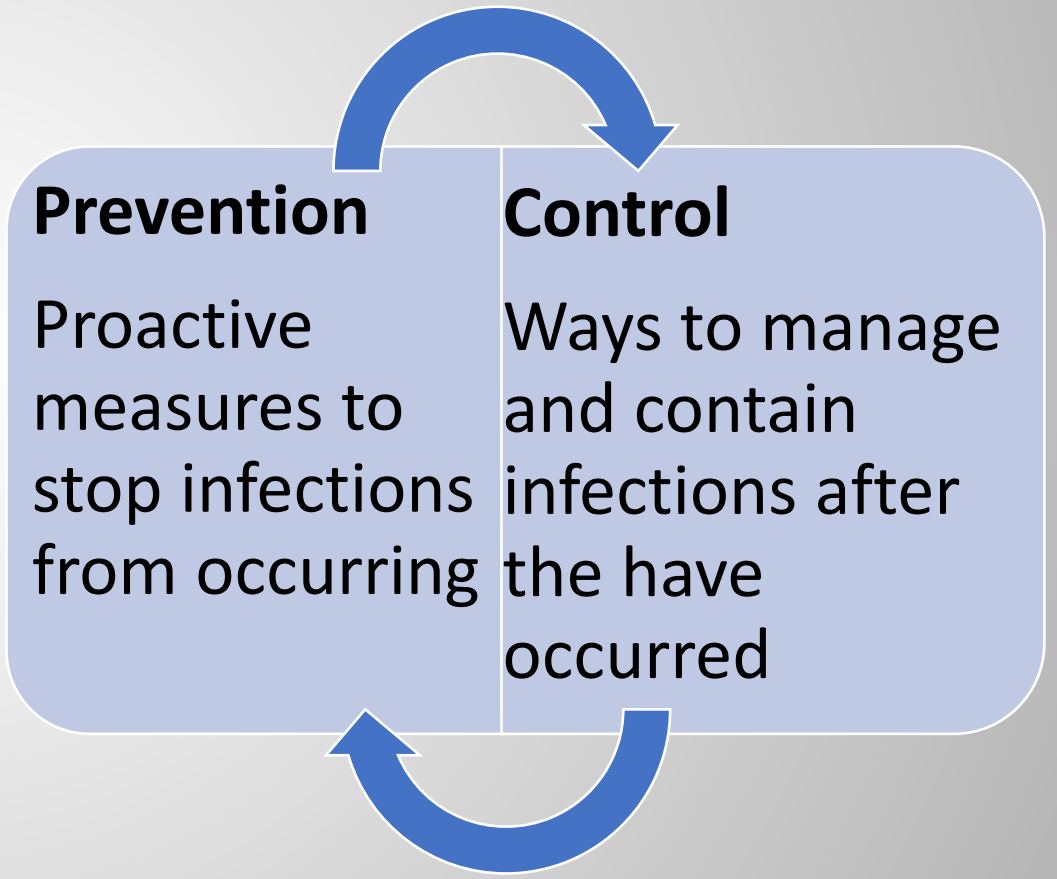


Plate 3: Causes of Antimicrobial Resistance (Srilaxmi and Munjam, 2023)

Infection Prevention and Control

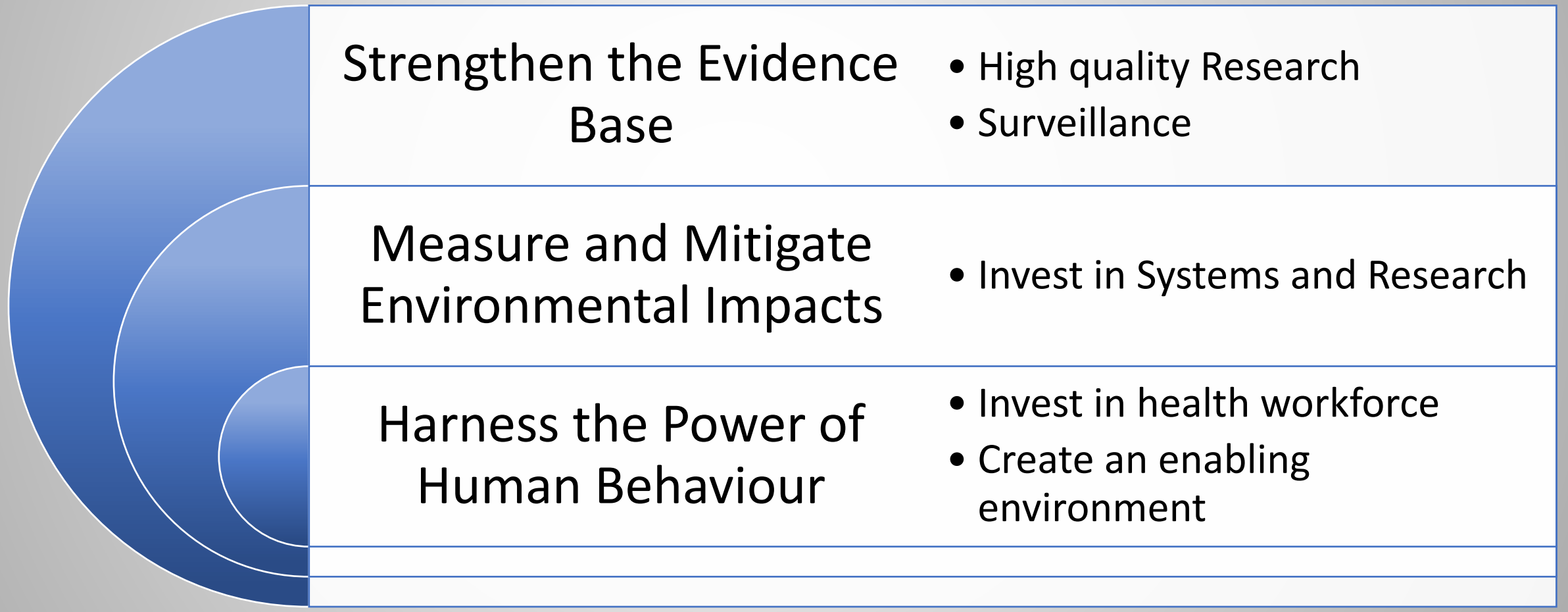
- Often used in conjunction with the word “and control”
- Making the complete phrase – “Infection Prevention and Control”
- Often simply referred to IPC
- Two sides of the same coin
- Very key in healthcare settings
- The bedrock of preventing HAIs and also safeguarding the health of healthcare workers



IPC Programmes

- Reduce infection risk
  (patients, health workers, community)
- Fundamental to achieving resilient, responsive, sustainable health systems
- Combat AMR
- Reduce health costs, deliver safer health

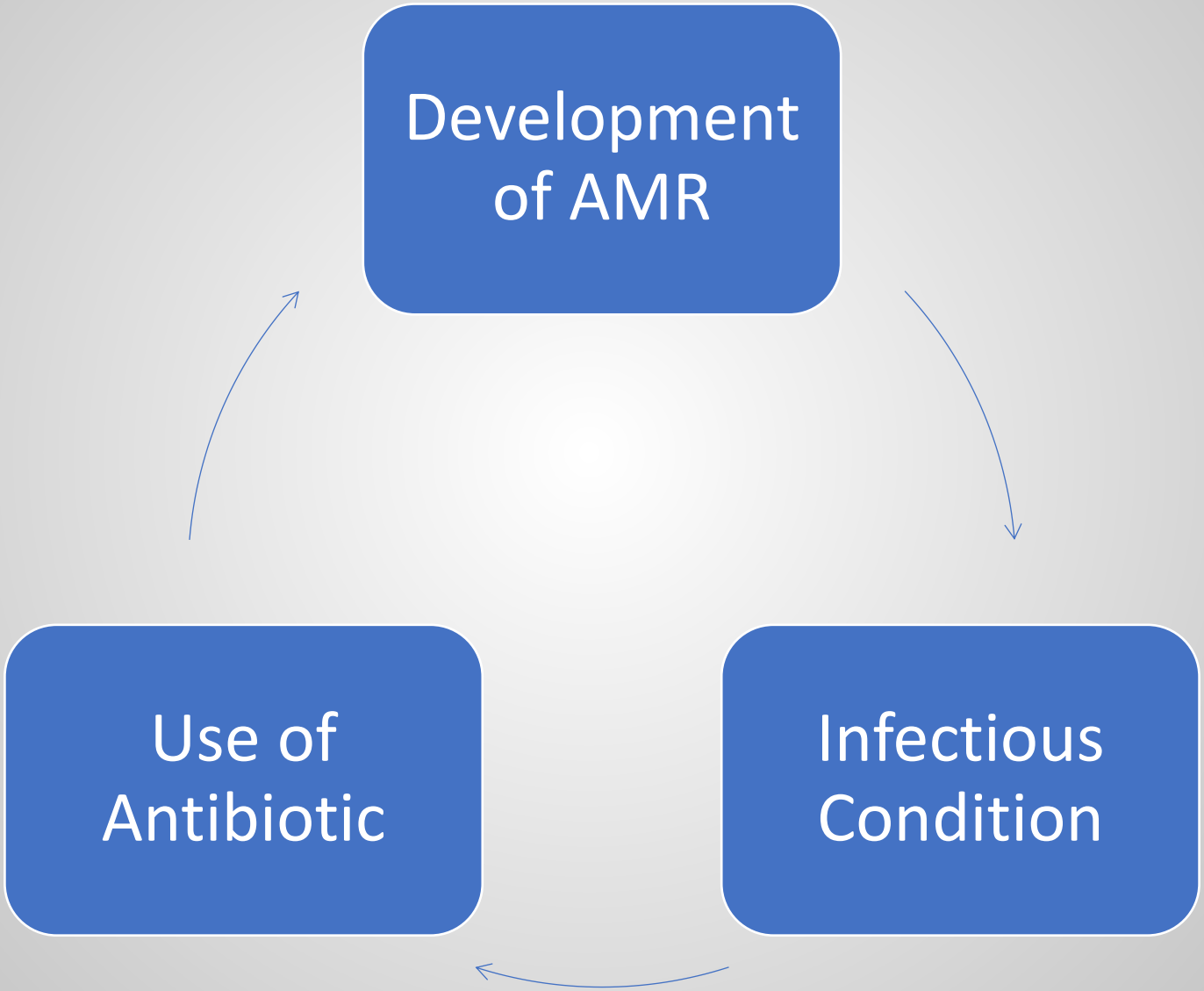
IPC Programme Priorities



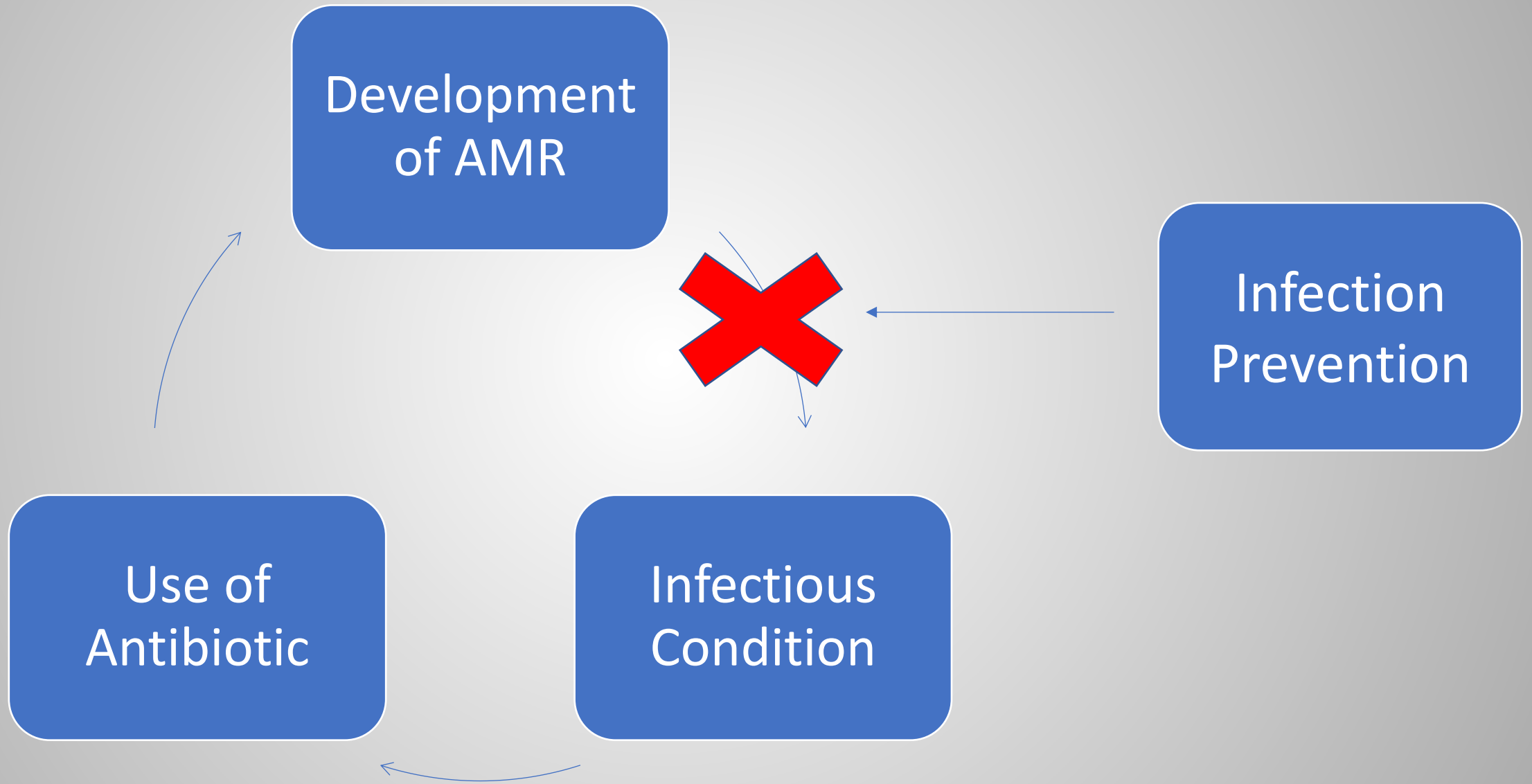
Infection Prevention

Minimizing the risk of infection by implementing measures to prevent pathogens from entering the body or a susceptible environment

IPC & AMR


Development of AMR
Infectious Condition
Use of Antibiotic

IPC & AMR


Development of AMR
Infection Prevention
Use of Antibiotic
Infectious Condition

WHOSE PROBLEM IS IT?

Infection Prevention in Healthcare Settings

Evidence Based Practices in Clinical Care

- There is a need for evidence based practices
- Contact Precautions for MRSA and VRE
  - Long standing practice in acute care hospitals
  - Involves isolating patients and requiring gown and glove use
  - Limited data on efficacy
  - Associated with patient harm
  - Limited data on efficacy

Evidence Based Practices in Clinical Care

- Current focus on backing practices with evidence
- Clinical trial data limited
- Current studies are quasi-experimental and interrupted time series analyses
- Reports show
  - Safety on discontinuing contact precautions
  - No increase in healthcare associated infections
- But dependent on
  - Low MRSA/VRE rates
  - High hand hygiene compliance

Antimicrob Steward Healthc Epidemiol. 2024 Sep 20;4(1):e137. doi: 10.1017/ash.2024.350

Contact precautions for MRSA and VRE: where are we now? A survey of the *Society for Healthcare Epidemiology of America* Research Network

Observational Study > Infect Control Hosp Epidemiol. 2018 Jul;39(7):788-796. doi: 10.1017/ice.2018.93. Epub 2018 May 10.

Noninfectious Hospital Adverse Events Decline After Elimination of Contact Precautions for MRSA and VRE

Multicenter Study > Am J Infect Control. 2020 Dec;48(12):1466-1473. doi: 10.1016/j.ajic.2020.06.219. Epub 2020 Jul 4.

Stopping the routine use of contact precautions for management of MRSA and VRE at three academic medical centers: An interrupted time series analysis

> Infect Control Hosp Epidemiol. 2022 Nov;43(11):1595-1602. doi: 10.1017/ice.2021.457. Epub 2021 Dec 1.

Discontinuing MRSA and VRE contact precautions: Defining hospital characteristics and infection prevention practices predicting safe de-escalation

Hand Hygiene (HH)

- The hands of HCW are often implicated in pathogen transmission
- HH is identified as a key HAI prevention strategy by WHO
- The focus of global efforts to reduce the burden of these infections
- Hand hygiene practices can be measured using a WHO standard observation tool (SOT)
- The SOT defines five opportunities or “moments” for hand hygiene within the health care setting.
  - (i) before touching a patient,
  - (ii) before the performance of clean/aseptic procedures,
  - (iii) after bodily fluids exposure risk,
  - (iv) after touching a patient
  - (v) after touching a patient’s surroundings.

Evidence Based Practices - Handwashing

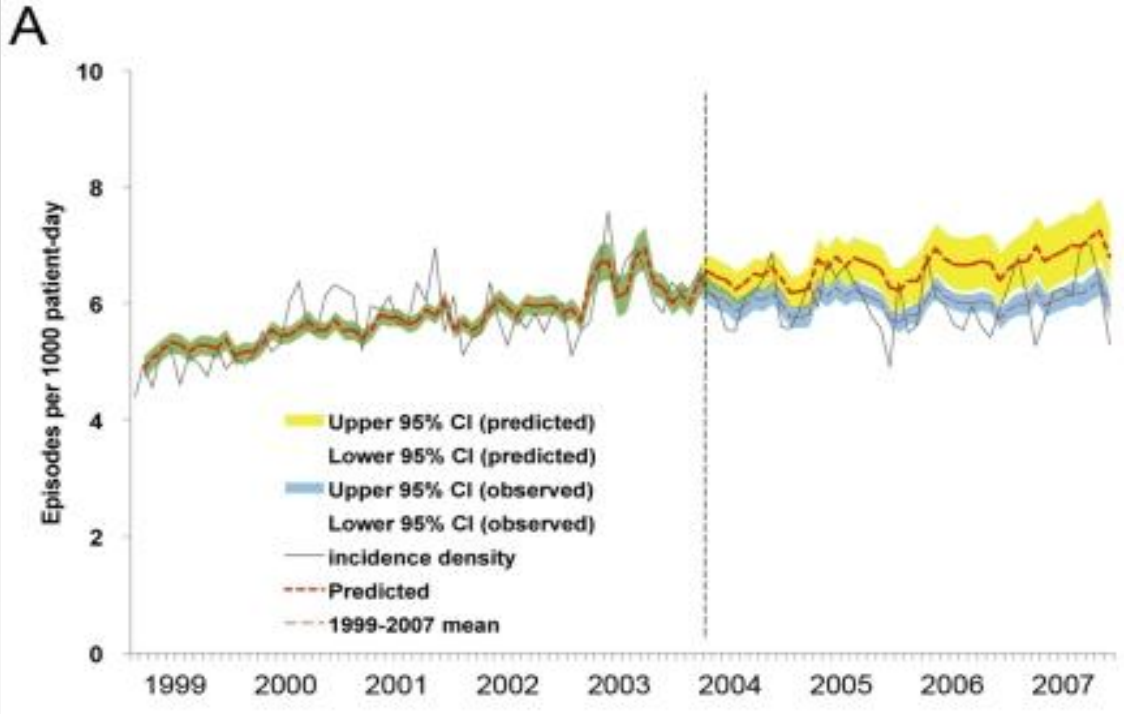
- **Case Study 1**

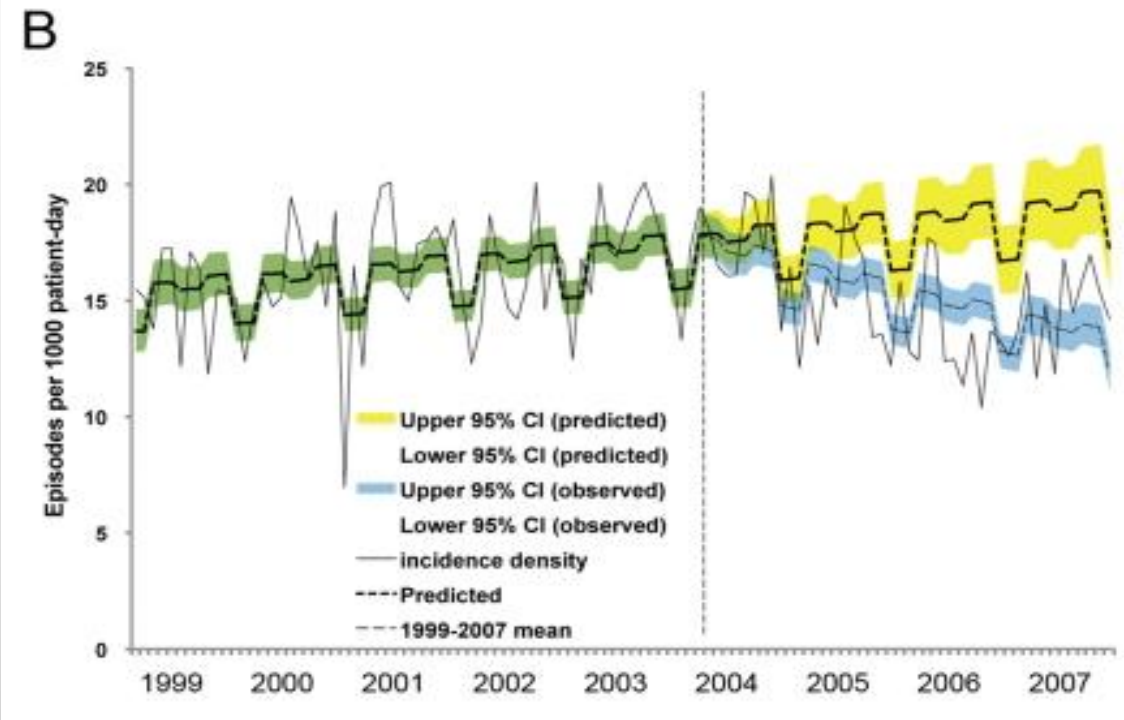
> PLoS One. 2011;6(11):e27163. doi: 10.1371/journal.pone.0027163. Epub 2011 Nov 16.

Effectiveness and limitations of hand hygiene promotion on decreasing healthcare-associated infections

Yee-Chun Chen [1], Wang-Huei Sheng, Jann-Tay Wang, Shan-Chwen Chang, Hui-Chi Lin, Kuei-Lien Tien, Le-Yin Hsu, Keh-Sung Tsai

- **Details**
  - 4 year hospital wide HHP
  - 2,200-bed teaching hospital in Taiwan
- **Findings**
  - 8.9% reduction in HAIs
  - Cost benefit
  - Every US$1 spent = US$23.7 benefit.





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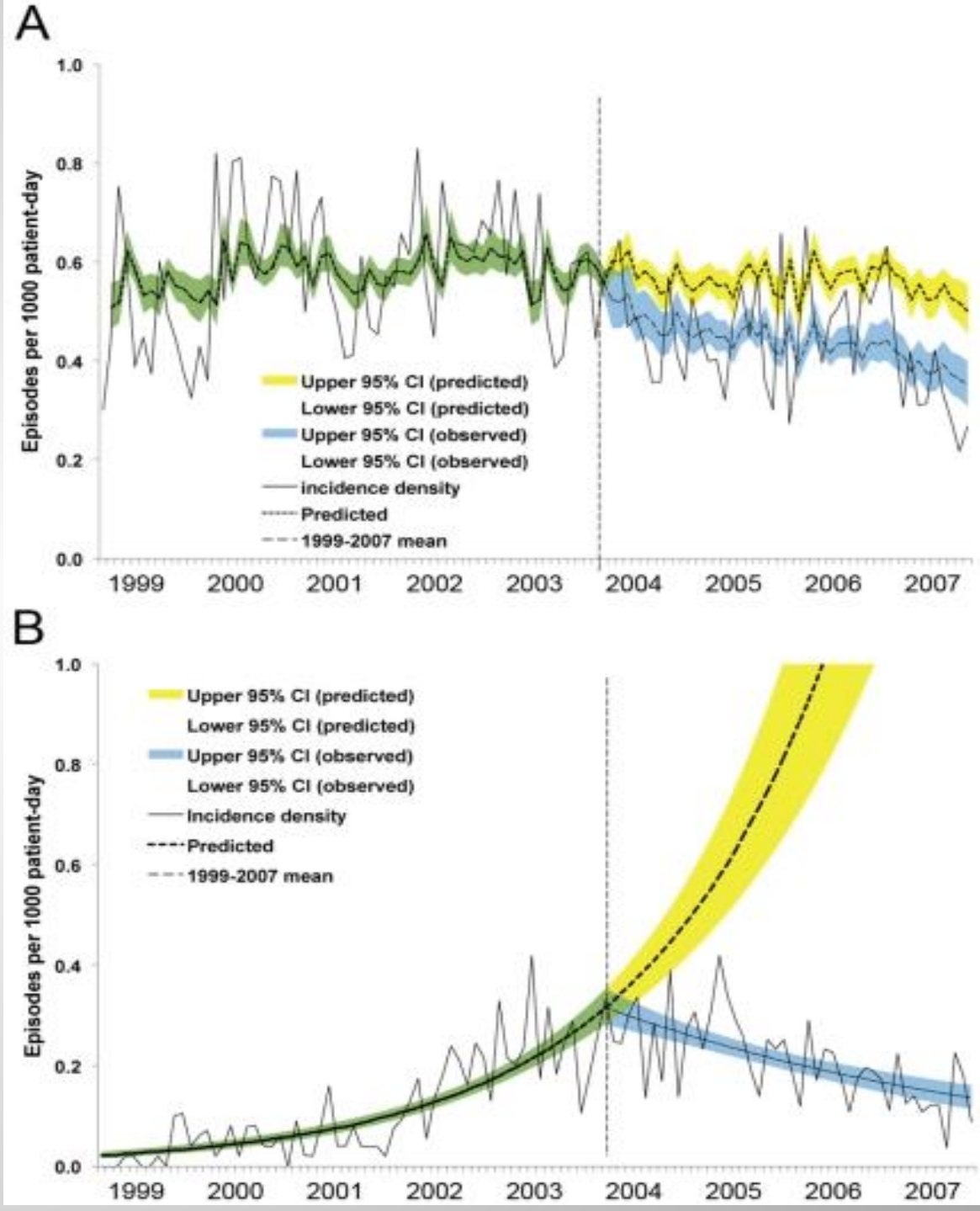


Evidence Based Practices - Handwashing

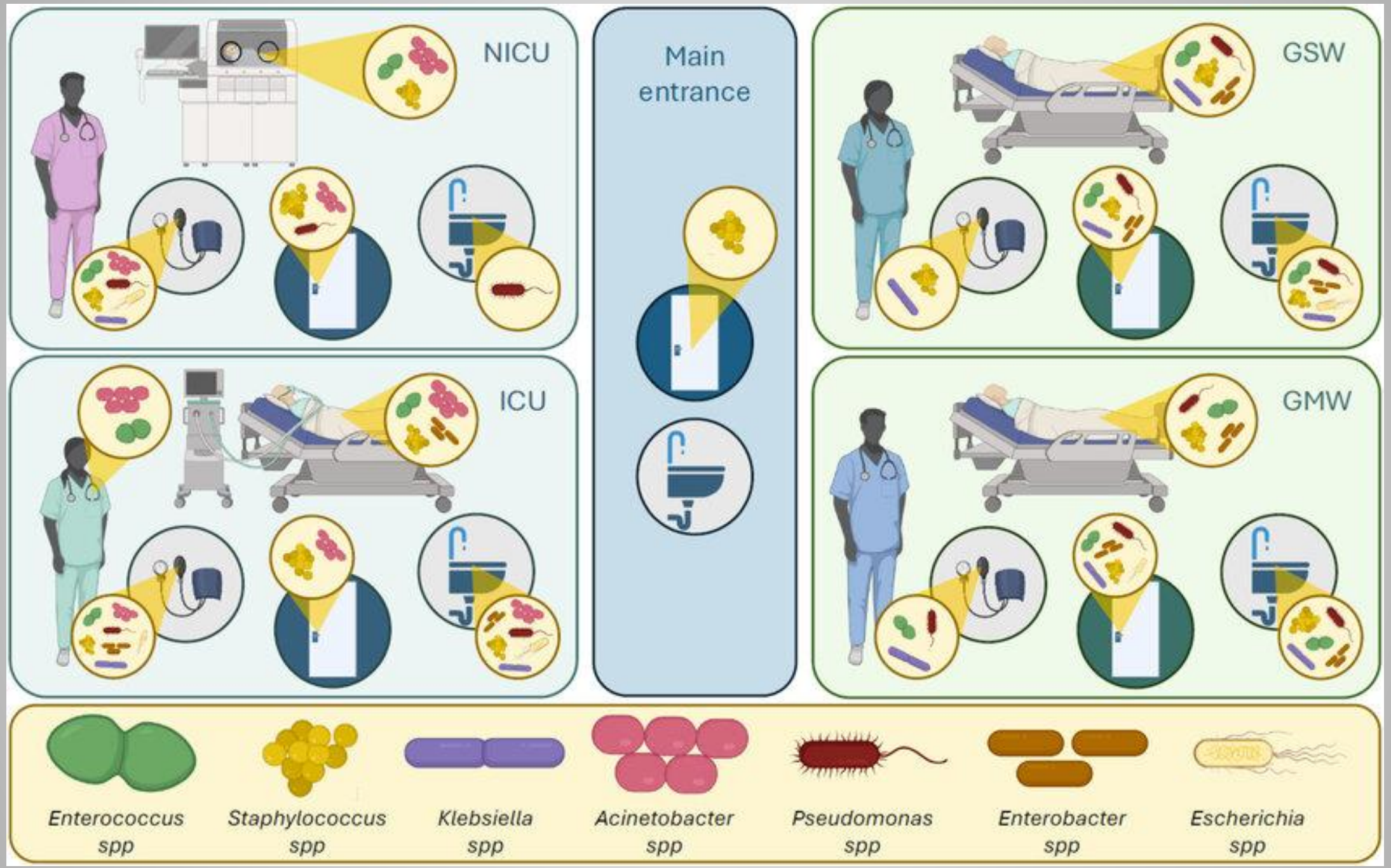
- An Australian study published in 2018 reported on the effects of a National Hand Hygiene Initiative after 8 years (Grayson et al., 2018).
  - Observed declines in incidence of health-care-associated *Staphylococcus aureus* bacteraemia HA-SAB (15% decrease for every 10% increase in compliance).
- A multicentre US based 2 year observational study (Trick et al., 2007) reported a significantly reduced incidence of antimicrobial-resistant bacteria from clinical culture
  - From the hospital with the greatest increase in the frequency of hand hygiene performance
- A German study carried out over a 2 year period (Kaier et al., 2009), reported a significant influence on using alcohol-based hand rub for hand disinfection on the ESBL incidence

Where is Africa in This?

Take home!!!

- Most studies pertaining to LMIC are on evaluating hand hygiene practice compliance
- In Nigeria, most studies are focusing on evaluating the knowledge, attitude and practice of HH in HCW (not actual compliance)
- In the absence of a significant level of HH compliance, there can be no effect on AMR
- **WHAT WILL WE DO DIFFERENT?**

Environmental Cleaning & Disinfection


NICU
Main entrance
GSW
ICU
GMW
Enterococcus spp
Staphylococcus spp
Klebsiella spp
Acinetobacter spp
Pseudomonas spp
Enterobacter spp
Escherichia spp

Those who clean help to prevent health care-associated infections (HAIs)

Survival Rates of Organisms on Dry Hospital Surfaces

Organism	Survival time
Clostridium difficile (spores)	>5 Months
Acinetobacter spp	3 Days to 11 months[79]
Enterococcus spp including VRE	5 Days to >46 months[32]
Pseudomonas aeruginosa	6 Hours to 16 months
Klebsiella spp	2 Hours to >30 months
Staphylococcus aureus, including MRSA	7 Days to >12 months[80]
Norovirus (and feline calicivirus)	8 Hours to >2 weeks[81]

Evidence Based Practices – Cleaning & Disinfection

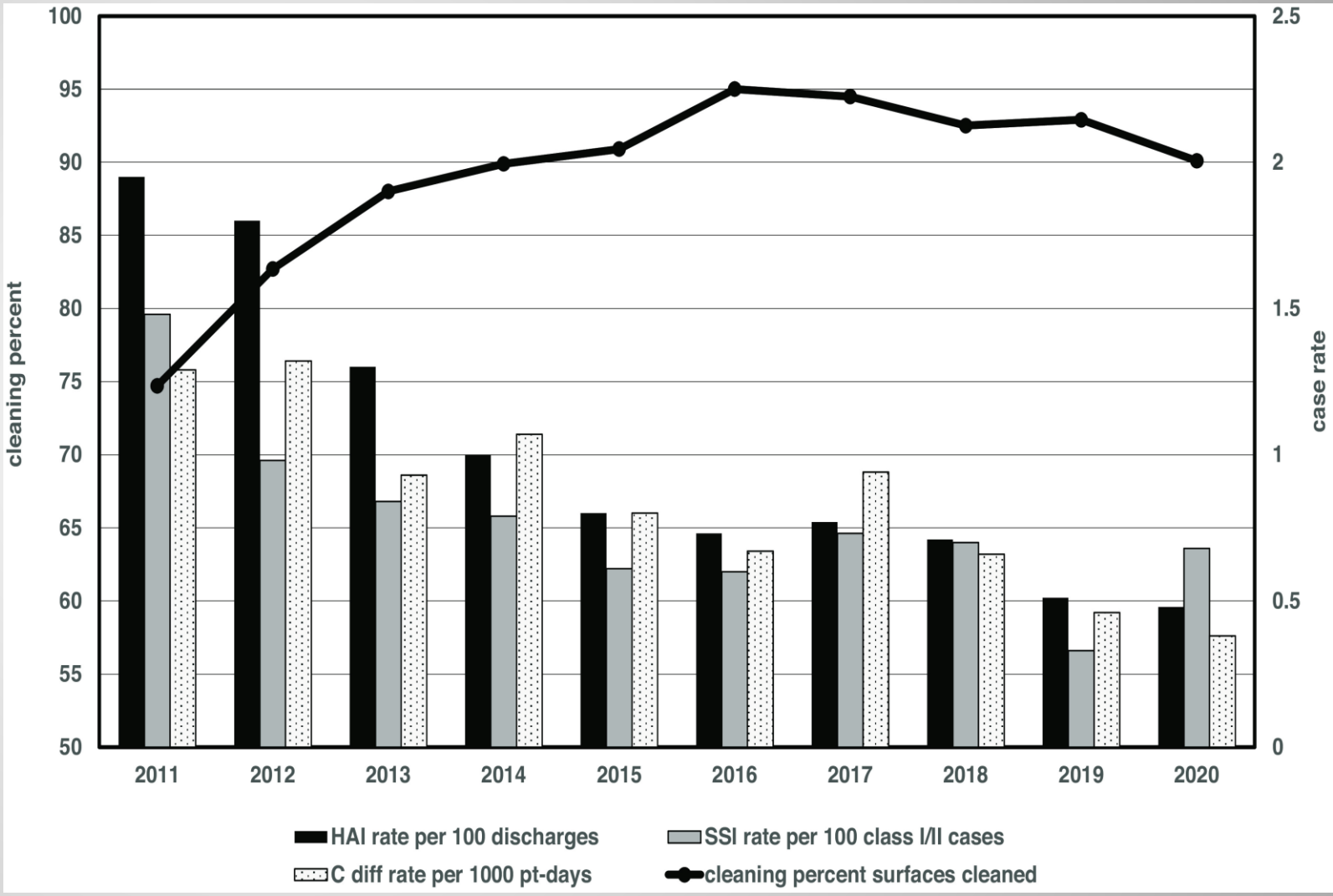
- **Case Study 1**

Antimicrob Steward Healthc Epidemiol. 2022 Jul 12;2(1):e113. doi: 10.1017/ash.2022.257

Environmental cleaning and disinfection: Sustaining changed practice and improving quality in the community hospital

Michael F Parry [1,4,✉], Merima Sestovic [2], Christopher Renz [3], Abegail Pangan [2], Brenda Grant [2], Asha K Shah [1,4]

- **Details**
  - 10 year hospital wide ECI
  - 305-bed community hospital in USA
- **Findings**
  - Cleaning rates rose to >90%
  - HAIs decreased by 75%
  - SSIs decreased by 55%



Evidence Based Practices – Cleaning and Disinfection

- An Egyptian study published in 2024 reported on the effects of enhanced cleaning in an 18 month period (Hamed et al., 2024).
  - Significant decrease compared to routine cleaning
  - Reduced Gram negative bacteria to 16.3%
  - Resulted in a significant reduction in total infections
- A multicentre US based 33 month intervention study (Carling et al., 2023) reported a significant reduction in HO-CDI from 8.9 to 3.2/10,000 patient days.
- An Australian study carried out over an 18 month period (Browne et al., 2024), reported a relative reduction in HAIs following the intervention.

Safe Injection Practices

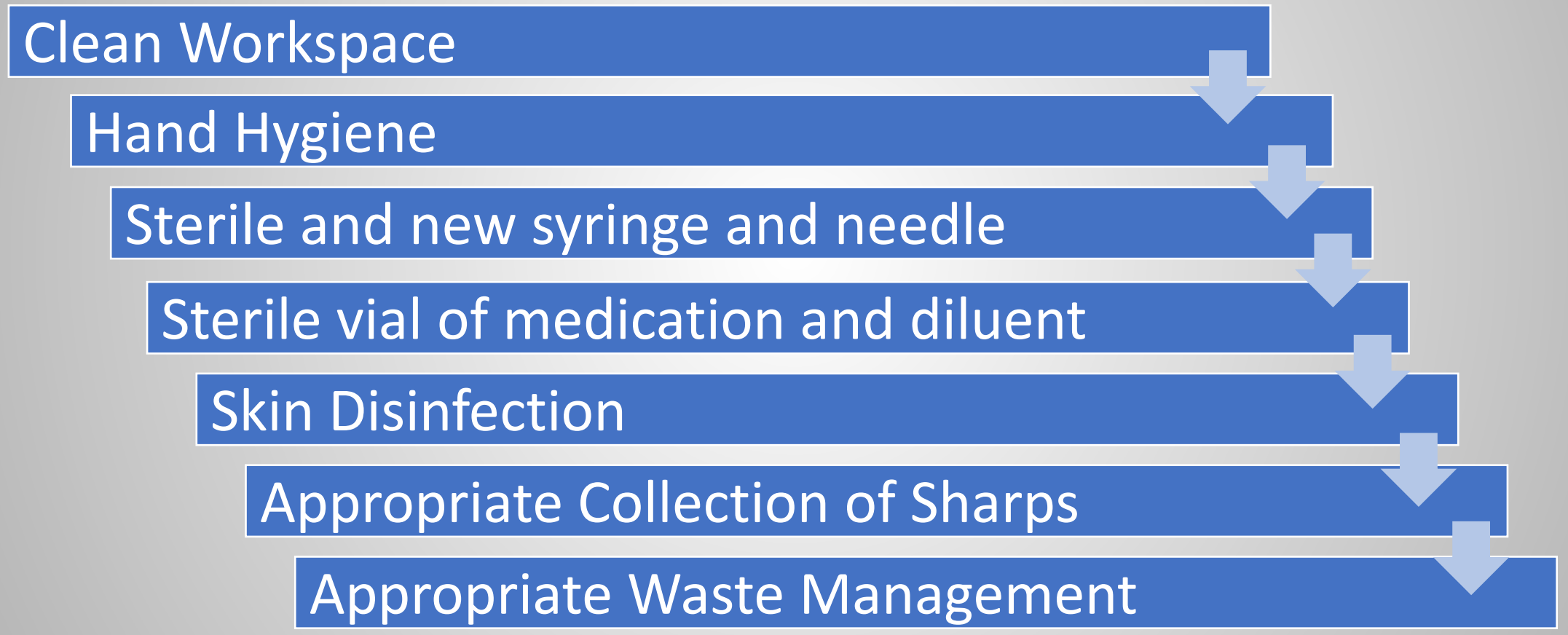
DANGEROUS MISPERCEPTIONS

Here are some examples of dangerous misperceptions about safe injection practices.

Myth	Truth
Changing the needle makes a syringe safe for reuse.	Once they are used, both the needle and syringe are contaminated and must be discarded. A new sterile needle and a new sterile syringe should be used for each injection and each entry into a medication vial.
Syringes can be reused as long as an injection is administered through IV tubing.	Syringes and needles should never be reused. The IV tubing, syringe, and other components represent a single, interconnected unit. Distance from the patient, gravity, or infusion pressure do not ensure that small amounts of blood won't contaminate the syringe once it has been connected to the unit.
If you don't see blood in the IV tubing or syringe, it means that those supplies are safe for reuse.	Germs such as hepatitis C virus and staph or MRSA are invisible to the naked eye, but can easily infect patients even when present in microscopic quantities. Do not reuse syringes, needles, or IV tubing.
It's okay to use leftover medicine from use single-dose or single-use vials for more than one patient.	Single-dose or single-use vials should not be used for more than one patient regardless of how much medicine is remaining.

Injection Safety is Every Provider's Responsibility!

WHO 7 Steps to Safe Injection Practices



Summary

- AMR is a very topical pressing issue which we cannot afford to ignore
- Prevention here might just be the cure
- Everyone has a role to play
- Beating this requires collective effort
- **Now we know better, can we pledge to do better?**


THANK YOU