



MINISTRY OF HEALTH



NATIONAL ANTIMICROBIAL STEWARDSHIP MANUAL

— MARCH 2025 —

National Antimicrobial Stewardship Manual

Published by the Ministry of Health, Republic of Uganda

First edition: 2024

All parts of this publication may be reproduced in any form, provided due acknowledgement is given.

Copies may be obtained from:

Ministry of Health Headquarters,

Plot 6 Lourdel Road, P.O.Box 7272

Kampala, Uganda

Tel: +256-417-771330

Email: ugandaclinicalguidelines@gmail.com

Website: www.health.go.ug

© 2024 Ministry of Health, Republic of Uganda

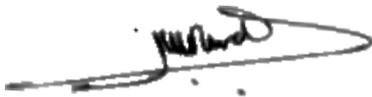
FOREWORD

Uganda is a signatory to the International Health Regulations (IHR) 2005 which guide member states to prioritize health security. In 2013, Uganda joined the Global Health Security Agenda to strengthen its health security capabilities to respond to public health threats. This led to the development of the National Action Plan for Health Security in 2018. Antimicrobial resistance is one of Uganda's public health threats prioritised in the plan. Uganda later developed the National Action Plan for Antimicrobial Resistance whose purpose is to guide the government to respond to threats related to Antimicrobial resistance.

During the Joint External Evaluation, The Ministry of Health was advised to strengthen technical areas to detect and respond to threats related to Antimicrobial resistance in the human health sector. These areas included strengthening surveillance against antimicrobial-resistant pathogens, and rational use and consumption of antimicrobials

The National Antimicrobial Stewardship Manual is developed to guide policymakers, health workers, and the community on a system approach to establish and implement antimicrobial stewardship programs (ASPs) that promote the prudent use of antimicrobials and help the country respond to AMR threats.

The MOHs through the Departments of Pharmaceutical and Natural Medicines; National Health Laboratory and Diagnostic Services; and Clinical Services will coordinate and support health workers within the health facilities and the community in implementing the manual. I urge all relevant stakeholders including the partners, district and health facility leadership and the public to support the implementation of this manual to ensure that the country achieves the Global targets. I say this for God and my country.



DR HENRY G. MWEBESA
DIRECTOR HEALTH SERVICES: CURATIVE SERVICES

PREFACE

Antimicrobial resistance is a natural process that happens over time through genetic changes in pathogens. Its emergence and spread is accelerated by human activity, mainly the misuse and overuse of antimicrobials to treat, prevent or control infections in humans. Antimicrobial Resistance poses a threat to the progress towards patients care through reduced treatment options, increased healthcare costs and eventual increase in mortality. The National Plan for Antimicrobial Stewardship provides for promotion of antimicrobial stewardship, optimal access and use of antimicrobials.

This National Antimicrobial Stewardship Manual describes the Antimicrobial stewardship governance and leadership, approaches to surveillance of Antimicrobial resistance and diagnostic stewardship, guidance on generating information on antimicrobial consumption and use at national and subnational levels, application of infection prevention and control, supply chain management for AMS, education, training, advocacy, implementation of AMS at facility level and monitoring and evaluation.

I am therefore certain that this manual comprehensively describes the key components of successful AMS programs at national and subnational levels. It is a major milestone in attaining the health sector goals.

I commend the efforts of all who actively participated in developing this manual and thank all the stakeholders who provided input and support under the coordination and leadership of the Departments of Pharmaceutical and Natural Medicines; National Health Laboratory and Diagnostic Services; and Clinical Services.

I encourage all stakeholders including the partners, district and health facility leadership and the public to support the implementation of this manual.



DR CHARLES OLARO
DIRECTOR HEALTH SERVICES: CURATIVE SERVICES

ACKNOWLEDGEMENTS

The Ministry of Health acknowledges the efforts and contribution of all individuals and institutions towards the development of the National Antimicrobial Stewardship Manual (AMS). We extend sincere gratitude to Dr Seru Morris, Dr. Harriet Akello, Dr. Martha Grace Ajulong from the department of Pharmaceuticals and Natural Medicine; Dr Rony Bahatungire and Dr Elizabeth Katwesigye from Department of Clinical Services; and Dr Susan Nabada, Dr Saudah Namubiru and Dr Mugerwa Ibrahim from the Department National Health Laboratories and Diagnostics Services for their leadership, technical input and coordination of the development of the manual. Further, we thank Dr Harriet Akello for Chairing and coordinating the secretariate who were responsible for development of the manual.

We also extend profound thanks to all the institutions that supported us throughout the development of the manual. In a special way we thank Dr. Sheba Gita from THET Uganda, Dr Winnie Nambatya of the Commonwealth Pharmacists Association, Dr. Ambrose Katende from Baylor Foundation Uganda, Dr Vivian Bazanye Twemanye from the Infectious Disease Institute. We also thank the United States government and the Dr Isabirye Michael from Management Sciences for Health and the technical teams from the National Medical Stores and the National Drug Authority for their input.

We also extend sincere gratitude to the Health facility leadership and Members of the Medicine and Therapeutics Committee from the regional referral and general hospitals who cooperated extensively to make sure that the development of this AMS manual occurred comprehensively and in line with national and international policies.



DR. SERU MORRIES
AG COMMISSIONER HEALTH SERVICES:
PHARMACEUTICAL AND NATURAL MEDICINES

TABLE OF CONTENTS

FOREWORD	3
PREFACE	4
ACKNOWLEDGEMENTS	5
ABBREVIATIONS	8
GLOSSARY (OPERATIONAL DEFINITIONS)	9
CHAPTER 1: INTRODUCTION	12
1.1 BACKGROUND	
1.2 SITUATION ANALYSIS	
1.2.1 AMR in Uganda	
1.2.2 Antibiotic consumption and use in human health.	
1.2.3 Community use of antibiotics	
1.2.4 Facility infection prevention and control	
1.3 GLOBAL AND NATIONAL PLANS AND ON ADDRESSING AMR	
1.3.1 Uganda Clinical Guidelines and Essential Medicines List	
1.3.2 WHO AWaRe Categorization	
1.4 GOALS OF ANTIMICROBIAL STEWARDSHIP IN UGANDA	
1.5 PURPOSE OF THIS MANUAL	
1.6 SCOPE OF THE MANUAL	
CHAPTER 2: AMS GOVERNANCE AND LEADERSHIP	18
2.1 NATIONAL LEVEL	
2.1.1 Introduction	
2.1.2 Organizational Structure	
2.2 SUBNATIONAL LEVEL	
2.2.1. Introduction	
2.2.2. Antimicrobial stewardship team	
2.2.3 Leadership and governance of AMS in a National Referral and specialized health facilities	
2.2.4 Leadership and governance AMS at Regional Referral Hospital and other Levels of Care.	
2.2.5 Coordination of AMS at community level	
CHAPTER 3: ANTIMICROBIAL RESISTANCE SURVEILLANCE	28
3.1 INTRODUCTION	
3.2 AMR SURVEILLANCE AND AMS	
3.3 DIAGNOSTIC STEWARDSHIP (DS)	
3.3.1 Objectives of microbiological diagnostic stewardship	
3.3.2 Microbiology diagnostic Pathway	
3.3.3 The link between Diagnostic stewardship and Antimicrobial Stewardship	
3.3.4 Roles of the Medicines and Therapeutics Committee in microbiology diagnostic stewardship	
3.3.5 Role of the clinicians	
3.3.6 Role of laboratory staff	
3.3.7 What is needed to enable diagnostic stewardship?	
3.4 DEVELOPING AN ANTIBIOGRAM	
3.4.1 Interpretation of an antibiogram	
3.4.2 How to utilize an antibiogram.	
3.5 HOW OFTEN WILL THE ANTIBIOGRAM BE UPDATED?	
CHAPTER 4: MONITORING ANTIMICROBIAL CONSUMPTION AND USE.	37
4.1 ANTIMICROBIAL CONSUMPTION	
4.1.1 AMC at National Level	
4.1.2 AMC at facility level	
4.1.3 Reporting metrics for AMC data	
4.2 ANTIMICROBIAL USE	

4.2.1 Approaches to measuring AMU	
4.2.2 What should be done when the problem is seen	
CHAPTER 5: INFECTION PREVENTION AND CONTROL	45
5.1 LINK BETWEEN IPC & AMS	
5.2 HOW TO INTEGRATE INFECTION PREVENTION MEASURES INTO ANTIMICROBIAL STEWARDSHIP PROGRAMS	
5.3 TARGETED CARE BUNDLES	
5.4 ENVIRONMENTAL SWABBING.	
CHAPTER 6: SUPPLY CHAIN MANAGEMENT IN ANTIMICROBIAL STEWARDSHIP	50
6.1 INTRODUCTION	
6.2 SUPPLY CHAIN PROCESSES IN AMS	
6.2.1 Selection	
6.2.2 Quantification	
6.2.3 Procurement	
6.2.4 Distribution and storage of antimicrobials and laboratory supplies	
6.2.5 Dispensing	
6.3 LABORATORY AND DIAGNOSTIC SUPPLIES IN AMS	
6.3.1 Rational use of laboratory microbiology supplies	
6.4 ROLES OF THE MTC IN SUPPLY CHAIN MANAGEMENT	
CHAPTER 7: EDUCATION, TRAINING, AND ADVOCACY	59
7.1 INTRODUCTION	
7.2 OBJECTIVES OF THE TRAININGS	
7.3 ESSENTIAL AMS COMPETENCIES	
7.4 EDUCATIONAL STRATEGIES	
7.5 AWARENESS AND ADVOCACY	
7.6 RESPONSIBLE ENTITIES FOR AMS AWARENESS, EDUCATION, AND TRAINING	
CHAPTER 8: IMPLEMENTING AMS INTERVENTIONS AT FACILITY LEVEL.	66
8.1 CORE ELEMENTS OF THE FACILITY AMS PROGRAM	
8.2 KEY STEPS IN ESTABLISHING A HEALTH FACILITY AMS PROGRAM.	
8.2.1 Conduct a health facility AMS situation (SWOT) analysis.	
8.2.2 Developing an AMS action plan	
8.2.3 Implement health facility AMS interventions	
8.3 BEHAVIOUR CHANGE	
CHAPTER 9: MONITORING AMS INTERVENTIONS	71
ANNEXES	72
ANNEX 1: DETAILED LIST OF ANTIBIOTICS CATEGORIZED BY THE WHO AWARE CLASSIFICATION	
ANNEX 2: GOOD DISPENSING GUIDELINES	
ANNEX 3: AMS COMPETENCIES FOR HEALTH CARE WORKERS IN FACILITIES UNDERTAKING ASPs	
ANNEX 4: EDUCATIONAL STRATEGIES	
ANNEX 5: EXAMPLE OF A SWOT ANALYSIS	
ANNEX 6: EXAMPLE OF AMS ACTION PLAN	
ANNEX 7: COMPREHENSIVE LIST OF AMS INTERVENTIONS FOR IMPROVING ANTIBIOTIC PRESCRIBING PRACTICES	
ANNEX 8: OPD DRUG INDICATOR SURVEY TOOL FOR PRESCRIPTION AUDITS AND MEDICINES USE EVALUATION	
ANNEX 9: POINT PREVALENCE SURVEY TOOL TO ASSESS INPATIENT ANTIBIOTIC USE	
ANNEX 10: INDICATOR MATRIX FOR FACILITY-LEVEL USE	
ANNEX 11: INDICATOR MATRIX TO MONITOR AMS AT NATIONAL LEVEL	
ANNEX 12: LIST OF CONTRIBUTORS	

ABBREVIATIONS

AMCU	Antimicrobial Consumption and Use
AMR	Antimicrobial Resistance
AMR NAP	National Action Plan against AMR
AMS	Antimicrobial Stewardship
AMU	Appropriate Medicines Use
AWaRe	Access, Watch, Reserve
CAP	Community-acquired pneumonia.
CDC	Centers for Disease Control and Prevention
CHEWs	Community Health Workers
CLSI	Clinical and Laboratory Standards Institute
DDD	Defined daily dose.
DOTs	Days of therapy
EML	Essential Medicines list
EUCAST	European Committee on Antimicrobial Susceptibility Testing
GLASS	Global Antimicrobial Resistance Surveillance System
GOU	Government of Uganda
HCW	Health-care worker
IPC	Infection Prevention and Control
eLMIS	electronic Logistics Management Information System
LMIC	Low- and Middle-income Countries
M&E	monitoring and evaluation
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MDR	Multi drug-resistant
MOH	Ministry of Health
MPM TWG	Medicine Procurement Management Technical Working Group
MTC	Medicine and Therapeutics Committee
NDA	National Drug Authority
NHLDS	National Health Laboratory and Diagnostic Services
OHP	One health platform
OVI	Objectively verifiable indicators
PDR	Pan Drug-Resistant
PK/PD	Pharmacokinetic/Pharmacodynamics
PPS	Point Prevalence Survey
SMART	Specific, Measurable, Achievable, Relevant, Time- Bound
SSTI	Skin and soft tissue infection
SWOT	Strengths, Weaknesses, Opportunities and Threats
TWG	Technical Working Group
UCG	Uganda Clinical Guidelines
UNAMRC	Uganda National Antimicrobial Resistance Sub-committee
UTI	Urinary Tract Infection
VHT	Village Health Team
WAAW	World Antimicrobial Resistance Awareness Week
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
XDR	Extensively Drug-Resistant

GLOSSARY (OPERATIONAL DEFINITIONS)

Antibiotic	An agent or substance that is produced by or derived from a microorganism that kills or inhibits the growth of another living microorganism. Antibiotic substances that are synthetic, semi-synthetic, or derived from plants or animals are, strictly speaking, not antibiotics. However, for the purposes of the toolkit they are included. In this document “antibiotic” refers to an antimicrobial agent with the ability to kill or inhibit bacterial growth.
Antibiogram	An overall profile of antimicrobial susceptibility testing results of a specific microorganism to a set of antimicrobials.
Antimicrobial	Are medicines used to prevent and treat infections in humans, animals and plants. It includes antibiotics, antivirals, antifungals and antiparasitics.
Antimicrobial Resistance	A phenomenon that occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to antimicrobial medicines. As a result, antimicrobial medicines become ineffective, infections are harder to treat, increasing the risk of disease spread, severe illness and death.
Antimicrobial stewardship	A coherent set of actions which promote the responsible use of antimicrobials. This definition can be applied to actions at the individual level as well as the national and global level.
Antimicrobial Stewardship Program	An organizational or system-wide health-care strategy to promote appropriate use of antimicrobials through the implementation of evidence-based interventions .
AWaRe Classification	A categorization of antibiotics established to assist in the development of tools for antibiotic stewardship at local, national, and global levels. The AWaRe classification of antibiotics was developed by WHO in which antibiotics are classified into three different groups - Access, Watch and Reserve - based on their clinical importance and the risk of their use promoting resistance to emphasize the importance of their appropriate use.
Community	A specific group of people, usually living in a defined geographical area, who share common values, norms, culture, and customs, and are arranged in a social structure according to relationships which the community has collectively developed over a period.

Community acquired infections	Infections that are contracted outside of a hospital or are diagnosed within forty-eight hours of admission and without any previous health care encounter.
Community Health delivery structures	These include the Village Health Teams (VHTs) private sector composed of traditional and complementary medicine practitioners, private health professionals, the non-facility based non-governmental organizations who offer preventive, curative and rehabilitative health services, social enterprises offering subsidized health services and lay community workers who are the beneficiary targets by all the players
Competence	The development of observable ability of a person (or individual health worker) that integrates knowledge, skills and attitudes in their performance of tasks. Competencies are durable, trainable and, through the expression of behavior, measurable.
Days of therapy (DOTs)	The number of days a patient receives an antibiotic independent of dose.
Defined Daily dose (DDDs)	The assumed average maintenance dose per day for a medicine used for its main indication in adults as established by the WHO Collaborating Centre for Drug Statistics and Methodology.
Diagnostic stewardship	Coordinated guidance and interventions to improve appropriate use of microbiological diagnostics to guide therapeutic decisions.
Directed antibiotic treatment	The use of antimicrobial drugs (such as antibiotics) specifically chosen to target a particular pathogen or group of pathogens causing an infection. It involves selecting an antimicrobial agent based on the identified or suspected causative organism and its known susceptibility to certain drugs.
Empirical antibiotic treatment	The initial antimicrobial treatment administered based on clinical judgment and knowledge of common pathogens associated with a particular infection, even before the specific causative organism has been identified. The clinicians rely on their clinical expertise, knowledge of common pathogens, and local guidelines to select an antimicrobial agent or combination of agents that is likely to cover the most probable pathogens.
Health-care-associated infection/ nosocomial infection/ hospital acquired infection :	An infection that occurs after a patient is admitted to a hospital or any healthcare facility and that were not present or incubating at the time of admission. An infection is usually defined as a HAI if it manifests more than forty-eight hours after admission to the healthcare facility. Health-care- associated infections can also appear after discharge.
Medical prophylaxis	The use of preventive measures, including medications or interventions, to reduce the risk of developing a particular disease or condition in individuals who are at high risk or have specific predisposing factors. It aims to prevent the occurrence of the disease or minimize its severity.

Objectively Verifiable indicators	These are the measures, direct or indirect that will verify to what extent the objectives have been fulfilled. The term “objectively” implies that if these should be specified in a way that is independent of possible bias of the observer.
Occupied bed days	Total number of bed days of all admitted patients accommodated during the reporting period, taken from a count of the number of inpatients.
Outcome measures/ indicators for AMS programs:	Outcome measures/indicators are used in AMS activities to capture quantitative change in e.g., patient, or economic outcomes, but most of all in antibiotic use. Antibiotic consumption is expressed with a numerator indicating the quantity used (i.e., DDDs or DOTs) per defined denominator (i.e., patient-days, admissions, consultations), to enable comparisons over time in the same setting or with other settings.
Patient days	Patient Days are the sum of the lengths of stays of each patient separated during the reporting period.
Process measures/ indicators for AMS programs:	Process measures/indicators aim to capture information about the key processes that contribute to achieving the desired outcome(s). An example in AMS would be the proportion of patients prescribed antibiotic treatment in compliance with standard treatment guidelines.
Prophylaxis	Measures that seek to avert the occurrence of disease, arrest its progress, and reduce its consequences once it is established.
SWOT Analysis	A SWOT (strengths, weaknesses, opportunities, and threats) analysis (alternatively called a situational analysis) is a popular method of identifying internal and/or present strengths and weaknesses, and external and/or future opportunities and threats to aid a decision-making process.
Structural measures/ indicators for AMS programs:	Structure refers to the characteristics (capacity, systems and processes) of the setting in which AMS programs are conducted. Structures may be material or human resources, such as availability of financial resources, number of personnel, availability of guidelines, availability of information technology tools, etc.
Surgical Prophylaxis:	The administration of antimicrobial agents to patients undergoing surgical procedures to prevent surgical site infections (SSIs). It involves the use of antibiotics before, during, and sometimes after surgery to reduce the risk of infection at the surgical site.



CHAPTER 1

INTRODUCTION

This chapter introduces the concept of antimicrobial resistance (AMR) and sets the stage for prioritization of stewardship interventions to address the overuse and misuse of antimicrobials as the major modifiable driver. The chapter also provides a description of the aims of antimicrobial stewardship in Uganda and insight into the scope of this manual.

1.1 Background

Antimicrobial stewardship refers to a coordinated approach that aims to optimize the use of antimicrobials to ensure their effectiveness while minimizing development of antimicrobial resistance. It involves various interventions, policies implemented in health care settings to promote appropriate use of antimicrobial agents.

The problem of antimicrobial resistance in infectious agents has been rising, and there is global concern that in the absence of interventions to reverse these trends, the means to treat infectious diseases will be limited and out-of-reach for many, especially those living in low- and middle income countries (LMICs)

1. Pathogen resistance to antimicrobials is a natural phenomenon that has been observed since the first antibiotics were discovered. AMR has increased in recent years with the growing global population and concordant increase in the use of antimicrobials. This has exerted selection pressure on microbes and resulted in increased populations of antimicrobial resistant strains of pathogenic organisms. Unfortunately, the upward trend of AMR has not been matched by the development of new antimicrobial agents to treat the emerging resistant pathogens
2. The consequences of infection with antimicrobial-resistant organisms can be severe leading to increased mortality, morbidity, and economic depreciation due to loss of productivity.

In 2015, the World Health Assembly (WHA) endorsed the Global Action Plan against Antimicrobial resistance (GAP)³. This was followed by a political declaration by the high level meeting of the general assembly on AMR in September 2017⁴. The two policy initiatives acknowledged overuse and misuse of antimicrobial as the main recipe for development of resistance. They also acknowledged need for optimization of use of the available antimicrobials.

In 2018, Uganda approved the National Action Plan against AMR (AMR NAP) hinged on the five strategic objectives proposed in the Global Action Plan against AMR. The strategic objectives include improving awareness and understanding of AMR through effective communication, education, and training; strengthening the knowledge and evidence base through surveillance and research; reducing the incidence of infection through effective sanitation, hygiene, and infection prevention measures; optimizing the use of antimicrobial medicines in human and animal health; developing the economic case for sustainable investment that takes account of the needs of all countries; and increasing investment in new medicines, diagnostic tools, vaccines, and other interventions.

This manual therefore aims to guide the implementation of antimicrobial stewardship (AMS) encompassing all five strategic objectives, including defining the governance and coordination mechanisms to implement and sustain AMS programs at national and facility levels.

1.2 Situation analysis

1.2.1 AMR in Uganda

The burden of communicable diseases in Uganda is still high, contributing up to 75% of the national disease burden, with malaria, acute respiratory infections, and HIV/AIDS among the top 10 causes of illness and death (1). In this context, the problem of AMR is pronounced further by the substantial economic burden and effect on the national health systems through prolonged stays in hospitals, the need for more expensive drugs, and the greater need for intensive care treatment.

In 2019, there were an estimated 1.05 million deaths associated with bacterial AMR and 250,000 deaths attributable to bacterial AMR in the WHO African region. 48% of the AMR burden was attributed to lower respiratory and thorax infections. 22% of all estimated bacterial pathogen AMR deaths were bloodstream infections, 10% were intra-abdominal infections, and 7% were tuberculosis [1].

In the same year, the number of AMR deaths in Uganda was higher than deaths from respiratory infections, tuberculosis, cardiovascular diseases, HIV/AIDS, sexually transmitted infections, neglected tropical diseases, malaria, and neoplasms. There were 7,100 deaths attributable to AMR and 30,700 deaths associated with AMR [1].

Five pathogens have been identified to be the highest contributors to the number of deaths associated with AMR in Uganda: *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Escherichia coli*, *Staphylococcus aureus*, and *Salmonella Typhi*. These commonly cause lower respiratory infections and all related infections in the thorax, bloodstream infections, and peritoneal and intra-abdominal infections. Evidence suggests increasing trends of drug resistance to Watch and Reserve antibiotics such as ciprofloxacin, ceftriaxone, meropenem, imipenem, and tetracycline (among the Gram-negative organisms) in Uganda [1]. This data and information have been used in patient management, the development of antibiograms, and updates to the national treatment guidelines.

Considerable progress has been achieved in establishing the national AMR surveillance program in Uganda [1]. Currently, human AMR surveillance occurs at national and regional referral hospitals and in selected public universities.

1.2.2 Antibiotic consumption and use in human health.

Standardized monitoring of antibiotic use underpins the effective implementation of antimicrobial stewardship interventions in combatting antimicrobial resistance (AMR). Uganda has approved national guidelines for monitoring antimicrobial consumption and use.

The implementation of these guidelines at the national level includes monitoring the volumes of antimicrobials imported and distributed for human and animal use. In 2021, the average daily defined doses (DDDs) per 1000 inhabitants was 29.02 for all antimicrobials; 80.7% of antimicrobials consumed were oral. 27.6% of the total DDDs were penicillins, and 15.5% were sulfonamides. Between 2018 and 2021, 62.19% of the total volume of antibiotics imported was in the Access category of the WHO AWaRe classification, while 14.5% were in the Watch category. Between 2020 and 2021, at the height of the COVID-19 pandemic, the consumption of Watch antibiotics increased by 10%. Azithromycin and ciprofloxacin were the most consumed Watch antibiotics in 2021[1].

Between 2017 and 2019, most antimicrobials distributed by the central-level warehouses (National Medical Stores and Joint Medical Stores) to public and private-not-for-profit facilities fell under the Access category. Additionally, a higher therapeutic density of antibiotics measured in Defined Daily Doses (DDD) per 100 patient days observed at national and regional referral hospital level compared to lower-level health facilities .

The consumption of antibiotics at facility level is driven by the high use of antibiotics among outpatients and inpatients. Data from routine public and PNFP facility point prevalence surveys and outpatient drug indicator surveys suggest overuse and misuse of antibiotics. Published and anecdotal data indicate that between 60–74% of admitted patients are on one or more systemic antibiotics. The adherence to the national treatment guidelines and use of microbiology test results is low. The proportion of broad-spectrum Watch category antibiotics such as ceftriaxone is high, often prescribed more for the prevention of infections (surgical prophylaxis) than to treat infections. The clinician’s aversion of loss or risks to the patient often does not include the risk of AMR ; broad spectrum antibiotics are prescribed “just in case” for diagnoses that don’t need require treatment with antibiotics.

1.2.3 Community use of antibiotics

In 2001, Uganda institutionalized a national community health worker (CHW) program at the Health Center I level called the Village Health Teams (VHTs). Led primarily by decentralized mechanisms, VHTs have steered health care service delivery at the household level for decades playing the role of a vital conduit between health facilities and households and delivering high quality and equitable health services to vulnerable communities. However, the system to manage and support community health workers has not been well established leading to fragmented geographic coverage, inconsistent functionality, and intermittent assistance from external partners. There is also a vacuum in the policy frameworks and guidance for implementation of concerted community health strategies .

In the societal context of Uganda, how antibiotics are perceived in the social, economic, and political realities of the everyday lives of the people is responsible for “irrational” medicine use . There is documented evidence that patients will use antibiotics before a hospital visit or consultation with a doctor . This self-medicated use of antibiotics is enabled by the ease of access to these medicines in drug shops and pharmacies despite the prevailing law requiring a prescription from a clinician.

Recognizing the importance of community health and the need to address its related challenges, the Ministry of Health (MoH) has developed a National Community Health Strategy (NCHS) for the period of 2021/22–2025/26. This strategy is anchored in the Parish Development Model as well as other national frameworks. It is also intended to ensure that health services are accessible and that a person-centered approach in the provision of healthcare is implemented to achieve significant impact in the short and long term.

1.2.4 Facility infection prevention and control

Good infection prevention and control (IPC) is proposed as a key intervention against the spread of resistant pathogens within the facility and limits the use/exposure to antibiotics. Evidence has shown that effective hand hygiene practices reduce the incidence of healthcare-associated infections (HCAI) by 50% while effective infection prevention and control reduce healthcare-associated infections by at least 30% (WHO). However, compliance with this practice among healthcare workers is low.

Methicillin-resistant *Staphylococcus aureus* (MRSA), the commonest cause of HAIs, has been isolated from the hands of more than half of healthcare workers. Hand hygiene may help in the control of nosocomial infections. Studies conducted among healthcare workers who have daily contact with patients, the prevalence of healthcare-associated infection in their immediate environment at the national referral hospital (NRH) was found to be 2.5%–14.8%.

Uganda adopted the World Health Organization (WHO) recommended core elements for Infection Prevention and Control. The Ministry of Health rolled out a National IPC mentorship program in 2019 to strengthen nationwide IPC capacity following the COVID-19 pandemic. The IPC practices have been routinely assessed through the IPC mentorship dashboard, with documented outcomes at facility level.

Various factors such as knowledge gap, limited resources such as IPC materials, personal protective equipment (PPE) and many more have contributed to the poor performance of IPC in Uganda. In addition to knowledge gaps, poor attitude towards IPC in the hospital still poses a threat to proper management of hospital related infections.

1.3 Global and National Plans on Addressing AMR

Broad global and national policies as well as the more granular facility interventions against AMR are currently focused on antimicrobial stewardship (AMS); a coherent set of actions that promote responsible use of antimicrobials.

In May 2015, the World Health Assembly discussed and agreed to a One Health Global Action Plan focusing on five key strategic objectives: public awareness, infection prevention and control, optimal access and use of antimicrobials, surveillance, and research and development.

In 2018, Uganda launched the National Action Plan (NAP), a mirror image of the GAP. Under the strategic objective to optimize access and use of antibiotics, the NAP proposes strengthening technical and regulatory frameworks, ensuring the availability of the required medicines, and changing behavior among prescribers.

In line with the NAP documented approaches for implementing AMS programs nationwide, it is crucial to emphasize increasing capacity for surveillance of resistant bacteria and monitoring volumes of antibiotics consumed alongside conducting awareness campaigns among health workers (Dr Adrian J Brink et al., 2016, Mera A. Ababneh et al., 2021).

1.3.1 Uganda Clinical Guidelines and Essential Medicines List

The appropriate use of antimicrobials requires that the patients receive medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period.

The Uganda Clinical Guidelines have been developed and regularly revised to assist prescribers in deciding on appropriate treatments for specific clinical problems. These guidelines usually reflect the consensus on the optimal treatment options within a health facility or health system. They also provide a rational basis for an efficient procurement and supply system that ensures the availability of safe, efficacious, quality medicines and health supplies.

1.3.2 WHO AWaRe Categorization

To assist in the development of tools for antibiotic stewardship at local, national, and global levels and to reduce antimicrobial resistance. The AWaRe classification of antibiotics was developed by WHO in which antibiotics are classified into three different groups - Access, Watch, and Reserve - based on their clinical importance and the risk of their use promoting resistance to emphasize the importance of their appropriate use. Currently, all antibiotics in common clinical use globally are now classified using the AWaRe framework. The details of which antibiotics belong to each category can be found in Annex 1.

Access	<p>This group includes antibiotics that have activity against a wide range of commonly encountered susceptible pathogens while also showing lower resistance potential than antibiotics in the other groups.</p> <p>Selected Access group antibiotics are recommended as essential first or second-choice empiric treatment options for infectious syndromes reviewed by the EML Expert Committee and are listed as individual medicines on the Model Lists of Essential Medicines to improve access and promote appropriate use.</p>
Watch	<p>This group includes antibiotic classes that have higher resistance potential and includes most of the highest priority agents among the Critically Important Antimicrobials for Human Medicine and/or antibiotics that are at relatively high risk of selection of bacterial resistance.</p> <p>These medicines should be prioritized as key targets of stewardship programs and monitoring. Selected Watch group antibiotics are recommended as essential first or second-choice empiric treatment options for a limited number of specific infectious syndromes.</p>
Reserve	<p>This group includes antibiotics and antibiotic classes that should be reserved for treatment of confirmed or suspected infections due to multi-drug-resistant organisms. Reserve group antibiotics should be treated as “last resort” options. These antibiotics should be accessible, but their use should be tailored to highly specific patients and settings, when all alternatives have failed or are not suitable.</p> <p>These medicines should be protected and prioritized as key targets of national and international stewardship programs involving monitoring and utilization reporting, to preserve their effectiveness.</p>

1.4 Goals of Antimicrobial Stewardship in Uganda

The overarching goals of AMS are;

- Optimise antimicrobial prescribing by ensuring that only those who need antibiotics receive the right drug promptly in the appropriate dose and duration.
- Prevent antimicrobial overuse, misuse and abuse, and development of antimicrobial resistance by ensuring that antibiotic prescribing is evidence-based and indicated. This ensures that those who do not need antibiotics do not have them and that those who need them do not use them indiscriminately.

- Reduce antibiotic-related adverse events by ensuring that the Right patients get the right drug, and decrease mortality, morbidity, and length of hospital stay attributed to diagnostic uncertainty and untargeted treatment.
- Reduce healthcare-associated costs attributed to the length of stay and prescriptions of expensive antibiotics without any laboratory evidence, whereas equally effective and much less expensive alternatives would suffice.

1.5 Purpose of this manual

The development of this manual is in line with the objectives of the AMR NAP to optimize access and use of antimicrobials. It considers the recommendations in international guidelines such as the WHO practical toolkit on Antimicrobial Stewardship Programs in Health Care Facilities in Low and Middle-Income Countries (LMICs), CDC Hospital Core Elements for Antimicrobial Stewardship and the Commonwealth Partnerships for Antimicrobial Stewardship (CWPAMS) Toolkit.

This manual is a concise guide for national actors, healthcare facility managers and their AMS teams, and community health workers on how to establish, implement, monitor and evaluate AMS programs in their institutions, including study tools for assessing progress and performance.

The purpose of this manual is to enable optimal use of antimicrobials to improve the clinical management of infectious diseases and improve patient outcomes.

This manual is developed to;

1. Support policymakers, health workers, and the community to develop mechanisms for the optimization of antimicrobial use.
2. Promote behavior change in rational antimicrobial prescribing and dispensing practices.
3. Guide on the composition and provide terms of reference for the governance of Antimicrobial Stewardship (AMS).

1.6 Scope of the manual

The focus of this manual is to guide policymakers, health workers, and the community on a system approach to establishing and implementing antimicrobial stewardship programs (ASPs) that promote the prudent use of antimicrobials.

Manual Objective

To guide on establishing a system for optimization of surveillance and use of antimicrobials in human health.

Specific Objectives

- To provide a mechanism to guide leadership commitment and coordination of AMS at National and Subnational levels.
- To guide AMR surveillance at the National and subnational level
- To guide the monitoring of antimicrobial consumption and use.
- To guide skills gap identification, training, and advocacy for AMS
- To describe the relationship between AMS and IPC
- To describe the relationship between AMS and supply chain management
- To guide on the AMS interventions in Uganda
- To provide indicators for AMS implementation, monitoring, and evaluation.



CHAPTER 2

AMS GOVERNANCE AND LEADERSHIP

This chapter describes the structure of leadership and governance for antimicrobial stewardship programs at national and subnational levels, including the accountable stakeholders and their responsibilities.

2.1 National Level

2.1.1 Introduction

The responsibility and accountability for AMS in human health lies with the Ministry of Health under the Directorate of Curative Services. Three departments play vital role in AMS governance at the National level: the Department of Pharmaceuticals and Natural Medicines (DPNM), the Department of National Health Laboratory and Diagnostic Services (NHLDS), and the Department of Clinical Services.

The Division of Quality Assurance under the Department of Pharmaceutical and Natural Medicines shall coordinate all activities related to AMCU including linking use and the emergence of AMR.

- The National Health Laboratory and Diagnostics Services Department shall be responsible for coordinating activities of AMR surveillance.
- The Department of Clinical Services shall coordinate all activities related to IPC and the implementation of the treatment and prescribing guidelines.

At sub-national level, AMS activities in human health are implemented at the health facility and the community level. At the Health facility level, AMS activities are coordinated through the Medicines

and Therapeutic Committee governance structure irrespective of ownership. The AMS agenda is driven by the AMS subcommittee under the stewardship of the MTC.

At the community level, the implementation of AMS activities takes place at health services outlets which include pharmacies and drug shops, laboratories, clinics, parishes operated by Community Health workers (CHEWs), and villages operated by Village Health Teams (VHTs). The district and health sub-district leadership shall coordinate and supervise the facilities to make sure they adhere to set standards by the Ministry of Health. The committee shall be instituted at the district level to govern AMS activities at the community and health facility levels. The committee shall comprise the District Health Officer (DHO), Assistant DHO Maternal and Child Health, Assistant DHO Environmental Health, health inspector, and representatives from the pharmacy, laboratory, data, community, and Allied Health Professions Council.

All health facilities from Health Center III and above should have functional Medicines and Therapeutics committees irrespective of ownership.

At the health sub-district level, the committee shall comprise a clinician, a health educator, a health inspector, a dispenser and, representatives from the nursing and laboratory sections.

2.1.2 Organizational Structure

Technical coordination, governance and decision making for Antimicrobial Stewardship shall be a responsibility of the Medicines Management and Procurement technical working group (MPM-TWG), Clinical Care & HIF-TWG and the health promotion TWG of MOH. While, the Advisory Committee on Appropriate Medicines Use (AMU) shall advise the TWGs upon recommendations from the Nation AMS subcommittee. The advisory committee on Appropriate Medicine Use shall be the link between the Ministry of Health and the One-Health National AMR Sub-committee. The AMU shall report all the relevant recommendations and shall direct and coordinate actions of all its relevant sub-committees. The advisory and the national AMS committee membership shall be appointed by the Director General Health Services and its secretariat will comprise at most 5 people nominated from the core departments. The role of secretariat to AMU advisory committee and AMS subcommittee shall be coordination and facilitation of the activities of the committee. The secretariat shall ensure that meetings are held at least quarterly.

The AMU advisory committee shall be composed of:

1. Director, Directorate of Curative Services (Chairperson)
2. Commissioner, DPNM (Co-Chairperson)
3. Assistant Commissioner, Division of Quality Assurance, DPNM
4. Representation from all MOH departments – nursing, UNHLS clinical, pharmacy, community health, public health, and health promotion
5. Representation from the regulatory authorities (NDA)
6. Representation of the central warehouses (NMS, JMS, MAUL)
7. Members of each of the sub-committees and IPC
8. Representation (one) from the national and regional referral hospitals
9. Representation from the community AMS advocacy groups and related civil society organizations
10. Academia representatives working on the AMS program
11. Representation from professional associations and councils

Role of the Advisory Committee on Appropriate Medicines Use

The overall goal of the Advisory Committee on AMU is to promote the availability and appropriate use of medicines and health supplies in the private and public sectors.

Specific roles will include;

- Advise the Ministry of Health in the development and promotion of policies related to medicines management and use
- Coordinate the development of standard operating procedures for the updating, dissemination, and implementation of treatment guidelines by the different MOH programs.
- Oversee the periodic review of standard treatment guideline
- Promotion of guideline-based prescribing and dispensing in the public and private sectors
- Promote research in medicines and health supplies use
- Recommend adoption of appropriate medicines use in pre-service and in-service training
- Advise on the functionalization of medicines and therapeutics committee activities in health facilities
- Make recommendations on the AMS program implementation at community levels
- Advise on strategies and measures against the spread of antimicrobial resistance in the public and private sectors

Composition of the National AMS subcommittee

The National AMS subcommittee shall comprise technical officers from the three departments of the Ministry of Health, regulatory authorities, central warehouses, medical bureaus, patient/consumer representatives, academia, and representation from the relevant health implementing partners for AMS. The Assistant Commissioner, Division of Quality Assurance of the DPNM shall be the Chairperson of the AMS subcommittee, and co-chaired by the Assistant Commissioner Clinical and Pathology Laboratory Services of NHLDS.

The National AMS subcommittee shall have a secretariat whose role will be the coordination and facilitation of the activities of the subcommittee. The National AMS subcommittee will be comprised of 15-20 persons and shall include all but not limited to:

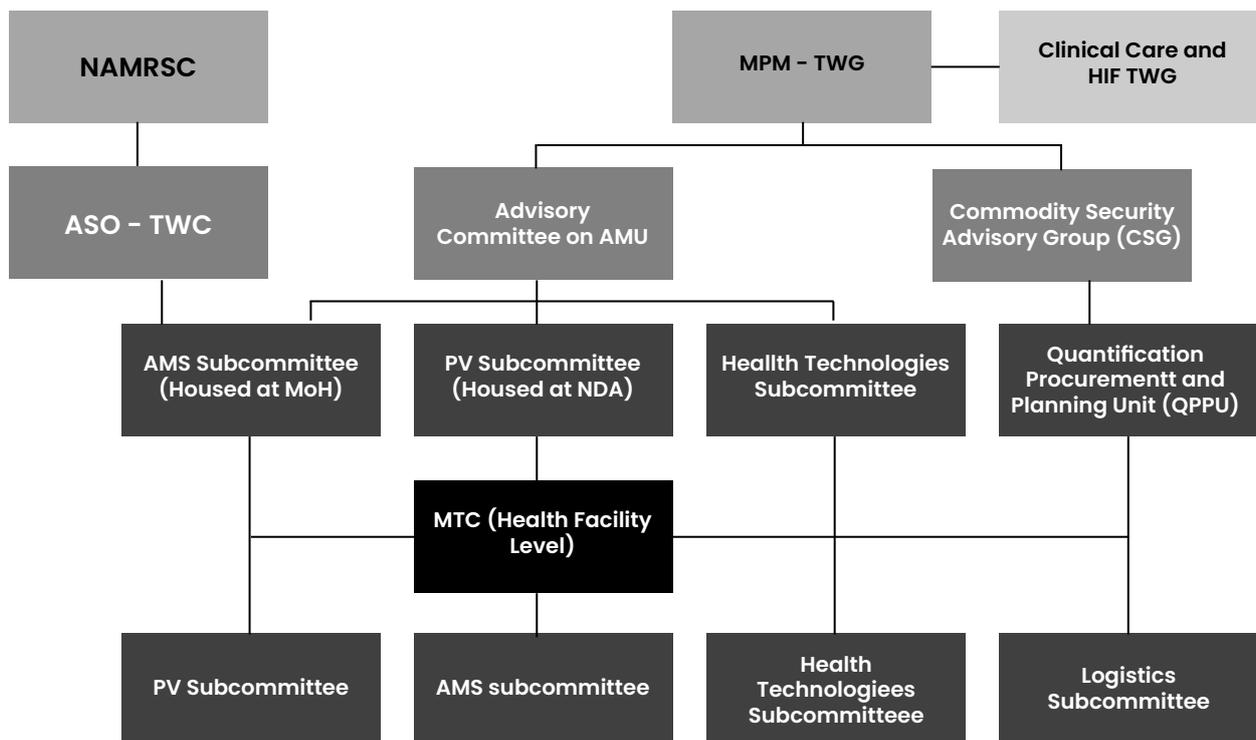
1. Assistant Commissioner, Quality Assurance (Chairperson)
2. Assistant Commissioner, Clinical and Pathology Laboratory Services at NHLDS. (Co-Chairperson)
3. Principal Medical Officer – MoH
4. Principal Microbiologist – MoH-
5. Senior Microbiologist – MoH
6. Principal Pharmacist – MoH
7. Senior Pharmacist – MoH (Secretary)
8. Regulatory Officer – AMR (NDA)
9. Senior Pharmacist – NMS
10. Pharmacist – JMS

11. A representative from the Medical Bureau (UCMB, UPMB, UMMB)
12. Representatives from the Academia (2)
13. Representatives from Patient/Consumer groups (2)
14. A representative from Implementing Partners for AMS (2)

The National AMS subcommittee shall have a secretariat which will consist of a group of selected individuals from the Division of Quality Assurance, NHLDS, health implementing partners and shall comprise at most 5 people. The members shall be nominated from the subcommittee and will include the Chairperson, representation from the 3 departments and one health partner. The secretariate roles include: mobilization and coordination of members, logistical support for meeting, minute taking and preparing reports to the National AMS subcommittee to the AMU advisory committee. The secretariate will ensure that meetings are held at least 6 times annually.

Role of the National AMS subcommittee

- Coordinates Collection and analysis of information used to develop policies concerning optimal use of antimicrobial at health facility and community level
- Propose national targets to monitor AMS implementation
- Monitor and evaluate consumption and use of antimicrobials
- Coordinate mechanism to create awareness for AMR including activities during WAAW, developing IEC materials etc
- Coordinate all relevant departments at MOH to monitor and prevent/limit the emergence and spread of resistant microorganism.
- Conduct capacity building for AMS at subnational level
- Implement the recommendations from the Advisory committee on AMS



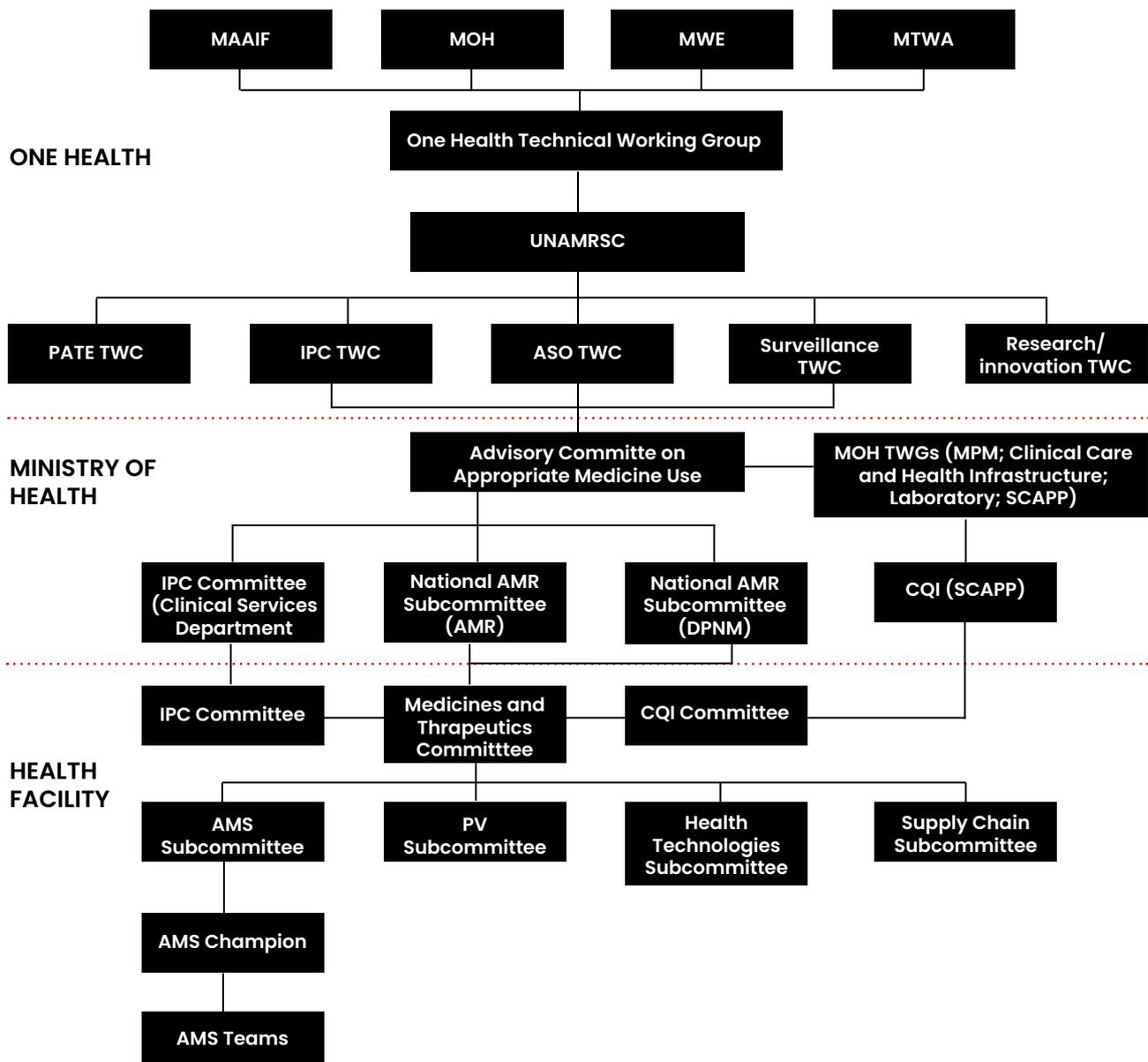
AMR AND ONE HEALTH IN UGANDA

Country AMR governance structures

Uganda’s AMR governance for human health operates through a three-tiered structure, spanning from national to facility levels. At the health facility level, AMR containment is led by the Medicines and Therapeutics Committee (MTC). The MTC is supported by an AMS sub-committee for AMR-related activities. The IPC and Continuous Quality Improvement committees are two additional committees that closely collaborate with MTC and together they submit relevant information to the National level.

At the national level, MOH coordinates AMR efforts through its departments of Laboratory Services, Clinical Services, and Pharmaceutical and Natural Medicines. These departments have respective national committees that receive and analyse AMR-related data from health facilities. Recommendations from these committees are reviewed by the Advisory Committee on Appropriate Medicine Use, which forwards critical insights to the TWCs within the ministry and to the One Health Technical Working Group for policy and decision-making.

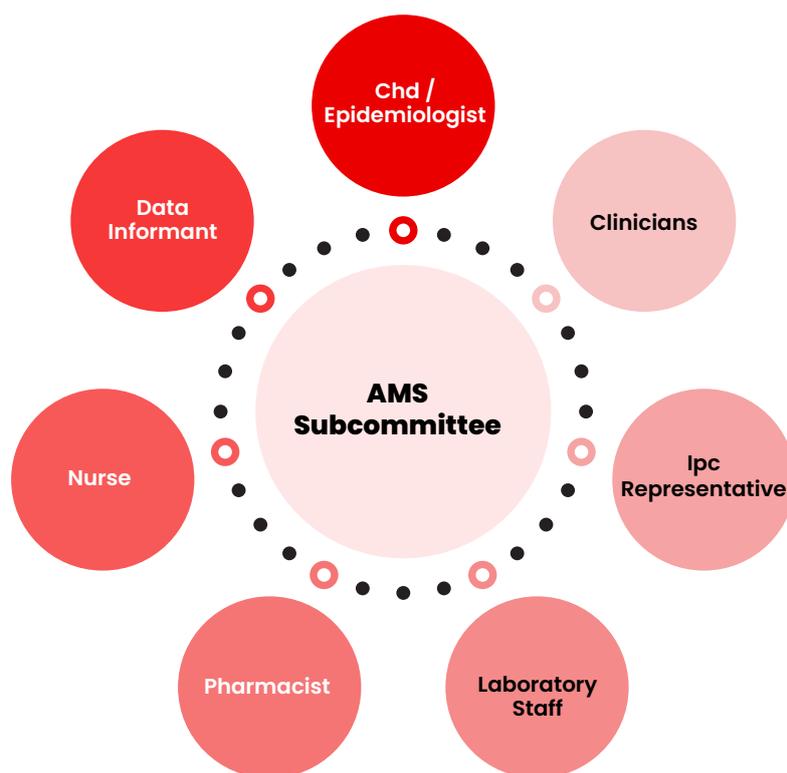
AMR Governance structure under one Health framework



2.2 Subnational Level

2.2.1. Introduction

AMS activities at health facility level will be governed by the AMS subcommittee of the health facility MTC. The members of the AMS subcommittee at health facility will be appointed by the MTC. The chairperson and secretary of the AMS subcommittee will be appointed from the MTC members. The members should include the following but not limited to: clinicians, pharmacists, laboratory staff (preferably microbiologist), nurse, community health focal (CHD) person, epidemiologist, data informant, and a representative from the IPC committee (IPC focal person).



The AMS subcommittee should be a small but agile team that will work within the MTC and the wider Quality Improvement framework to promote the antimicrobial stewardship agenda as per the MTC manual.

The AMS subcommittee will coordinate and facilitate activities that will include but not be limited to AMR surveillance, diagnostic stewardship, AMU/C monitoring, IPC, and other activities related to AMS. The subcommittee shall meet regularly and make recommendations to the MTC. The MOH recommends that each subcommittee should meet at least six times a year.

The composition of the AMS subcommittee should involve all healthcare workers under the 3 key areas mentioned above. However, the MTC will nominate members, and the director/ head of the health facility will officially appoint the members of the AMS subcommittee as deemed necessary according to the facility's needs. The MoH recommends that the AMS committee chairperson and the secretary should be members of the MTC.

Functions of the AMS subcommittee

- Advise the MTC and medical staff on all aspects of antimicrobial surveillance and use.

- Assist in evaluating, selecting and recommending antimicrobials for inclusion into the formulary and standard treatment guidelines as guided by the antibiogram.
- Develop and recommend policies concerning optimal use of antimicrobials for approval by the MTC. Policies should specifically include sections on methods to limit and restrict use of antimicrobials in the health facility and primary care clinics.
- Monitor and assess consumption and use through prescribing quality assurance programs and medicine use evaluations to ensure use of effective antimicrobials of adequate quality only when clinically indicated, in the correct dose, route and for the appropriate duration.
- Participate in the educational programs for health-care staff.
- Collaborate with the IPC committee and laboratory departments to monitor and prevent/limit the emergence and spread of resistant microorganism.
- Implementation of the AMS strategy and guidelines

2.2.2. Antimicrobial stewardship team

This is a team of committed and agile members of the health facility from different service points. These support in collecting day to day AMS surveillance data. The team shall manage the health facility's AMS programme at a day to day level and shall be responsible for enacting the strategy to achieve the goals determined by the AMS subcommittee. The team leader of AMS team should be a member of AMS subcommittee.

Roles of the AMS team include:

1. Implementing AMS strategies and performing interventions as required
2. Establish, maintain, and enforce a formulary of restricted antimicrobials and any approval systems.
3. Developing and maintaining clinical treatment guidelines and pathways
4. Education of staff, students, and consumers
5. Provide expert advice on patient management, including reviews of patients prescribed restricted antimicrobials.
6. Monitoring and analysing the effectiveness of AMS strategies and interventions, including antimicrobial usage and appropriateness.
7. Reporting and feedback to AMS committee or other executive groups

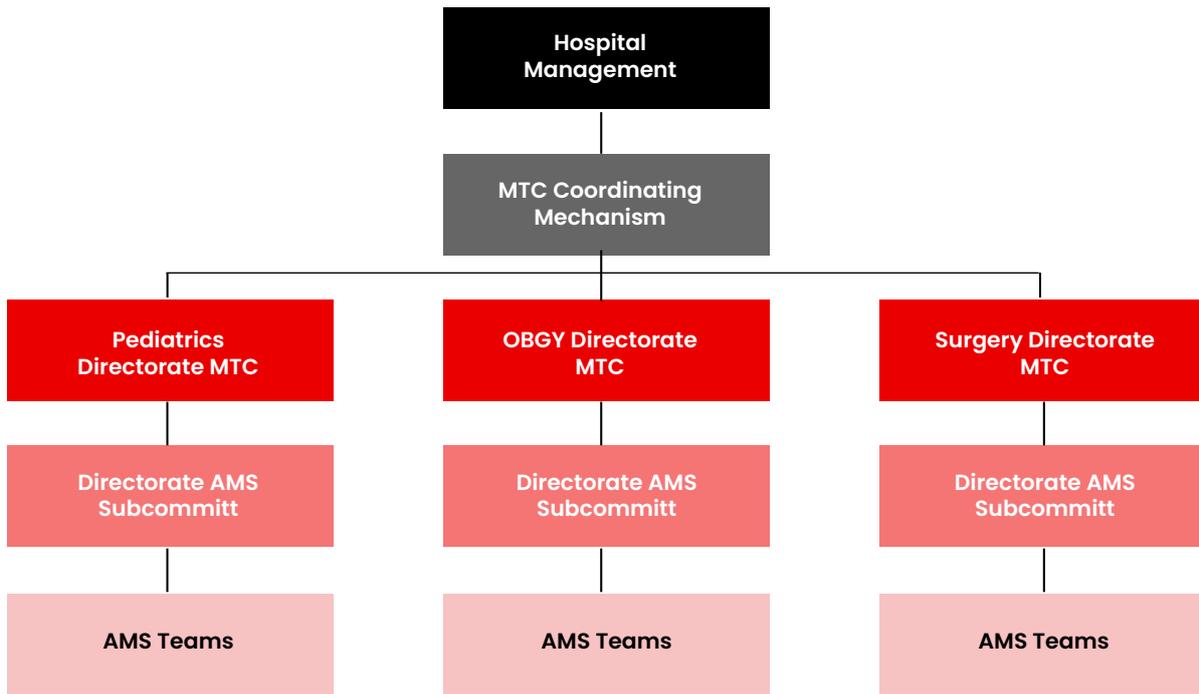
2.2.3 Leadership and governance of AMS in a National Referral and specialized health facilities

The implementation of AMS in this category of health facilities is complex given the structural arrangement. The MoH recommends that the MTCs for these institutions is constituted at directorate level. For example, in Mulago NRH we will expect multiple MTCs under each directorate and corresponding AMS sub-committees per directorate such as pediatrics, surgery, etc. The head of the health facility, institution will be responsible for appointing the MTC coordinating mechanism which will be responsible for overseeing and making necessary AMS recommendations on all the MTCs from all the directorates. The MOH recommends that such mechanisms meet and report to the hospital administration / board quarterly. The surveillance data should be reported quarterly to AMS and AMR national sub-committees and for the alert organisms, these should be reported immediately as soon as they are identified as per MoH guidelines.

The MTC coordination mechanism shall be composed of:

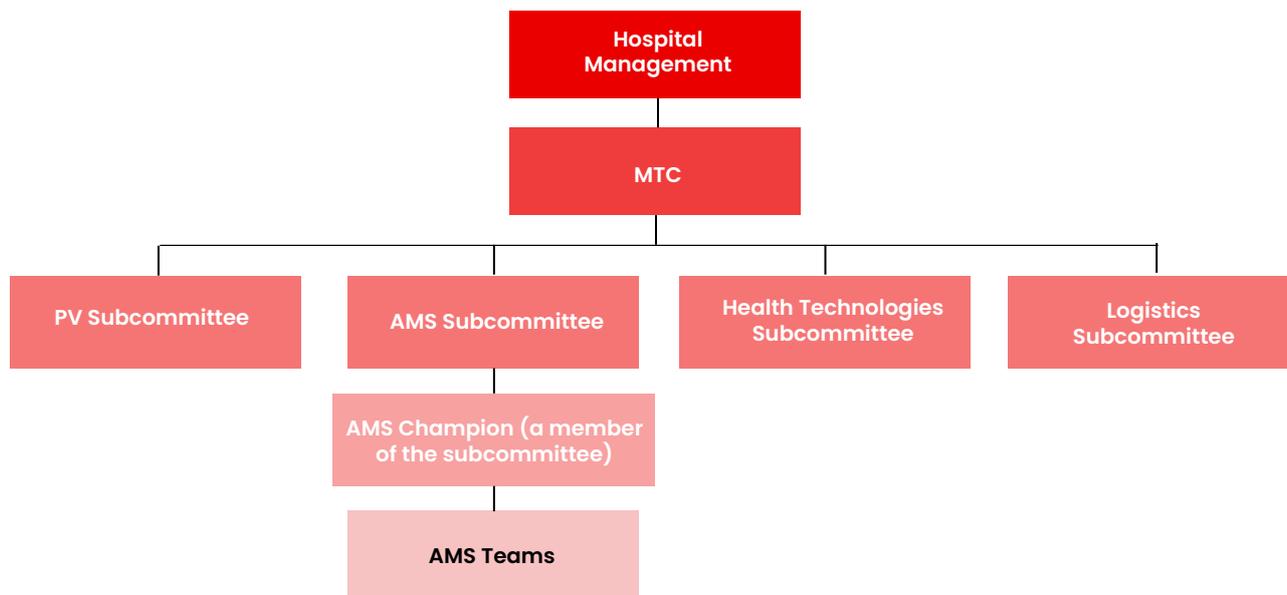
- The head of the health facility,
- The chairpersons of the directorate MTC,
- The secretaries of the directorate MTC,
- Members of the hospital administration and finance
- And other relevant stakeholder as advised by the hospital administration.

The MTC coordinating mechanism will be chaired by the head of the health facility and the secretary will be the head of pharmacy. This mechanism shall be responsible for decision making related to antimicrobial use, microbiology services, diagnostic stewardship, and IPC.



2.2.4 Leadership and governance AMS at Regional Referral Hospital and other Levels of Care.

The composition of the AMS subcommittee shall be guided by the respective level of care. It may include health workers from AMR surveillance, diagnostic stewardship, AMU&C and IPC. The number may vary as per the level of care depending on the number of operational units/wards. The surveillance data should be reported quarterly to AMS and AMR national sub-committees and for the alert organisms, these should be reported immediately as soon as they are identified as per MoH guidelines.



2.2.5 Coordination of AMS at community level

The community comprises of the community health workers (CHEWs) locally known as Village health Teams (VHTs), private health providers and the consumers. The private health service providers will include the private drug outlets (pharmacies and Drug shops), the private clinics, private laboratories.

The Community Health Extension Workers (CHEWs) are mandated to optimise antimicrobial consumption and use through consultations, recommendations of the use of the relevant treatment guidelines e.g Integrated Community Case Management (iCCM) , promoting awareness about antimicrobial consumption and use under the supervision of their respective health facilities.

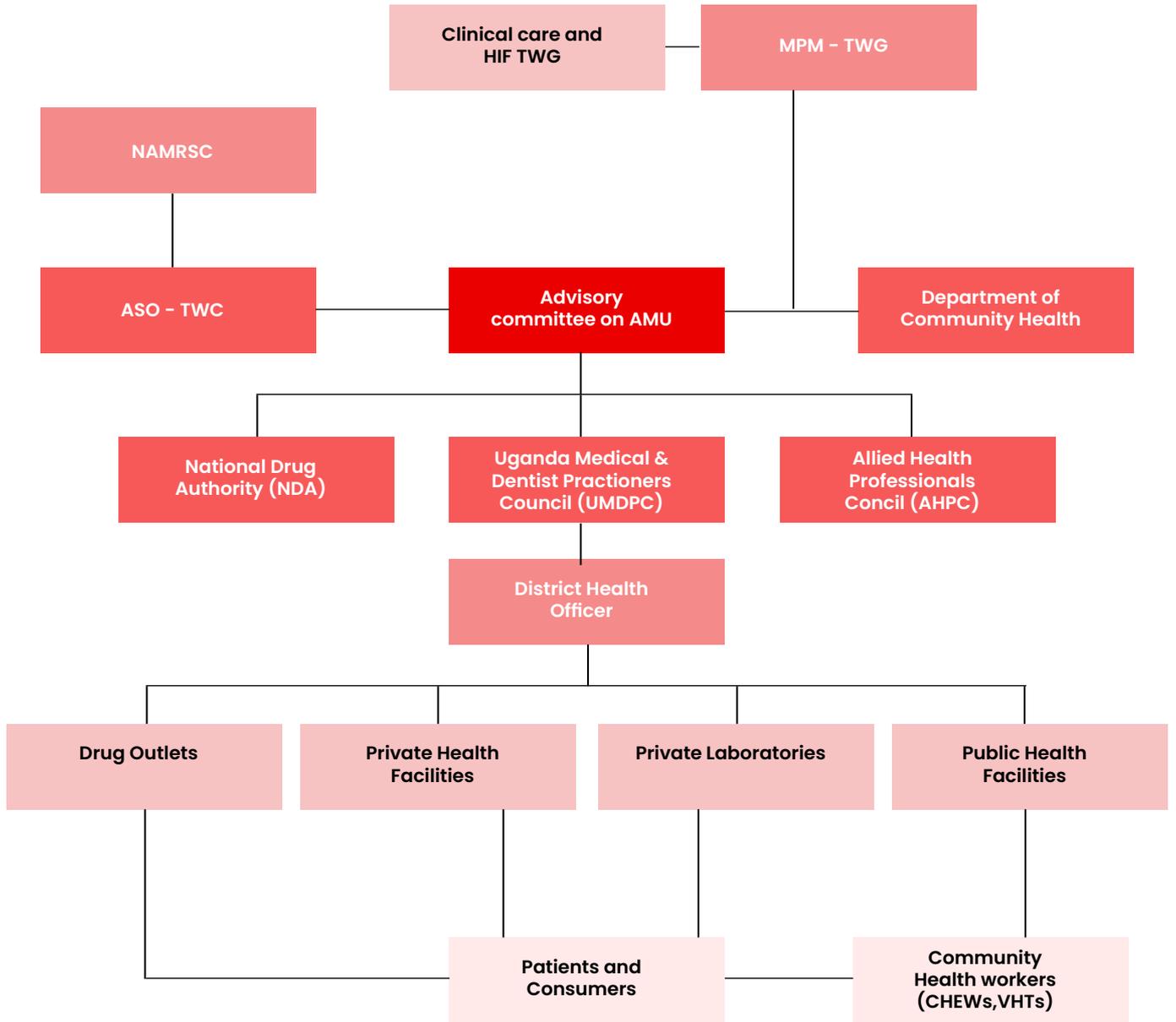
The private drug outlets are mandated to optimise antimicrobial consumption and use through, consultations, recommendations of the use of the relevant treatment guidelines, promoting patients referral and awareness about antimicrobial resistance. The dispensing of antimicrobials should be done on valid prescription only. Drug outlets should source their supplies from licensed distributors.

The private clinics are tasked to ensure adherence to the standard treatment guidelines and rational prescribing. They should observe referral system.

The private laboratories will promote AMR surveillance (including pathogen identification and Antimicrobial susceptibility testing) and advise clinicians on the right antimicrobial to be used as per the national guidelines.

The consumers include the patients, and the general public who are involved directly or indirectly in the consumption and use of antimicrobials. Their major role is to adhere to treatment, seek medical care from licensed health service providers, report and promote rational use of antimicrobials by alerting the prescribers at different points of care and any other relevant regulatory authorities on any possible irrational use of antimicrobials.

Secondly, the community through their local leaders, CHEWs and community-based organisations shall advocate for proper use of antimicrobials and propose relevant actions to be adopted by the community leadership to improve AMS in the community.



03

CHAPTER 3

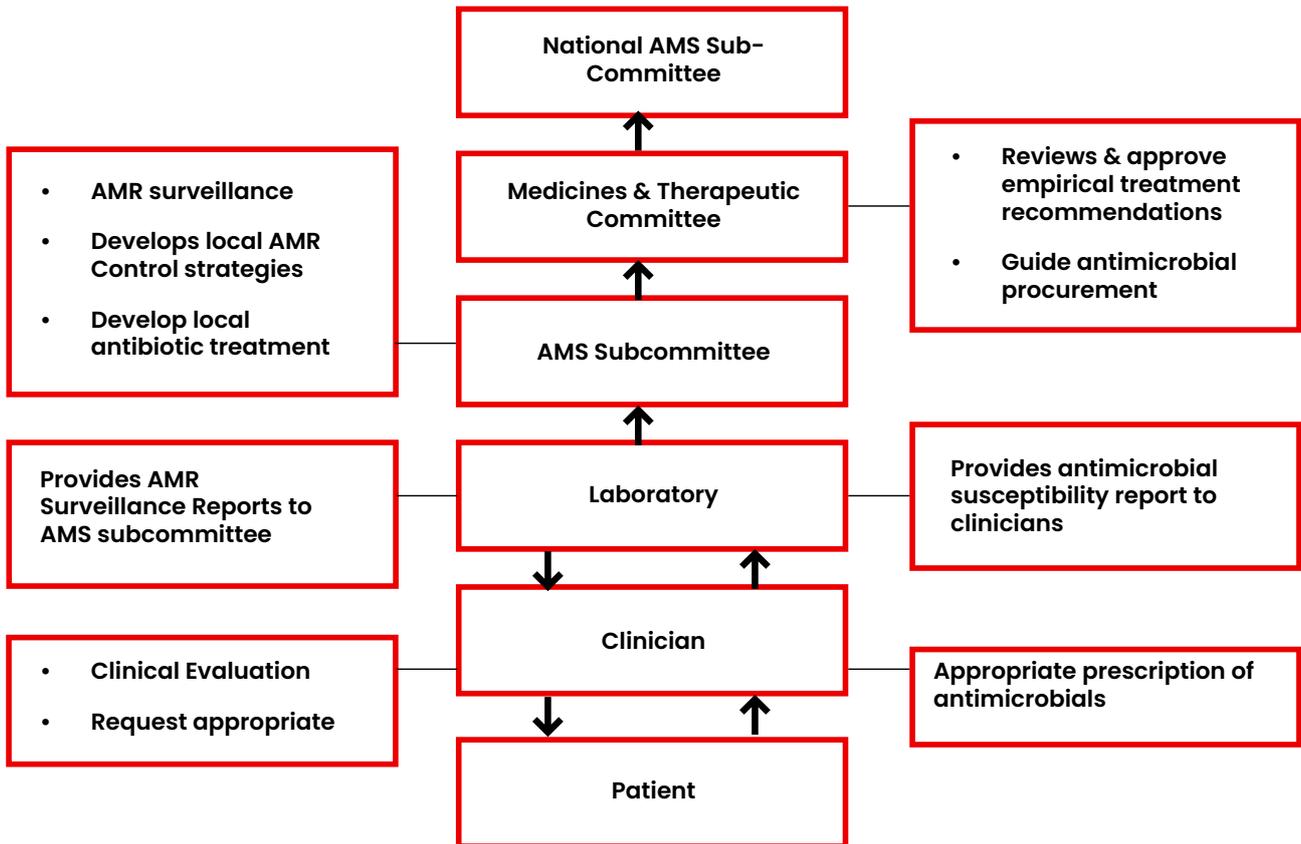
ANTIMICROBIAL RESISTANCE SURVEILLANCE

This chapter provides an overview of Antimicrobial resistance (AMR) surveillance and its role in AMS. It also guides on diagnostic stewardship, development and utilization of antibiograms.

3.1 Introduction

Surveillance of AMR refers to efforts to monitor changes in microorganism populations to understand the evolving patterns of resistance to antimicrobials. AMR surveillance is achieved through testing clinical specimens to identify causative agents and their response to antimicrobials.

The figure below illustrates the relationship between laboratory results generated for individual patient care and surveillance data which are used to inform empirical treatment recommendations and AMR control strategies, including infection prevention and control.



Underutilization and incorrect use of microbiological tests and diagnostic tools can have a negative effect on the management and outcome for individual patients. It also results in a lack of representative surveillance data for empiric treatment recommendations and AMR control strategies.

3.2 AMR surveillance and AMS

Quality AMR surveillance data forms the basis for an effective AMS program. AMR surveillance and AMS programs are inherently intertwined. AMR surveillance should provide critical data that:

- Informs selection of antimicrobials,
- Identifies emerging resistance,
- Monitors the effectiveness of stewardship interventions.

Conversely, the AMS subcommittee should utilize surveillance data to guide/inform antimicrobial prescriptions, target interventions, and assess their impact. The collaboration between the AMR surveillance and antimicrobial stewardship is essential for optimizing antimicrobial use, reducing AMR rates, and preserving the effectiveness of antimicrobial agents for future use.

The laboratory representative on the AMS subcommittee at facility level shall be responsible for providing AMR surveillance data to the committee for action and subsequent reporting to facility level monthly report, (HMIS 105_10) and to national level on a quarterly basis.

3.3 Diagnostic Stewardship (DS)

Diagnostic stewardship refers to coordinated guidance and interventions to improve appropriate use of microbiological diagnostics to guide therapeutic decisions[1]. It should promote timely, appropriate, diagnostic testing, including specimen collection, and pathogen identification, antimicrobial susceptibility testing, accurate, and timely reporting of results to guide patient treatment. Diagnostic stewardship aims to deliver the right test(s) to the right patient at the right time. It is optimally combined with antimicrobial stewardship to allow for the right interpretation to translate into the right antimicrobial at the right time. However, to achieve this, good laboratory practices and affordable access to laboratories with quality management systems, as well as the capacity and capability to perform timely and reliable microbiological diagnostics are essential. Therefore, the AMS subcommittee is responsible for implementing diagnostic stewardship at facility level.

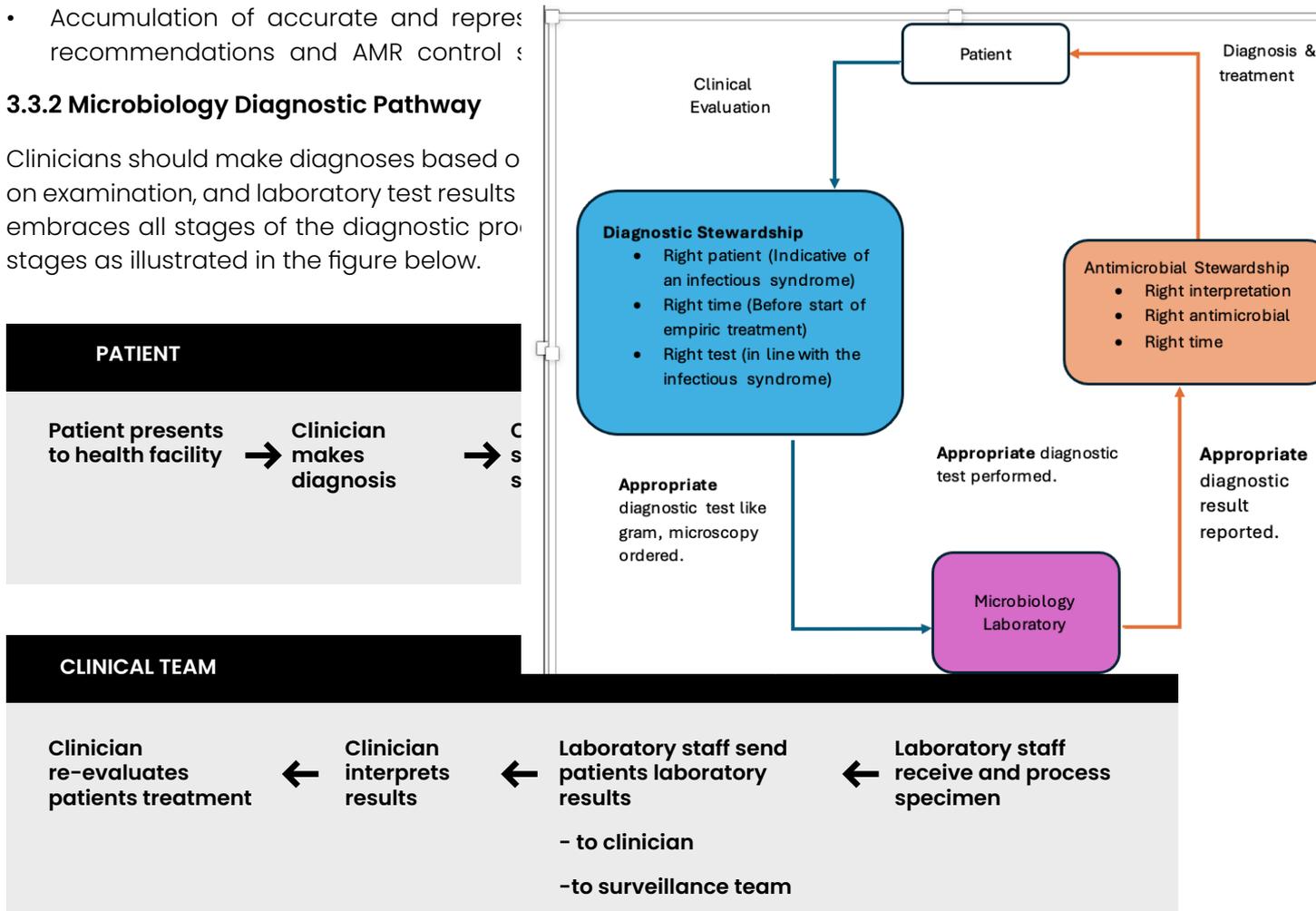
3.3.1 Objectives of Diagnostic Stewardship

The main objective of microbiological diagnostic stewardship is to enable:

- Patient management guided by timely microbiological data to deliver safer more effective and efficient patient care.
- Accumulation of accurate and representative recommendations and AMR control :

3.3.2 Microbiology Diagnostic Pathway

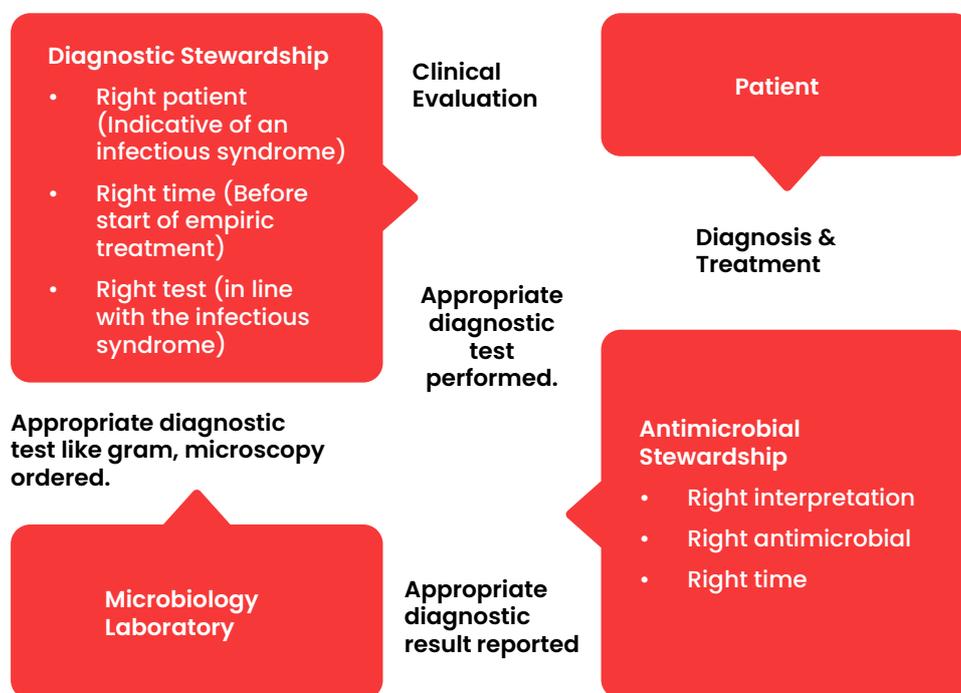
Clinicians should make diagnoses based on examination, and laboratory test results embraces all stages of the diagnostic process as illustrated in the figure below.



- 1. Pre-analytical:** Patient identification, clinical diagnosis-related test decision-making, completion of the laboratory request form, sample collection, labeling, packaging, and transportation to maintain sample integrity.

Specimen collection should take place before initiating any empiric treatment (Initial treatment targeted at the most probable causative microorganism). The recommendations should be based on local susceptibility data (facility antibiogram), national treatment guidelines like the Uganda Clinical Guidelines, available scientific evidence, or expert opinion, when evidence is lacking).[1]

- 2. Analytical:** The testing and any associated laboratory practices, including test methods, microscopy, culture and identification, antimicrobial susceptibility testing (AST), and internal and external laboratory quality systems.
- 3. Post-analytical:** Reporting and use of laboratory data, such as selective reporting of antimicrobial susceptibility data to encourage the use of narrower spectrum agents; preparation and dissemination of AMR surveillance data like antibiograms.



3.3.4 Roles of the Medicines and Therapeutics Committee in microbiology diagnostic stewardship

- Development, adoption, and implementation of quality management practices including local guidelines and SOPs for specimen selection, collection, transport, laboratory testing, and reporting.
- Monitoring the progress of the implementation of diagnostic stewardship activities in the workplan.
- Review and identify training needs and activities, including supportive supervision for diagnostic stewardship at the surveillance sites.
- Convene regular team meetings to:

- » present and discuss laboratory results and related issues,
- » present progress in implementation
- » identify and address administrative, technical, operational, and logistical issues.
- Establish links with infection prevention and control programs, and other sub-committees.
- Participation in local surveillance data management for:
 - » Development of hospital-specific antimicrobial use guidelines.
 - » Routinely provide information that requires action and decision-making at the national level.

3.3.4.1 Role of the AMS subcommittee in diagnostic stewardship

- Ensure appropriate compilation and analysis of patient clinical, demographic, epidemiological, and microbiological data,
- To enhance diagnostic stewardship within the facility
- Ensure dissemination of compiled and analyzed AMR results and antibiograms to all healthcare workers at the facility.
- Ensure that AMR reports are transmitted to staff responsible for developing treatment recommendations.
- Ensure transmission of regular reports and alerts to the national AMR surveillance coordinating center and the national AMS committee, through the Medicines and Therapeutic Committee.

3.3.5 Role of the Clinicians in Diagnostic Stewardship

Clinical Diagnosis and sample identification

- ensure correct clinical diagnosis and appropriate sample selection,
- ensure complete and correct clinical, demographic, and epidemiological patient information is provided for each specimen (complete filling of the microbiology request form).
- interpret and act on laboratory results to optimize patient management.

Sample collection.

- Collect specimens using the appropriate techniques, based on the National Microbiology Reference Laboratory Clinician's handbook.
- Label specimens appropriately and complete all accompanying documentation accurately.
- Ensure appropriate transportation or, appropriate storage while awaiting transportation to the laboratory.

3.3.6 Role of Laboratory Staff in Diagnostic Stewardship

Sample collection.

- The designated laboratory staff is responsible for specimen collection where needed, training other health workers in appropriate sample collection, oversee the sample collection processes at the facility level, and provide guidance on sample packaging, storage, and transportation.

Processing samples

- Record receipt of specimens upon arrival at the laboratory

- Ensure processing of specimens according to standard operating procedures (SOPs)
- Read and record results, including interpretation and confirmation
- Provide clinicians with timely results as per clinicians' handbook and advise on further patient management.
- Provide on-call services for follow-up requests, queries from clinical team, and urgent testing requests beyond working hours,
- Provide accurate and timely data to surveillance staff.
- Implement and enforce quality control procedures.

3.3.7 Enablers of Diagnostic Stewardship

Organizational aspects of implementing good diagnostic stewardship should begin with a review of the existing human, material, and financial resources, and an evaluation of the additional requirements.

Cost estimations for each stage of the diagnostic pathway should cover developing and adapting local guidelines and SOPs, developing, and implementing training material, as well as any infrastructure and costs related to efficiently transporting samples, documentation, and information technology.

Requirements	Details
Planning (baseline)	Situation analysis, resources, and needs assessment conducted
Input (needed resources)	<ul style="list-style-type: none"> • Funding for diagnostic stewardship activities in the surveillance site • Local guidelines and SOPs for diagnostic stewardship • Trained and competent staff to implement local diagnostic stewardship guidelines. • Microbiology laboratory facilities with equipment and consumables • Communication
Process (activities)	<ul style="list-style-type: none"> • Mobilization and management of funds • Development or adaptation of SOPs • Development and implementation of training materials and courses for diagnostic stewardship • Internal and external quality assurance, regular procurement, and maintenance of equipment and consumables • Agreed means and frequency of communication among clinical, laboratory and surveillance staff
Output (results)	<ul style="list-style-type: none"> • Sustainable financing and resources available on regular basis • Common understanding of protocols for Diagnostic Stewardship • Training and empowering Staff comply with local Diagnostic Stewardship protocols and steps. • Increase in specimens submitted to the laboratory according to SOPs. • Good laboratory practices in place resulting in reliable and timely results. • Patient treatment and surveillance actions are informed in a timely manner

Outcome	<ul style="list-style-type: none"> • Patient treatment guided by timely microbiology data resulting in safer and more efficient patient care. • Accurate and representative AMR surveillance data to inform treatment guidelines and AMR control strategies
---------	---

3.4 Developing an Antibiogram

An antibiogram is an aggregated profile of antimicrobial susceptibility testing data of a specific microorganism to a set of antimicrobials.

The antibiogram is an essential resource for facilities to track changes in antimicrobial resistance and to guide empirical antimicrobial treatment. Antibiograms can also be used to perform surveillance for the emergence of drug-resistant organisms and identify areas for intervention by antimicrobial stewardship programs and training needs.

Health facilities should use antibiograms to guide optimal empiric antimicrobial treatment, minimize the unnecessary use of broad-spectrum antibiotics, reduce the risk of antibiotic resistance, and improve patient outcomes by increasing the likelihood of successful treatment.

An antibiogram is developed from specific information about the facility's microbiology cultures. You will need to access the results of the cultures, including those concerning antibiotic susceptibilities. You can potentially obtain these data from several different sources.

What data are needed to create the antibiogram?

1. Patient data

The antibiogram should enable the categorization of patient characteristics, thereby providing access to detailed, clinically relevant, and up-to-date antimicrobial susceptibility data. Therefore, completeness of laboratory/microbiology data collection tools is critical. These data elements include;

- Patient ID: patient number
- Patient age
- Patient sex
- Diagnosis
- Date of admission
- Duration of admission
- Setting where sample was collected e.g. OPD, ICU, Ward etc.
- Sample collection date
- Sample type
- Sample processing date
- Culture results

2. Antibiotic susceptibility data

Antibiograms are developed from data generated from routinely collected antimicrobial susceptibility testing data for pathogens and summarize the results in a table. Health facility antibiograms should be reviewed annually. Antibiotic susceptibility data should include the following;

- Pathogen identification
- Number of pathogens identified
- Proportion of pathogens that are susceptible to each tested drug

The antibiogram should only include pathogen species for which there are 30 or more isolates. If the data available includes organisms with fewer than 30 isolates, you should determine if it is essential to include the species. If they are, you should include a note to indicate less statistical validity of the estimates of percentage susceptibility (%S). Alternatively, consider analyzing data over a longer time frame e.g. two years, and include a footnote of this exception on the cumulative antibiogram report.

The following should be considered when preparing an antibiogram to guide clinicians in the selection of empirical antimicrobial therapy for initial infections:

- Analyze and present a cumulative antibiogram report at least annually.
- Include only the final and verified test results.
- Include only species with testing data for at least 30 isolates.
- Include only diagnostic (not surveillance) isolates.
- Eliminate duplicates by including only the first isolate of a species/patient/analysis period, irrespective of body site or antimicrobial susceptibility profile.
- Include only antimicrobial agents routinely tested and calculate the percent susceptibility (%S) from results reported, as well as those that might be suppressed on patient reports using selective reporting rules; do not report supplemental agents selectively tested on resistant isolates only.
- Report the susceptibility (%S) and do not include the intermediate resistance (%I) in the statistic.

The factors that can affect cumulative antibiogram data include:

- Patient population served.
- Culturing practices
- Laboratory antimicrobial susceptibility testing and reporting policies.
- Temporal outbreaks

3.4.1 Interpretation of an antibiogram

The following table illustrates an example of a routine cumulative antibiogram report.

Organism	No. isolates	(%) Susceptibility									
		AMK	AMP	CFZ	CRO*	CIP	GEN	MEM*	PTZ	SXT	TOB
E. coli	1165	100	62	88	94	88	100	100	88	74	100
Enterobacter cloacae	223	100	∞	∞	82	91	91	99	82	72	100
Klebsiella pneumoniae	521	100	∞	∞	78	94	93	93	86	75	100

The first column lists the organisms that were included; these may be separated by Gram-positive and Gram-negative results. The second column shows the total number of isolates of each organism included in the antibiogram. The remaining columns of the antibiogram are the antibiotics that were tested, and the organisms' susceptibilities are presented as a percentage of the total number of isolates.

The tool only includes the first isolate per person within the timeframe of consideration. This ensures that each person contributes equally to the antibiogram. A patient may be cultured multiple times in a year and their results consistently reveal *Staphylococcus aureus*. Only that person's first *Staphylococcus aureus* culture will be counted.

3.4.2 How to utilize an antibiogram.

The antibiogram should only be used as a general guide for empirical antimicrobial therapy until the specific antimicrobial susceptibility test results for a particular patient become available.

Clinical application of the cumulative antimicrobial susceptibility test data for an initial choice of antimicrobial agents depends on a variety of factors, including the suspected organism, the antimicrobial agent, patient characteristics, site of infection, and other clinical parameters.

Thus, the selection of empiric therapy in a particular patient should not be based solely on the antibiogram. A patient's particular infection history, including past antimicrobial use, must also be considered.

A cumulative antibiogram may provide the basis for selection of empirical antimicrobial treatments for specific infections before the patient's antimicrobial susceptibility results become available. Suitable empirical antimicrobial choices following the AWARE classification should include drugs to which the potential pathogens demonstrate had high susceptibility for example susceptibility >80% (1–4). However, upon receipt of the patient's antimicrobial susceptibility test results, the clinicians should de-escalate antimicrobial therapy to the definitive treatment as guided by the microbiology results.

3.5 How often will the antibiogram be updated?

In general, hospital antibiograms are updated annually. It is important to consider the frequency at which culturing occurs within the facility. If you have a small number of cultures represented in your antibiogram, updating your antibiogram once a year may be sufficient. For further guidance, consider section 3.4 of this chapter.

Key considerations:

1. The antibiograms developed at National and Regional Referral Hospitals will be representative of their catchment areas. Peripheral Health facilities not performing culture and sensitivity should use the sample referral system for obtaining such tests to be able obtain AMR surveillance data for their facilities.
2. The chair for the facility AMS subcommittee is responsible for ensuring the availability and access to the facility antibiogram.
3. The National antibiogram will be developed using data representative of all National and Regional referral hospitals.

04

CHAPTER 4

MONITORING ANTIMICROBIAL CONSUMPTION & USE (AMC/U).

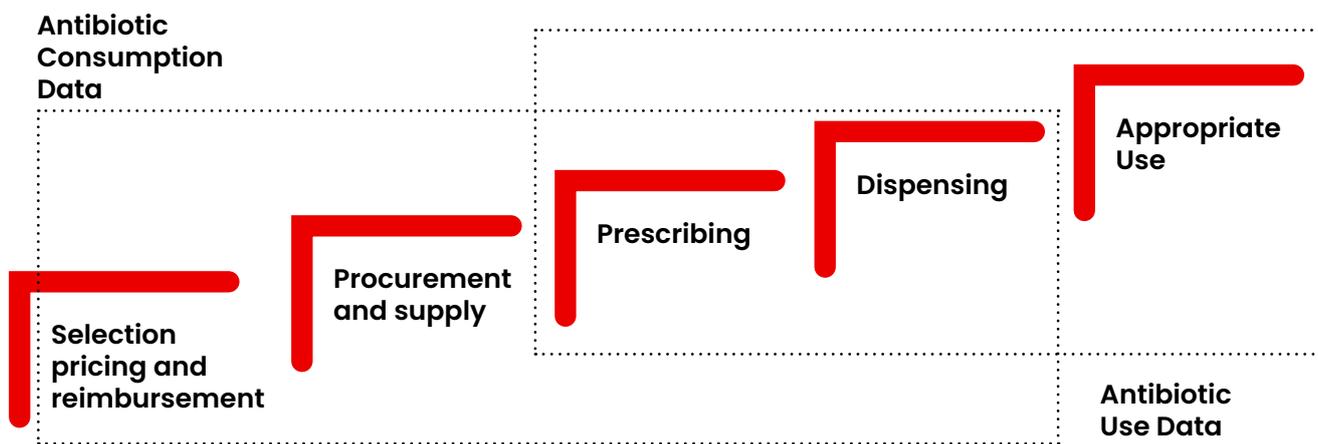
This chapter provides guidance on monitoring of antimicrobial consumption and use at both National and Sub-national levels. The different metrics of measuring consumption as well as assessing use are also described.

Introduction

Irrational use of Antimicrobials is a modifiable risk factor for antimicrobial resistance. Optimal use of antimicrobials is important at all levels of care within the country and will go a long way in addressing the emergence of antimicrobial resistance.

The treatment guidelines, such as the Uganda Clinical Guidelines, institutional treatment protocols and microbiology data clearly provide guidance on treatment of different conditions and guide clinicians on when or which antimicrobials agents to use. However, there are some limitations to the optimal use of antimicrobials including inadequate access to diagnostic services, insufficient knowledge, limited experience of health workers on AMS and limited availability of essential antimicrobials and other health supplies among others.

AMCU data can be used to provide baseline information to evaluate AMS interventions.



Relevance of collection of Antimicrobial Consumption and Use data.

1. To link the extent of exposure to antimicrobials as a key to the emergence of AMR.
2. To identify challenges relating to changes in antimicrobial exposure and utilization to develop targeted interventions.
3. To monitor the outcomes of interventions aimed at improving rational antimicrobial use.
4. To raise awareness among health care professionals, consumers and policy makers about the contribution of inappropriate use of antimicrobials to AMR..
5. To contribute to the development of the Regional and National AMCU database.
6. To assess the therapeutic outcome of antimicrobials.

4.1 Antimicrobial Consumption

Antimicrobial Consumption (AMC) refers to estimates of volumes of antimicrobials derived from aggregated data sources such as imports, local manufacturers, distributors, wholesalers, retailers, and stores. The data collected focuses on the quantity and types of antimicrobials consumed and does not contain any patient information or treatment indication.

One of the key assumptions for AMC data is that all that is imported is consumed locally and all that is distributed, sold, or issued from health facility stores is consumed; thus, it serves as a proxy estimate of the use of antimicrobials.

LEVEL	TYPE OF RECORDS	SOURCES
National	Import data (using Verification certificates, Pro-forma /commercial invoices, certificate of analysis, and declaration forms)	National Drug Authority
National	Production records of domestic manufacturers (excluding records of any exported products)	Manufactures, NDA
National	Wholesaler/distributor data. This could be data on procurement by wholesalers or records of sales by the wholesalers to healthcare facilities and Drug outlets.	NDA, Warehouses LTRs, Medicines Outlets, and Health Facilities.

National	Donations. This may relate to programs such as HIV, TB, and malaria or to special populations such as migrants and refugees.	NDA, Warehouses MOH, Development Partners.
National	Procurement records, invoices, and delivery notes from Central level warehouses	Warehouses
Health Facility	Records from Service delivery points such as Dispensing logs and stock cards.	Health facility main stores, satellite pharmacies, facility dispensaries.

4.1.1 AMC at National Level

Imports and local manufacture

Import and local manufacture data provide aggregated volume estimates of antimicrobial consumption in Uganda. This consumption data is useful for comparisons between Uganda and other countries, evaluating trends of use over time, and assessing the impact of high-level policy.

National/Centralized distributors

Centralized level warehouse distribution records can also provide aggregated data of antimicrobial consumption that act as a proxy for use to the health facilities or institutions that they serve. The consumption can be disaggregated or stratified by region/geographical location, by health facility level of care, by public or private sectors, and again by population-level metrics using the population estimates of the regions supplied.

Data Collection

Data collection at the national level is done annually by collaboration between the NDA and the Department of Pharmaceuticals and Natural Medicine. The data is then submitted to the GLASS portal. The data collection methodology is based on the WHO GLASS Manual on management of Antimicrobial consumption data.

4.1.2 AMC at facility level

Consumption data at the health facility is described as the quantity of a particular antimicrobial issued from the main store for a defined period of time. The data may be aggregated at the store level to represent the total consumption for the facility, or disaggregated by antimicrobial consumed per ward.

Data collection

The data collection method is based on the WHO Methodology for AMC surveillance in hospitals (version 2019). It uses the ATC/DDD methodology to calculate consumption, and an MS. Excel template is available and instructions for filling it are provided in WHO guidance on surveillance of antimicrobial consumption in hospitals; V0.1-20190619.

4.1.3 Reporting metrics for AMC data

Antimicrobial consumption is measured using aggregate data of all antimicrobials consumed in a given period using a common system of nomenclature and standardized methodology. The most commonly used system is the Anatomical Therapeutic Chemical (ATC) classification system, and the most commonly used measurement metric is the number of Defined Daily Doses (DDDs).

The daily defined dose is a standardized unit of measurement established by the World Health Organization (WHO) that represents the average maintenance dose of a specific antibiotic used for its main indication in adults. DDDs are assigned to different antibiotics based on their pharmacological properties and recommended daily dosages.

Metric	Details
DDDs per 1000 inhabitants per day	<p>Consumption data presented in DDDs per 1000 inhabitants per day provides a rough estimate of the proportion of the population treated daily with a particular drug or group of drugs.</p> <p>For example 10 DDDs per 1000 inhabitants per day can be interpreted as a representative group of 1000 inhabitants, 10 DDDs of the drug are utilized on average, on any given day of the year analysed.</p> <p>Alternatively, this can be expressed as 10/1000 (1%) of the population are receiving this drug each day in that year. This estimate is most useful for drugs used chronically and when there is good agreement between the average prescribed daily dose (PDD) and the DDD.</p>
DDDs per 100 bed days	<p>This metric combines two important factors: the total amount of antibiotics consumed and the patient exposure or bed occupancy in a healthcare facility. It estimates the facility's antimicrobial consumption by patient load or bed utilization.</p> <p>It is calculated by dividing the total number of DDDs consumed over a given period by the number of bed days in the same period, multiplied by 100.</p> <p>The number of bed days refers to the total number of days that beds in a healthcare facility are occupied by patients during a specific time frame.</p>
DDDs per patient	<p>This metric provides a way to quantify the amount of antibiotics used per individual patient during a specific time period.</p> <p>To calculate DDDs per patient, the total number of DDDs consumed within a defined period is divided by the total number of individual patients who received antibiotics during the same period.</p> <p>This metric helps healthcare facilities evaluate the average amount of antibiotics prescribed or administered to each patient. By comparing DDDs per patient over time or across different settings, healthcare providers can identify patterns, trends, or deviations from established guidelines.</p>

4.2 Antimicrobial Use

Antibiotic use (AMU) is derived from individual patient data and may include information on patient characteristics and indications for treatment.

Measurement of antimicrobial use at facility and community levels is critical to understanding the prevailing trends of antimicrobial use and providing context to the emergence of AMR. It requires measuring certain antimicrobial use parameters to understand appropriate use or misuse. Antimicrobial use data also contributes greatly to facility antimicrobial stewardship programs i.e. identifying problem areas, setting targets, and evaluating the impact of interventions.

Nine common areas to improve antimicrobial prescribing are described in the table below;

Prescription error	Description
Overprescribing	Antibiotics are prescribed when not needed, e.g. fever without evidence of infection, asymptomatic urinary tract colonization, viral infections, malaria, and inflammatory conditions.
Overuse of broad-spectrum antibiotics	More broad-spectrum antibiotics (WATCH and RESERVE antibiotics) are prescribed than are necessary (e.g. surgical prophylaxis).
Unnecessary antibiotic combinations including certain fixed dose combinations	Multiple antibiotics are used, particularly with overlapping spectra and in combinations that have not been shown to improve clinical outcomes.
Wrong antibiotic choice	Wrong antibiotic(s) is (are) prescribed for particular indications/infections.
Wrong dose	Antibiotics are prescribed with the wrong dose (over- or under dosing).
Wrong dose interval	Antibiotics are prescribed with the wrong dose interval (too much or too little time between doses).
Wrong route	Antibiotics are prescribed by the wrong route: IV vs oral
Wrong duration	Duration of antibiotic treatment should be optimized (e.g. antibiotics prescribed for too long a period, prolonged surgical prophylaxis).
Delayed drug administration	Administration of the antibiotic(s) is delayed from the time of prescription. Repeat doses are not administered in a timely way, which is critical in the case of septic shock and other serious infections.

4.2.1 Approaches to Measuring AMU

4.2.1.1 Point Prevalence Surveys

The point prevalence survey (PPS) is a methodology to collect antimicrobial treatment data from hospitalized inpatients at a particular point in time.

PPS is a standard assessment methodology used by hospital inpatient departments to assess prescription practices, identify targets for quality improvement, and assess the effectiveness of antimicrobial stewardship interventions. Point prevalence surveys highlight areas and processes that require root cause analyses and deeper investigations such as prescription audits and medicines use evaluations.

Conducting a PPS is more resource-intensive than collecting antimicrobial consumption data, as data is collected on individual patients, and requires more human resources. This additional effort is important for antimicrobial stewardship interventions geared towards achieving optimal use of antimicrobials. This will ultimately lead to better antimicrobial use and improved treatment outcomes.

Details of the methods of collection data for point prevalence surveys are clearly outlined in the National Guidelines for Antimicrobial Consumption and Use Surveillance in Human Health and the WHO Methodology for Point Prevalence Survey on Antibiotic Use In Hospitals(1, 2). See Annex 9 for the PPS Tool. The data generated from a PPS is fed into the national database at the MoH which provides a dashboard where facilities can access their performance and design necessary interventions.

A uniform methodology to survey antimicrobial prescribing in hospitals encourages standardization and facilitates comparisons of antimicrobial use over time and between hospitals, districts, countries, and regions.

4.2.1.2 WHO/INRUD Drug indicator surveys for Out patients

Data on antimicrobial use at the OPD shall be collected using the WHO/INRUD drug indicator survey (DIS) and the OPD antibiotic survey adapted from the Ministry of Health's Medicines and Therapeutics Committee manual 2018. OPD Register is the data source.

The OPD antibiotic survey narrows down to specifics of the use of individual antibiotics to ensure that the antimicrobial agent has been prescribed for the right patient, in the right dose for the right duration in line with the guidance from the Uganda Clinical Guidelines. See Annex 8 for the data collection tool

4.2.1.3 Medicines Use Evaluation

Antimicrobial use evaluation studies are systematic in-depth analyses of the use of a drug or set of drugs to further understand their safety, appropriateness and outcomes against certain criteria. During this analysis, in addition to the patient prescription and laboratory records, information on availability and clinician perceptions may be analyzed as well.

Prospective drug use evaluations are easier to conduct and will yield good evidence since data will be collected with the objectives of the study in mind.

Antimicrobial use evaluations can be conducted at facility level to further understand the factors associated with the use of a particular drug. The findings of these studies can then be used to put in place strategies to address overuse/or any form of misuse.

4.2.1.4: Prescription Audit

Prescription audits and Medicines Use evaluations are essential parts of any AMS program. They are used to assess for compliance of antibiotic prescription and administration in accordance with guidelines or protocols. The evaluation can identify any deviations related to overuse, underuse or misuse, identify areas for quality improvement as well as monitoring treatment outcomes.

The evaluation can be done prospectively through direct observation or retrospectively through chart reviews.

4.2.1.5 Triggers for medicine use evaluation or a prescription audit.

The need for audit or evaluation can be triggered in two ways. Through selection of one or more infections or through selecting antibiotic(s) for audit.

Selecting one or more infections

The audit should provide figures on compliance with the guidelines or use of culture and sensitivity tests and suggest where there is room for improvement. This data can be collected on ward rounds or directly from patients' medical charts, or from outpatient prescriptions and registers.

How to choose which infections to audit?

- i. Common infections, such as community-acquired pneumonia (CAP), UTIs, and SSTIs.
- ii. When a problem is detected, for example, an increase in infections after surgery or in urine cultures referred to the microbiology lab which might indicate that patients with asymptomatic bacteriuria are wrongly being treated for UTIs.
- iii. Infections treated for a long duration (e.g. >7 days).

Selecting antibiotic(s) for audit

The audit should provide figures on who is receiving antibiotic(s), indications for treatment and whether the patient is receiving the right antibiotic treatment.

How to choose which antibiotics to audit?

- Antibiotics where consumption has increased significantly over time.
- Antibiotics with a higher potential of inducing and propagating resistance (e.g. WATCH and RESERVE antibiotics).
- Broad-spectrum antibiotics (e.g. piperacillin/tazobactam, ticarcillin/clavulanate, carbapenems).
- RESERVE (Last resort) antibiotics (e.g. polymyxins, linezolid).
- Expensive antibiotics.

4.2.1.6 Retrospective vs Prospective (real-time) Evaluations

Prospective evaluations involve real-time assessment of antibiotic therapy while a retrospective evaluation involves collecting past antibiotic use data to evaluate the impact of AMS interventions (baseline and follow-up data). A prospective evaluation should be prioritized over a retrospective evaluation because it provides a current description of antibiotic use practices that is more relevant and useful to the clinical team.

Prospective evaluations can be performed alongside clinical personnel on ward rounds, providing recommendations for changes in antibiotic treatment in real-time.

4.2.2 What should be done when the problem is seen

- Determine the prevalence of the conditions
- Review lab samples if available
- Meet and discuss with prescribers
- Meet the unit in-charge and present your problems
- Continue doing the audit
- Develop an intervention

4.2.2.1 Feedback

A critical aspect of monitoring antibiotic use is feedback of findings to the entire hospital team i.e. clinicians and administrative staff.

The feedback content and approach may vary and can influence staff engagement, and the changes observed over subsequent evaluations. Feedback can be delivered to groups e.g. the

entire hospital or to specific wards. It can also be delivered to individuals. Feedback will include visual summaries of the quantitative and qualitative findings; synthesized areas of improvement and recommendations can be delivered in presentations or as posters.

Consider the following:

- All clinical staff regardless of cadre or practice type should be targeted for feedback.
- The recommendations should include specific actions that are within the recipients control to enable behavior change
- Include benchmarks or achievable targets for comparisons within the facility for antibiotic prescribing that are indicator specific and based on national and/or local performance data of high performing peers.
- The information should be displayed such that recipients can understand their performance and desired actions within seconds.
- Use multiple strategies including verbal, paper, and/or electronic means.
- Presentations should be delivered to prescribers by a respected authority figure or colleague.
- Individual-level antibiotic feedback should be delivered confidentially to the prescribers, and create the opportunity for peer discussion.

05

CHAPTER 5

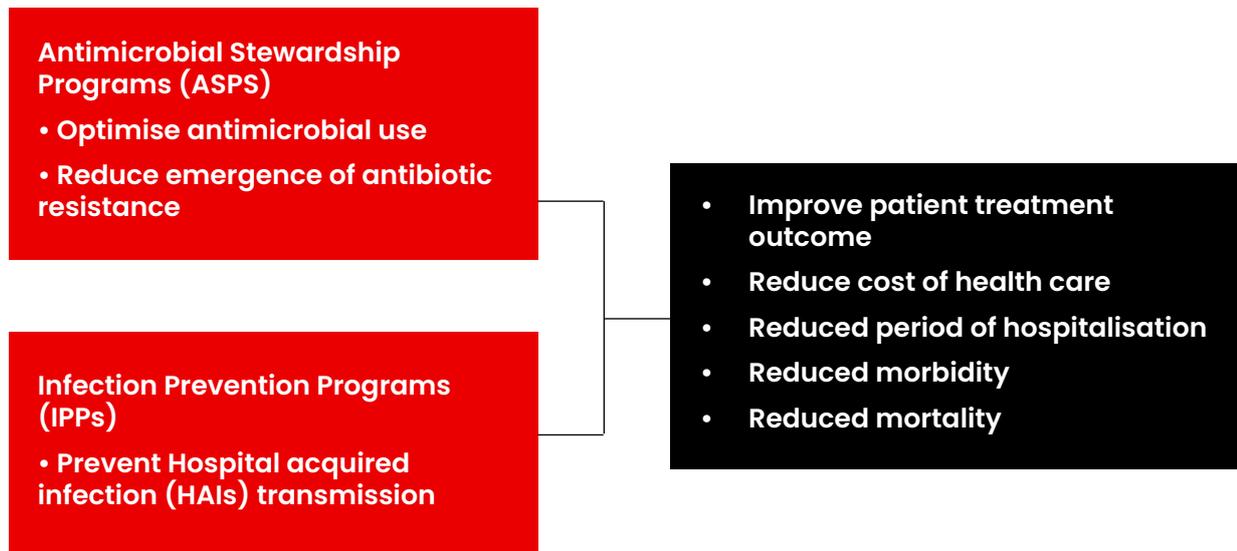
INFECTION PREVENTION AND CONTROL

This chapter provides guide for a practical, evidence-based approach involving policies, procedures, and activities to prevent harm from avoidable infections for patients and health workers.

5.1 Link between IPC & AMS

Antimicrobial stewardship programs (ASPs) and infection prevention and Control programs (IPCPs) are separate health system-based programs that share the goal of improving patient outcomes.

AMS Programmes focus on optimizing antimicrobial use to reduce the emergence of antimicrobial resistance, while the IPC Programme focuses on reducing healthcare-associated infections (HAIs). AMS Programmes and IPC Programmes have similar goals, strategies, and metrics, and an integrated model can benefit both programs. By working together, these approaches promote patient safety, enhance patient outcomes, minimizing antibiotic usage hence preserving the effectiveness of antimicrobial agents and reducing the frequency of AMR infections. The end results are reduced patients' hospital stay, and reduced costs for both the patient and facility contributing to a reduction in mortality and morbidity hence improved public health.



AMS and IPC programme interrelationship can be understood as follows:

- **Prevention of spread of Infections:** Infection prevention measures are crucial for reducing the incidence of healthcare-associated infections. By implementing strategies such as hand hygiene, proper disinfection, and environmental cleaning, the risk of infections can be minimized. This, in turn, can reduce the need for antimicrobial treatment.
- **Reduced transfer of resistant pathogens:** Proper IPC interventions minimize the transfer of resistant pathogens among patients, between patients and healthcare workers, and between the facility and the community thus promoting the containment of resistant organisms.
- **Reduction of antimicrobial usage:** Antimicrobial resistance arises primarily due to the selective pressure exerted by using antimicrobial agents. When infections are prevented through robust infection prevention practices, the overall burden of infections decreases, resulting in a reduced need for antimicrobial treatment. This decreased use of antimicrobials helps mitigate the development and spread of antimicrobial resistance.
- **Rational Use of Antimicrobials:** Antimicrobial stewardship programs promote the appropriate use of antimicrobial agents, including choosing the right drug, optimizing dosing and treatment duration, and minimizing unnecessary antimicrobial use. By preventing infections in the community and within the health facility, hence the need for antimicrobial treatment is reduced.
- **Collaborative Efforts:** Effective collaboration between antimicrobial stewardship and infection prevention teams is vital to achieve optimal patient outcomes and reduce the transmission of infections. Coordinated efforts ensure that infection prevention measures and antimicrobial prescribing practices are aligned and reinforce each other. This collaboration involves sharing data, conducting joint assessments, and implementing interventions that address both infection prevention and appropriate antimicrobial use. Drug administration also requires several IPC techniques for patient safety.

5.2 How to Integrate Infection Prevention Measures into Antimicrobial Stewardship Programs

The composition of the AMS subcommittee should include IPC-trained personnel i.e. an infection preventionist/IPC link nurse/IPC focal point person.

Various IPC measures shall be used to improve AMS programs as shown in table 3

IPC measure	Activity
Enhance IPC standard precautions in the health facility	<ul style="list-style-type: none"> • Hand Hygiene: Promote and enforce proper hand hygiene • Practices among healthcare workers, patients, attendants, and visitors. Hand hygiene is a fundamental infection prevention measure that reduces the transmission of pathogens, thereby decreasing the need for antimicrobial treatment. • Personal Protective Equipment (PPE): Ensure appropriate use of PPE, such as gloves, masks, and gowns, to prevent the spread of infections. Proper utilization of PPE can reduce the risk of healthcare-associated infections and subsequently decrease the need for antimicrobial therapy. • Environmental Cleaning and Disinfection: Implement robust cleaning and disinfection protocols to maintain a clean and hygienic healthcare environment. Regular cleaning of surfaces and equipment reduces the risk of transmission of pathogens, reducing the incidence of infections and the associated antimicrobial use. • Sterilization and Disinfection of Instruments: Establish standardized protocols for the sterilization and disinfection of medical instruments to prevent the introduction and spread of pathogens. Properly sterilized and disinfected instruments minimize the risk of healthcare-associated infections and subsequent antimicrobial treatment. • Risk assessment and management: Notify and isolate patients with identified resistant pathogens and those with highly infectious organisms from the rest of the ward for specialized precautions , • Encourage health workers to remove indwelling devices from patients that are no longer needed e.g. catheters and cannulas.
Collaboration and Communication between Antimicrobial Stewardship and Infection Prevention teams	<p>Interdisciplinary Collaboration:</p> <p>Foster collaboration and communication between the antimicrobial stewardship and infection prevention teams within healthcare facilities.</p> <p>Encourage regular meetings, joint training, and sharing of data and expertise to align efforts and optimize infection control practices alongside appropriate antimicrobial prescribing.</p>

	<p>Data Sharing and Feedback: Establish mechanisms for sharing and reviewing relevant data between the antimicrobial stewardship and infection prevention teams. This includes sharing surveillance data on healthcare-associated infections, antimicrobial consumption, and resistance patterns. Feedback on infection prevention practices and the impact of reducing antimicrobial use can help guide targeted interventions.</p> <p>Joint Audits and Assessments: Conduct joint audits and assessments of infection prevention practices and antimicrobial prescribing within healthcare facilities. Collaborative assessments provide a comprehensive understanding of areas for improvement and allow for coordinated action plans to enhance both infection prevention and antimicrobial stewardship efforts.</p> <p>Joint decision-making and interventions.</p> <p>The IPC and AMS programs should make decisions and undertake joint interventions to address the identified gaps for better patient outcomes.</p>
<p>Education and Training for Healthcare Workers, Patients, caretakers and support staff and training institutions</p>	<p>Comprehensive Training Programs: Develop comprehensive educational programs that integrate both infection prevention and antimicrobial stewardship principles. Provide healthcare workers with training on proper hand hygiene, appropriate use of PPE, environmental cleaning, and effective antimicrobial prescribing practices.</p> <p>Multidisciplinary Workshops and Conferences: Organize multidisciplinary workshops and conferences that bring together healthcare professionals from various disciplines. These events facilitate knowledge sharing, collaboration, and the exchange of best practices.</p> <p>Ongoing Professional Development: Support ongoing professional development for healthcare workers involved in antimicrobial stewardship and infection prevention. Encourage participation in relevant courses, conferences, and webinars to stay updated on the latest guidelines, research, and strategies.</p> <p>Orientation of new staff on IPC and AMS</p> <p>Routine orientation for all new staff in the various departments and disciplines on IPC and AMS in the facility</p> <p>Routine health education.</p> <p>Continuous health education of patients, caretakers, and visitors on their roles in promoting IPC and AMS practices while in the facility and community. The patients should be empowered to remind health workers to perform hand hygiene before any procedure is performed on them.</p> <p>On job refresher training for support staff/Cleaners (also known as environmental cleaning staff or environmental services technicians):</p> <p>There should be routine refresher training for support staff on IPC practices and their roles and impart in combatting HAI should be emphasized.</p>

Data Integration and Monitoring	<p>Integrated Surveillance Systems: Establish integrated surveillance systems that capture data on healthcare-associated infections, antimicrobial consumption, and resistance patterns. These systems should facilitate collaboration between infection prevention and antimicrobial stewardship teams to analyse and interpret data collectively.</p> <p>Performance Metrics and Indicators: Develop performance metrics and indicators that measure both infection prevention and antimicrobial stewardship outcomes. This can include indicators such as hand hygiene compliance rates, adherence to appropriate antimicrobial prescribing guidelines, and rates of healthcare-associated infections. Regular monitoring and feedback on these metrics drive continuous improvement.</p> <p>Reporting and Documentation: Ensure comprehensive reporting and documentation of infection prevention practices and antimicrobial stewardship activities. This includes recording interventions, outcomes, and lessons learned. Documentation helps track progress, identify areas for improvement, and supports accountability and transparency.</p>
---------------------------------	--

5.3 Targeted care bundles

These are a set of evidence-based practices designed to prevent specific healthcare-associated infections (HAIs) or improve patient outcomes. Care bundles are a systematic approach that combines several interventions or measures into a cohesive package to ensure comprehensive and standardized care delivery.

Targeted care bundles are specifically developed to address a particular type of infection, such as central line-associated bloodstream infections (CLABSIs), ventilator-associated pneumonia (VAP), catheter-associated urinary tract infections (CAUTIs), surgical site infections (SSIs), or other healthcare-associated infections. These bundles are typically based on best practices and guidelines.

Each targeted care bundle consists of a set of interventions that, when implemented together, have been shown to effectively reduce the risk of infection or improve patient outcomes.

Several specific bundles are available that can be implemented at healthcare facilities in resource-limited settings. These packages of care contribute to infection prevention, reduce unnecessary antibiotic prescribing, and may limit the spread and development of antibiotic resistance in healthcare facilities.

5.4 Environmental swabbing.

Routine random/undirected environmental sampling/swabbing is not recommended unless the rate of health care associated infections have been associated with levels of general microbial environmental contamination, research, quality assurance, to confirm the presence of hazardous chemical or biological agent and other targeted interventions.



CHAPTER 6

SUPPLY CHAIN MANAGEMENT IN ANTIMICROBIAL STEWARDSHIP

This chapter provides an overview of the processes involved in supply chain management of antimicrobial, laboratory and other diagnostic supplies. These processes include selection, quantification, procurement, distribution, storage and use.

6.1 Introduction

Supply chain refers to the set of procedures to ensure that pharmaceuticals and health supplies reach the final consumer (patient) or the healthcare worker at the right time and place, in the right quality and quantity, and at an appropriate cost and level of effectiveness

The link between AMS and Supply chain management

The aim of supply chain management for AMS is to ensure that safe, effective and quality antimicrobials and health supplies are available and accessible at all times. This ensures that HCWs are able to use appropriate laboratory and diagnostic tools, clinicians are able to select and prescribe the most appropriate antimicrobials, and the right health supplies are available for effective infection prevention and control, which is essential for AMS.

Shortage of appropriate, safe and effective antimicrobials may lead to use of less effective alternatives, which is a major driver for development of AMR. In addition, ineffective supply chain management may also limit availability of relevant laboratory and diagnostic supplies, thereby encouraging empirical prescribing of antimicrobials, another key driver of AMR.

6.2 Supply chain processes in AMS

6.2.1 Selection

Efforts at both national and sub-national level shall be projected on identification of safe, effective, and cost – effective antimicrobials and health supplies that meet the needs of majority of the population. The following tools and criteria should guide the selection process for antimicrobials and health supplies.

Tool	Selection Criteria
Essential Medicines and Health Supplies List of Uganda (EMHSLU) National Drug Register	Selection of antimicrobials shall be based on the National Drug Register of Uganda and/or the EMHSLU. This ensures that the products selected are likely to be already available on the Ugandan market. However, it is possible to arrange for special imports for items not on the National Drug register.
WHO AWaRe classification of antibiotics	ALL categories of antibiotics shall be included depending on the level of care while prioritizing antibiotics in the ACCESS category (>60% of all antibiotics),
Product catalogues e.g., NMS and JMS catalogues	Check product catalogs as these provide the available range of products and dosage forms for selection e.g., which antimicrobials are in cream, ointment or suspension, or injectable form.
Standard Treatment Guidelines e.g. UCG, consolidated HIV management guidelines, and other institutional guidelines. Clinical and Laboratory Standards Institute (CLSI) guidelines	Select antimicrobials recommended in the UCG and other standard guidelines for the treatment of various conditions. Selecting the recommended antimicrobials for procurement promotes adherence to the standard treatment guidelines by ensuring their availability when required. The Clinical and Laboratory Standards Institute (CLSI) guidelines guide the choice of antimicrobial discs to be set per organism during susceptibility testing.
Antimicrobial Consumption and Use data (Prescription audits, point prevalence surveys (PPS))	Refer to findings from studies like PPS and prescription audits for guidance on which antimicrobials to procure or restrict. See Chapter 4 for details
Antimicrobial Resistance Surveillance Data	Use data from AMR surveillance to generate antibiograms which guide selection of the most effective antimicrobials.

6.2.2 Quantification

Quantification is the process of estimating how much of the specific EMHS is needed for procurement for a specific period to ensure an uninterrupted supply. In the context of AMS, quantification ensures that antimicrobials and the associated laboratory supplies are sufficiently supplied to mitigate stock outs.

At both national and sub-national levels, there should be mechanisms to monitor consumption patterns, shelf life and implementation of effective inventory management systems to support quantification.

You can quantify antimicrobials and laboratory supplies using one or a combination of the following methods:

Method	Use in quantification
Morbidity data	Estimates quantities of antimicrobials, laboratory, and other health supplies based on actual and projected incidences of health problems based on the population and patient attendance and using standard treatment guidelines or protocols.
Consumption method	Involves using records of past consumption for individual medicines to project future needs. This data can be obtained from records such as stock cards, stock books, or electronic logistics management information systems (eLMIS). To enhance accuracy and reliability, the data should be complete, accurate, and properly adjusted for stockouts and anticipated changes in demand and use.
proxy consumption method	Used to estimate consumption of antimicrobials, laboratory, and health supplies by using medicine consumption, demand, or use and/or pharmaceutical expenditure for different facilities to extrapolate to a similar or related health facility taking into consideration the population coverage or service level. This can work for new facilities where morbidity or prior consumption data are not available.
Service level projection of budget requirements:	This method uses average medical supply per attendance or bed-days in different types of health facilities in one system to project needs for similar types of facilities in another system. In other words, the service performance (e.g., consumption of a particular commodity) in one facility is used to project needs of a facility with similar level of care, whose data is not available at the time of quantification exercise.

More details on use of these different quantification methods can be found in the EMHS Management manual.

6.2.3 Procurement

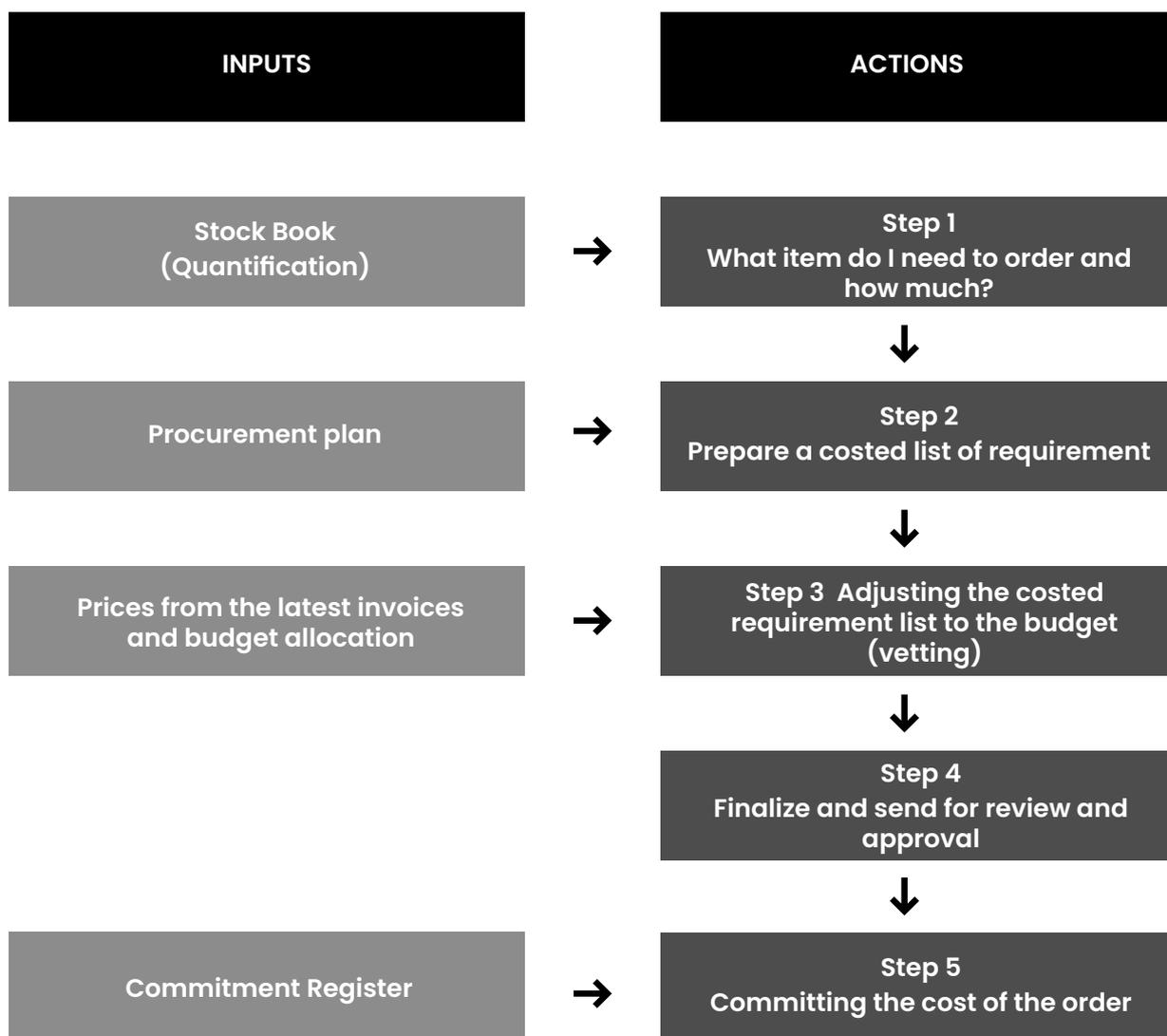
Procurement of antimicrobials and laboratory supplies involves all decisions and actions in costing and purchasing/procuring the selected commodities, in line with the available resources. At the facility level, this process should follow quantification, which generates a requirement list showing the quantities of the different commodities needed for a specified period. Next, the facility should cost this requirement list by multiplying these quantities with the estimated unit prices of these commodities. The prices can be obtained from supplier catalogs or recent invoices. The resulting list, called the costed non-vetted requirement list or “wish list” is crucial for documenting the actual commodity and financial needs of the facility. This wish list guides the development

of a procurement plan, which will then guide the ordering of EMHS from the central warehouses and wholesalers. The AMS committee can work with the supply chain committee, or work with the MTC to assign staff with expertise in the area if there is no supply chain committee, to quantify and develop a wish list for antimicrobials and health supplies relevant for AMS alongside other commodities.

Prior to the development of a procurement plan, the MTC should convene an entry meeting with various facility stakeholders to discuss or review the quantification process, tools for data collection, review period, and the budget allocated. For further information on procurement planning, refer to the EMHS manual, Chapter 3, section 3.4.4.

When developing the final procurement plan, the MTC should use the tools below to ensure the review process is as objective and cost-effective as possible. The table 4 below provides the tools critical in the procurement process.

TOOL	Use in procurement
VEN Concept	Use this to prioritize commodities based on their VEN classification. Vital (V) commodities take top priority while necessary (N) commodities take the lowest priority and can be entirely eliminated if the budget is constrained. When the budget is so limited that even the V items must be reduced, this should be done with the consensus of the MTC members.
Therapeutic Category Analysis	Analyze the wish list and final procurement plan by therapeutic category to establish the relative contribution of different categories. This helps to assess whether the plan is representative of the priorities of the facility.
ABC Analysis	Use the ABC analysis to assess the proportionate expenditure on different items. This can be used to identify items that account for the highest costs and/or high use when considering ways to reduce procurement costs.
AWaRe Concept	Use the AWaRe classification to monitor and apportion expenditure on antimicrobials to keep it within the recommended ranges, e.g., at least 60% of the expenditure on antibiotics should go to drugs in the ACCESS category. When adjusting the wish list to fit the budget, focus on reducing the expenditure on antibiotics in WATCH before the ACCESS category.



6.2.4 Distribution and storage of antimicrobials and laboratory supplies

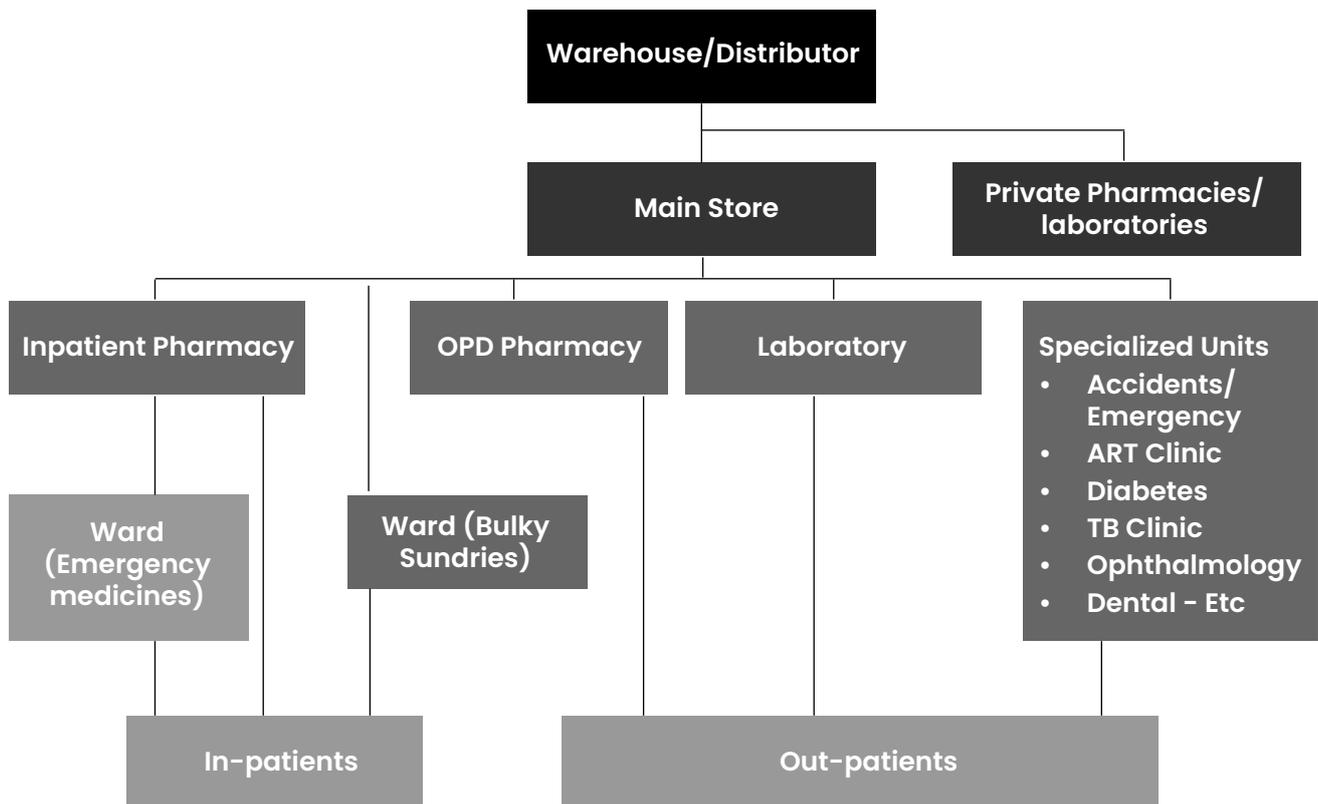
The health facility should enter all supplies received from the warehouse or other sources into the appropriate HMIS tool e.g., Stock cards and or any e-LMIS. The facility should also store copies of proof of delivery records that accompany these supplies, such as delivery notes/goods received notes (GRNs) and invoices. Facility personnel receiving supplies must always physically inspect them to ensure they are of acceptable quality and shelf – life and that they quantities match those quoted on the delivery records.

Movement of stock from the health facility store to the user units should be recorded on approved requisition and issue vouchers (manual or electronic). At the user units, health workers should record all dispensed medicines in the correct dispensing logs or electronic system.

In the community, drug outlets like pharmacies must have systems in place to record supplies they receive from wholesalers/suppliers and sell to customers, both individuals and retailers.

Recording the distribution of antimicrobials is a key component of AMS as it ensures traceability and accountability, and provides complete data needed for analysis. MTCs and/or AMS committees at health facilities must invest sufficient energy in ensuring that distribution of antimicrobials within the health facility is recorded consistently, completely, and accurately.

The diagram below shows a model of the flow of antimicrobials and laboratory supplies



6.2.5 Dispensing

Good dispensing practices include having a safe, clean, and organized work environment. The staff dispensing should be qualified and trained. Medicines must be dispensed in appropriate packs with complete, clear labelling and instructions. Dispensing staff must ensure patients receiving medicines understand the instructions. The staff must also fill the relevant dispensing records promptly, accurately, and completely.

The dispensing process is composed of 6 steps;

1. Receiving and validation of the prescription,
2. Understanding and interpretation of the prescription,
3. Preparing and labeling items for issue,
4. Performing a final check,
5. Recording of the actions taken and
6. Issuing medicine to the right patient with clear instructions and advice

Details of the dispensing process are in Annex 2 and are further discussed in the Uganda Essential Medicines and Health Supplies Management manual.

Dispensing procedures to ensure antimicrobial stewardship

Extra caution should be taken for prescriptions with antimicrobials in order to ensure antimicrobial stewardship through;

- Review of prescriptions to ensure that they are appropriate and in line with the national guidelines on the use of antimicrobials. Factors such as; indication of use, dosing regimen, duration of treatment and patient specific factors such as allergies, drug-disease interactions and drug-drug interactions among others.
- Ensuring that patient counselling emphasizes the importance of adherence to the prescribed regimen, the potential side effects or adverse events and any specific instructions for use. Patients should be educated on antimicrobial resistance and infection prevention measures.
- Ensuring that health workers dispense the correct antimicrobial as prescribed and properly document the dispensed antimicrobial prescriptions to ensure surveillance of the indication, dosage, duration and susceptibility.

6.3 Laboratory and diagnostic supplies in AMS

The availability of high-quality laboratory supplies and equipment directly impacts the accuracy and reliability of diagnostic tests, which in turn influences the selection and administration of appropriate antimicrobial therapy. The link between laboratory supplies and antimicrobial stewardship emphasizes the critical importance of ensuring that laboratories have access to sufficient and reliable tools and resources to support effective management of infectious diseases.

6.3.1 Rational use of laboratory microbiology supplies

Promoting the appropriate use of laboratory supplies within the context of antimicrobial stewardship involves implementing various activities aimed at optimizing the utilization of microbiology supplies while ensuring accurate, reliable and timely results. The rational use of microbiology supplies refers to the appropriate and judicious use of materials and resources in the field of microbiology testing. Promoting the rational use of microbiology supplies not only reduces unnecessary costs and resource consumption but also enhances the accuracy and efficiency of laboratory testing.

Key things to consider:

- **Test Appropriateness:** Ensure that the selection of tests aligns with the clinical indications. Clinicians should understand the specific diagnostic needs and choose the most appropriate tests and avoid unnecessary or redundant testing that may waste supplies and resources.
- **Proper and Timely Sample Collection:** Emphasize the importance of proper sample collection techniques to minimize the need for repeat testing or additional samples. Provide clear guidelines and training to healthcare staff on appropriate sample collection methods, transport conditions, and necessary volumes to ensure adequate testing without excessive use of supplies. Ensure that samples are collected at the right time, e.g., before initiation of empiric treatment and at the time of fever spikes in the case of blood cultures.
- **Quality Control Measures:** Implement quality control measures to maintain the accuracy and reliability of testing. Regularly monitor the performance of supplies, such as culture media, antimicrobial discs, reagents, and controls, to ensure they meet established quality standards. This helps prevent false-positive or false-negative results and misdiagnosis that may lead to repeat testing and inappropriate prescriptions.
- **Standardized Protocols:** Ensure the availability and use of the standardized protocols for various microbiology tests. These protocols provide clear instructions on the appropriate use of supplies, including culture media, antimicrobial discs, reference strains reagents, etc. Ensure that staff are trained and adhere to these protocols to maintain consistency and avoid wastage.

- **Effective inventory management:** Establish efficient inventory management practices to monitor and optimize the use of microbiology supplies. Regularly assess supply levels, expiration dates, and appropriate storage conditions to minimize wastage due to expiry or poor storage. Implement inventory tracking systems to accurately monitor usage and facilitate timely restocking.
- **Collaboration and communication:** Enable communication and collaboration among laboratory staff, clinicians, and other healthcare professionals. Regularly engage in discussions to address test selection, result interpretation, and any concerns related to the rational use of supplies. Effective communication ensures that testing is aligned with patient needs, reducing unnecessary testing and supply consumption.
- **Continuous education and training:** Provide ongoing education and training to laboratory staff regarding the rational use of microbiology supplies. Keep staff updated on best practices, and continuously reinforce the importance of resource optimization and accuracy in testing.

6.4 Roles of the MTC in supply chain management

A procurement planning team shall be responsible for the process of selection, quantification and procurement of the needed antimicrobials, laboratory and diagnostic supplies. A procurement planning team should include a user departments, stores, pharmacy staff and administration/finance staff .

In facilities with an MTC, the committee should lead the procurement planning process. The MTC may co-opt additional members to support the process where necessary to provide technical guidance during the procurement planning process.

07

CHAPTER 7

EDUCATION, TRAINING, AND ADVOCACY

7.1 Introduction

Implementers of AMS programs need to be competent through comprehensive education and training. This can be achieved through quality improvement methods and current evidence-based knowledge regarding the appropriate use of antimicrobials. Training will be done for health workers and non-healthcare workers such as health facility support staff, caretakers, patients, VHTs, and the community/public. Training on AMS principles is essential to causing positive behavioral change (Chukwu et al., 2021). Options for capacity building include active education strategies such as one-on-one, peer-to-peer learning sessions, benchmarking, case studies, consensus-building sessions, and educational and awareness workshops. These are more effective than passive education (CDC, 2019; Majumder et al., 2020). This is because active education promotes interaction and active participation, especially among healthcare workers. Education provides the best results when done together with other interventions and measurement of outcomes.

7.2 Objectives of the training

1. To improve knowledge of AMR and AMS among HCWs
2. To create public awareness about AMR and promote rational use of antimicrobials
3. To cause a sustainable behavioral change among HCWs and the public

7.3 Essential AMS Competencies

To enable AMS, health workers must change their antimicrobial prescribing behaviour to only prescribe these drugs for patients whose indications warrant antimicrobials and choose antimicrobials in a hierarchical (stepwise) manner, with preference to those with the least spectrum of activity.

Prescribing behaviour is a manifestation of a clinician's competencies, which are the observable abilities of a person that integrate knowledge, skills and attitudes towards performance of a given task (WHO, 2019).

Competencies are transferrable through training, coaching, and mentoring, and can be measured (as basic, intermediate and advanced). Once acquired, competencies are durable (sustainable or long-lasting). Achieving AMS in health facilities requires healthcare workers to have core competencies in terms of knowledge, skills, and attitudes for better use of antimicrobial drugs.

When prescribing antimicrobials healthcare workers should consider the following;

- i. National standard treatment guidelines such as the Uganda Clinical Guidelines, the Essential Medicines and Health Supplies List of Uganda (EMHLU), the AwaRe classification, and any other healthcare facility's standard treatment guidelines.
- ii. The importance and rationale for using recommended empirical antimicrobial agents for patients, but also the potential immediate and long-term harm of broad-spectrum therapy.
- iii. The benefit, timing, and safety of de-escalation of antimicrobial treatment using microbiology data.
- iv. The importance and benefits of switching from intravenous (IV) to oral antimicrobials.

Knowledge of the following five topics (modules or domains) is essential to healthcare workers involved in AMS programs;

- **Introduction to AMR:** Global, regional, national, and local situation of AMR and AMS; the link between AMS and IPC, drivers and consequences of AMR; distinguishing microorganisms and antimicrobials, general mechanisms of AMR; Gender Equity, and Social Inclusion (GESI); principles of IPC and WASH and scaling up vaccines for IPC; use of antimicrobials in the One Health Approach; current AMS strategies and interventions; current AMR / AMS policy frameworks; call to action; community and Hospital-Acquired Infections as drivers of AMR.
- **Antimicrobials:** Antimicrobial classes; pharmacokinetics and pharmacodynamics; formulations and patient characteristics; indications, antimicrobial use in special patients groups; prescribing principles, prophylaxis, empirical therapy, definitive therapy; pharmacovigilance related to AMS (substandard and falsified medicines, medication errors, allergies, cross-reactions, adverse effects); documentation and communication on antimicrobial prescription and use; EMHLU and the AWARe classification.
- **Microbiology:** Definition of important terms such as understanding the difference between colonization and infection, the spectrum of activity, bactericidal, bacteriostatic, Drug Antimicrobial Sensitivity Testing such as disc diffusion, minimum inhibitory concentration (MIC), Minimum Bactericidal Concentration (MBC), classification of microorganisms; antimicrobial diagnostic stewardship principles (preanalytical activities including sample collection and preparation, analytical activities like tests, culture & sensitivity testing, and post-analytical activities e.g. result interpretation, bud-drug combination charts and antibiogram development); common causative agents.

- **Clinical syndromes:** Guidance and best practice in antimicrobial prescribing and AMS; Common infections
- **AMS:** Planning an AMS program; Performing AMS interventions; Assessing an AMS program

As shown in Annex 3, each of these modules is associated with a set of competencies which healthcare workers in a health facility undertaking AMS Program need. The scope of competencies required will vary with category of health care worker and their role in antimicrobial prescribing and use.

Conduct a competence needs assessment for each health care worker to identify the competence gaps among those in Annex 3. These AMS competencies should be graded into three incremental levels: basic, intermediate, and advanced.

- **Basic competencies:** The professional is aware of, has knowledge of, or understands the core principles of AMS.
- **Intermediate competencies:** The professional is aware of the core principles of AMS, understands them, and knows how to apply them in his/her practice.
- **Advanced (expert) competencies:** The professional is aware of the core principles of AMS, understands them, knows how to apply them in his/her practice, can show others how to apply them, and provides leadership, expertise, or support to others in this area.

Competences	Cadre	Content
Basic	All (Clinicians, pharmacy professionals, laboratory professionals, Nurses/midwives)	Know the basics of AMS (Introduction to AMS as in Annex 3)
Intermediate	Pharmacy and laboratory professionals, Clinicians, and nurses/ midwives	Conduct and interpret PPS, prescription audits, drug indication surveys, and medicines use evaluation
	Nurses/midwives, clinicians, pharmacy, and laboratory professionals	HAI surveillance Aseptic procedures during drug administration Cleaning, disinfection and sterilization,
	Nurses/midwives, clinicians, Pharmacy and Laboratory professionals	Sample collection, transportation, and storage, AST, Antibiograms, bug-drug charts
Advanced	pharmacy and laboratory professionals, clinicians, and nurses	Design and implement AMS programs, Design treatment plans,
	Pharmacy and Laboratory professionals, Nurses /midwives and clinicians	Interpreting and utilizing antibiograms
	All	AMS leadership, support in cascading best practices in AMS

The competence gaps will then determine the learning needs of your facility's healthcare workers, such as training content, learning materials, and mode of training delivery.

After some time into the implementation of the AMS, particularly after monitoring and evaluation of the AMS program through periodic antibiotic use surveys, further competency assessments and refresher training responsive to the emerging needs may be triggered.

7.4 Educational strategies

Educational strategies aim to inform and persuade health workers and the community to use antimicrobials appropriately. However, AMS champions should be aware that simply providing knowledge passively by sharing facts rarely changes behavior. This is because the knowledge gap alone is rarely the most important barrier to appropriate use. Therefore, AMS champions should employ persuasive messaging as a fundamental component of educational strategies. The success of these strategies relies on the availability of standard treatment guidelines or protocols to set the standard of care health workers should adhere to.

In all educational interventions, the following principles should apply:

1. Focusing on context-specific problems for the target group
2. Emphasize only a few key messages at a time.
3. Addressing the underlying specific knowledge gap (not a general lecture!)
4. Allowing an interactive discussion that involves the targeted audience.
5. Using concise, authorized, and validated materials to augment presentations.
6. Giving sufficient attention to solving practical problems encountered by implementers in real settings i.e., the facility/system-specific issues (not textbook knowledge!)

See Annex 3 for details on educational strategies.

The table below presents a summary of the suggested educational strategies, their advantages and disadvantages.

Strategy	Advantages	Disadvantages	Comments
Posters, leaflets IEC Materials	<ul style="list-style-type: none"> • Many people can access • Summarized information • Simple information, easy to understand • Long-lasting, portable • Easy to interpret and visualize • Used as reminders e.g., SOP posted everywhere • Used for IEC/SOP/ new staff orientation / mentorship • Allows multiple languages 	<ul style="list-style-type: none"> • Easily destroyed, removed, spoiled or lost • May be overlooked or ignored if people are busy or if the right people are not targeted specifically • Language problem • May have little effect on behavior or attitudes • Illiterate or blind people excluded • Sometimes not easy to interpret/can be misinterpreted • Can be costly 	Good in association with other methods

<p>“Big” training (Above 30 participants)</p>	<ul style="list-style-type: none"> • Many people reached at the same time • A lot of ideas can be shared • Good for brainstorming • The multiplier effect can be big • Allows pre and post-assessment of the participants • Allows assessment of attitudes 	<ul style="list-style-type: none"> • Costly in terms of resources needed • Poor concentration of the participants (requires very good trainers) • Hard to manage large numbers • Cannot confirm understanding/ (information can get distorted) • Some people may be too vocal • Not very effective and time-consuming • Sometimes it is difficult to reach a consensus 	<p>Good to disseminate policy changes, new SOPs to targeted groups, etc.</p>
<p>Small training (30 participants and below)</p>	<ul style="list-style-type: none"> • Easy to manage, organize and evaluate • Better attention and concentration • Free discussion of ideas • Less costly • Easy to get feedback • Quick decision making 	<ul style="list-style-type: none"> • Few people getting information – difficult to reach everyone • Can be expensive / time consuming 	<p>Good to train people on specific issues</p>
<p>One-on-One</p>	<ul style="list-style-type: none"> • Very effective • Active participation. • Improves relationship. • High concentration. • Can cause attitude change • Easy to obtain ideas and feedback • Easy to target people 	<ul style="list-style-type: none"> • Time consuming, tedious and demanding • Overall impact may be small • May create fear or discomfort • Very dependent on emotions or relationship • Need someone with experience and skills to deliver message 	<p>Good to persuade opinion leaders</p>
<p>Peer to peer</p>	<ul style="list-style-type: none"> • Allows free exchange of ideas • Allows more active participation • Easy to get feedback • Creates a comfortable environment 	<ul style="list-style-type: none"> • Easy to lose focus • Depends on emotions and relationship • Needs someone with skills and experience 	<p>Good for team work and team building</p>

Trainer of Trainers	<ul style="list-style-type: none"> • Good for capacity building • Big multiplier effect • Flexibility and customization • Allows for mentorship and supervision • Cost-effective • Boosting employees morale and engagement 	<ul style="list-style-type: none"> • Depends on the trainer (requires a good trainer & skills) • Time and costs for Initial resources investment are high • Risk of inaccurate information • Knowledge loss in case of transfer of the trainer to another facility 	Creates sustainability and respect within the organisation
E-learning	<ul style="list-style-type: none"> • Better coverage • Less costly than physical training • Shorter time to prepare 	<ul style="list-style-type: none"> • Lack of control on the target audience • Not easy get feedback • Easy to lose focus • Requires internet/data, maybe costly • Cannot validate level of understanding • Hard to monitor large groups 	Is effective for participants in scattered locations
Benchmarking	<ul style="list-style-type: none"> • Good for behavioral change • Allows for allocation and prioritization of resources • Serves as eye opener • Saves resources • Increases competition 	<ul style="list-style-type: none"> • May not work for all settings • Requires high standard place to benchmark • May be resource intensive to implement • May be costly for the participants • Stabilized standards • Insufficient information may be declared 	Implements creative ideas

7.5 Awareness and advocacy

Several awareness strategies at national and sub-national levels should be done to improve public awareness on AMR through performing activities on recognized National and international days such as the

- i. Participating in the World AMR Awareness Week (WAAW) through;
 - Radio and TV Talk shows
 - AMR awareness walks, runs, competitions and debates, dinners, symposia & conferences e.t.c
 - Distribution of IEC materials on AMR
 - Using Music Dance and Drama to communicate AMR
 - Media as advocates for AMR
 - School and community outreach programs on AMR

- ii. Empowering AMR Champions to disseminate AMS information. They include; AMR survivors and AMS heroes.
- iii. Stake Holder Engagement: Include all stake holders such as; the unaware, the resistant, the neutral, the supportive and those ones leading AMS activities in the facilities and communities

7.6 Responsible entities for AMS awareness, education, and training

The AMS teams and subcommittees at a health facility level are mandated to conduct AMS trainings to the health care workers, VHTs, and health facility support staff. Health facilities are encouraged to conduct the trainings at least on a quarterly basis.

For patients and caretakers, the healthcare workers are mandated to educate them on adherence and appropriate use of antimicrobials. Healthcare workers are encouraged to prioritize health education on AMS as per the MoH health promotion programs. At the point of dispensing antimicrobials to the patients and or caretakers, healthcare workers are reminded to emphasize adherence and consequences of their irrational use.

The respective professional councils under the supervision of MoH should train private health facilities (clinics and hospitals), laboratories, and drug outlets (drug shops and pharmacies)

At district level, community AMS education, training and advocacy should be overseen by the District Health Office. For VHTs and community members, health promotion and awareness activities should be led by the District Health Educators (DHE). The VHTs should oversee the training in the community / public on AMS under the supervision of the DHEs.



CHAPTER 8

IMPLEMENTING AMS INTERVENTIONS AT FACILITY LEVEL

Implementing health facility antimicrobial stewardship interventions involves a systematic approach to promoting appropriate use of antimicrobial medications to combat antimicrobial resistance and improve patient outcomes. This chapter provides some steps to implement these interventions.

8.1 Core elements of the facility AMS program

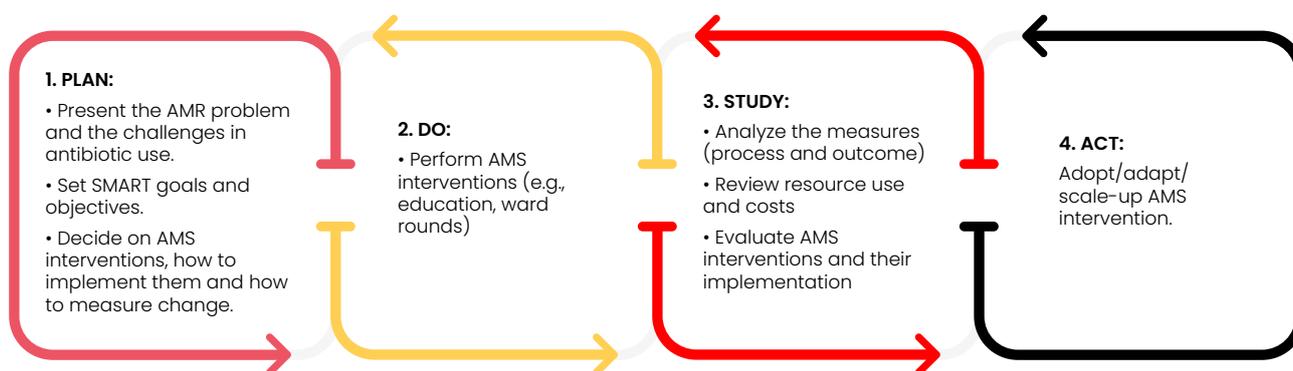
Core element	Description of the element
Leadership commitment	<ul style="list-style-type: none">• Management identifies AMS as a priority for the healthcare facility.• Healthcare facility AMS action plan endorsed that prioritizes activities and measures progress and accountability• Budget and allocate resources for the healthcare facility AMS action plan
Accountability and responsibilities	<ul style="list-style-type: none">• A multidisciplinary AMS leadership committee is in place with clear terms of reference.• The AMS subcommittee should identify a dedicated AMS leader/ champion to lead the AMS team.

	<p>Other health professionals identified and involved in AMS activities Other healthcare professionals apart from the AMS team (e.g. from the ICU, internal medicine and surgery, health informatics, or pharmacy or nursing personnel) participate in AMS activities based on the priorities of the healthcare facility AMS action plan.</p> <ul style="list-style-type: none"> • Clearly define collaboration between the AMS and IPC programs • Ensure regular activity reports on the implementation of the AMS program: <ul style="list-style-type: none"> » AMS subcommittee: at least monthly meetings, to report to the Medicines & Therapeutic Committee » AMS team: at least monthly meetings, to report to the AMS subcommittee
AMS actions	<ul style="list-style-type: none"> • To develop and implement an annual AMS workplan, aligning with the national action plan for AMR • To disseminate up-to-date standard treatment guidelines • To conduct regular AMS team review/audit of specified antibiotic therapy or clinical conditions at the healthcare facility and provide Advice/feedback from AMS team members to all prescribers • To conduct Regular ward rounds and other AMS interventions in select healthcare facility departments • To develop and disseminate Healthcare facility formulary with a list of approved and restricted antibiotics • To improve accessibility and utilization of laboratory and imaging services to support AMS interventions • To improve access and utilization of information technology (IT) services to support AMS activities • To standardize facility prescription charts and medical records • To develop institutional antibiograms and disseminate to healthcare workers • To develop local antibiotic prescription guidelines for healthcare workers based on available treatment guidelines and local antimicrobial susceptibility patterns
Education and training	<ul style="list-style-type: none"> • To conduct continuous training and mentorship on optimal antibiotic use among healthcare professionals • To conduct regular training of the AMS team on antimicrobial stewardship and infection management. • To develop/mobilize and disseminate AMS IEC materials for health workers • To engage the community and public on antimicrobial stewardship through health education and outreach programs.
Monitoring and surveillance	<ul style="list-style-type: none"> • To Monitor the appropriate use of antibiotics at the unit and/or facility-wide level through audits or PPSs • To Monitor quantity and types of antibiotic use (purchased/prescribed/dispensed) at the unit and/or facility-wide level • To Monitor antibiotic susceptibility and resistance rates for a range of key indicator bacteria • To Monitor compliance of AMS interventions by the AMS subcommittee

Reporting and feedback	<ul style="list-style-type: none"> To disseminate regular reports on antibiotic use and resistance rates with healthcare workers To conduct regular meetings (for the AMS team and AMS subcommittee) and disseminate reports to the Medicine & Therapeutic Committee on quality of antimicrobial prescriptions.
------------------------	---

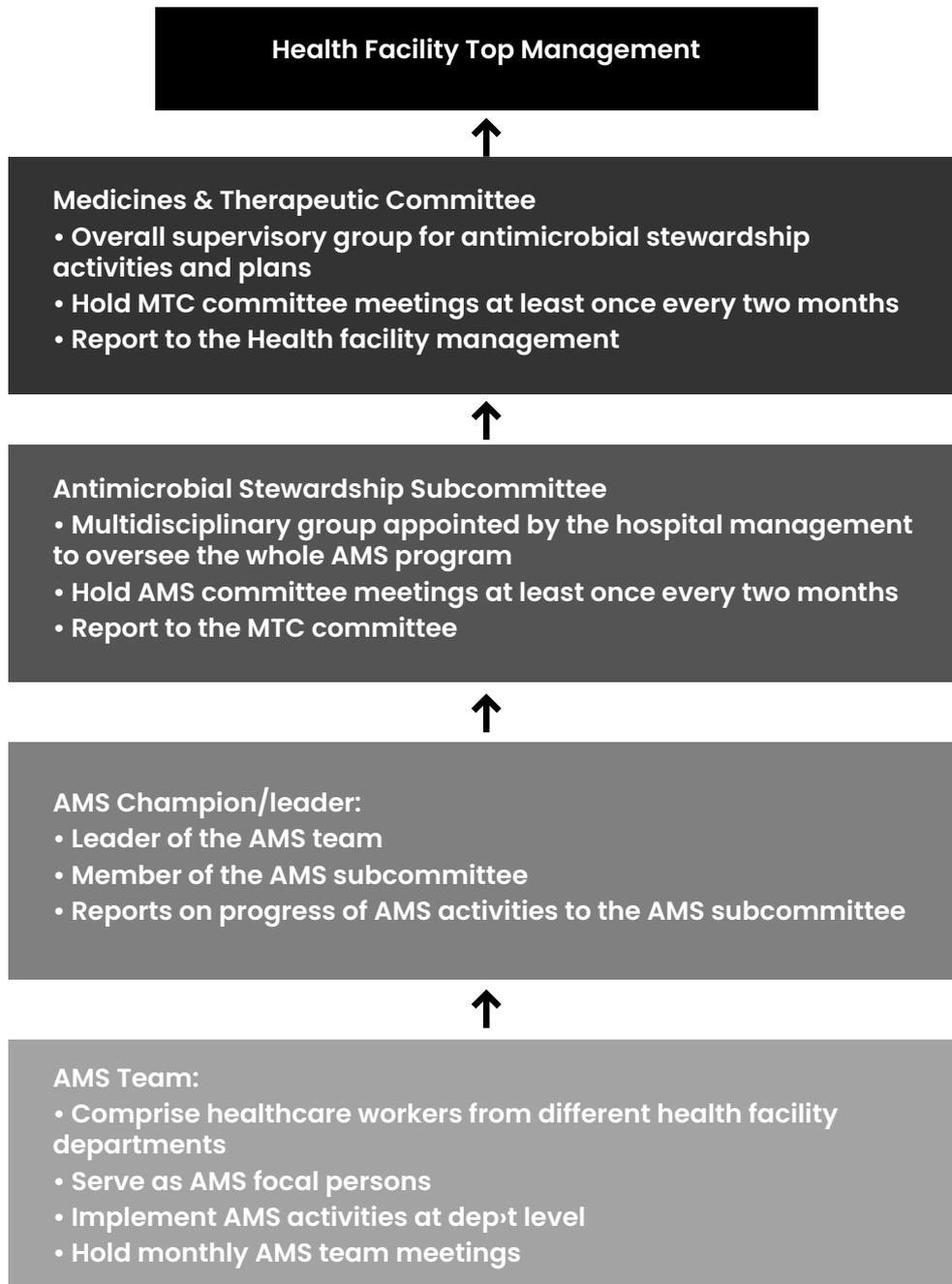
8.2 Key steps in establishing a health facility AMS program.

One of the goals of antimicrobial stewardship programs at facility level is quality improvement. Implementation should take on a systematic approach as described in the Quality improvement model.



Establishing a healthcare facility AMS program requires a systematic and step wise approach. As shown in the figure below, there are eight (8) key steps in establishing a health facility AMS program which healthcare facility management should adhere to for successful establishment of the program. This chapter provides a detailed description of the key steps in setting up the AMS program.

QI Stage	Step	Description of Step
PLAN	One	Conduct a facility AMS situational/SWOT analysis
	Two	Establish a sustainable AMS governance structure based on existing structures
	Three	Prioritize the facility core elements based on situational analysis
	Four	Identify AMS interventions starting with the simplest to implement first
	Five	Develop a healthcare facility AMS action plan, specifying human and financial requirements
DO	Six	Implement AMS Interventions
	Seven	Offer Continuous education resources and training on optimized antibiotic prescription
STUDY	Eight	Monitor and evaluate the AMS intervention
ACT	Nine	To adopt/adapt/scale-up AMS intervention



8.2.1 Conduct a health facility AMS situation (SWOT) analysis.

A situational/SWOT analysis should be conducted before an AMS program is established to determine what needs to be done and what can be done. The analysis should include:

- Mapping which core elements are in place in the facility.
- Conducting a baseline antibiotic use analysis
- Identifying main challenges related to antibiotic prescribing and use.
- Identifying available human and financial resources.

In addition, the analysis should include identifying strengths, weaknesses, opportunities, and threats (SWOT) at different levels in the facility; and possible barriers and enablers for the full participation of the different healthcare professionals and departments in the AMS program.

The situational and/or SWOT analysis will help the healthcare facility in developing a stepwise AMS action plan that identifies what is already in place (healthcare facility core elements), what needs to be put in place over time (short and medium/long-term priorities), the human resources needed (including champions), the composition of an AMS team and other core elements (including guidelines) based on the facility core elements checklist and priorities.

An example of a SWOT analysis can be found in Annex 5

8.2.2 Developing an AMS action plan

The health care facility AMS action plan should be developed based on situational analysis to ensure accountability, prioritize activities, and measure progress.

The AMS action plan should provide an overview of the facility AMS program with overall goals, how they will be reached by whom, and how progress will be measured over a specific period. AMS activities or interventions should be applied in a phased manner, starting with the simplest and eventually advancing to more complex activities. The action plan should include time-bound targets.

Determine priority core elements to be implemented in the short and medium term, including accountability, timeline, and indicators (Refer to Section 8.1). An example of an AMS action plan can be found in Annex 6

8.2.3 Implement health facility AMS interventions

After developing the AMS action plan, the plan should be implemented to realize behavior change in antibiotic prescribing practices and responsible use of antibiotics.

The interventions are primarily informed by the findings of the situational and SWOT analysis. Intrinsic factors that may influence prescribing behavior should also be addressed. Therefore, performing AMS interventions requires that they be tailored to address the facility-specific factors that may influence antibiotic prescribing and use.

Two ways of tailoring AMS interventions are:

- Involve clinical staff in identifying local targets for improving antibiotic use
- Apply a systematic and stepwise approach to implementing AMS interventions, review progress over time, and make changes when appropriate.

The type of interventions will depend on the set of immediate, medium, or long-term and resources required to implement these priorities. The interventions can generally be classified into; Educational, managerial, regulatory, and economic/financial. However, studies have shown that combining multiple strategies, are significantly more effective than single strategy initiatives. A detailed list of interventions is included in Annex 7

8.3 Behaviour change

One main outcome of performing AMS interventions in a healthcare facility is behaviour change in antibiotic prescribing practices, leading to more responsible use of antibiotics.

In the implementation of AMS activities, it is important to recognize that the behavior of the healthcare professionals is a key source of variance that must be understood before effective uptake can be reliably achieved.

Factors influencing prescribing behavior.

Implementing evidence-based AMS interventions to change prescribing behavior means considering factors that influence prescribing and use at the facility/department/ward level.

1. Extrinsic factors include structural and organizational factors such as the number of available staff, the availability of microbiology equipment.
2. Intrinsic factors relate to the individual such as peer influence, attitude, etc. Examples of intrinsic factors include the following:
 - The perception that AMR is an immediate threat (lack of awareness and knowledge about AMR)
 - Fear of losing a patient
 - The belief that broad-spectrum antibiotics are very effective.
 - Iof a senior clinician's preferences over a junior
 - Physician autonomy in prescribing what he or she thinks is best.
 - Uncertainty due to inadequate microbiology services.

Consequently, when performing AMS interventions, implementation requires that they be tailored to address the different factors that may influence antibiotic prescribing and use in a specific context.



CHAPTER 9

MONITORING AMS INTERVENTIONS

Successful AMS programs include all the elements of quality improvement programs and measuring the effectiveness of program activities is a key component.

For any AMS program, it is important to define the goals and objectives. Using the priorities of the facility or department, SMART (Specific, Measurable, Achievable, Realistic and Time-bound) goals and objectives should be set.

What are we trying to achieve?

Set a goal for change in antibiotic use that is SMART (i.e. specific, measurable, achievable, relevant and time-bound)

How will we measure the change?

Determine what quantitative measures will be used to show change.

What changes will result in improvement?

Identify processes, outputs and outcomes that will lead to the desired change.

Monitoring and evaluating the implementation of AMS programs is necessary to gauge the efficacy of interventions and structural inputs. The quantitative measures for change at each facility will be selected, based on the activities, outputs and outcomes detailed in the AMS Action Plan.

- **Structural indicators:** measure the capacity of systems and processes at the facility to support the AMS program. These indicators measure the extent to which the core elements of the program have been put in place.
- **Process indicators:** measure change due to important processes that contribute to the achievement of outcomes e.g. number of AMS trainings conducted.
- **Output indicators:** these measure the immediate result of a process: Such as number of IPC nurses trained on AMS.
- **Outcome indicators:** These measure the impact or overall change brought about by the AMS program; e.g. “5% reduction in volume of Ceftriaxone consumed”

It is important to note that assessing a large set of indicators is unrealistic; a facility should select the most relevant and feasible measures tailored to its settings.

The MTC and the AMS subcommittee team should be involved in the choice or development of indicators.

Annex 10 provides a sample of indicators that can be used to monitor and evaluate AMS programs.

Annexes

Annex 1: Detailed list of antibiotics categorized by the WHO AWaRe Classification

AWaRe Category	Antibiotic	Antibiotic Class
Access	Amikacin	Aminoglycosides
	Amoxicillin	Penicillins
	Amoxicillin/clavulanic-acid	Beta-lactam/beta-lactamase-inhibitor
	Ampicillin	Penicillins
	Ampicillin/sulbactam	Beta-lactam/beta-lactamase-inhibitor
	Azidocillin	Penicillins
	Bacampicillin	Penicillins
	Benzathine-benzylpenicillin	Penicillins
	Benzympenicillin	Penicillins
	Brodinoprim	Trimethoprim-derivatives
	Cefacetrile	First-generation-cephalosporins
	Cefadroxil	First-generation-cephalosporins
	Cefalexin	First-generation-cephalosporins
	Cefaloridine	First-generation-cephalosporins
	Cefalotin	First-generation-cephalosporins
	Cefapirin	First-generation-cephalosporins
	Cefatrizine	First-generation-cephalosporins
	Cefazedone	First-generation-cephalosporins
	Cefazolin	First-generation-cephalosporins

Cefradine	First-generation-cephalosporins
Cefroxadine	First-generation-cephalosporins
Ceftazidime	First-generation-cephalosporins
Chloramphenicol	Amphenicols
Clindamycin	Lincosamides
Clometocillin	Penicillins
Cloxacillin	Penicillins
Dicloxacillin	Penicillins
Doxycycline	Tetracyclines
Epicillin	Penicillins
Flucloxacillin	Penicillins
Furazidin	Nitrofurantoin derivatives
Gentamicin	Aminoglycosides
Hetacillin	Penicillins
Mecillinam	Penicillins
Metampicillin	Penicillins
Meticillin	Penicillins
Metronidazole_IV	Imidazoles
Metronidazole_oral	Imidazoles
Nafcillin	Penicillins
Nifurtoinol	Nitrofurantoin derivatives
Nitrofurantoin	Nitrofurantoin-derivatives
Ornidazole_IV	Imidazoles
Ornidazole_oral	Imidazoles
Oxacillin	Penicillins
Penamocillin	Penicillins
Phenoxymethylpenicillin	Penicillins
Pivampicillin	Penicillins
Pivmecillinam	Penicillins
Procaine-benzylpenicillin	Penicillins
Propicillin	Penicillins
Secnidazole	Imidazoles
Spectinomycin	Aminocyclitols
Sulbactam	Beta-lactamase-inhibitors
Sulfadiazine	Sulfonamides
Sulfadiazine/trimethoprim	Sulfonamide-trimethoprim-combinations
Sulfadiazine/trimethoprim	Sulfonamide-trimethoprim-combinations
Sulfadimethoxine	Sulfonamides
Sulfadimidine	Sulfonamides
Sulfadimidine/trimethoprim	Sulfonamide-trimethoprim-combinations
Sulfafurazole	Sulfonamides
Sulfaisodimidine	Sulfonamides
Sulfalene	Sulfonamides
Sulfamazone	Sulfonamides

	Sulfamerazine	Sulfonamides
	Sulfamerazine/trimethoprim	Sulfonamide-trimethoprim-combinations
	Sulfamethizole	Sulfonamides
	Sulfamethoxazole	Sulfonamides
	Sulfamethoxazole/ t r i m e t h o p r i m	Sulfonamide-trimethoprim-combinations
	Sulfamethoxy pyridazine	Sulfonamides
	Sulfametomidine	Sulfonamides
	Sulfametoxydiazine	Sulfonamides
	Sulfametrole/trimethoprim	Sulfonamide-trimethoprim-combinations
	Sulfamoxole	Sulfonamides
	Sulfamoxole/trimethoprim	Sulfonamide-trimethoprim-combinations
	Sulfanilamide	Sulfonamides
	Sulfaperin	Sulfonamides
	Sulfaphenazole	Sulfonamides
	Sulfapyridine	Sulfonamides
	Sulfathiazole	Sulfonamides
	Sulfathiourea	Sulfonamides
	Sultamicillin	Beta-lactam/beta-lactamase-inhibitor
	Talampicillin	Penicillins
	Tetracycline	Tetracyclines
	Thiamphenicol	Amphenicols
	Tinidazole_IV	Imidazoles
	Tinidazole_oral	Imidazoles
	Trimethoprim	Trimethoprim-derivatives
Watch	Arbekacin	Aminoglycosides
	Aspoxicillin	Penicillins
	Azithromycin	Macrolides
	Azlocillin	Penicillins
	Bekanamycin	Aminoglycosides
	Biapenem	Carbapenems
	Carbenicillin	Penicillins
	Carindacillin	Penicillins
	Cefaclor	Second-generation-cephalosporins
	Cefamandole	Second-generation-cephalosporins
	Cefbuperazone	Second-generation-cephalosporins
	Cefcapene-pivoxil	Third-generation-cephalosporins
	Cefdinir	Third-generation-cephalosporins
	Cefditoren-pivoxil	Third-generation-cephalosporins
	Cefepime	Fourth-generation-cephalosporins
	Cefetamet-pivoxil	Third-generation-cephalosporins
	Cefixime	Third-generation-cephalosporins
	Cefmenoxime	Third-generation-cephalosporins
	Cefmetazole	Second-generation-cephalosporins
	Cefminox	Second-generation-cephalosporins

	Cefodizime	Third-generation-cephalosporins
	Cefonicid	Second-generation-cephalosporins
	Cefoperazone	Third-generation-cephalosporins
	Ceforanide	Second-generation-cephalosporins
	Cefoselis	Fourth-generation-cephalosporins
	Cefotaxime	Third-generation-cephalosporins
	Cefotetan	Second-generation-cephalosporins
	Cefotiam	Second-generation-cephalosporins
	Cefoxitin	Second-generation-cephalosporins
	Cefozopran	Fourth-generation-cephalosporins
	Cefpiramide	Third-generation-cephalosporins
	Cefpirome	Fourth-generation-cephalosporins
	Cefpodoxime-proxetil	Third-generation-cephalosporins
	Cefprozil	Second-generation-cephalosporins
	Cefsulodin	Third-generation-cephalosporins
	Ceftazidime	Third-generation-cephalosporins
	Cefteram-pivoxil	Third-generation-cephalosporins
	Ceftibuten	Third-generation-cephalosporins
	Ceftizoxime	Third-generation-cephalosporins
	Ceftriaxone	Third-generation-cephalosporins
	Cefuroxime	Second-generation-cephalosporins
	Chlortetracycline	Tetracyclines
	Cinoxacin	Quinolones
	Ciprofloxacin	Fluoroquinolones
	Clarithromycin	Macrolides
	Clofoctol	Phenol derivatives
	Clomocycline	Tetracyclines
	Delafloxacin	Fluoroquinolones
	Demeclocycline	Tetracyclines
	Dibekacin	Aminoglycosides
	Dirithromycin	Macrolides
	Doripenem	Carbapenems
	Enoxacin	Fluoroquinolones
	Ertapenem	Carbapenems
	Erythromycin	Macrolides
	Fidaxomicin	Macrolides
	Fleroxacin	Fluoroquinolones
	Flomoxef	Second-generation-cephalosporins
	Flumequine	Quinolones
	Flurithromycin	Macrolides
	Fosfomicin_oral	Phosphonics
	Fusidic-acid	Steroid antibacterials
	Garenoxacin	Fluoroquinolones
	Gatifloxacin	Fluoroquinolones

	Gemifloxacin	Fluoroquinolones
	Grepafloxacin	Fluoroquinolones
	Imipenem/cilastatin	Carbapenems
	Isepamicin	Aminoglycosides
	Josamycin	Macrolides
	Kanamycin_IV	Aminoglycosides
	Kanamycin_oral	Aminoglycosides
	Lascufloxacin	Fluoroquinolones
	Latamoxef	Third-generation-cephalosporins
	Levofloxacin	Fluoroquinolones
	Levonadifloxacin	Fluoroquinolones
	Lincomycin	Lincosamides
	Lomefloxacin	Fluoroquinolones
	Loracarbef	Second-generation-cephalosporins
	Lymecycline	Tetracyclines
	Meropenem	Carbapenems
	Metacycline	Tetracyclines
	Mezlocillin	Penicillins
	Micronomicin	Aminoglycosides
	Midecamycin	Macrolides
	Minocycline_oral	Tetracyclines
	Miocamycin	Macrolides
	Moxifloxacin	Fluoroquinolones
	Nemonoxacin	Quinolones
	Neomycin_IV	Aminoglycosides
	Neomycin_oral	Aminoglycosides
	Netilmicin	Aminoglycosides
	Norfloxacin	Fluoroquinolones
	Ofloxacin	Fluoroquinolones
	Oleandomycin	Macrolides
	Oxolinic-acid	Quinolones
	Oxytetracycline	Tetracyclines
	Panipenem	Carbapenems
	Pazufloxacin	Fluoroquinolones
	Pefloxacin	Fluoroquinolones
	Penimepicycline	Tetracyclines
	Pheneticillin	Penicillins
	Pipemidic-acid	Quinolones
	Piperacillin	Penicillins
	Piperacillin/tazobactam	Beta-lactam/beta-lactamase-inhibitor_anti-pseudomonal
	Piromidic-acid	Quinolones
	Pristinamycin	Streptogramins
	Prulifloxacin	Fluoroquinolones
	Ribostamycin	Aminoglycosides

	Rifabutin	Rifamycins
	Rifampicin	Rifamycins
	Rifamycin_IV	Rifamycins
	Rifamycin_oral	Rifamycins
	Rifaximin	Rifamycins
	Rokitamycin	Macrolides
	Rolitetracycline	Tetracyclines
	Rosoxacin	Quinolones
	Roxithromycin	Macrolides
	Rufloxacin	Fluoroquinolones
	Sarecycline	Tetracyclines
	Sisomicin	Aminoglycosides
	Sitafloxacin	Fluoroquinolones
	Solithromycin	Macrolides
	Sparfloxacin	Fluoroquinolones
	Spiramycin	Macrolides
	Streptoduocin	Aminoglycosides
	Streptomycin_IV	Aminoglycosides
	Streptomycin_oral	Aminoglycosides
	Sulbenicillin	Penicillins
	Tazobactam	Beta-lactamase-inhibitors
	Tebipenem	Carbapenems
	Teicoplanin	Glycopeptides
	Telithromycin	Macrolides
	Temafloxacin	Fluoroquinolones
	Temocillin	Penicillins
	Ticarcillin	Penicillins
	Tobramycin	Aminoglycosides
	Tosufloxacin	Fluoroquinolones
	Troleandomycin	Macrolides
	Trovaflaxacin	Fluoroquinolones
	Vancomycin_IV	Glycopeptides
	Vancomycin_oral	Glycopeptides
Reserve	Aztreonam	Monobactams
	Carumonam	Monobactams
	Cefiderocol	Other-cephalosporins
	Ceftaroline-fosamil	Fifth-generation cephalosporins
	Ceftazidime/avibactam	Third-generation-cephalosporins
	Ceftobiprole-medocartil	Fifth-generation cephalosporins
	Ceftolozane/tazobactam	Fifth-generation cephalosporins
	Colistin_IV	Polymyxins
	Colistin_oral	Polymyxins
	Dalbavancin	Glycopeptides
	Dalfopristin/quinupristin	Streptogramins

	Daptomycin	Lipopeptides
	Eravacycline	Tetracyclines
	Faropenem	Penems
	Fosfomycin_IV	Phosphonics
	Iclaprim	Trimethoprim-derivatives
	Imipenem/cilastatin/ relebactam	Carbapenems
	Lefamulin	Pleuromutilin
	Linezolid	Oxazolidinones
	Meropenem/vaborbactam	Carbapenems
	Minocycline_IV	Tetracyclines
	Omadacycline	Tetracyclines
	Oritavancin	Glycopeptides
	Plazomicin	Aminoglycosides
	Polymyxin-B_IV	Polymyxins
	Polymyxin-B_oral	Polymyxins
	Tedizolid	Oxazolidinones
	Telavancin	Glycopeptides
	Tigecycline	Glycylcyclines

STEPS	What to do	What to pay attention to
STEP 1	Check the prescription.	<p>Check that contents of prescribed treatment is correct considering:</p> <ul style="list-style-type: none"> • Indication and UCG recommended treatment. • Form, strength and dosage of medicine is right for the patient (e.g. child dosage and syrups for children)
STEP 2	Prepare the medicine	<ul style="list-style-type: none"> • Make sure you use the right medicine. Check name and strength on the container label • Check quality of the medicines. Do not use cracked or broken tablet. • Count correct quantity using gloves or counting tray and spatula/spoon. DON'T USE BARE HANDS!

STEP 3	Double-check information and counting	<p>If more than one staff in dispensary</p> <ul style="list-style-type: none"> • Preferably another person need to double-check STEP 1 (prescription) and STEP 2 (medicine preparation) • If one person in dispensary • Check again to ensure that you have picked the right medicines as prescribed • Check again to ensure that you have counted correctly
STEP 4	Dispense the medicines	<ul style="list-style-type: none"> • Use a dispensing envelope or small bottle • Label the package clearly with patient's name, facility name, generic name, strength and quantity of medicine, dose and duration
STEP 5	Provide appropriate information patient	<p>Ensure that the patient has understood;</p> <ul style="list-style-type: none"> • Why to take medicine • How to take i.e. oral or topical • When to take (morning, midday and/or evening) • How much of the medicine to take? (number of tablets or mls) • How long to take (until all tablets are used or number of days) • Information about interaction (patient must know which food or medicine affects the effect of the medicine) • Information about side effects (patient must understand that side effects can occur and know when to continue or stop treatment and return to the doctor. <p>General information i.e. dose should be taken in full and not shared</p>
STEP 6	Record in the prescription and dispensing log	Fill in date, patient number/name, diagnose, medicine name, initials of prescriber and dispenser

Topic 1. Introduction to AMR		Level of care
Global situation of AMR and AMS	Understand the morbidity, mortality and economic threat of AMR to human health.	All levels
Drivers of AMR	<ul style="list-style-type: none"> • Use of antibiotics in humans, animals, plants and environment: • Understand the development and main drivers of AMR. • Know the importance of optimizing use of antimicrobials in the human and animal sectors to prevent development of resistance. • Understand that travel, recent hospitalization or previous microbiology findings of resistant bacteria are factors that predispose to colonization/infection with a resistant pathogen. 	All levels
WASH and IPC	<ul style="list-style-type: none"> • Advocate for WASH and scaling up vaccines for common infections. Understand the link between AMS and IPC. • Understand the infection chain: organism, source, route of transmission and susceptible host, and the importance of practicing hand hygiene to prevent transmission. 	All levels
Call for action	Promote awareness of AMR and appropriate antimicrobial use amongst all HCWs, patients and the general public to protect the effectiveness of antimicrobials as a public good.	All levels
Topic 2. Antibiotics		
Different antibiotic classes	<ul style="list-style-type: none"> • Understand the clinically relevant spectrum of activity for commonly prescribed antibiotics and use this knowledge when prescribing. • Understand the mechanisms of actions for commonly prescribed antibiotics. 	Hospitals, HC4
Pharmacokinetic/ Pharmacodynamics (PK/D), formulations and Patient characteristics	<ul style="list-style-type: none"> • Understand the basic principles of pharmacokinetics and pharmacodynamics (PK/PD) and use this knowledge when prescribing. • Understand the use of antibiotics in special care groups (e.g., pediatrics, pregnancy, breast feeding, renal diseases and obese persons). 	Hospitals
Prescribing principles Prophylaxis, empirical therapy, definitive therapy and drivers of excess antibiotic use	<ul style="list-style-type: none"> • Understand the principles of empiric, syndromic or culture-based treatment options in relation to the selection of antibiotics. • Understand single prophylactic antibiotic dosing for surgical and other procedures for which prophylaxis has been shown to be effective, and use this knowledge when prescribing. 	All levels

	<ul style="list-style-type: none"> • Understand that an inflammatory response can be due to both infectious and non-infectious causes (e.g., acute pancreatitis). • Understand when not to prescribe antibiotics (e.g., for viral infections, or when there is bacterial colonization). Understand best practices for some infections may not include antibiotic treatment (e.g. incision and drainage of abscesses, removal of foreign material, most upper respiratory tract infections). • Understand key elements for initiating antibiotic therapy: • Indication for antibiotic therapy, including assessment of the severity of the infection (sepsis syndrome recognition) to inform urgency of therapy. • Bacterial infection, infection site, probable causative bacteria. • Antibiotic choice, dosage, interval, duration, preparation and administration of antibiotics, review and stop dates. • Importance of avoiding unnecessary use of antibiotics. • Empirical treatment guided by local antibiotic susceptibility patterns. • Broad- and narrow-spectrum antibiotics and the importance of avoiding unnecessary use, especially of those with broad-spectrum activity. 	
Documentation and communication on antibiotic prescription and use	<ul style="list-style-type: none"> • Understand the need to document important details of the antibiotic treatment plan (e.g., agent, dosing, administration route, clinical indication, duration and review dates) in the prescription chart, medical records and transfer notes to other health-care institutions. • Ensure appropriate documentation of antibiotics dispensed, including route, time, dose, therapeutic drug monitoring and response for individual patients. • Be able to communicate with patients on the appropriate use of antibiotics, including patient counseling etiquette, discussion techniques and psychology for patient communication: • Promote better patient understanding of all treatment issues, such as safety concerns (including alerts) and adherence. • Promote a standard for the appropriate use of antibiotics and manage patient expectations and demands especially when the use of antibiotics is not indicated. 	All levels

Allergies, cross reactions, adverse effects	<ul style="list-style-type: none"> • Understand the significance of common antimicrobial and drug/food interactions and utilize strategies to avoid interactions. • Understand that optimizing antimicrobial use can limit common side effects and collateral damage related to treatment (e.g., disruptive effects on host normal flora, which may lead to <i>C. difficile</i> infection, super infection with <i>Candida</i> spp.). • Understand common side effects of antimicrobials, including allergy, and use this knowledge when prescribing: • Understand allergy types: immediate, non-life-threatening, severe adverse drug reactions (e.g., Stevens-Johnson syndrome). • Understand the mechanisms and risks of beta-lactam cross-reactions. • Understand how to monitor common side effects and use this knowledge when prescribing. • Understand what to do when common side effects of antimicrobial therapy are suspected (e.g., documenting allergic reactions in patient records, reporting side effects). 	All levels
EML and the AWaRe classification	<ul style="list-style-type: none"> • Encourage adherence to antimicrobial formulary / protocol restrictions. • Discourage use of fixed-dose combinations of different antibiotics that have not been shown to improve clinical outcome. • Ensure regular and timely supply of appropriate medicines. • Understand that antimicrobials have different resistance potential (AWaRe categories). • Understand the importance of promoting appropriate use of antimicrobials according to their AWaRe categories to implement specific resistance-prevention actions for these antimicrobials. 	Hospitals, HC4
Topic 3. Microbiology		
Important terms	<ul style="list-style-type: none"> • Understand the differences between colonization (e.g., isolation of bacteria from a skin wound or urine with no sign of inflammation or infection) and infection. • Understand the difference in microorganisms and resistance patterns for infections acquired in the community compared with hospital settings. 	Hospitals, HC4

Common causative agents and resistance mechanisms	<ul style="list-style-type: none"> • Understand the common and important gram-positive and gram-negative bacteria (WHO priority pathogens list plus <i>C. difficile</i>). • Understand the nature and classification of microorganisms that commonly cause infections in humans. Recognize common mechanisms of resistance within an institution for different antimicrobial/organism combinations. Understand their impact on resistance to other antimicrobials. • Understand local AMR epidemiology, resistance and susceptibility patterns. 	Hospitals, HC4
Data collection and analysis	<ul style="list-style-type: none"> • Be able to collect microbiology samples correctly. • Ensure timeliness in the handling of microbiology samples and communication of susceptibility results. • Act as first line of surveillance in the correct use and reporting of microbiological tests and diagnostic tools. Be able to interpret and use basic antimicrobial susceptibility testing results (in settings where they are commonly used) and other microbiology testing tools: blood cultures, urine samples, wound samples and screening cultures. • Be able to interpret and use new, more advanced microbiology samples, biomarkers, point-of-care tests: • Understand how to use and interpret investigations that can help inform diagnosis of an infection (e.g. microbiological investigations, biomarkers, point-of-care tests). • Understand how to use and interpret investigations (e.g. microbiological investigations, biomarkers, point-of-care tests) that can help in monitoring the response to treatment of infections. 	Hospitals, HC4
Selective sensitivity reporting/antibiogram	<ul style="list-style-type: none"> • Advocate for and comply with guidelines regarding antimicrobial susceptibility testing. • Understand how to implement selective sensitive reporting to minimize broad-spectrum antimicrobial use. Understand the basic principles of antibiograms and other reporting tools and their interpretation. • Understand the use of antibiograms in detecting and reporting AMR patterns. 	Hospitals, HC4
Bug-drug combination chart	<ul style="list-style-type: none"> • Understand the common microbiological etiology and treatment of human infections. 	Hospitals, HC4

Topic 4. Clinical syndromes		
Guidance and best practice in antibiotic prescribing	<ul style="list-style-type: none"> • Understand how and where to access relevant guidance on antimicrobial prescribing and AMS and use this knowledge when prescribing. • Understand that empirical treatment should be guided by local antimicrobial susceptibility patterns. Promote best practice approaches by developing and implementing guidelines and/or clinical pathways. 	Hospitals, HC4
Common infections	<p>Understand the decision process for appropriate antibiotic use: clinical assessment and clinical symptoms probable diagnosis, causative agents, diagnostics including microbiology sampling, patient characteristics including comorbidities and risk factors for AMR, whether or not to treat with antibiotics, and how to choose antibiotics to treat or prevent common infections including but not limited to:</p> <ol style="list-style-type: none"> 1. CAP 2. UTI 3. Diarrhea 4. Skin and soft tissue infection (SSTI) 5. Sepsis 6. Surgical antibiotic prophylaxis 7. Bacterial infections that resolve by themselves e.g., sinusitis and otitis media 8. Influenza, malaria and other non-bacterial infections 9. Symptoms not indicative of a bacterial infection e.g. nonspecific uro-gynaecological symptom 10. Common health-care-associated infections e.g., UTIs, surgical site infections, catheter-related infections 	All levels
Topic 5. AMS		
Planning an AMS program	<p>Plan AMS activities:</p> <ul style="list-style-type: none"> • Provide clear mechanisms for the governance of AMS, including addressing responsibility and accountability for the quality and quantity of antimicrobials prescribed within a system. • Ensure that health workers have the knowledge and awareness of effective approaches/interventions to control AMR and have the skills to implement change according to their role. • Understand basic principles of behavior change in the context of prescribing antimicrobials and model good prescribing behavior to colleagues. 	All levels

	<ul style="list-style-type: none"> Understand the use of quality-improvement frameworks to address gaps and to improve antimicrobial use. 	
Performing AMS interventions	<p>Understand the key elements of a logical approach to continuation and appropriateness of antimicrobial therapy and be able to implement AMS interventions:</p> <ul style="list-style-type: none"> Adjusting doses (e.g. for patients with renal impairment), and where to seek advice about this. Monitoring antibiotic levels when indicated, and where to seek advice about this. Reviewing antibiotic therapy at 48–72 hours and regularly thereafter in hospitalized patients, and inappropriate situations in the community. Switching antibiotics from intravenous to oral administration as soon as possible when indicated (according to guidelines). Changing antibiotics, ideally to a narrower spectrum (de-escalation) or broader (escalation) spectrum, according to microbiology results and clinical condition. Stopping antibiotics if there is no evidence of infection based on clinical findings and investigations, e.g. negative microbial cultures, imaging reports. 	All levels
Assessing an AMS program	<ul style="list-style-type: none"> Understand the types of indicators (structure, process and outcome measures). Identify sources of data, recognizing the benefits and limitations of each. Be able to use PPSs. Understand how to measure and calculate antimicrobial use metrics (DDDs, DOTs, etc). Ensure timely and appropriate feedback to prescribers and other care groups. Understand and engage with any locally or nationally agreed quality measures for assessing antibiotic prescriptions (e.g., compliance with guidance, adverse events reviews of antibiotic therapy at 48–72 hours in hospitalized patients). Understand the principles of AMR surveillance and the use of surveillance data. Understand and implement balancing measures. Understand the importance and stages of evaluation. Be able to monitor and report on the performance of hospital AMR and related AMS programs. 	

Educational Strategy	Key Principles
<p>Training for prescribers/ patients: in-service educational programmes, workshops, seminars (CMEs)</p>	<ul style="list-style-type: none"> • Useful for both updating staff on new knowledge and also addressing problems identified by the MTC. • Success of educational interventions depends on how the information is presented. Visual and audio aids (posters/power point presentations) can be useful. • A problem-based approach (e.g., through actual case studies on real patients) is more likely to be effective than textbook lectures. • Small group meetings are also more effective than large group meetings • Educational programmes should be provided along with guidance and policies and the tools and structures needed to follow them (e.g., if the message is to prescribe antimicrobial A instead of antimicrobial B, antimicrobial A has to be made available!). • Patient education influences antimicrobial prescribing. All health workers should regularly/routinely provide patient education about appropriate therapy and adherence to drug regimens, so leading to improved health outcomes.
<p>Face-to-face persuasive outreach</p>	<ul style="list-style-type: none"> • Face-to-face individual teaching is the most effective (e.g., as done by drug sales representatives), though time-consuming. It usually targets prescribers, has few key messages to convey and is usually followed up with a reinforcement visit two or three times to strengthen the likelihood of behavior change. • Influencing opinion leaders has been shown to influence prescribing habits significantly. Junior officers tend to copy the habits of their senior, so a face-to-face with an opinion leader may have a cascade effect.
<p>Printed Educational Material</p>	<ul style="list-style-type: none"> • For example, treatment guidelines, newsletters, bulletins, clinical literature, illustrated persuasive material (flyers, poster). • Can be valuable in providing accurate and unbiased drug information. • Unlikely to be effective in changing behavior unless combined with a more interactive teaching method. Having a reliable source of unbiased and updated information augments other educational activities. • There should be a small drug resource center/library with at least 2-3 current authoritative books. • The most current edition of the Uganda Clinical Guidelines (UCG), Practical Guideline for Dispensing and Essential Medicines and Health Supplies List should be available. • Local bulletins can be periodically produced by the MTC or provided by an external source (e.g., MOH, WHO). • Good printed materials: Information should be concise, simple and brief; key points should be repeated, not lengthy; they should have short but catchy headings, visually appealing illustrations; the information should be oriented towards actions and decisions. They should have respected sponsors e.g., MOH, WHO.

Media based approaches	<ul style="list-style-type: none"> • Posters, audio tapes, plays, radio, TV, social networks • Used especially for patient education • Can reach many people but not very effective in changing behavior
------------------------	---

Annex 5: Example of a SWOT Analysis

	Strengths	Weakness
Internal/Present Factors	<p>Core elements:</p> <ul style="list-style-type: none"> • Functional MTC with clear TORs and an up-to-date workplan • Implementation of activities is endorsed by hospital management <p>Human resources:</p> <ul style="list-style-type: none"> • There is clinical knowledge of AMS • Personnel on the AMS sub-committee are trained in AMR surveillance as well as antimicrobial use surveys • Antimicrobial use and resistance data: • Presence of a functional Microbiology Laboratory • Routine Point Prevalence surveys are conducted <p>AMS activities:</p> <ul style="list-style-type: none"> • Regular activity reports on surveillance are shared with hospital management and health facility staff. • Regular data use to design and implement interventions to improve antimicrobial use. • The team is developing disease specific treatment algorithms to guide antimicrobial use. 	<p>Core elements:</p> <p>The objectives of the AMS program are not clearly defined</p> <p>Human resources:</p> <ul style="list-style-type: none"> • Limited training of personnel AMS-sub-committee on AMU/C surveillance data collection, analysis and reporting • Antimicrobial use and resistance data: • Records for retrospective data collection are unavailable • Limited use of the results from culture and sensitivity tests <p>AMS activities:</p> <ul style="list-style-type: none"> • There are no clear targets and indicators for change • There is a lack of unified support for implementation of AMS interventions.
	Opportunities	Threats

External/Future Factors	<p>Core elements:</p> <ul style="list-style-type: none"> Increasing awareness of AMR and its consequences for health and patient management within the facility, lower level facilities and community. Increasing financial prioritization of MTC activities based on impact on expenditures, patient management and clinical outcomes <p>Human resources:</p> <ul style="list-style-type: none"> Increasing collaborations with other quality improvement teams including the IPC committee <p>Antimicrobial use and resistance data:</p> <ul style="list-style-type: none"> The facility is able to identify its own problems and design solutions for them <p>AMS activities:</p> <ul style="list-style-type: none"> Presenting findings from surveillance and AMS activities to other health-care professionals 	<p>Core elements:</p> <p>Prioritization of issues other than Medicine Use/AMS in the facility</p> <p>Human resources:</p> <ul style="list-style-type: none"> Too many non-functional committees in the health-care facility Limited staff to participate in hospital medicine use surveys Staff turnover <p>Antimicrobial use and resistance data:</p> <p>AMS activities:</p> <ul style="list-style-type: none"> Much of the interventions suggested for AMS are marred by gaps in infection prevention and control Inability to conduct group CME's and discussions due to the COVID 19 pandemic
-------------------------	--	--

Core element	Action	Timeline	Key performance indicator	Means of verification	Person responsible
Governance	Establish an AMS subcommittee (new or incorporated into an existing structure)		AMS subcommittee members officially appointed	Appointment letters	MTC Chairperson
	Develop and Endorse an AMS Annual Action plan		Annual action plan developed by	AMS Annual workplan document	AMS subcommittee
	Allocation of resources for AMS workplan		Human and Financial resources allocated towards AMS workplan	Approved Budget with allocated resources	MTC committee and Hospital Administration
Accountability and Responsibility	Identify an AMS champion from the AMS subcommittee		AMS Champion identified	AMS Champion	AMS subcommittee

	Formulate an AMS team comprising healthcare workers from different departments		Presence of AMS team members representing different departments of the healthcare facility	List of AMS team members submitted to the AMS subcommittee for approval	AMS Champion
AMS Actions	Depends on which AMS intervention was selected by the health facility. Refer to section 8.1 and Annex 6				AMS Subcommittee AMS Champion AMS Team
Education and Training	Training and mentorship of healthcare workers on AMS		<ul style="list-style-type: none"> Number of AMS training sessions conducted or Number of healthcare workers mentored on AMS 	Attendance list for training or mentorship sessions Mentorship plans	AMS Champion & AMS Team
	Dissemination of IEC Materials		<ul style="list-style-type: none"> Number of IEC materials distributed throughout the facility 	Presence of IEC materials/posters at different workstations	AMS Champion & AMS Team
	Community Engagement on antimicrobial stewardship		<ul style="list-style-type: none"> Number of health education talks given Number of community outreaches conducted 	Timetables for health education talks Mobilization posters for community outreaches	AMS Champion & AMS Team
Monitoring and Surveillance	Developing an institutional antibiogram		Annual antibiogram	AMR reports Any publication of Institution's antibiogram	AMS Subcommittee
	Antibiotic prescription audits/surveys		<ul style="list-style-type: none"> Number of antibiotic audits/surveys done 	Antibiotic audits or point prevalence surveys	AMS Subcommittee

Reporting and Feedback	Dissemination of regular AMR prevalence reports to healthcare workers		• Number of AMR prevalence reports to healthcare workers	Dated AMR reports	AMS Subcommittee
	Regular AMS team meetings		• Number of AMS team meetings held and minuted	Minutes and attendance lists of AMS team meetings	AMS Champion
	Regular AMS subcommittee meetings		• Number of AMS subcommittee meetings held and minuted	Minutes and attendance lists of AMS subcommittee meetings	AMS subcommittee chairperson

INTERVENTION	HOW TO DO IT	ADVANTAGES	DISADVANTAGES
EDUCATION Formal or informal teaching and training to engage prescribers and other HCWs in improving antibiotic prescribing, dispensing and administration practices.	Basic and continuous education of clinical staff, clinical case discussions, classes and regular sharing of information, reminders and AMS e-learning resources.	Can be performed by well-informed HCWs in informal settings (i.e. ward rounds). Necessary for better adoption of most AMS interventions. Results in improved prescribing behaviours when combined with other AMS interventions (bundle).	Few AMS team members a barrier for formal training of HCWs
TREATMENT GUIDELINES Facility treatment recommendations for common infection syndromes based on national or facility clinical guidelines, and on local susceptibility data, if available	Refer to the current Uganda Clinical Guidelines and Essential Medicines List WHO manual for developing antibiotic policy guidance	Empirical antibiotic prescribing guidelines and standard treatment guidelines lead to improved, standardized care for common infectious diseases, help prescribers select initial therapy, improve antibiotic use, and decrease cost and length of stay.	Requires broad dissemination through multiple formats and channels to ensure uptake

<p>SURGICAL PROPHYLAXIS GUIDELINES Facility recommendations for common surgical procedures.</p>	<p>Adapt surgical prophylaxis guidelines to local needs, providing antibiotic choice, dose and duration.</p> <p>Disseminate well: poster in the operating theatre, leaflet, apps, electronic platform</p>	<p>Ensure timely administration and stop of appropriate antibiotic(s). Significantly reduce surgical site infections.</p> <p>Easier to implement than other guidelines due to few controversies around the recommendations.</p> <p>Need to be disseminated to surgeons and/ or anaesthetists, and supervised by pharmacists.</p> <p>Low-hanging fruit: once the process is optimized, only periodic monitoring and feedback are required</p>	<p>Require coordination and collaboration of many disciplines in the facility.</p>
<p>AUDIT WITH FEEDBACK Refers to the assessment of prescribed antibiotic treatment, with feedback on antibiotic treatment considered as inappropriate. Prospective (preferred) assessment through PPS or retrospective assessment of antibiotic therapy in in-patients, performed by trained HCWs or AMS team members</p>	<p>See Chapter 4 and Annex 2 for details</p>	<p>Essential to prescribers' education; provides specific feedback on what antibiotics they prescribe and how they prescribe them.</p> <p>Identifies antibiotic prescribing challenges in the unit, and shows the impact of AMS interventions on antibiotic prescribing and use (e.g. de-escalation, duration).</p> <p>Data may include information on indication for treatment, prescribed antibiotic(s), dosage, interval, administration route, timing of administration of first dose and duration if collected after stop of treatment.</p> <p>Can be performed from very basic (only indication and antibiotics prescribed per patient) to more advanced.</p>	<p>Time-consuming. Can be perceived as intrusive; if so, ensure data is only used confidentially for improvement in the unit</p>

<p>WARDS ROUNDS</p> <p>Real-time assessment of antibiotics to be prescribed, or which are already prescribed, with instant feedback to prescriber.</p>	<p>Assess appropriateness of prescribed antibiotics for all inpatients or a group of patients (ICU, surgery, etc.), and provide real-time feedback. AMS members do ward rounds preferably with clinical staff, providing oral or written feedback. Issues to consider are redundant therapy, antibiotics prescribed (compliance with guidelines or microbiology test results), dose optimization, IV-to-oral switch and duration</p>	<p>Provide real-time feedback on inpatient antibiotic treatment and training of prescribers.</p> <p>Can be performed by clinical experts who are not AMS team members (e.g. on handover meetings between shifts).</p>	<p>Ward rounds happen at different times and limit attendance. Frequency of ward rounds depends on human resources and burden of antibiotic use.</p>
<p>ANTIBIOTIC SELF-REVISION BY PRESCRIBERS</p> <p>Scheduled re-assessment of need for and choice of antibiotics.</p>	<p>Involves prescribers performing a post-prescription review of antibiotics, combined with audit and feedback.</p> <p>Consider indication for treatment, redundant therapy, antibiotics prescribed (compliance with guidelines or microbiology test results), dose optimization, IV-to-oral switch, duration (see below).</p>	<p>Directly involves prescribers in charge of patients in reviewing prescribed antibiotic treatment. Facilitates prescriber education and maintains prescriber autonomy. Less resource-intensive than audit and feedback.</p>	<p>Opposition from prescribers and lack of facility policy for implementing it.</p> <p>May not happen if prescribers are not prompted or comfortable with making changes. May not lead to improved appropriateness if prescribers lack expertise in infection management.</p>

<p>REDUNDANT THERAPY Review of antibiotic therapy, revealing unnecessary or undesirable therapy</p>	<p>A quick review of a patients' antibiotic therapy may reveal undesirable antibiotic combinations: duplication of treatment, overlapping bacterial spectra (e.g. metronidazole and clindamycin) or interactions with other medicines.</p>	<p>A relatively easy target for AMS interventions.</p> <p>Cost savings on antibiotics, and potentially reduces AMR.</p> <p>Reduces adverse events (e.g. nephrotoxicity, gastrointestinal side effects).</p>	<p>Need for trained staff who can review antibiotic therapy and provide expert advice.</p>
<p>REVIEW OF PRESCRIBED ANTIBIOTICS 1. DE-ESCALATION by prescribers.</p>	<p>1. Self-revision by the prescriber irrespective of time and availability of microbiology test results.</p>	<p>Can reduce costs for broad-spectrum antibiotics, and potentially reduces AMR and further facility and patient costs.</p>	<p>1–2. May not occur if prescribers are not prompted or are not comfortable making changes.</p>
<p>2. DE-ESCALATION according to guidelines.</p>	<p>2. Self-revision by prescribers or review on ward rounds on whether empirical treatment is according to guidelines (diagnosis, drug, dose, interval, administration route, duration) and patient characteristics.</p>		<p>3. Requires that microbiology sampling be done correctly, as well as quality-assured microbiology testing, timely release of results and good communication with trained prescribers.</p>
<p>3. DE-ESCALATION according to microbiology test results +/- 48 hours after prescription.</p>	<p>3. When microbiological results become available, antibiotic treatment should be streamlined accordingly: choose the most active antibiotic(s) with least toxicity, narrowest spectrum and lowest cost.</p>		

<p>DOSE OPTIMIZATION Review of antibiotic doses based on infection, patient characteristics, antibiotic(s) and guidelines.</p>	<p>Optimize dose based on age, weight, organ dysfunction (kidney) and tissue penetration.</p> <p>Consider therapeutic drug monitoring, if available, especially for nephrotoxic antibiotics (aminoglycosides).</p> <p>Evaluate the need for loading dose and/or prolonged/continuous infusions.</p> <p>Integrate into pharmacists' review during ward rounds or other audit processes.</p>	<p>Improves patient outcomes, and reduces suboptimal drug concentrations and adverse events (mainly nephrotoxicity).</p>	<p>Requires patient-specific data to perform the assessment, e.g. weight, renal function, indication and recommendations for dosing in special patient populations (e.g. obesity, renal dysfunction), which are not always available. May also require microbiology laboratory results (minimum inhibitory concentration) for correct dose.</p>
<p>IV-TO-ORAL SWITCH Promotes the use of oral antibiotics instead of IV when clinically indicated.</p>	<p>Consider based on:</p> <ul style="list-style-type: none"> clinical condition and availability of adequate oral antibiotic; oral intake and gastrointestinal absorption (not impaired); adequacy of oral intake in terms of diagnosis (e.g. not in the case of endocarditis or meningitis). 	<p>Reduces unnecessary days of IV lines and common complications. Reduces length of stay, as patients can complete antibiotic treatment at home.</p>	<p>May meet opposition from prescriber (and patient).</p>
<p>DURATION Review (real-time or retrospective) of stop dates for antibiotic treatment in patients.</p>	<p>Can be performed:</p> <ul style="list-style-type: none"> by prescribers during self-revision; the entire AMS team during ward rounds pharmacists collecting prescriptions in every unit retrospectively. 	<p>Addresses a common area for improvement with regard to antibiotic prescribing.</p> <p>Improves patient outcomes, and prevents selection of MDR bacteria and adverse events</p>	<p>May need to be individualized in e.g. immune-compromised patients or patients with central nervous system or bone infection.</p>

<p>RESTRICTION</p> <p>Restricted dispensing of targeted antibiotics on the hospital's formulary, according to approved criteria (e.g. use the AWaRe categories).</p> <p>Use of restricted antibiotics may be limited to certain indications, prescribers, services, patient populations or a combination of these.</p> <p>Selective susceptibility reporting.</p>	<p>Restrictions on antibiotics are by diagnosis or unit.</p> <p>Selection of restricted antibiotics is done by facility authorities, the AMS team and heads of units based on spectrum, cost or toxicities. Antibiotics are restricted before use; ensures expert approval before initiation.</p> <p>Practical approach that allows attending physician to use the drug pending approval by physician or AMS team after +/- 48 hours.</p> <p>Report susceptible first-line narrow-spectrum antibiotics to regular wards.</p>	<p>Controlling targeted antibiotics defined by the AMS team or hospital formulary.</p> <p>Shown to be highly effective, especially in the early stages of an AMS programme, in an outbreak situation or as part of a response to an increase in or current high use of certain antibiotics in the facility. Has been shown to reduce medicine costs for hospitals over time.</p> <p>May reduce use of broad-spectrum antibiotics.</p>	<p>May delay initiation of treatment.</p> <p>Opposition from prescribers due to lack of autonomy.</p> <p>Risk of misusing other antibiotics that do not require authorization. Labour-intensive and time-consuming because it requires enforcement to be effective.</p> <p>Opposition from prescribers, lack of guidelines, poor system support, insufficient resources</p>
<p>AUTOMATIC OR MANUAL STOP ORDERS</p> <p>Stop dates automatically applied to an antibiotic order when the duration is not specified to ensure that antibiotics are not used longer than necessary.</p>	<p>Automatic stop orders are mostly used for a single dose of surgical antibiotic prophylaxis, or prescribing some antibiotics.</p> <p>Useful in small facilities and with limited pharmacy staff.</p> <p>Use only in a context with good control mechanisms to avoid unsafe treatment interruptions. Nurses can play a role in alerting the attending physician.</p>	<p>A simple measure, considering the high burden of antibiotics unnecessarily used for surgical prophylaxis.</p>	<p>IT is needed, which is often missing.</p> <p>Unintended treatment interruptions if not properly supervised by the AMS team.</p>

Patient form: Point Prevalence Survey on Antibiotic Use

CORE: Patient demographics

Hospital ID	<input type="text"/>	Hospital Code	<input type="text"/>
Ward ID	<input type="text"/>	Ward Code	<input type="text"/>
Survey Date	<input type="text"/>	Patient Code	<input type="text"/>
Patient Initials	<input type="text"/>	AgeYear (>2 years)	<input type="text"/>
Gender	<input type="text"/>	PreTermBirth	<input type="text"/>
Age (0-23 months)	<input type="text"/>	NeonatesBirthWeight	<input type="text"/>
Childe12YearWeight	<input type="text"/>	SurgerySinceAdmission	<input type="text"/>
AdmissionDate	<input type="text"/>	PeripheralVascularCatheter	<input type="text"/>
CentralVascularCatheter	<input type="text"/>	Intubation	<input type="text"/>
UrinaryCatheter	<input type="text"/>		
PatientOnAntibiotic	<input type="text"/>	PatientNumberAntibiotics	<input type="text"/>

OPTIONAL: Underlying infectious diseases variable

MalariaStatus	<input type="text"/>	TuberculosisStatus	<input type="text"/>
HIVStatus	<input type="text"/>	HIVonART*	<input type="text"/>
HIVCD4Count*	<input type="text"/>	<i>*Only if HIVStatus = "Yes"</i>	

OPTIONAL: Comorbidities variables

COPDStatus	<input type="text"/>	MalnutritionStatus	<input type="text"/>
------------	----------------------	--------------------	----------------------

OPTIONAL: Hospitalisation variables

TransferfromHospital	<input type="text"/>	TransferfromNonHospital	<input type="text"/>
Hospitalisation90Days	<input type="text"/>		

OPTIONAL: Hospitalisation variables

TypeSurgerySinceAdmission	<input type="text"/>
---------------------------	----------------------

Indication form: Point Prevalence Survey on Antibiotic Use

Core variables

Patient Code Ward Code Hospital Code

IndicationCounter	1	2	3	4
IndicationType	HAI/CAI/SP/MP/O	HAI/CAI/SP/MP/O	HAI/CAI/SP/MP/O	HAI/CAI/SP/MP/O
If IndicationType is SP:				
Surg.Proph.Duration	SP1/SP2/SP3	SP1/SP2/SP3	SP1/SP2/SP3	SP1/SP2/SP3
Surg.Proph.Site	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Diagnosis	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
StartDateTreatment	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
ReasonInNotes	YES/NO	YES/NO	YES/NO	YES/NO
CultureSampleTaken	YES/NO/UNK	YES/NO/UNK	YES/NO/UNK	YES/NO/UNK

IndicationType: HAI = Hospital Acquired Infection, CAI = Community Acquired Infection, SP = Surgical Prophylaxis, MP = Medical Prophylaxis, O = Other
Surg.Proph.Duration: SP1 = one dose, SP2 = Multiple doses on one day (up to 24 hours after the surgery), SP3 = multiple doses for more than 24 hours after the surgery

Antibiotic form (1): Point Prevalence Survey on Antibiotic Use

Patient Code Ward Code Hospital Code

Core variables

Antibiotic counter	Indication Counter	Antibiotics Notes Name	Antibiotic INN Name	Antibiotic Written in INN	Start Date of Antibiotic	Unit Dose	Unit Dose Combination	Unit Dose MeasureUnit	Unit Dose Frequency	Administration Route
1				YES NO				MG G IU MU		O P I R
2				YES NO				MG G IU MU		O P I R
3				YES NO				MG G IU MU		O P I R
4				YES NO				MG G IU MU		O P I R
5				YES NO				MG G IU MU		O P I R
6				YES NO				MG G IU MU		O P I R

Administration Route: O = Oral, P = Parenteral, I = Inhalation, R = Rectal

Antibiotic form (2): Point Prevalence Survey on Antibiotic Use

Patient Code Ward Code Hospital Code

Core variables

Antibiotic counter	Prescriber Type	Parenteral Type	Oral Switch	Number of Missed doses	Reason for Missed doses	Guideline compliance	Treatment type
1	SP GP O N	IM IV O	YES NO		S P O UNK	Yes No Not indicated	MG G IU MU
2	SP GP O N	IM IV O	YES NO		S P O UNK	Yes No Not indicated	MG G IU MU
3	SP GP O N	IM IV O	YES NO		S P O UNK	Yes No Not indicated	MG G IU MU
4	SP GP O N	IM IV O	YES NO		S P O UNK	Yes No Not indicated	MG G IU MU
5	SP GP O N	IM IV O	YES NO		S P O UNK	Yes No Not indicated	MG G IU MU
6	SP GP O N	IM IV O	YES NO		S P O UNK	Yes No Not indicated	MG G IU MU

Prescriber type: SP = Specialist, GP = General Practitioner, O = Other, N = Unknown

Parenteral type: IM = Intramuscular, IV = Intravenous, O = Other

Reason for Missed doses: S = Stock out, P = Failure to Purchase, O = Other, UNK = Unknown

Microbiology form: Point Prevalence Survey on Antibiotic Use

Hospital Code	<input style="width: 90%;" type="text"/>	Ward Code	<input style="width: 90%;" type="text"/>
Patient Code	<input style="width: 90%;" type="text"/>		
Microbiology data refers to anyculture & susceptibility result from a relevant clinical sample. Screening samples should not be reported			

Specimen 1:

	Specimen Type	<input style="width: 90%;" type="text"/>				
	Culture Result	<input style="width: 90%;" type="text" value="NA/POS/NEG"/>				
If culture result is Pos:						
Microorganism	1	<input style="width: 90%;" type="text"/>	2	<input style="width: 90%;" type="text"/>	3	<input style="width: 90%;" type="text"/>
Antibiotic Susceptibility Test Results	1	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>	2	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>	3	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>
		(Only if Antibiotic Susceptibility Test Result is "Yes")				
	1	<input style="width: 90%;" type="text"/>	2	<input style="width: 90%;" type="text"/>	3	<input style="width: 90%;" type="text"/>

Specimen 2:

	Specimen Type	<input style="width: 90%;" type="text"/>				
	Culture Result	<input style="width: 90%;" type="text" value="NA/POS/NEG"/>				
If culture result is Pos:						
Microorganism	1	<input style="width: 90%;" type="text"/>	2	<input style="width: 90%;" type="text"/>	3	<input style="width: 90%;" type="text"/>
Antibiotic Susceptibility Test Results	1	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>	2	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>	3	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>
	1	<input style="width: 90%;" type="text"/>	2	<input style="width: 90%;" type="text"/>	3	<input style="width: 90%;" type="text"/>

Specimen 3:

	Specimen Type	<input style="width: 90%;" type="text"/>				
	Culture Result	<input style="width: 90%;" type="text" value="NA/POS/NEG"/>				
If culture result is Pos:						
Microorganism	1	<input style="width: 90%;" type="text"/>	2	<input style="width: 90%;" type="text"/>	3	<input style="width: 90%;" type="text"/>
Antibiotic Susceptibility Test Results	1	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>	2	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>	3	<input style="width: 90%;" type="text" value="YES/NO/UNK"/>
	1	<input style="width: 90%;" type="text"/>	2	<input style="width: 90%;" type="text"/>	3	<input style="width: 90%;" type="text"/>

Culture result: NA = Not available. POS = Positive, NEG = Negative

Annex 10: Indicator matrix for Facility-level use

Indicator	Indicator Definition	Data Source	Baseline	Target
Structural Indicators				
Presence of a multi-disciplinary team coordinating AMC&U at the facility.	Presence of a multi-disciplinary team coordinating AMS at the facility	MTC feedback reports		
Proportion of human health staff trained in AMC&U surveillance	Numerator: Number of facility staff trained Denominator: number of targeted staff	Training logs Workshop reports		
Output indicators				
Proportion of antibiotic prescriptions in accordance to treatment guidelines or protocols	Numerator: number of patients receiving empiric treatment according to clinical guidelines Denominator: total number of patients on antibiotics	Point prevalence survey. OPD – Drug indicator survey		
Percentage of patients with Upper-Respiratory Tract Infections (URTI) who were prescribed with antibiotics	Numerator: Total number of patients diagnosed with URTI and antibiotics prescribed Denominator: Total number of patients diagnosed with URTI	OPD – Drug indicator survey		
Percentage of antibiotics prescribed by generic name	Numerator: Total number antibiotics prescribed by generic name for sampled patients Denominator: Total number antibiotics prescribed for the sampled patients	Point prevalence survey. OPD – Drug indicator survey		

Annex 11: Indicator matrix to monitor AMS at National level

Indicator	Indicator Definition	Responsible Institution	Level of care	Data Source	Baseline	Target	Frequency	Comment
Laboratory								
Percentage of Hospitals who have published an antibiogram	This indicator measures the proportion of hospitals monitoring how susceptible a series of organisms are to different antimicrobials	Health Facility (Chair MTC)	Hospital	Assessment Report	N/A	40%	Annual	
Percentage of Hospitals that have conducted at least one environmental swabbing	This indicator measures the proportion of hospitals monitoring the presence of pathogens within the Health Facility environment	Health Facility (Chair IPC Committee)	HCIV and above	Assessment Report	N/A	40%	Annual	

Proportion of Hospitals submitting summary trends of antimicrobial susceptibility test (AST) results	This indicator measures the proportion of hospitals submitting summary trends of antimicrobial susceptibility test (AST) results	Health Facility (Chair AMS Sub-Committee)	Hospital	HMIS Section 10		100%	Monthly	
Percentage of Hospitals submitting quarterly AMR patient-level data to the Ministry of Health	This measures the proportion of hospitals submitting Quarterly patient-level data to MOH	Health Facility	Hospital	MOH Quarterly Reports		100%	Quarterly	
National patient-level data submitted to GLASS	This indicator tracks the submission of national patient-level data to GLASS-AMR	MOH/UNHLS	MOH HQ	Health Facility Reports		100%	Annual	
Antimicrobial Use								
Proportion of Health Facilities conducting Point Prevalence Survey (PPS)	This measures the proportion of health facilities conducting point prevalence survey	Health Facilities (Chair AMS sub-committee)	HC III and above	Assessment Report	26%	70%	Hospitals and above - twice a year HCIII & HCIVS - once a year	
Proportion of Health Facilities conducting prescription and medicine use	This measures the proportion of health facilities conducting point prevalence survey	Health Facilities (Chair AMS sub-committee)	HCIII and above	Assessment Report	NA	70%	Hospitals and above - twice a year HCIII & HCIVS - once a year	
Antimicrobial consumption								
Proportion of health facilities with published consumption reports for antimicrobials	This measures the proportion of health facilities with published consumption reports for antimicrobials	Health Facility (Chair MTC)	HC III	Stock card/issue data	NA	100%	Annual	
National consumption data submitted to GLASS	This indicator tracks the submission of national consumption data to GLASS-AMC	MOH/DPNM	MOH HQ	Import data from NDA and Warehouse data from NMS and JMS	NA	100%	Annual	
Functionality of the Medicine and Therapeutic Committee								
Proportion of Health facility with functional Medicine and therapeutics committee	The indicator measures the proportion of Health facilities with functional MTC	MOH/DPNM	HCIII and above	MTC assessment reports	56%	90%	Biannual	

Annex 12: List of contributors

First	Surname	Title	Organisation
Morries	Seru	Ag. Commissioner Health Services	Ministry of Health - Department of Pharmaceuticals and Natural Medicines
Harriet	Akello	Senior Pharmacist	Ministry of Health - Department of Pharmaceuticals and Natural Medicines
Thomas	Obua Ocwa	Ag. Registrar Pharmacy Board	Ministry of Health - Department of Pharmaceuticals and Natural Medicines
Micheal	Isabirye	Technical Advisor - Supply Chain Management	Ministry of Health - Department of Pharmaceuticals and Natural Medicines
Moses	Mukiibi	Technical Officer - Appropriate Medicine Use	Ministry of Health - Department of Pharmaceuticals and Natural Medicines
Emmanuel	Watongola	Laboratory Supply Chain Officer	Ministry of Health - Department of Pharmaceuticals and Natural Medicines
Saudah	Namubiru Kizito	Microbiologist	Ministry of Health - Uganda National Laboratory and Diagnostic Services
Ritah	Namusoosa	Laboratory Microbiologist	Ministry of Health - Uganda National Laboratory and Diagnostic Services
Jonathan	Kabazi	Laboratory technologist (Microbiology)	Ministry of Health - Uganda National Laboratory and Diagnostic Services
Jonathan	Mayito	Project Manager - Fleming Fund	Makerere University College of Health Sciences Infectious Diseases Institute
Richard	Walwema	Technical Advisor - Fleming Fund	Makerere University College of Health Sciences Infectious Diseases Institute
Francis	Kakooza	Ag. Head of Department - Global Health Security	Makerere University College of Health Sciences Infectious Diseases Institute
Daniel	Kibombo	Senior Project Officer - Fleming Fund	Makerere University College of Health Sciences Infectious Diseases Institute
Vivian	Twemanye	Senior Project Officer - Fleming Fund	Makerere University College of Health Sciences Infectious Diseases Institute
Kamaba	Pakoyo	Head of Department	Makerere University Department of Pharmacy
Prof Richard	Odoi Adome	Professor	Makerere University Department of Pharmacy
Anthonia	Nakamya	Senior Lecturer	Makerere University Department of Pharmacy
Rajab	Kalidi	Lecturer	Makerere University Department of Pharmacy
Herbert Bush	Aguma	Lecturer	Makerere University Department of Pharmacy
John	Mulangwa	Assistant Lecturer	Makerere University Department of Pharmacy
Sulah	Balikuna	Assistant Lecturer	Makerere University Department of Pharmacy
Peter	Kageni	Lecturer	Makerere University Department of Pharmacy
Winnie	Nambatya	Lecturer/ Country Representative Common Wealth Pharmacists Association	Makerere University Department of Pharmacy
Grace	Biyinzika Lubega	Research Associate	Makerere University School of Public Health

Joel	Bazira	Head of Department – Medical Microbiology	Mbarara University of Science and Technology
Daniel Chans	Mwandah	Lecturer – Clinical Pharmacy	Mbarara University of Science and Technology
Edward John	Lukyamuzi	Lecturer – Clinical Pharmacy	Mbarara University of Science and Technology
Ventrine Marion	Chelimo	Regional Pharmacist	National Medical Stores
Theophile	Tuyishimire	Regional Pharmacist	National Medical Stores
Shiela	Ampire	Technical Officer – Product safety	National Drug Authority
Ddembe	Kaweesi	Pharmacist	National Drug Authority
John	Nameta	Microbiologist	Mulago National Referral Hospital
Darius	Owachi	Medical Officer – Special grade	Kiruddu National Referral Hospital
Florence	Ayoo Latim	Principal Nursing Officer	Kiruddu National Referral Hospital
Falisy	Lule	Pharmacist	Kiruddu National Referral Hospital
Onismus	Turyasingura	Medical Officer	Bwera General Hospital
Grace	Karakire	Laboratory Technologist	Bwera General Hospital
Gideon	Ononge	Medical Laboratory Technologist	Masaka Regional Referral Hospital
Frednald	Byamugisha	Medical Officer	Lira Regional Referral Hospital
Harriet	Tino Okello	Pharmacist	Lira Regional Referral Hospital
William	Olum	Senior Pharmacist	Jinja Regional Referral Hospital
Reuben	Kiggundu	Country Project Director – MTaPS	Management Sciences for Health (MSH)
John Paul	Waswa	Senior Technical Advisor – GHS/AMR	Management Sciences for Health (MSH)
Marion	Murungi	Senior Technical Advisor – GHS/AMR	Management Sciences for Health (MSH)
Hassan	Kasujja	Technical Advisor – GHS/AMR	Management Sciences for Health (MSH)
Julius	Mubiru	M&E Specialist	Management Sciences for Health (MSH)
Peter	Agababingi	M&E Specialist	Management Sciences for Health (MSH)
Simone	Cadorin	Program Manager	Medici con l’Africa
Jennifer	Ayopo	Project Officer	Medici con l’Africa
Rogers	Kisame	Project Manager – Global Health Security	Baylor College of Medicine Children’s Foundation Uganda
Ambrose	Katende	Medical Logistics and Supply Chain Officer	Baylor College of Medicine Children’s Foundation Uganda
Rony	R. Bahatungire	Ag. CHS (CS)	
Elizabeth	Katwesigye	IPC Specialist,	Ministry of Health
Christopher	Wagobera	Medical Officer	Kabale RRH
Victoria	Rutter		Commonwealth Pharmacists Association
Saudah	Namubiru		National Health Laboratory and Diagnostic Services
Ibrahim	Mugerwa		National Health Laboratory and Diagnostic Services



Ministry of Health Headquarters,

Plot 6 Lourdel Road, P.O.Box 7272

Kampala, Uganda

Tel: +256-417-771330

Email: ugandaclinicalguidelines@gmail.com

Website: www.health.go.ug

© 2024 Ministry of Health, Republic of Uganda