

**Curriculum Review
and Interview of
Experts to Identify
Topics on
Antimicrobial Use
and Antimicrobial
Resistance Included
in the
Undergraduate
Medicine Training
Program in Zambia**

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CONTENTS

ACRONYMS.....	i
EXECUTIVE SUMMARY	i
Curriculum Review.....	i
Interviews.....	i
Focus Group Discussions.....	i
BACKGROUND	1
Scope of Work	1
ACTIVITIES.....	1
Assessment Methodology	1
Findings.....	1
DISCUSSION AND RECOMMENDATIONS.....	1
Antimicrobial Use.....	1
Infectious Diseases of Major Public Health Importance	1
Infection Prevention and Immunization.....	1
Rational Use of Medicines.....	1
Antimicrobial Resistance	1
Recommendations.....	1
NEXT STEPS	1
REFERENCES	1
ANNEX 1. CURRICULUM REVIEW FORM—PART A.....	1
ANNEX 2. CURRICULUM REVIEW FORM—PART B	1
ANNEX 3. INTERVIEW SCHEDULES—MEDICAL COUNCIL AND MINISTRY OF HEALTH OFFICIALS	1
ANNEX 4. INTERVIEW SCHEDULES—FACULTY MEMBERS AND HEADS OF DEPARTMENTS	1
ANNEX 5. LIST OF PARTICIPANTS INTERVIEWED	1
ANNEX 6. INTERVIEW TRANSCRIPTS.....	1
Interviews with Medical Council and Ministry of Health Officials	1
Interviews with Faculty Members and Heads of Departments	1

ACRONYMS

AIDS	acquired immunodeficiency syndrome
AM	antimicrobial
AMR	antimicrobial resistance
Global Fund, GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV	human immunodeficiency virus
IMCI	Integrated Management of Childhood Illnesses
ID	infectious disease
IP	infection prevention
MB ChB	Bachelor of Medicine and Bachelor of Surgery [Zambia]
MDR	multidrug resistance
MRSA	methicillin-resistant <i>Staphylococcus aureus</i>
MSH	Management Sciences for Health
RPM Plus	Rational Pharmaceutical Management Plus
RUM	rational use of medicines
STGs	standard treatment guidelines
TB	tuberculosis
USAID	U.S. Agency for International Development
VRE	vancomycin-resistant enterococci
WHO	World Health Organization

EXECUTIVE SUMMARY

The study's objective was to conduct a curriculum review and interview experts to identify antimicrobial (AM) use and antimicrobial resistance (AMR) topics included in undergraduate medical training programs in Zambia. This exercise also aimed to identify gaps in the training programs and to assist in developing recommendations on suitable modifications and additions required in the Zambian context to ensure adequate coverage of these topics during the undergraduate medicine training. The survey methods included—

- Curriculum review
- Interviews with lecturers, governmental officials, and representatives of the professional physicians association
- Focus group discussions with graduates to review the findings

Curriculum Review

The curriculum review consisted of two steps, Part A and Part B, to collect information for the analysis. Part A was a course review using a Course-by-Course Review Form (Annex 1) to identify the course, its learning objectives, and its content. In addition, a preliminary analysis for AM use and AMR content was explored for each course. At this stage, each course was categorized as AM/AMR-related or non-AM/AMR related, using general themes from the *WHO Global Strategy for Containment of Antimicrobial Resistance*.¹ Part B was the Course Summary Form (Annex 2) and was used to gather information about the total number of courses in the curriculum, approximate length of each course, overall length of the curriculum, content covered, total number of courses with AM/AMR content, approximate amount of time devoted to AM/AMR-type content, and teaching/learning methods. Information from Part B was used to determine the total course time devoted to AM/AMR related teaching, using the following calculations—first, the total number of hours spent in the curriculum for all the courses was calculated. Second, using the focus group discussion with five graduates of the curriculum, the total number of hours spent on each major topic area was estimated and compared to the total number of hours spent on courses categorized as AM/AMR related.

Interviews

Three high-ranking government officials (Director General, Central Board of Health; Pharmacy Specialist, Central Board of Health; Registrar, Pharmaceutical Regulatory Authority), and 11 medical faculty members who teach undergraduates were interviewed. The disciplines represented in the interviews of faculty teaching members included pharmacology, microbiology,

¹ World Health Organization (WHO). 2001. *WHO Global Strategy for Containment of Antimicrobial Resistance*. WHO/CDS/CSR/DRS/2001.2a. Geneva: WHO. <<http://www.who.int/drugresistance/en>> (accessed May 8, 2006).

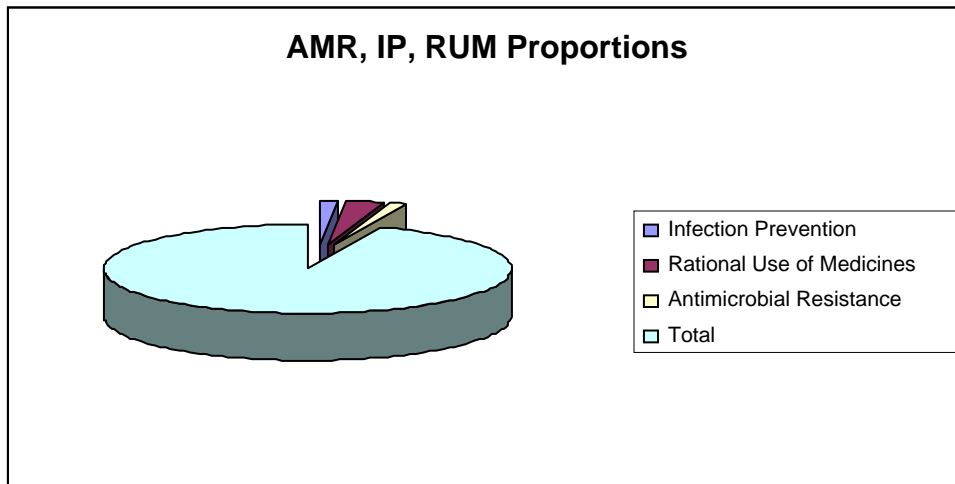
parasitology, pediatrics, obstetrics and gynecology, internal medicine, and surgery. One researcher conducted the interviews using a structured interview schedule.

Focus Group Discussions

To compare and verify the information obtained from the curriculum review and interviews with an additional source, a focus group discussion was conducted with five graduates of the undergraduate curriculum.

Located in Lukasa, the University of Zambia School of Medicine’s undergraduate curriculum offers 40 courses totaling 2,800 hours over a five-year period. Of the 40 courses, 10 courses include components on AM/AMR-related topics, totaling approximately 700 hours. Of these 700 hours, teaching hours in infection prevention (IP), rational use of medicines (RUM), and AMR were distributed as follows—

Proportion of Hours Specific to IP, RUM, and AMR



Note: IP = 43.75 hours; RUM = 87.5 hours; AMR = 43.75 hours (generated from focus group discussions with graduates).

Several significant gaps were identified in the curriculum regarding the teaching of AMR issues.

Antimicrobial Use

The mechanism of action of antibiotics, antifungals, antiparasitics, and antivirals was taught in the preclinical years of the curriculum. The clinical years did not emphasize these actions when they discussed the treatment of bacterial, fungal, parasitic, and viral diseases. Issues of patients’ misconceptions about AM treatment, self-medication, and poor adherence were not specifically addressed in either preclinical or clinical years.

Infectious Diseases of Major Public Health Importance

The science of microbes (pathogens) responsible for infectious diseases of major public health importance—such as HIV/AIDS, tuberculosis, malaria, sexually transmitted infections, diarrheal diseases (salmonella, cholera, shigella), acute respiratory infections, and measles—were covered in the preclinical years whereas the treatment was covered in clinical years. No special attention was paid to the use of antimicrobials in treating these diseases with regard to the issue of AMR. The problem was compounded by the increased volume of antimicrobials on the market caused by international initiatives such as The President’s Emergency Plan for AIDS Relief and the Global Fund to Fight AIDS, Tuberculosis and Malaria. However, the role of these initiatives and the inherent risk of AMR were not covered in the curriculum.

Infection Prevention and Immunization

IP and immunization were partially covered in the undergraduate curriculum. Vaccination schedules were emphasized in pediatrics and also mentioned in internal medicine and obstetrics/gynecology. The aspect of vaccination as a strategy for IP and how it relates to reduction of AMR was not covered in courses. Integrated Management of Childhood Illnesses was covered in pediatrics as a first-line management strategy for treating childhood diseases. Barrier precautions (hand washing, use of gloves, gowning), isolation procedures, injection safety and appropriate use of injections, sterilization and disinfection of supplies and equipment, and aseptic techniques for medical procedures were not taught as topics in lectures and tutorials. Because such techniques are practiced in the hospital, students were assumed to pick them up during apprenticeship.

Rational Use of Medicines

RUM and subtopics such as accurate diagnosis and selection of correct medicines, dosages, and treatment durations were not specifically addressed in the curriculum. In addition, patient education on appropriate use of medicines, use of standard treatment guidelines, and the role of counterfeit medicines and pharmaceutical promotions coercion as issues that are important for the containment of AMR were not expressly addressed. These components were taught occasionally in the clinical setting and in preclinical classes but left to the lecturer’s discretion (when they perceived relevance to the topic). Prescribing audits were neither taught in the curriculum nor conducted in the hospital.

Antimicrobial Resistance

AMR was covered in preclinical years in the microbiology course. Coverage included the mechanism of development of resistance and practices that may promote AMR. The extent of the AMR problem, AMR surveillance and research, and prevention and control were not taught. Examples of resistance—such as multidrug resistance (MDR), methicillin-resistant *Staphylococcus aureus*, and vancomycin-resistant enterococci—were mentioned in passing. AMR was not taught in clinical courses as a specific topic, but was mentioned if the lecturer’s perception of the context deemed it relevant to mention.

The need for teaching AMR issues in the undergraduate medical curriculum has been convincingly established by the curriculum review and interview of experts both from the government and from the teaching faculty members. It is recommended that the Antimicrobial Advocacy Working Group, the Ministry of Health, and the School of Medicine establish a committee to oversee the systematic and longitudinal coverage of AMR (components) in the undergraduate medical curriculum. The faculty members must be trained to effect this change; while the other support infrastructure, such as laboratory services, must be enhanced in the undergraduate training.

BACKGROUND

Antibiotic resistance is now a global problem of major concern. Infections continue to be a major cause of morbidity and mortality while traditional treatments are no longer effective due to the increase of antimicrobial resistance (AMR) both in hospitals and the community. It is widely accepted that there is a close link between the development of AMR and the use of antimicrobial (AM) agents in hospitals and the community. Resistance has increased over the past decade in community infections caused by organisms such as human immunodeficiency virus (HIV), *Mycobacterium tuberculosis*, *Streptococcus pneumoniae*, *S. aureus*, *Shigella*, *Salmonella*, and *Neisseria gonorrhoeae*. Infections with multiresistant organisms have resulted in serious morbidity and death among previously healthy adults and children. Africa faces heightened risks for AMR because it has one of the largest burdens of infections in the world. In addition, Africa has high poverty levels that limit access to effective antimicrobials.

At this time a new problem has emerged because of the increased volume of antimicrobials supplied to Africa by the world initiatives to fight diseases such as HIV/AIDS, tuberculosis (TB), malaria, and schistosomiasis—such as the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) and The President’s Emergency Plan for AIDS Relief. Furthermore, the increased demand leaves the African market vulnerable to counterfeit medicines. Clearly, the problem of AMR requires renewed vigilance and prioritization. Infections with antibiotic-resistant organisms raise several public health concerns; they cause delays in effective treatment because empiric therapies are not effective, resulting in widespread empiric use or abuse of broad-spectrum antibiotics. Additionally, some antibiotic-resistant bacteria seem to have increased pathogenicity compared to susceptible strains and colonization with antibiotic-resistant organisms can increase the potential for cross-transmission; for example, nosocomial methicillin-resistant *S. aureus* infection can spread to household contacts.

Appropriate AM use remains the most promising hope for Africa. The *WHO Global Strategy for Containment of Antimicrobial Resistance*² defines the appropriate use of antimicrobials as “the cost-effective use of antimicrobials which maximizes clinical therapeutic effect while minimizing both drug-related toxicity and the development of antimicrobial resistance.”³ Educating prescribers is a cornerstone of the interventions recommended in the *WHO Global Strategy*. Lack of knowledge and training contribute to the problem of AMR. Lack of knowledge about differential diagnoses, infectious diseases (IDs) and microbiology, the role of accurate diagnosis, and the appropriate selection of antimicrobials for various infections all contribute to inappropriate prescribing practices. Notably, even in developed countries, coverage of the “pharmacology of antimicrobial agents, their modes of action and spectrum of activity, and issues relating to resistance receive limited coverage in medical school curricula, resulting in poorly informed prescribers.”⁴ Pharmaceutical company sales representatives and commercially oriented publications, not uncommonly, serve as the main sources of information for

² World Health Organization (WHO). 2001. *WHO Global Strategy for Containment of Antimicrobial Resistance*. WHO/CDS/CSR/DRS/2001.2a. Geneva: WHO. <<http://www.who.int/drugresistance/en>> (accessed May 8, 2006).

³ *Ibid.*, 15.

⁴ *Ibid.*, 26.

prescribers.⁵ The role of training of health professionals in curbing AMR is now attaining more prominence. This work speaks to that realization.

The *WHO Global Strategy* recommendations for interventions aimed at prescribers are reproduced here for emphasis on the role of education and the other related interventions⁶—

Education

- 2.1 Educate all groups of prescribers and dispensers (including all drug sellers) on the importance of appropriate antimicrobial use and containment of antimicrobial resistance.
- 2.2 Educate all groups of prescribers on disease prevention (including immunization) and infection control issues.
- 2.3 Promote targeted undergraduate and postgraduate educational programmes on the accurate diagnosis and management of common infections for all health care workers, veterinarians, prescribers and dispensers.
- 2.4 Encourage prescribers and dispensers to educate patients on antimicrobial use and the importance of adherence to prescribed treatments.
- 2.5 Educate all groups of prescribers and dispensers on factors that may strongly influence their prescribing habits, such as economic incentives, promotional activities and inducements by the pharmaceutical industry.

Management, guidelines and formularies

- 2.6 Improve antimicrobial use by supervision and support of clinical practices, especially diagnostic and treatment strategies.
- 2.7 Audit prescribing and dispensing practices and utilize peer group or external standard comparisons to provide feedback and endorsement of appropriate antimicrobial prescribing.
- 2.8 Encourage development and use of guidelines and treatment algorithms to foster appropriate use of antimicrobials.
- 2.9 Empower formulary managers to limit antimicrobial use to the prescription of an appropriate range of selected antimicrobials.

⁵ *Ibid.*, 26.

⁶ Excerpt from WHO. 2001. Chapter 2: Prescribers and Dispensers. In *WHO Global Strategy*, 25.

Regulation

- 2.10 Link professional registration requirements for prescribers and dispensers to requirements for training and continuing education.
- 2.11 Effective interventions to improve antimicrobial use must address the underlying causes of current practice and barriers to change.

Scope of Work

This report was written for the work that was commissioned by the Management Sciences for Health (MSH)/Rational Pharmaceutical Management (RPM) Plus Program. The scope of work included a review of the curriculum and interviews of experts to identify topics included on AM use and AMR in the undergraduate medicine training program in Zambia (University of Zambia).

The U.S. Agency for International Development (USAID) supported the development and implementation of a country-level approach toward building local advocacy, coalition, and packages of activities to combat the growing problem of AMR. Although advocacy was identified as the main thrust of the Zambian program, opportunities were explored to identify and carry out relevant and suitable interventions. Education, regulation, surveillance, and research were the four major intervention areas identified for supporting containment of AMR. It was recognized that education involved both preservice and in-service components. Adequate, up-to-date, and locally relevant preservice training was regarded as critical to the development of knowledge and skills required for appropriate professional competence. As part of the overall AMR containment initiative in Zambia, an undergraduate curriculum review and development of appropriate preservice training packages on rational AM use and AMR were identified as an important intervention.

The report was produced by a local consultant who was hired to review the undergraduate medical training for the degrees of Bachelor of Medicine and Bachelor of Surgery (MB ChB) curriculum to generate information on what and how much of AMR and rational AM use-related topics were being addressed in preservice training. The aim of the exercise was to identify gaps that need to be filled and assist in the subsequent process of developing recommendations on suitable modifications and additions required for the MB ChB program to ensure adequate coverage on rational AM use and containment of AMR during undergraduate training in Zambia.

ACTIVITIES

Assessment Methodology

The assessment methods included—

- Curriculum review
- Interviews with teaching faculty members, governmental officials, and representatives of the professional body for doctors
- Focus group discussions with University of Zambia School of Medicine graduates to review the findings

Curriculum Review

The curriculum of the University of Zambia's School of Medicine was documented in its *Reference Book 2000*, which lists all the courses offered in the undergraduate medical training program for the MB ChB degrees. A total of 40 courses were listed with the following information: course title, aim of the course, course objectives, course content, teaching methods and contact hours, assessment, prescribed textbooks, and recommended references. The course content was itemized by headings and subheadings.

The curriculum review consisted of two steps, Part A and Part B, to collect information for the analysis. Part A was a course review using a Course-by-Course Review Form (Annex 1) to identify the title of the course, learning objectives, and content. In addition, a preliminary analysis for AM use and AMR content was explored for each course. At this stage, each course was categorized as AM/AMR related or non-AM/AMR related, using general themes from the *WHO Global Strategy for Containment of Antimicrobial Resistance*. The consultant also applied expert knowledge in categorizing the courses at this stage.

Step two, or Part B, of the curriculum review involved completing a table, the Curriculum Review Form (Annex 2), to summarize information from the Course-by-Course Review Form from Part A. The summary table included information about the total number of courses in the curriculum, approximate length of each course, overall length of the curriculum, content covered, total number of courses in which AM/AMR-type content was covered, approximate amount of time devoted to AM/AMR-type content, and teaching and learning methods. Seven major topic areas were listed on the form: (1) AM use; (2) IDs; (3) infection prevention (IP)/immunization; (4) rational use of medicines (RUM); (5) AMR; (6) science of microbes; and (7) others. These major topic areas were generated from a literature review of AM use and AMR, and subtopics were listed to help distinguish the content that constituted each major topic area. First, the total number of hours spent on these seven major topic areas in the curriculum for all the courses was calculated. Second, using the focus group discussion with five graduates of the curriculum, the total number of hours spent on each major topic area was estimated and compared to the total number of hours spent on courses categorized as AM/AMR related. The different subtopics listed

under each of the seven areas were not necessarily covered in the courses and no attempt was made to estimate the time spent on each of the subtopics.

Interviews of Relevant Experts

Interviews with teaching faculty members and heads of department for each of the AM/AMR-related courses were conducted using established interview guidelines (Annexes 3 and 4). The purpose of the interview was to compare what was stated in the *Reference Book 2000* curriculum outline regarding the topics, hours of exposure, and teaching-learning methodologies to the information gathered from the interview questions. Additionally, the experts were asked to state which of the major topic areas matched what they taught in the curriculum. Further questions were asked about whether or not each specific subtopic of the seven major topic areas was covered (along with information on the hours of exposure and the teaching and learning methods). Interviews were also conducted with government officials and representatives of the professional body for doctors (Annex 3). All interviewees were requested to offer an opinion about the adequacy (amount and scope of coverage) of AMR and AM use topics with emphasis on rational AM use and the consequences of irrational use, including AMR.

Focus Group Discussion with Graduates of the Curriculum

The information obtained from the teaching staff, government officials, and representatives of the professional body and from the curriculum review was discussed in a focus group discussion with five graduates of the curriculum. The aim of this exercise was to compare and verify the information generated with an additional source.

Findings

Curriculum Review: Amount and Scope of Coverage of Antimicrobial Use and Antimicrobial Resistance Related Courses

Located in Lukasa, the University of Zambia School of Medicine's undergraduate curriculum offers 40 courses totaling 2,800 hours in a five-year period. Of the 40 courses, 10 courses included components on AM use and AMR-related topics, totaling approximately 700 hours. It is important to note that the 700 hours represented courses that had any relation to one of the seven major categories listed in the curriculum review form—AM use, IDs, IP/immunization, RUM, AMR, and science of microbes. The 700 hours were not specific to IP, RUM, and/or AMR. Table 1 and Figures 1 and 2 further elaborate the amount and scope of coverage.

Table 1. Summary of Features of the MB ChB Program Curriculum

Total number of courses in curriculum	40
Total number of hours in curriculum	2,800 hours
Number of AM/AMR-related courses	10
Total number of hours of AM/AMR-related courses	700 hours
Hours per course	70

Source: *Reference Book 2000*

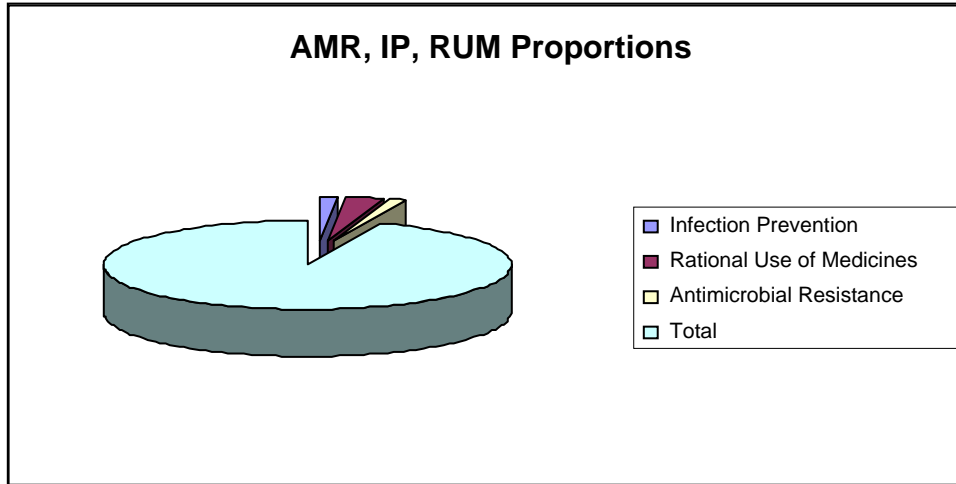


Figure 1. Proportion of hours specific to IP, RUM, and AMR

IP = 43.75 hours; RUM = 87.5 hours; AMR = 43.75 hours (generated from focus group discussions with graduates)

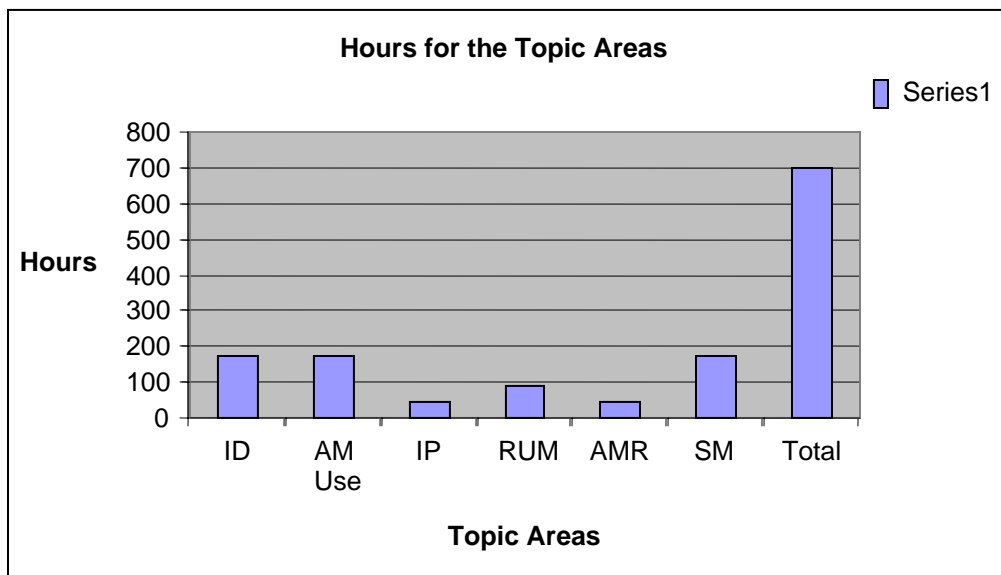


Figure 2. Frequency of hours spent on six major topics reviewed

ID = infectious diseases; AM Use = antimicrobial use; IP = infection prevention; RUM = rational use of medicines; AMR = antimicrobial resistance; SM = science of microbes

Interviews with Lecturers, Government Officials, and Representatives of Medical Professional Body

Accurate Diagnosis and Management of Common Infections

All the respondents from the teaching faculty of courses with AM/AMR components confirmed that their courses covered infections and the treatment of such infections. The respondents recognized the importance of accurate diagnosis in the management of common infections with regard to RUM and AMR containment. However, they unanimously cited lack of laboratory equipment, reagents, staff, and long waiting times for laboratory results as the major hindrance to practicing accurate diagnosis in the management of common infections. The government officials indicated that a policy direction toward accurate diagnosis in the management of common infections is embedded in the 1999 National Drug Policy, which contains a section on Rational Drug Use, Essential Drug Lists, and the promotion of therapeutic committees in hospitals. An important finding is that a mismatch exists between the theoretical knowledge taught in the undergraduate medical curriculum together with the government policy documents and what actually happens in practice. Accurate diagnosis in management of common infections was not practiced.

Disease Prevention, Including Immunization

The respondents indicated that disease prevention through the use of immunization is covered adequately in the curriculum. However, IP was not being adequately addressed. Two aspects of IP were identified: (1) sterilization of surgical and nursing equipment and use of sterile procedures for the equipment, and (2) prevention of nosocomial infections among health care

staff members and patients. Consensus indicated that although the former was being attempted, the latter was by and large neglected. Students were expected to learn IP from observing supervisors and other practitioners. No specific topics were scheduled for lectures or tutorials in IP. Nevertheless, the government had adopted an IP policy, which was yet to be widely disseminated and implemented.

Patient Education

The majority of respondents decried the poor doctor-patient communication trends. It was recognized that this component of the teaching-learning practices was neglected and that not many good examples existed to learn from. This information implied that opportunities to teach students about patient education regarding appropriate AM use were lost. Issues such as adherence to AM treatment, self-medication, and causes of resistance could be discussed at such opportunities. Two of the respondents insisted that in their practice patient education was a requirement for all their students. The government officials reported about public awareness campaigns that promote RUM in the community, which include information about antimicrobials.

Antimicrobial Use and Containment of Antimicrobial Resistance

All the respondents stated that AMR was recognized as a significant and important problem for their departments and the country. The undergraduate curriculum covered the science of microbes in significant detail. In the microbiology course, antimicrobial pathogens' structure, mechanism of pathogenicity, and mechanism of antimicrobials were covered specifically. Lecture handouts and two two-hour sessions were offered on AMR. The mechanism of the development of resistance and the mode of action of drugs was not taught in the clinical years of the curriculum. It was assumed that these topics had been covered in the preclinical years of the curriculum. RUM, as a standalone topic, was not covered per se; however, RUM was emphasized at many relevant opportunities when treatment of infectious diseases was taught. However, it was noted that the teaching of RUM was only theoretical because it was the availability (or nonavailability) of medicines that determined what the patient received. Furthermore, poor laboratory infrastructure, equipment, and reagents also prevented promotion of RUM. The government officials reported and provided copies of books and policies on standard treatment guidelines (STGs) (protocols) and promotion of essential drug lists. It is important to note that the academic staff members in the clinical departments expressed ignorance of such STGs and essential medicines lists (EMLs), citing nonavailability of medicines as rendering such STGs and EMLs obsolete. The majority of the respondents were of the view that the amount and scope of coverage of antimicrobial RUM and AMR was severely deficient. Matters related to AMR were in many instances not provided for in the curriculum. Teaching faculty members used their discretion on whether to discuss AMR and in many instances discussed the matter when, in their judgment, the topic at hand was relevant for AMR. This approach was also true for rational AM use.

Teaching Methods and Hours of Coverage

Lectures, bedside teaching, tutorials, and seminars were the methods cited for teaching AM use and AMR. Regrettably, the undergraduate curriculum did not have any laboratory practical components. Lack of funds for reagents and supplies was cited as the reason for not doing laboratory practicums. No problem-based sessions or participatory methods for students were done. The lecturers were unable to provide specific information about how much time was dedicated to AM use and the containment of AMR. When showed the curriculum review findings the majority agreed with the time estimates reflected there.

Other Issues

The respondents from the clinical departments admitted that knowledge about nosocomial infection prevention strategies was available for the hospital but noted that this aspect was not covered in the undergraduate training. All academic respondents also admitted to knowing about The President's Emergency Plan for AIDS Relief, the Global Fund, and other programs, which had in particular increased the availability and use of antimicrobials. They all denied any knowledge of strategies to combat the AMR risks inherent in such access and use. All respondents denied teaching about these funds and the AMR risks they present. The government officials indicated that an Antimicrobial Advocacy Working Group had been constituted to address AMR specifically, and that plans existed to set up resistance surveillance for antimalarials, HIV/AIDS, and the monitoring of adverse reactions in antiretroviral therapy.

Summary of Curriculum Gaps—School of Medicine Curriculum Compared with Literature Review Curriculum Outline

Curriculum gaps in the University of Zambia's School of Medicine were identified with regard to issues in AM use and AMR. Although an ideal curriculum for AM/AMR was not available, the consultant developed a comparison curriculum outline based on a literature review. The comparison distinguished the preclinical years and clinical years (Table 2) and the different subject disciplines (Table 3). Tables 2 and 3 illustrate the gaps.

Table 2. University of Zambia School of Medicine versus “Ideal” Literature Review Curriculum— Comparison of Preclinical and Clinical Curriculum

Specific Topics/Content Covered in Literature under Each Broad Area	School of Medicine Comparison— Preclinical Years	School of Medicine Comparison— Clinical Years
<p>AM use</p> <ul style="list-style-type: none"> • Antibiotics (treatment and mechanism of action) • Antifungals (treatment and mechanism of action) • Antiparasitics (treatment and mechanism of action) • Antivirals (treatment and mechanism of action) • Patients’ (mis)perceptions • Self-medication issues • Poor adherence issues 	<ul style="list-style-type: none"> • Mechanism of action of classes of antibiotics and antivirals is covered in microbiology and pharmacology 4th-year courses. • Indications for use of antimicrobials done in microbiology and parasitology. • Patient issues such as misperceptions, self-medication, and adherence issues not covered. 	<ul style="list-style-type: none"> • Common ailments requiring antimicrobials are covered, including recommended doses and duration of treatment. • Patient education not emphasized.
<p>IDs of major public health importance</p> <ul style="list-style-type: none"> • HIV/AIDS • TB • Malaria • Sexually transmitted infections • Diarrheal diseases (salmonella, cholera, shigella) • Acute respiratory infections • Measles 	<ul style="list-style-type: none"> • Mechanism of infection, pathogenicity, signs and symptoms, epidemiology of diseases, and the science of causative agents covered. • Profile of drug resistance of these diseases is mentioned in passing, no deliberate effort to cover AMR profile of these diseases. 	<ul style="list-style-type: none"> • Epidemiology, signs and symptoms, treatment, and investigations covered. • Profile of drug resistance of these diseases is mentioned in passing, no deliberate effort to cover AMR profile of these diseases.
<p>IP/immunization</p> <ul style="list-style-type: none"> • Vaccinations • Integrated Management of Childhood Illnesses (IMCI) • Barrier precautions (hand washing, gloves, gowning) • Isolation procedures • Injection safety and appropriate use • Sterilization and disinfection of supplies and equipment • Aseptic techniques for medical and nursing procedures • Recognition and investigation of outbreaks or clusters of infections 	<ul style="list-style-type: none"> • Infection prevention was not a topic in the curriculum; students expected to learn the concept by apprenticeship. Immunization covered with regard to immunization schedules but not emphasized for its role in infection prevention and ultimately AMR prevention. 	<ul style="list-style-type: none"> • Sterilization and disinfection of supplies and equipment done in hospital, but not in curriculum. • It is assumed IP is learned by apprenticeship and observation.

Curriculum Review and Interview of Experts to Identify Topics on Antimicrobial Use and Resistance

Specific Topics/Content Covered in Literature under Each Broad Area	School of Medicine Comparison— Preclinical Years	School of Medicine Comparison— Clinical Years
<p>Rational use of medicines</p> <ul style="list-style-type: none"> • Accurate diagnosis (laboratory diagnostic support) • Selection of correct medicines • Selection of correct dosages • Optimum treatment durations • Patient education on appropriate use • STGs • Need for community to appropriate access to antimicrobials (EMLs) • Counterfeit medicines • Role of pharmaceutical promotions • Prescribing audits 	<ul style="list-style-type: none"> • Recommended medicines for diseases covered in microbiology, pharmacology, and parasitology. • RUM is not specifically addressed, mentioned in passing. • Role of counterfeit medicines in promotion of AMR not covered. • Role of pharmaceutical coercion in promotion of AMR not covered. • Patient education inadequately emphasized on its importance to appropriate use of antimicrobials and prevention of AMR. 	<ul style="list-style-type: none"> • Accurate diagnosis based on laboratory support is taught theoretically; however, practice depends on clinical diagnosis because labs are unreliable. • RUM negated by medicine shortages. • Patient education neglected. • No prescribing audits. • Role of counterfeit drugs and pharmaceutical coercion in promotion of AMR not covered.
<p>AMR</p> <ul style="list-style-type: none"> • Mechanism of development of resistance • Extent of AMR problem • AMR surveillance • Research • Prevention and control • Multidrug resistance • Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) • Vancomycin-resistant enterococci (VRE) 	<ul style="list-style-type: none"> • Mechanism of development of resistance covered in microbiology and pharmacology. • Extent of AMR problem, AMR surveillance, research, and prevention control not covered. 	<ul style="list-style-type: none"> • AMR mentioned in passing, no deliberate effort to discuss as a problem, the extent, and how to prevent and control.
<p>Science of microbes</p> <ul style="list-style-type: none"> • Bacteria (structure and pathogenesis) • Viruses (structure and pathogenesis) • Fungi (structure and pathogenesis) • Parasites (structure and pathogenesis) • Mechanism of action of antimicrobials • Development of resistance 	<ul style="list-style-type: none"> • Structure of pathogens and pathogenesis covered in microbiology and parasitology. • Development of resistance also covered in microbiology and pharmacology. 	<ul style="list-style-type: none"> • It is assumed that structure of pathogens and pathogenesis were covered in preclinical years.

Table 3. University of Zambia School of Medicine versus “Ideal” Literature Review Curriculum—Review of Subject Disciplines and Identified Gaps

Discipline	Topics Covered	Identified Gaps
Microbiology	Science of microbes Infections AMR	RUM; AMR surveillance; IP; patient education
Pharmacology	AMR (random for individual antimicrobials)	Systematic coverage of AMR (e.g., the scope of problem, mechanism of resistance); RUM
Internal medicine	Infections Vaccinations Treatment of infections Drug resistance (random) RUM(occasional)	IP; systematic coverage of RUM and AMR; patient education; role of inducement from pharmaceutical firms and counterfeit drugs on AMR; AMR surveillance
Pediatrics	Infections Vaccinations Treatment of infections Drug resistance (random) RUM	IP; systematic coverage of RUM and AMR; patient education; role of inducement from pharmaceutical firms and counterfeit drugs on AMR; AMR surveillance
Obstetrics and gynecology	Infections Vaccinations Treatment of infections Drug resistance (random) RUM (occasional)	IP; systematic coverage of RUM and AMR; patient education; role of inducement from pharmaceutical firms and counterfeit drugs on AMR; AMR surveillance
Surgery	Infections IP (random) Treatment of infections Drug resistance (random) RUM (occasional)	IP; systematic coverage of RUM and AMR; patient education; role of inducement from pharmaceutical firms and counterfeit drugs on AMR; AMR surveillance

Source: Curriculum review, interview of experts, and focus group discussions with graduates

DISCUSSION AND RECOMMENDATIONS

Several significant gaps were identified in the curriculum regarding the teaching of issues of AMR—

Antimicrobial Use

The mechanism of action of antibiotics, antifungals, antiparasitics, and antivirals were taught in the preclinical years of the undergraduate years; however, they were not emphasized in the clinical years during discussion of the treatment of bacterial, fungal, parasitic, and viral diseases. Issues of patients' misconceptions about AM treatment, self-medication, and poor adherence issues were not specifically addressed in either the preclinical or clinical years.

Infectious Diseases of Major Public Health Importance

The science of microbes (pathogens) responsible for the diseases of major public health importance such as HIV/AIDS, TB, malaria, sexually transmitted infections, diarrheal diseases (salmonella, cholera, shigella), acute respiratory infections, and measles were covered in the preclinical years; treatment of these diseases was covered in the clinical years. No special attention was paid to the use of AMs in treating these diseases with regard to the issue of AMR. The concern for AMR was compounded by the increased volume of AMs on the market due to international initiatives such as the The President's Emergency Plan for AIDS Relief funds and the Global Fund. However, the role of these initiatives and the inherent risk of AMR were not covered in the curriculum.

Infection Prevention and Immunization

IP and immunization were partially covered in the undergraduate curriculum. Vaccination schedules were emphasized in pediatrics and also mentioned in internal medicine and obstetrics/gynecology. The aspect of vaccination as a strategy for IP and how it relates to reduction of AMR was not particularly taught. IMCI was covered in pediatrics as a first-line management strategy for treating childhood diseases. Barrier precautions (hand washing, use of gloves, gowning), isolation procedures, injection safety and appropriate use of injections, sterilization and disinfection of supplies and equipment, and aseptic techniques for medical procedures were not taught as topics in lectures and tutorials. It was assumed that, because they were practiced in the hospital, students picked up the concepts by apprenticeship.

Rational Use of Medicines

Subtopics such as accurate diagnosis and selection of correct medicines, dosages, and treatment durations, as well as patient education on appropriate use, use of STGs, and the role of

counterfeit drugs and pharmaceutical promotions coercion as aspects that were important for the containment of AMR were not specifically addressed in the curriculum. These components were taught in the clinical setting and in preclinical classes occasionally; however, coverage was dependent on the lecturer's discretion when they perceived the components as relevant to the topic. Prescribing audits were not taught in the curriculum nor conducted in the hospital.

Antimicrobial Resistance

AMR was covered in the preclinical years in the microbiology course. The scope of coverage included mechanism of development of resistance and practices that may promote AMR. The extent of the AMR problem, AMR surveillance and research, and prevention and control were not included in the teaching. Examples of resistance—such as multidrug resistance (MDR), methicillin-resistant *Staphylococcus aureus*, and vancomycin-resistant enterococci—were mentioned in passing. The clinical years teaching did not include AMR as a subject area but AMR was mentioned when the lecturer deemed it relevant to the context.

Recommendations

- Increase the amount and scope of coverage for AM RUM in the undergraduate curriculum.
- Increase the amount and scope of coverage for AMR and containment of AMR, especially in the clinical years.
- Draw a comprehensive curriculum outline of AM RUM and AMR and containment of AMR. Plan for placement of topics in the curriculum to have systematic coverage of all important components.
- Increase availability of laboratory infrastructure, supplies, and staffing to students in training to improve awareness and practices of accurate diagnosis and RUM.
- Improve the availability of essential medicines in the pharmacies, and dissemination of EMLs and STGs for student training, to promote RUM.
- Increase awareness of students on the impact of increase of volume of consumption and availability of AMs caused by international initiatives such as The President's Emergency Plan for AIDS Relief and the Global Fund.
- Provide funds for curriculum review to support the integration of AM/AMR in the School of Medicine undergraduate program.

NEXT STEPS

It is recommended that the Antimicrobial Advocacy Working Group, the Ministry of Health, and the School of Medicine establish an AM/AMR committee to oversee the systematic and longitudinal coverage of AMR (components) in the undergraduate medical curriculum. The committee would use several sources, including this report, to develop the specific recommendations to address the gaps.

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ANNEX 1. CURRICULUM REVIEW FORM—PART A

Curriculum Review Form Part A: Course-by-Course Review

Directions: Make one copy of Part A for each course. Review each course. Show what content the course covers, a note on the focus of the content covered. Use the letter codes for teaching methods used for each course. Write the approximate number of hours spent for each content area.

Title of Course: _____

Learning Goals/Objectives of Course: _____

What Type of Content Is Taught in This Course?

Antimicrobial Use: Yes / No. If yes, please list topics.

Infectious Diseases: Yes/No. If yes, please list topics.

Infection Prevention/Immunization: Yes / No. If yes, please list topics.

Rational Drug Use: Yes / No. If yes, please list topics.

Antimicrobial Resistance: Yes / No. If yes, please list topics.

Science of Microbes

Other: Yes/ No. If yes, please describe briefly.

How strong is the link between the course content and overall WHO Global Strategy for Containment of Antimicrobial Resistance?

Very strong Strong Moderate Not very strong Not strong

Codes for teaching methods:

A. Lecture	D. Assignment
B. Small Group Teaching (Tutorials)	E. Laboratory Practical
C. Seminar	F. Individual activities (worksheets, etc.)

ANNEX 2. CURRICULUM REVIEW FORM—PART B

Curriculum Review Form Part B: Course Summary

Directions: Use the table below to summarise the information from the Course Review Form for Part A.

Name of Curriculum: _____

Source of Curriculum: _____

Total Number of Courses in Curriculum: _____

Approximate Length of Each Course: _____ (Hours).

Overall Length of Curriculum: _____ (Hours)

Total Number of AM/AMR-Related Courses: _____

Total Length of AM/AMR-Related Courses: _____

Content Covered	Total Number of Courses in Which This Type of Content Is Covered	Total Number of Hours Devoted to This Type of Content	Teaching/ Learning Method
Antimicrobial Use <ul style="list-style-type: none"> • Antibiotics (treatment and mechanism of action) • Antifungals (treatment and mechanism of action) • Antiparasitics (treatment and mechanism of action) • Antivirals (treatment and mechanism of action) • Patients' (mis)perceptions • Self-medication issues • Poor adherence issues 			
Infectious Diseases <ul style="list-style-type: none"> • HIV/AIDS • TB • Malaria • STIs • Diarrhoeal diseases (salmonella, cholera, shigella) • Acute respiratory infections • Measles 			

Content Covered	Total Number of Courses in Which This Type of Content Is Covered	Total Number of Hours Devoted to This Type of Content	Teaching/ Learning Method
Infection Prevention/Immunization <ul style="list-style-type: none"> • Vaccinations • Integrated Management of Childhood Illnesses (IMCI) • Barrier precautions (hand washing, gloves, gowning) • Isolation procedures • Injection safety and appropriate use • Sterilisation and disinfection of supplies and equipment • Aseptic techniques for medical and nursing procedures. • Recognition and investigation of outbreaks or clusters of infections 			
Rational Drug Use <ul style="list-style-type: none"> • Accurate diagnosis (laboratory diagnostic support) • Selection of correct drugs • Selection of correct dosages • Optimum treatment durations • Patient education on appropriate use • Standard treatment guidelines (STGs) • Need for community to have appropriate access to antimicrobials (Essential Drug Lists) • Counterfeit drugs • Role of pharmaceutical promotions • Prescribing audits 			
Antimicrobial Resistance <ul style="list-style-type: none"> • Mechanism of development of resistance • Extent of AMR problem • AMR surveillance • Research • Prevention and control • Multidrug resistance (MDR) • Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) • Vancomycin-resistant enterococci (VRE) 			
Science of Microbes <ul style="list-style-type: none"> • Bacteria (structure and pathogenesis) • Viruses (structure and pathogenesis) • Fungi (structure and pathogenesis) • Parasites (structure and pathogenesis) • Mechanism of action of antimicrobials • Development of resistance 			

Were there any courses in which you rated the link between the content/activities and the overall WHO Global Strategy for Containment of Antimicrobial Resistance? (e.g., does each course move closer to reaching the stated WHO strategies) as “Very strong,” “Strong,” or “Moderate”?

No

Yes. If so, please list:

Other comments:

ANNEX 3. INTERVIEW SCHEDULES— MEDICAL COUNCIL AND MINISTRY OF HEALTH OFFICIALS

Interview Schedules

Questions for **Medical Council and Ministry of Health officials** concerning Antimicrobial Use and Antimicrobial Resistance issues.

Accurate Diagnosis and Management of Common Infections

Introduction: Your organisation is obviously concerned with several health issues.

- Does your institution have a policy (or strategies/interventions) about accurate diagnosis and management of common infections? (E.g., laboratory supported diagnosis and treatment of infections).

Disease Prevention, including immunization

Introduction: Your institution is deals with issues related to disease prevention.

- What aspects of infection prevention are covered in the policy (or strategies/interventions) that you deal with?

Patient Education

Introduction: The community has an important role to play in issues of antimicrobial use.

- Does your institution have a policy (or strategies/interventions) concerning patient education with regard antimicrobial use?
- What aspects about patient education are covered?

Antimicrobial Use and Containment of Antimicrobial Resistance

- Does your institution have a policy (or strategies/interventions) about antimicrobials (antibiotics, antifungals, antivirals, and antiparasitics)?
- If yes:
- What aspects of appropriate antimicrobial use are covered?
- Is antimicrobial resistance recognised as a problem per se?
- If so, what and how much addresses AMR as a problem?
- Is rational drug use a component of appropriate antimicrobial use, if so what is being done about it?
- What aspects of containment of antimicrobial resistance are covered in the policy (or strategies/interventions)?
- What is your opinion about the amount and scope of coverage about antimicrobial resistance? Do you think enough is being done?

Other:

- Is the issue of AMR problem amongst nosocomial infections covered in any of your institutions policies (strategies/interventions)?
- With the increase in access to antimicrobials through Global Fund, PEPFAR funds, and others, is the escalation of AMR being covered?
- Is irrational use and AMR covered for infectious diseases of major public health importance in Zambia (HIV/AIDS, TB, malaria, STI, diarrhoeal diseases, and ARI)?

Part 2: Interviews:

Below are findings of a curriculum review that was done to assess what and the amount of antimicrobial use and antimicrobial resistance related topics that are taught in the curriculum. First, the main themes were identified from the WHO Strategy for the Containment of Antimicrobial Resistance. Second, the total number of courses and hours spent on AM/AMR were worked out from the curriculum review and lastly the proportion of hours spent on each theme was worked out by consensus in a group interview with 5 graduates from the curriculum that was reviewed. Kindly comment on each theme and sub-themes as stipulated in the table of results below.

**Curriculum Review Form
Part B: Course Summary**

Directions: Use the table below to summarise the information from the Course Review Form for Part A.

Name of Curriculum: **Medicine (MB ChB) University of Zambia**

Source of Curriculum: **Reference Book 2000**

Total Number of Courses in Curriculum: **40**

Approximate Length of Each Course: **70 Hours.**

Overall Length of Curriculum: **2, 800 Hours**

Total Number of AM/AMR related Courses: **10**

Total Length of AM/AMR related Courses: **700 Hours**

Content Covered	Total Number of Courses in Which this Type of Content is Covered	Total Number of Hours Devoted to this Type of Content	Teaching-Learning Method
Antimicrobial Use <ul style="list-style-type: none"> • Antibiotics (treatment and mechanism of action) • Antifungals (treatment and mechanism of action) • Antiparasitics (treatment and mechanism of action) • Antivirals (treatment and mechanism of action) • Patients' (mis)perceptions • Self medication issues • Poor adherence issues 	10	175 hours (1/4 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Infectious Diseases <ul style="list-style-type: none"> • HIV/AIDS • TB • Malaria • STIs • Diarrhoeal diseases (salmonella, cholera, shigella) • Acute Respiratory Infections • Measles 	10	175 Hours (1/4 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Infection Prevention/ Immunization <ul style="list-style-type: none"> • Vaccinations • Integrated Management of Childhood Illnesses (IMCI) • Barrier precautions (hand washing, gloves, gowning) • Isolation procedures • Injection safety and appropriate use • Sterilisation and disinfection of supplies and equipment • Aseptic techniques for medical and nursing procedures. • Recognition and investigation of outbreaks or clusters of infections 	10	43.75 Hours (1/16 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Rational Drug Use <ul style="list-style-type: none"> • Accurate diagnosis (laboratory diagnostic support) • Selection of correct drugs • Selection of correct dosages • Optimum treatment durations • Patient education on appropriate use • Standard Treatment Guidelines (STGs) • Need for community to have appropriate access to antimicrobials (Essential Drug Lists) • Counterfeit drugs • Role of pharmaceutical promotions • Prescribing audits 	10	87.5 Hours (1/8 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group

Content Covered	Total Number of Courses in Which this Type of Content is Covered	Total Number of Hours Devoted to this Type of Content	Teaching-Learning Method
Antimicrobial Resistance <ul style="list-style-type: none"> • Mechanism of development of resistance • Extent of AMR problem • AMR surveillance • Research • Prevention and control • Multidrug resistance (MDR) • Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) • Vancomycin-resistant enterococci (VRE) 	10	43.75 Hours (1/16 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Science of Microbes <ul style="list-style-type: none"> • Bacteria (structure and pathogenesis) • Viruses (structure and pathogenesis) • Fungi (structure and pathogenesis) • Parasites (structure and pathogenesis) • Mechanism of action of antimicrobials • Development of resistance 	10	175 Hours (1/4 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group

- What is your opinion about what is taught about antimicrobial use and antimicrobial resistance?
- What is your opinion about the amount that is taught about antimicrobial use and antimicrobial resistance?
- Do you have any recommendations for the undergraduate training regarding antimicrobial use and antimicrobial resistance?

ANNEX 4. INTERVIEW SCHEDULES—FACULTY MEMBERS AND HEADS OF DEPARTMENTS

Interview Schedules

Questions for **Teaching Faculty Members /Head of Departments** in Courses that were identified as having components related to Antimicrobial Use/Antimicrobial Resistance (AM/AMR related)

Accurate Diagnosis and Management of Common Infections

Introduction: Your course teaches about infections.

- Are there any aspects of the course that address accurate diagnosis and management of common infections?

Disease Prevention including immunization

- One expects your course to teach about disease prevention?
- What aspects of infection prevention are covered in the course?

Patient Education

- Are your students taught about patient education with regard antimicrobial use?
- If yes, what are they taught about patient education?

Antimicrobial Use and Containment of Antimicrobial Resistance

- Your course covers issues about antimicrobials (antibiotics, antifungals, antivirals, and antiparasitics)?
- Is antimicrobial resistance recognised as a problem per se?
- If so what and how much is taught about AMR as a problem?
- What aspects of appropriate antimicrobial use are covered?
- Is rational drug use a component of appropriate antimicrobial use, if so why?
- What aspects of containment of antimicrobial resistance are covered in the course?
- What is your opinion about the amount and scope of coverage about containment of antimicrobial resistance? Do you think enough is being done?

Teaching Methods and Hours of Coverage

- What teaching methods are used for teaching about antimicrobial resistance?
- How much time is dedicated to issues related to antimicrobial resistance?

Other:

- Is the issue of AMR problem amongst nosocomial infections covered in any of your courses you teach?
- Does your course cover Global issues such as the Global Fight against AIDS TB and Malaria (GFATM – Global Fund), President’s Emergency Plan for AIDS Relief Funds (PEPFAR), and other such initiatives?
- These programmes are bringing a lot of antimicrobials into Zambia. With the increase in access to antimicrobials through these initiatives and others, is the escalation of AMR being covered with regard paying attention to their rational use?
- Is irrational use and AMR covered for infectious diseases of major public health importance in Zambia (HIV/AIDS, TB, malaria, STI, diarrhoeal diseases, and ARI)?

Part 2: Interviews:

Below are findings of a curriculum review that was done to assess what and the amount of antimicrobial use and antimicrobial resistance related topics that are taught in the curriculum. First, the main themes were identified from the WHO Strategy for the containment of Antimicrobial Resistance. Second, the total number of courses and hours spent on AM/AMR were worked out from the curriculum review and lastly the proportion of hours spent on each theme was worked out by consensus in a group interview with 5 graduates from the curriculum that was reviewed. Kindly comment on each theme and sub-themes as stipulated in the table of results below.

**Curriculum Review Form
Part B: Course Summary**

Directions: Use the table below to summarise the information from the Course Review Form for Part A.

Name of Curriculum: **Medicine (MB ChB) University of Zambia**

Source of Curriculum: **Reference Book 2000**

Total Number of Courses in Curriculum: **40**

Approximate Length of Each Course: **70 Hours.**

Overall Length of Curriculum: **2, 800 Hours**

Total Number of AM/AMR related Courses: **10**

Total Length of AM/AMR related Courses: **700 Hours**

Content Covered	Total Number of Courses in Which this Type of Content is Covered	Total Number of Hours Devoted to this Type of Content	Teaching-Learning Method
Antimicrobial Use <ul style="list-style-type: none"> • Antibiotics (treatment and mechanism of action) • Antifungals (treatment and mechanism of action) • Antiparasitics (treatment and mechanism of action) • Antivirals (treatment and mechanism of action) • Patients' (mis)perceptions • Self medication issues • Poor adherence issues 	10	175 hours (1/4 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Infectious Diseases <ul style="list-style-type: none"> • HIV/AIDS • TB • Malaria • STIs • Diarrhoeal diseases (salmonella, cholera, shigella) • Acute Respiratory Infections • Measles 	10	175 Hours (1/4 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Infection Prevention/ Immunization <ul style="list-style-type: none"> • Vaccinations • Integrated Management of Childhood Illnesses (IMCI) • Barrier precautions (hand washing, gloves, gowning) • Isolation procedures • Injection safety and appropriate use • Sterilisation and disinfection of supplies and equipment • Aseptic techniques for medical and nursing procedures. • Recognition and investigation of outbreaks or clusters of infections 	10	43.75 Hours (1/16 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group

Content Covered	Total Number of Courses in Which this Type of Content is Covered	Total Number of Hours Devoted to this Type of Content	Teaching-Learning Method
Rational Drug Use <ul style="list-style-type: none"> • Accurate diagnosis (laboratory diagnostic support) • Selection of correct drugs • Selection of correct dosages • Optimum treatment durations • Patient education on appropriate use • Standard Treatment Guidelines (STGs) • Need for community to Appropriate access to antimicrobials (Essential Drug Lists) • Counterfeit drugs • Role of pharmaceutical promotions • Prescribing audits 	10	87.5 Hours (1/8 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Antimicrobial Resistance <ul style="list-style-type: none"> • Mechanism of Development of Resistance • Extent of AMR problem • AMR Surveillance • Research • Prevention and control • Multidrug resistance (MDR) • Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) • Vancomycin-resistant enterococci (VRE) 	10	43.75 Hours (1/16 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group
Science of Microbes <ul style="list-style-type: none"> • Bacteria (structure and pathogenesis) • Viruses (structure and pathogenesis) • Fungi (structure and pathogenesis) • Parasites (structure and pathogenesis) • Mechanism of action of antimicrobials • Development of resistance 	10	175 Hours (1/4 of time in all courses that are AM/AMR related)	Lectures Seminars Small Group

Which area of the 7 topics do you specifically teach? Kindly comment on each the topic and whether the sub-topics are covered in your teaching.

Please indicate whether each of these 7 topics and sub-topics are covered or not in your teaching (Code C = Covered, NC = Not Covered).

NB: For Zambia Medical Association Officials only:

You are an office bearer in Zambia Medical Association – Can you enlighten me about any issues about the subject we have covered that ZMA is concerned with and/or doing something about.

ANNEX 5. LIST OF PARTICIPANTS INTERVIEWED

Name	Organization	Department/Section	Position
Dr. Vilepi Mtonga	Central Board of Health	Clinical Care	Acting Director General; Director Clinical Care Services
Ms. Caroline Yeta	Central Board of Health	Pharmacy and Procurements	Pharmacy Specialist
Ms. Esnart Mwape	Pharmaceutical Regulatory Authority	Secretariat	Registrar
Dr. Chipeco Kankasa	University Teaching Hospital	Pediatrics	Consultant; Head— Clinical Care; Honorary Lecturer
Dr. Veronica Mulenga	School of Medicine	Pediatrics	Lecturer
Dr. Cecilia Shinondo	School of Medicine	Biomedical Sciences	Head of Department; Senior Lecturer
Ms. Gina Mulundu	School of Medicine	Pathology and Microbiology	Lecturer
Dr. Lackson Kasonka	University Teaching Hospital, Zambia Medical Association	Obstetrics and Gynecology	Acting Head of Department; Honorary Lecturer Chair Publications Board
Dr. Robert Zulu	University Teaching Hospital	Surgery	Honorary Lecturer
Dr. Peter Mwaba	School of Medicine Zambia Medical Association	Internal Medicine	Head of Department; Senior Lecturer President
Dr. James Mwansa	University Teaching Hospital	Pathology and Microbiology	Head of Microbiology; Honorary Lecturer
Dr. Sindwa Kanyimba	School of Medicine	Pharmacology— Physiological Sciences	Lecturer

ANNEX 6. INTERVIEW TRANSCRIPTS

Interviews with Medical Council and Ministry of Health Officials

Accurate Diagnosis and Management of Common Infections

Introduction: Your organization is obviously concerned with several health issues.

Does your institution have a policy (or strategies/interventions) about accurate diagnosis and management of common infections (e.g., laboratory-supported diagnosis and treatment of infections)?

Interview A

Name: Dr. Vilepi Mtonga
Organization: Central Board of Health (CBOH)
Position: Acting Director General;
Director—Clinical Care Services

The CBOH does not have a policy specifically for accurate diagnosis and management of common infections; however, we have developed a policy guide on essential drug use and a national drug policy. Those documents provide some guidelines on accurate diagnosis. I think that is where the role of therapeutic committees is also spelled out and those committees should outline use of the laboratory in diagnosis and management of common infections. Unfortunately, I think the drug shortages and lack of laboratory support, such as funds for reagents, are working against standard treatment guidelines and accurate diagnosis efforts. In the past we had good laboratory support.

Interview B

Name: Ms. Caroline Yeta
Organization: Central Board of Health
Position: Pharmacy specialist

Yes, these are covered in our documents: Standard Treatment Guidelines, Essential Medicines List, and Essential Laboratory Supplies List For Zambia.

Interview C

Name: Ms. Esnart Mwape
Organization: Pharmaceutical Regulatory Authority (PRA)
Position: Registrar

This is not applicable to us.

Disease Prevention, Including Immunization

Introduction: Your institution deals with issues related to disease prevention.

What aspects of infection prevention are covered in the policy (or strategies/interventions) that you deal with?

Interview A Name: Dr. Vilepi Mtonga	Infection prevention is a big issue with CBOH and the Ministry of Health. Last year the Minister launched an Infection Prevention policy. The policy covers many aspects of infection prevention including waste disposal, injection safety, [and] infection prevention hospital committees. There is even a national working group on Infection Prevention.
Interview B Name: Ms. Caroline Yeta	That aspect is best discussed with the directorate of clinical care.
Interview C Name: Ms. Esmart Mwape	This not applicable to us.

Patient Education

Introduction: The community has an important role to play in issues of antimicrobial use.

Does your institution have a policy (or strategies/interventions) concerning patient education with regard to antimicrobial use? What aspects about patient education are covered?

Interview A Name: Dr. Vilepi Mtonga	There is no specific policy on this but there are some activities like public awareness campaigns through posters and advert[isements]s that encourage the public to only take drugs when they need them and where they should be obtained from.
Interview B Name: Ms. Caroline Yeta	I don't think there is a policy as such but there has been work done in conjunction with the Pharmaceutical Society of Zambia, such as campaigns and posters. The posters promote rational drug use in the community.
Interview C Name: Ms. Esmart Mwape	When the organization [PRA] was still known as the Pharmacy and Poisons Board we funded some public awareness campaigns on rational drug use. There are plans underway to run similar public awareness campaigns. However, these campaigns are not limited to antimicrobials, but for all medicines.

Antimicrobial Use and Containment of Antimicrobial Resistance

Does your institution have a policy (or strategies/interventions) about antimicrobials (antibiotics, antifungals, antivirals, and antiparasitics)?

If yes:

- What aspects of appropriate antimicrobial use are covered?
- Is antimicrobial resistance recognized as a problem per se? If so, what and how much addresses AMR as a problem?
- Is rational drug use a component of appropriate antimicrobial use? If so, what is being done about it?
- What aspects of containment of antimicrobial resistance are covered in the policy (or strategies/interventions)?
- What is your opinion about the amount and scope of coverage about antimicrobial resistance? Do you think enough is being done?

Interview A

Name: Dr. Vilepi Mtonga

The policies about antimicrobial use and antimicrobial resistance are embedded in guidelines we have developed for clinical work and rational drug use. Rational drug use is comprehensively covered in the 1999 National Drug Policy, where I believe there are 14 parts that address rational drug use. It also elaborates about drug therapeutic committees, which should coordinate activities that promote rational drug use. We have developed standardized treatment protocols and guidelines and also hospital policies—all these should address antimicrobial use, rational drug use, and antimicrobial resistance. For your own information the Japanese International Cooperation Agency (JICA) has funded a program for tracking resistance to ARVs [antiretrovirals]—a document about this is available. We also have a Technical Working Group called AWG that is specifically looking at antimicrobial resistance, prescribing protocols, and standard treatment guidelines, and the Zambia National Formulary. Concerning the amount of work being done on antimicrobial resistance I think the government [Republic of Zambia] (CBOH and MOH) have put in place a number of programs to address these issues. A little more can be done, but I think a substantial amount is already being done. I would also like to note that approaches, such as syndromic management, work against rational drug use because you may treat fever with so many drugs. Shortages of drugs can also result in the theory being very divergent from the practice.

Interview B

Name: Ms. Caroline Yeta

The policies that are there address standard treatment guidelines. Antimicrobial resistance is recognized as a problem and in fact we have held two workshops on antimicrobial resistance. In one workshop we invited doctors from the public sector and in another we invited different health workers. The workshop title was “Workshop on Development of Advocacy Strategies and Communication: Creative Briefs to Reduce Drug Resistance.” Concerning rational drug use a lot of it is covered in the National Drug Policy and some work is being done with the Pharmaceutical Society of Zambia. I think a lot still needs to be done in this field.

Interview C
Name: Ms. Esnart Mwape

The PRA has no policy. Standard Treatment Guidelines are done by the CBOH; however, when PRA is fully functional it will have a Medicines Committee. This committee will look after all formulary activities and may be [this is a] committee that will develop a policy on antimicrobial use and antimicrobial resistance. AMR is a problem particularly with regard to use of antimicrobials in the community where there is a lot of misuse, even if I can't support this assertion with data. Rational drug use is covered in STGs and formularies, but what I see as the challenge is to get them implemented in the face of drug shortages and laboratory support. I think the question of the amount and scope of work being done is an important one. We are consuming a huge chunk of antimicrobials and the veterinary industry is also using antimicrobials, but not much is being done about antimicrobial resistance.

Other

- Is the issue of AMR problem among nosocomial infections covered in any of your institution's policies (strategies/interventions)?
- With the increase in access to antimicrobials through Global Fund [GFATM], PEPFAR funds, and others, is the escalation of AMR being covered?
- Is irrational use and AMR covered for infectious diseases of major public health importance in Zambia (HIV/AIDS, TB, malaria, STI, diarrheal diseases, and ARI)?

Interview A
Name: Dr. Vilepi Mtonga

Like I said earlier, JICA is funding the tracking of resistance to ARVs. Additionally, a document is available for resistance tracking, and also the pharmacovigilance unit at the PRA will track adverse reactions to ARVs. There are also plans to track resistance to Coartem, the new antimalarial drug, by the malaria research center, so some work is being done in this regard. Standard treatment guidelines have been developed for HIV/AIDS, TB, malaria, STI and all major infectious diseases of major public health importance, [and] they are being implemented. In hospitals we have developed guidelines for infection prevention and therapeutic committees that should take care of nosocomial infections.

Interview B
Name: Ms. Caroline Yeta

Yes, we work closely with initiatives like PEPFAR and [the] Global Fund [GFATM]. I think there is a program related to watching out for antimicrobial resistance. There is the Pharmacovigilance center which will monitor adverse reaction; it is a kind of post-market surveillance of new drugs, [and] it is being funded by the government and the Health Systems Support Programme (HSSP). The National Formulary and STGs address irrational use and AMR for infectious diseases of major public health importance.

Interview C
Name: Ms. Esnart Mwape

I don't think much is being done. There are plans to set up a pharmacovigilance unit with the help of HSSP but it is still in the planning phase. It will address adverse reactions and AMR. It does not include malaria and TB. For me, I think the problem is made worse because the private sector is not obliged to comply with such initiatives, and even with STGs. By the time patients report to the public sector they have already been exposed to a lot from the private sector. STGs and formulary issues should take care of major diseases, but like I said, the private sector is not obliged to follow these.

Introduction: This table [annex 2, filled with summary data from the completed course review forms] represents the findings of what is being taught in the medical school concerning this problem.

What is your opinion about what is taught about antimicrobial use and antimicrobial resistance?

Interview A Name: Dr. Vilepi Mtonga	In my days of training I think a lot was covered and we learned about rational drug use and risks of antimicrobial resistance. If things are still the same I think about enough is being taught.
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Interview B Name: Ms. Caroline Yeta	I am not very familiar with what is taught in medical school but I thought it was being covered.
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Interview C Name: Ms. Esnart Mwape	I am surprised that so little is being done about such an important topic.
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Do you have any recommendations for the undergraduate training regarding antimicrobial use and antimicrobial resistance?

Interview A Name: Dr. Vilepi Mtonga	In my view the medical school should teach the right thing. Some antimicrobial use and resistance should be taught, but it is important that the school provides bedside labs to enhance accurate diagnosis. The school should pick the major categories, focus on drugs and mechanisms of actions, bug resistance, and we also do our own research. I suppose we should add a few hours and be specific to AMR and rational drug use.
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Interview B Name: Ms. Caroline Yeta	They should increase the amount of rational drug use and also improve on prescribing habits so that doctors use sensitivity results before prescribing. I also hope that the policies that the government agencies have developed can filter down to each hospital. We can also increase awareness about the function of therapeutic committees.
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Interview C Name: Ms. Esnart Mwape	The time spent right now is too little. We need to create more time when learning about treatment of diseases to address rational drug use and antimicrobial resistance. I think you should develop specific content on rational drug use and AMR. You should also do studies on RDU/AMR and share the results with other stakeholders. Lastly, I think you should bring the Veterinary School on board for these activities.
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Interviews with Faculty Members and Heads of Departments

Accurate Diagnosis and Management of Common Infections

Introduction: Your course teaches about infections.

Are there any aspects of the course that address accurate diagnosis and management of common infections?

Interview D Name: Dr. Chipepo Kankasa Organization: University Teaching Hospital Position: Head Clinical Care; Honorary Lecturer Pediatrics	Our management is mostly clinical because we do not have facilities for laboratory support. So accurate diagnosis is not emphasized. We do trial of management and see if the patient improves.
Interview E Name: Dr. Veronica Mulenga Organization: School of Medicine Position: Lecturer Pediatrics	There are many barriers to practicing accurate diagnosis; the major one is poor laboratory services. We do not get laboratory results in time and the findings are questionable on many occasions.
Interview F Name: Ms.Gina Mulundu Organization: School of Medicine Position: Lecturer Microbiology	This practice depends on what is prevailing in the laboratory. Currently, few people send specimens; they have lost faith in the laboratory services or they think that the results don't contribute to the management of the patients. But we do emphasize the role of accurate diagnosis in the course.
Interview G Name: Dr. James Mwansa Organization: University Teaching Hospital Position: Head of Microbiology Section, Honorary lecturer in microbiology	Most of what we teach is basic science-focused with little clinical aspects.
Interview H Name: Dr. Cecilia Shinondo Organization: School of Medicine Position: Lecturer Parasitology	Where parasitology is concerned accurate diagnosis is emphasized in my teaching.

Annex 6. Interview Transcripts

Interview I

Name: Dr. Sindwa Kanyimba
Organization: School of Medicine
Position: Lecturer Pharmacology and Medicine

Not covered.

Interview J

Name: Dr. Lackson Kasonka
Organization: University Teaching Hospital
Position: Honorary Lecturer Obstetrics and Gynecology

In clinical practice we have weak laboratory services and the treatment of patients is mostly based on the clinical picture and it may be modified when we receive results. The problem is that some patients cannot afford laboratory costs and we have to manage them without the results.

Interview K

Name: Dr. Gordon Silumbe
Organization: University Teaching Hospital
Position: Honorary Lecturer Internal Medicine

Generally speaking, the “shotgun” method of prescription is used—where broad-spectrum antimicrobials [are administered] to cover for both gram negative and gram positive microbes. This is perpetuated because our laboratory is unreliable, and they don’t yield appropriate results. For example, in medicine we can do about 16 lumbar punctures in a day and not receive results for 72 hours, and all can be negative when we are clearly dealing with a case of meningitis.

Interview L

Name: Dr. Peter Mwaba
Organization: School of Medicine
Position: Head of Department Medicine;
President—Zambia Medical Association

Most of the patients we deal with are very sick so we use presumptive diagnosis and commence treatment with empirical regimes before the results are available. We send specimens to the lab with the hope of adjusting treatment when the lab reports come. But our lab results are delayed for as much as two and half days, and by the time they come they are not of much use.

Interview M

Name: Dr. Robert Zulu
Organization: University Teaching Hospital
Position: Honorary Lecturer Surgery

In my unit we encourage sensitivity swabs to be done, especially on burns, and we also discourage widespread use of antibiotics. Students are encouraged to wait until the laboratory results are available, in the meantime, they can use broad-spectrum antibiotics. We also use our experience with infections with regard to which organisms are most likely in some anatomical regions, e.g. anorectal region. Where resistant is found we encourage manual wound cleaning.

Disease Prevention Including Immunization

One expects your course to teach about disease prevention. What aspects of infection prevention are covered in the course?

Interview D Name: Dr. Chipepo Kankasa	Infection prevention is not included on the syllabus per se. However, I cover universal and personal hygiene when teaching students.
Interview E Name: Dr. Veronica Mulenga	Infection prevention is covered in the teaching but I think it takes a backseat. We have poor infection control clinical measures and these are not emphasized in the teaching. For example, it is not practical to do hand washing between patients when you are seeing 63 patients. My hope is that students learn by apprenticeship by observing their seniors do the appropriate thing.
Interview F Name: Ms.Gina Mulundu	In microbiology our focus is on specimen handling and disposal.
Interview G Name: Dr. James Mwansa	We cover sterilization methods in general and do not focus on hospital infections per se.
Interview H Name: Dr. Cecilia Shinondo	Parasitology is a lot hygiene. Infection prevention is important in clinic and sanitary disposal of specimen. We emphasize these.
Interview I Name: Dr. Sindwa Kanyimba	Not covered.
Interview J Name: Dr. Lackson Kasonka	There is no deliberate provision for infection prevention in our course. I think our students acquire it by apprenticeship.
Interview K Name: Dr. Gordon Silumbe	In the clinical setting infection prevention guidelines are available but are rarely observed, such things as hand washing, gloving, and gowning.
Interview L Name: Dr. Peter Mwaba	In the clinical setting we teach about use of gloves, needle use, decontamination, and sterilizing of equipment. But hand washing, isolation, cohorting of patients, and measures that address nosocomial infections are underplayed.
Interview M Name: Dr.Robert Zulu	In the clinical setting we teach about use of gloves, washing hands between patients, gowning, and other sterile precautions.

Patient Education

Are your students taught about patient education with regard to antimicrobial use? If yes, what are they taught about patient education?

Interview D Name: Dr. Chipepo Kankasa	Patient education is covered when teaching the importance of patient counseling. It is entrenched in my teaching but I don't know how much the other lecturers cover on this subject.
Interview E Name: Dr. Veronica Mulenga	This component is not covered uniformly in the curriculum and it is not specified as a curriculum requirement.
Interview F Name: Ms.Gina Mulundu	Emphasis is on teaching patients to adhere to their treatment plans, including the duration of treatment and dosage of drugs.
Interview G Name: Dr. James Mwansa	Most of what we teach is basic science-focused with little clinical aspects.
Interview H Name: Dr. Cecilia Shinondo	In parasitology we emphasize this; how else can you know when you are dealing with a re-infection or the same infection if patients are not taught to comply with antimicrobial treatment? Especially for malaria we emphasize this.
Interview I Name: Dr. Sindwa Kanyimba	Not covered.
Interview J Name: Dr. Lackson Kasonka	Students are encouraged to educate their patients about their disease and to share the diagnosis and management plan with them.
Interview K Name: Dr. Gordon Silumbe	Personally, I focus on communication because poor doctor-patient communication is rampant in our setting. I hope students are learning from observations.
Interview L Name: Dr. Peter Mwaba	Very little emphasis is placed on patient education—it is widely lacking.
Interview M Name: Dr.Robert Zulu	In our unit this is categorically emphasized; patients must be taught about the importance of adherence to treatment plans.

Antimicrobial Use and Containment of Antimicrobial Resistance

- Your course covers issues about antimicrobials (antibiotics, antifungals, antivirals, and antiparasitics)?
- Is antimicrobial resistance recognized as a problem per se?
- If so what and how much is taught about AMR as a problem?
- What aspects of appropriate antimicrobial use are covered?
- Is rational drug use a component of appropriate antimicrobial use, if so why?
- What aspects of containment of antimicrobial resistance are covered in the course?
- What is your opinion about the amount and scope of coverage about containment of antimicrobial resistance? Do you think enough is being done?

Interview D Name: Dr. Chipepo Kankasa	In my teaching I recognize AMR as a problem and it is emphasized. The amount of teaching is difficult to quantify but I do emphasize it. Here in pediatrics our disease burden is mostly infections, so AMR should be covered all the time. Rational drug use is difficult to cover because we have no laboratory support and poor availability of drugs. So we do a lot of trial and error selection of antimicrobials. The amount of time spent on AMR and rational drug use—as far as I am concerned I cover a lot. But it must be noted that in the curriculum there is not enough covered.
Interview E Name: Dr. Veronica Mulenga	AMR is recognized as a problem, but surprisingly it is not included in clinical teaching. I suppose it is best covered in lectures. Rational drug use is covered during clinical teaching but it is difficult to practice because of the many challenges we face, such as drug shortages. The amount of time spent on antimicrobial use, rational drug use, and antimicrobial resistance is too little, a lot more needs to be done.
Interview F Name: Ms. Gina Mulundu	AMR is a big topic. We give it two 2-hour sessions and we also give out a handout. Where basic science is concerned we cover quite a bit; the problem is that in the clinical areas not much is covered there. In microbiology, we discuss the history of antimicrobials, the mechanism of action of the drugs, and the mechanism of resistance. Rational drug use ought to be taught thoroughly; however, most of our practitioners use “shotgun” prescriptions which promote indiscriminate use and misuse, and that is what our students are learning. The amount of time spent on antimicrobial use, rational drug use, and antimicrobial resistance is adequate for microbiology, but more should be done on those components that are clinical.
Interview G Name: Dr. James Mwansa	AMR is recognized as real problem. We have four hours dedicated to antimicrobial resistance issues and another four hours dedicated to discussing the mechanism of action of antimicrobials and the mechanism of resistance. In these lectures we also cover the containment of AMR. AMR surveillance and issues like MRSA [methicillin-resistant Staphylococcus aureus] are mentioned in passing. Not much is covered about rational drug use because that is a clinical subject and it is hoped that it is covered in clinical rotations. It is my opinion that the amount of time dedicated to these issues should be increased and spread throughout the curriculum.

Annex 6. Interview Transcripts

Interview H Name: Dr. Cecilia Shinondo	AMR is recognized as a problem and we teach about it every time we are discussing a disease and its management, when it is relevant. Antimicrobial resistance is covered, but I think it is important to differentiate between treatment failure and resistance. In parasitology, for example, we have dealt with chloroquine resistance. The full topic on AMR I think is done in bacteriology. Rational drug use is also taught in our course when we are teaching about treatment guidelines. The amount of time spent on antimicrobial use, rational drug use, and antimicrobial resistance is adequate for parasitology.
Interview I Name: Dr. Sindwa Kanyimba	AMR is a problem but the pharmacology course does not treat it as special subject and no specific time is allocated to it. Issues are mentioned as they arise in discussing other topic areas. The course still uses the traditional approach of discussing properties of classes of drugs. Resistance may be tackled when talking about antibiotics. Rational drug use is not tackled in pharmacology. There is inadequate coverage of these issues in pharmacology. More can be done.
Interview J Name: Dr. Lackson Kasonka	AMR is recognized as a problem but it is not a topic on its own. It is covered when talking about treatment of diseases and if the lecturer thinks that resistance is relevant for that case. Rational drug use ideally should be based on laboratory findings but this is not the case with us and we also have a limited range of drugs to choose from, a laboratory service that is not reliable—all these prevent rational drug use. The theory is different from the practice and I suspect the students will learn more from the practice. We also do not have standard treatment guidelines for gynecology and doctors use whatever is available. We only have STGs for obstetrics. The amount and scope of coverage about antimicrobial use, rational drug use, and antimicrobial resistance is worryingly too little.
Interview K Name: Dr. Gordon Silumbe	AMR is recognized as a problem; for example, most bugs are resistant to penicillins. Students are taught whenever the opportunity to address it arises, especially when discussing antimicrobial treatment. The magnitude and scope of the problem I hope is communicated by the regularity with which we bring up the issue. Rational drug use is covered mostly in the clinical setting. However, drug selection, dosages, and duration of medication are constrained by poor stock of drugs. The department has also started developing some standard management guidelines. Another problem that may compound irrational drug use is that in our hospital pharmacists are allowed to substitute drugs on the prescription. You must note that they are not privy to the drug sensitivity results. In my opinion this practice must be discouraged. I think the coverage is reasonable.
Interview L Name: Dr. Peter Mwaba	AMR is a big problem, but it is only mentioned in passing in lectures where such issues arise. We give a therapeutics course to final year students, but it is not comprehensive. Rational drug use is a problem because of poor laboratory services and prescriptions are done based on what antimicrobials are available in the pharmacy. The magnitude and scope of AMR is not really conveyed to our students because they receive conflicting messages from our theory and our practice. The coverage of antimicrobial use, rational drug use, and antimicrobial resistance is terribly inadequate.

Interview M Name: Dr. Robert Zulu	AMR is recognized as a problem; for example, in our burns unit we found pseudomonas strains which were resistant to almost all of our antibiotics and we had to close the unit and take measures before it was opened. Rational drug use is so important that our students are taught about irrational drug use as a cause for AMR. Our biggest problem is that it appears other departments do not tackle this adequately and students rotating from other departments have poor prescription habits. I think the coverage is reasonable.
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Teaching Methods and Hours of Coverage

- What teaching methods are used for teaching about antimicrobial resistance?
- How much time is dedicated to issues related to antimicrobial resistance?
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Interview D Name: Dr. Chipepo Kankasa	You [can] see our curriculum is outdated—the timetable was fixed a long time ago and we are failing to respond to changes in disease burden; for example, we have a big gap in HIV/AIDS teaching. Our methods are lectures, tutorials, and bedside teaching.
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Interview E Name: Dr. Veronica Mulenga	Lectures, clinical bedside teaching, and tutorials whenever we mention it.
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Interview F Name: Ms. Gina Mulundu	Lectures and tutorials. No laboratory sessions are being done for microbiology currently.
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Interview G Name: Dr. James Mwansa	Lectures and tutorials. No laboratory sessions.
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Interview H Name: Dr. Cecilia Shinondo	Lectures, clinical bedside teaching, and tutorials. No laboratory sessions are done for AMR specifically.
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Interview I Name: Dr. Sindwa Kanyimba	Lectures and tutorials. No laboratory sessions. Planning on introducing problem-based sessions.
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Interview J Name: Dr. Lackson Kasonka	Lectures, clinical teaching, and tutorials.
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Interview K Name: Dr. Gordon Silumbe	Lectures, clinical teaching, and tutorials.
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Interview L Lectures, clinical teaching, and tutorials.
Name: Dr. Peter Mwaba

Interview M Lectures, clinical teaching, and tutorials.
Name: Dr. Robert Zulu

Other

- Is the issue of AMR problem among nosocomial infections covered in any of the courses you teach?
- Does your course cover global issues such as the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM – Global Fund), The President’s Emergency Plan for AIDS Relief (PEPFAR), and other such initiatives?
- The above mentioned programs are bringing a lot of antimicrobials into Zambia. With the increase in access to antimicrobials through these initiatives and others, is the escalation of AMR being covered with regard to their rational use?
- Is irrational use and AMR covered for infectious diseases of major public health importance in Zambia (HIV/AIDS, TB, malaria, STI, diarrheal diseases, and ARI)?

Interview D Nosocomial infections and the issue of AMR is covered in clinical teaching only. We do not discuss such initiatives as the PEPFAR funds or [the] Global Fund with our students. I am not aware of any strategies to counteract the AMR risk and I do not cover this specifically when teaching students. The infectious diseases of major public health importance you have mentioned have standard treatment guidelines that should encourage rational use and address AMR, but like I said, shortages of drugs make them difficult to implement.

Interview E Infection prevention, if it is taught properly, would deal with nosocomial infections and the issue of AMR. Not much is done now. No we do not teach about these and I am not aware of any strategy to manage the risk that accompanies the increase in consumption of the antimicrobials made available. I am not sure if these measures are effective but I am aware that standard treatment guidelines exist.

Interview F Nosocomial infections are covered by the hospital but not much is taught to our students. There are corresponding strategies to tackle AMR risk due to PEPFAR funds and [the] Global Fund putting more antimicrobials on the market. Students are not taught any of these. I am not conversant with any irrational use and AMR strategies for the infectious diseases of major public health importance to Zambia.

Curriculum Review and Interview of Experts to Identify Topics on Antimicrobial Use and Resistance

Interview G Name: Dr. James Mwansa	Nosocomial infections are covered in hospital interventions but not much in our teaching. We do not cover PEPFAR/Global Fund issues and their impact is not considered at all. Zambia has STGs for public health diseases and implementation is good. The “Alliance for Prudent Use of Antimicrobials” has potential to support implementation of STGs and national formulary issues.
Interview H Name: Dr. Cecilia Shinondo	Nosocomial infections are not applicable to parasitology in our setting. The issue of PEPFAR funds and other funds is important. We are going to see an increase of counterfeit drugs on the market but I am not aware of any corrective measures in place. We also need to introduce molecular epidemiology for survey markers for resistance, especially for malaria; this will enhance rational drug use. These are mentioned to our students. Diseases of major public health importance are not specifically relevant to parasitology, except for malaria, which we cover adequately.
Interview I Name: Dr. Sindwa Kanyimba	Not covered.
Interview J Name: Dr. Lackson Kasonka	Nosocomial infections are covered by the hospital but not much is taught to our students. We do not cover PEPFAR/Global Fund issues and their impact is not considered at all.
Interview K Name: Dr. Gordon Silumbe	Nosocomial infections are covered by the hospital but not much is taught to our students. We do not cover PEPFAR/Global Fund issues and their impact is not considered at all.
Interview L Name: Dr. Peter Mwaba	Nosocomial infections are underplayed in our teaching. We do not cover PEPFAR/Global Fund issues and their impact is not considered at all. Zambia has STGs for public health diseases but no capacity to enforce them.
Interview M Name: Dr. Robert Zulu	Nosocomial infections are taught to our students as we have first-hand experience with these problems in our wards. We do not cover PEPFAR/Global Fund issues and their impact is not considered at all.

Introduction: The table [annex 2, filled with summary data from the completed course review forms] below reflects the results of the curriculum review done on the topic.

Which of the six disciplines do you specifically teach? Kindly comment on each discipline and whether all the topics are covered in your teaching. Please indicate whether each of these six disciplines and topics are covered or not in your teaching

Interview D Name: Dr. Chipepo Kankasa	In pediatric teaching we cover infectious diseases and their management. We cover infection prevention and rational drug use in clinical teaching but we do not cover the science of microbes, infection prevention, rational drug use, and antimicrobial resistance as spelt out on this form.
Interview E Name: Dr. Veronica Mulenga	Pediatric teaching covers infectious diseases and their management. Infection prevention, rational drug use, and antimicrobial resistance are not covered the way they are presented on this form.
Interview F Name: Ms.Gina Mulundu	Microbiology tackles the science of microbes and antimicrobial resistance in enough detail comparable to the list on the form. Rational drug use, infection prevention, and others should be covered in detail by others.
Interview G Name: Dr. James Mwansa	Microbiology focuses on the science of microbes and antimicrobial resistance. Antimicrobial use, infectious diseases, infection prevention, and rational drug use are not emphasized.
Interview H Name: Dr. Cecilia Shinondo	The area of concern for parasitology is the science of microbes and we do cover it the way it appears. These other components are not covered in great detail by us.
Interview I Name: Dr. Sindwa Kanyimba	Most of these are not covered in pharmacology. Resistance [is] done in bits and pieces when it arises.
Interview J Name: Dr. Lackson Kasonka	Obstetrics and gynecology will address antimicrobial use, infectious diseases, aspects of infection prevention, aspects of rational drug use, and antimicrobial resistance. RDU, AMR, and infection prevention are not done to this kind of detail as on your form.
Interview K Name: Dr. Gordon Silumbe	Internal medicine covers antimicrobial use, infectious diseases, aspects of infection prevention, aspects of rational drug use, and antimicrobial resistance. RDU, AMR, and infection prevention are not done to this kind of detail as on your form.
Interview L Name: Dr. Peter Mwaba	Medicine covers antimicrobial use, infectious diseases, aspects of infection prevention, aspects of rational drug use, and antimicrobial resistance. RDU, AMR, and infection prevention are not done to the exact format covered by this form.
Interview M Name: Dr.Robert Zulu	Surgery covers antimicrobial use, infectious diseases, aspects of infection prevention, aspects of rational drug use and antimicrobial resistance. RDU, AMR, and infection prevention are not done to the exact format covered by this form.

Recommendations

Interview D Name: Dr. Chipepo Kankasa	Strengthen the laboratory capacity so that we can practice accurate diagnosis and rational drug use. We should also strengthen the teaching of basic sciences, especially practical microbiology with proper laboratory teaching. Reserved drugs and treatment guidelines should be enforced.
Interview E Name: Dr. Veronica Mulenga	Introduce a stand alone course that will cover rational drug use, infection prevention, and antimicrobial resistance.
Interview F Name: Ms.Gina Mulundu	Strengthen laboratory services, increase AMR coverage in clinical years.
Interview G Name: Dr. James Mwansa	Improve therapeutics, strengthen and introduce applied RDU/AMR.
Interview H Name: Dr. Cecilia Shinondo	For parasitology enough is covered. Increase in other relevant courses especially pharmacology. Also improve laboratory support for microbiology and pharmacology.
Interview I Name: Dr. Sindwa Kanyimba	Increase AMR, RDU coverage.
Interview J Name: Dr. Lackson Kasonka	Introduce specific programs for infection prevention, RDU, and AMR.
Interview K Name: Dr. Gordon Silumbe	Improve diagnostic facilities because clinical diagnosis cannot pinpoint causative organisms. Laboratory support is essential to make us scientific practitioners.
Interview L* Name: Dr. Peter Mwaba	Increase amount of coverage of this important topic
Interview M Name: Dr.Robert Zulu	Emphasize infection prevention, RDU, and AMR to final-year students.

* Additional question to Dr. Peter Mwaba—

You are also the President of Zambia Medical Association—Can you enlighten me about any issues about the subject we have covered that ZMA is concerned with and/or doing something about.

Currently there are no programs by ZMA that address this issue. However, with the support of the Royal College of Physicians of England, we are planning to introduce continuing medical education (CME) programs, some of which must tackle rational drug use and antimicrobial resistance.