

File S1
SURVEY QUESTIONNAIRE FOR ANTIBIOTIC USE AND ANTIMICROBIAL
RESISTANCE

This form has been designed and validated for the use to collect data from health professionals on their knowledge and effective use of antimicrobials for the purposes of training as part of an ongoing project on Antimicrobial Stewardship. We are particularly interested in knowing more about antibiotic use and antibiotic resistance in your health facility; your knowledge and how you manage it. We are also interested in any problems or concerns you might have about antibiotics use. We would appreciate it if you could spend about 10 minutes with us discussing the topic.

1. BACKGROUND INFORMATION ON THE HEALTH PROFESSIONAL

Kindly tick against the appropriate option applicable to you.

A	Sex	Male	<input type="checkbox"/>	Female	<input type="checkbox"/>
B	Age (Years)	19 to 24	<input type="checkbox"/>	25 to 34	<input type="checkbox"/>
		45 to 54	<input type="checkbox"/>	55 to 64	<input type="checkbox"/>
				35 to 44	<input type="checkbox"/>
				>64	<input type="checkbox"/>
C	Highest degree or level of school completed	No schooling completed	<input type="checkbox"/>	Junior high school level	<input type="checkbox"/>
		Technical / vocational school	<input type="checkbox"/>	Tertiary level, diploma or HND degree	<input type="checkbox"/>
		Tertiary level, master's or professional degree	<input type="checkbox"/>	Tertiary level, doctorate degree	<input type="checkbox"/>
				Senior high school	<input type="checkbox"/>
				Tertiary level, bachelor degree	<input type="checkbox"/>
				Other specify:	<input type="checkbox"/>
D	Profession	Medical Doctor	<input type="checkbox"/>	Physician Assistant	<input type="checkbox"/>
		Pharmacist	<input type="checkbox"/>	Pharmacy Technologist	<input type="checkbox"/>
				Nurse	<input type="checkbox"/>
				Other specify:	<input type="checkbox"/>
E	Years of practice	< 1 year	<input type="checkbox"/>	1 to 5 years	<input type="checkbox"/>
	Number of years			6 to 10 years	<input type="checkbox"/>
F	working at the present facility	< 1 year	<input type="checkbox"/>	1 to 5 years	<input type="checkbox"/>
				6 to 10 years	<input type="checkbox"/>
				> 10 years	<input type="checkbox"/>

2. HOSPITAL PRACTICE REGARDING THE USE OF ANTIMICROBIALS

Kindly tick against the appropriate option applicable to you

Sr. No	Information	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
A	The following factors influence the decision to start a patient on antimicrobial therapy in the hospital					
	<i>i. Patient's clinical condition</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>ii. Microbiological results in symptomatic patients</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	The following practices contribute to antimicrobial resistance in the hospitals					
	<i>i. Inappropriate prescribing habits of antibiotics</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>ii. Lack of effective diagnostics tools to diagnose bacterial infections</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>iii. Patients self-medication with antibiotics without consulting health professionals</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>iv. Spread of bacteria in healthcare settings due to poor hygiene practices</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	Antibiotics are overprescribed in this facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	Antibiotics choice should only be made base on laboratory results always	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	Current antibiotics available in the facility are unable to treat some infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	There are policies and protocols for antibiotic use in this facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G	All prescriptions are based on the hospitals protocol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H	Poor infection control practices by healthcare professionals will cause the spread of antimicrobial resistance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I	The following practices may help control antimicrobial resistance					
	<i>i. Consulting with infectious diseases experts</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>ii. Obtaining local antibiotic resistance profile</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>iii. Targeting antimicrobial therapy to likely pathogens</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>iv. Changing the attitudes of prescribers and patients to</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*reduce unnecessary antibiotic
usage*

- J** In using antibiotics in the hospital, the following resources are consulted (enter 1, 2, or 3 based on the order in which you would consult these)

Google	<input type="checkbox"/>	Standard Treatment Guidelines	<input type="checkbox"/>	
Colleagues	<input type="checkbox"/>	British National Formulary	<input type="checkbox"/>	Other <input type="checkbox"/> Specify _____

- K** Is there an antimicrobial stewardship (AMS) team in your hospital? **Yes** ☐ **No** ☐

If yes, Please state the following

- I. Composition of the team

Medical Doctor	<input type="checkbox"/>	Physician Assistant	<input type="checkbox"/>	Nurse	<input type="checkbox"/>
Pharmacist	<input type="checkbox"/>	Pharmacy Technologist	<input type="checkbox"/>	Other	<input type="checkbox"/>
					specify: _____

- II. Frequency of meetings _____

- III. Are minutes taking during meetings? **Yes** ☐ **No** ☐

- IV. List the activities undertaken by the AMS team

3. GENERAL KNOWLEDGE ABOUT ANTIBIOTICS AND THEIR USE

Kindly tick against the appropriate option applicable to you

Sr No	Information	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
A	Antibiotics are used in the management of all infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	Treatment with antibiotics should be stopped once you feel better, especially the expensive ones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	It's okay to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	It's okay to buy the same antibiotics, or request these from a doctor, if you're sick and they helped you get better when you had the same symptoms before"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	Frequent use of antibiotics may decrease the efficacy of treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	Antibiotics use should be strictly controlled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G	The following factors may influence the inappropriate use of antibiotics					
	i. Counselling of patients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	ii. Skills and knowledge of prescribers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	iii. Patient self-medication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	iv. Inadequate supervision with the medicine administration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H	It is possible for the antibiotics we are using today to stop working properly in the future	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I. The following conditions can be treated with antibiotics (*you may tick more than one, if appropriate*)

HIV/AIDS	<input type="checkbox"/>	Bladder infection or urinary tract infection (UTI)	<input type="checkbox"/>	Cold and flu	<input type="checkbox"/>
Gonorrhoea	<input type="checkbox"/>	Diarrhoea	<input type="checkbox"/>	Fever	<input type="checkbox"/>
Malaria	<input type="checkbox"/>	Measles	<input type="checkbox"/>	Skin or wound infection	<input type="checkbox"/>
Sore throat	<input type="checkbox"/>	Body aches	<input type="checkbox"/>	Headaches	<input type="checkbox"/>

J. What does the WHO AWaRE categories for antibiotics stand for?

4. AWARENESS OF ANTIMICROBIAL RESISTANCE and STEWARDSHIP

Kindly tick against the appropriate option applicable to you

Sr. No	Information	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
B	Antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	Many infections are becoming increasingly resistant to treatment by antibiotics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infections they cause	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	Antibiotic resistance is an issue that could affect me or my family	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F	Antibiotic resistance is an issue in other countries but not here	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G	Antibiotic resistance is only a problem for people who take antibiotics regularly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H	Bacteria which are resistant to antibiotics can be spread from person to person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I	Antibiotic-resistant infections could make medical procedures like surgery, organ transplants and cancer treatment much more dangerous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
J	Inappropriate use of antibiotics can lead to antibiotic resistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K	Inappropriate use of antibiotics can lead to increased adverse effects and additional burden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A List three to five barriers to antimicrobial stewardship and suggest ways to overcome these.

(In particular, please highlight barriers and solutions relevant to low resource settings.) *

B Which of the following are the recognised key components for behaviour change strategy? (Select maximum 3) *

- ☐ Capability
- ☐ Motivation
- ☐ Opportunities
- ☐ Skills
- ☐ Knowledge
- ☐ I do not know

☐ Other:

- C** Select which of the following are included in the '5 moments of hand hygiene' according to WHO? (select all that apply)
- ☐ I do not know
 - ☐ Before touching a patient
 - ☐ before clean/aseptic procedures,
 - ☐ after body fluid exposure/risk
 - ☐ after touching a patient
 - ☐ after touching patient surroundings
 - ☐ after adjusting the IV rate and before checking blood pressure
- D** What is the appropriate minimum length of time required for adequate hand hygiene
- ☐ I do not know
 - ☐ 5 seconds for alcohol-based hand rub, 15 seconds for hand washing
 - ☐ 15 seconds for hand washing, 5 seconds for alcohol-based hand rub
 - ☐ 30-40 seconds for alcohol-based hand rub, 40-60 seconds for hand washing
 - ☐ 60 seconds for alcohol-based hand rub, 60 seconds for hand washing
 - ☐ None

File S2

HEALTHCARE PROVIDERS' INTERVIEW TOPIC GUIDE

Date of interview:

Respondent ID:

Sex:

Age range:

Specialty:

Length of time in Practice:

Introduction (to be read by interviewer just before commencing the interview):

Thank you for accepting to take part in this interview. I would just like to reiterate that everything you say in the interview is confidential. All data collected will be anonymized. The interview itself will be open ended and the questions themselves are usually fairly broad. There aren't any right or wrong answers. I'm simply interested in your experience and your views with antibiotics use. Is there anything you'd like to ask me?

Did you attend the training session on AMR/Stewardship in July 2019? Y/N (if no skip next section)

Knowledge/Awareness of antimicrobial resistance post training

- 1) Generally, how was this training helpful to you?
- 2) How did the training impact on your knowledge of AMR?
- 3) Has your practice with antibiotics changed since the training?
- 4) What are specific changes, what do you do differently?
- 5) Can you tell me about the WHO AWaRE classification of antibiotics?
[*List of Access, Watch and Reserve categories*]
- 6) We had a Global point prevalence survey (GPPS) on antibiotics in July, how has this affected your practice and understanding of antibiotics use?

Pharmacist's roles:

- 1) In your opinion, how do pharmacists fit in AMS in hospitals?
- 2) Do you feel competent to deliver AMS roles within the hospital as a pharmacist/nurse/doctor/laboratory scientist? [*Explore reasons*].
- 3) Are there enough resources within the hospital to help pharmacists be more efficient in doing this?
- 4) What would you recommend [resources/ structures] to support hospital pharmacists on AMS delivery?

Knowledge/Awareness on antibiotics use in Ghana

- 1) What is your general opinion on antibiotics use in Ghanaian hospitals?
- 2) Can you explain to me some of the factors that contribute to the current

practices? [availability and access to antibiotics; lack of regulation; OTC availability; diagnostics; general knowledge expectations; cost; conflict of interest –business model]

- 3) To your knowledge are there any interventions put in place or any steps taken to help with antibiotics use in this hospital?

Probe: Any form of stewardship programmes? Antibiotic prescribing policies/ guidelines? Infection control groups; patient and public information campaigns; staff knowledge and awareness.

Prescribing patterns

- 1) Tell me about the antibiotics that are commonly used in this hospital, what are the common classes prescribed?
- 2) Are the prescribed antibiotics in the essential medicines list and hospital formulary?
- 3) What are the common indications requiring antibiotic prescriptions?
- 4) In your hospital practice, do you normally use antibiotics by brand names or by generic names...tell me about any reasons or factors that will affect generic or brand name use?

Decision making process

- 1) What are the factors that influence the choice of antibiotics you prescribed and dispensed? (Probes: Tests results, PC symptoms diagnosis, availability, cost, co- morbidities).
 - a) What factors do you consider relevant in choosing antibiotics?
- 2) Are there treatment guidelines or antibiotic policies available to guide antibiotics use?
- 3) How often do you consult guidelines/policies/official books when dealing with antibiotics in the hospital?
- 4) In your opinion, do patients have any role to play in deciding if/ which antibiotic should be prescribed and dispensed to them?

Recommended strategies

- 1) In your opinion what interventions should be implemented in this setting to improve antibiotics use? Toolkits or checklists as potential facilitators?
- 2) What would be the likely barriers in implementing this intervention(s)

File S3: AMS Interview data analysis

S/N	Question	Responses/Codes	Key messages /Themes
Knowledge/Awareness of antimicrobial resistance post training			
1	Generally, how was this training helpful to you?	Increased my ABX use knowledge Very educative Yes, very helpful Yes, I learnt a lot, it was very very helpful. very effective and helpful	Hcps described the training as educative, helpful and found it useful in their practice with antibiotics
2	How did the training impact on your knowledge of AMR?	Increases understanding of factors impacting AMR Importance of patient counselling on abx use I can now educate my patients better It created another opportunity for us to help us with how antimicrobials will be used it came to increase the knowledge that I had in AMR impacted my knowledge of AMS yes I have better understanding on the use of abx	The training generally increased knowledge about antibiotics use, AMR and AMS. Led to better understanding of different aspects of antibiotics use including importance of proper patient education
3	Has your practice with antibiotics changed since the training?	Personally yes -Reduced antibiotics use, - yes, I do more counselling with Abx drugs Yes-reduced empirical abx prescribing I should say yes, Yes, I educate patients better now	After the training, some changes in practice observed in the hospital include reduction in antibiotics use and empirical prescribing. Better patient counselling and education on antibiotics use
4	What are specific changes, what do you do differently?	Complete my course of ABX and advice others too Abx prescription checks I educate patients more on Abx, I contribute during ward rounds and query some abx prescriptions	HCPs feel more confident to contribute on AMR topics during rounds and educate patients better. Pharmacists carry out prescription checks for antibiotics prescribed and query antibiotics prescribed where there is a need too

		<p>We now query some antibiotic prescriptions without justification</p> <p>Prescription checks for antibiotics</p> <p>I stopped telling people to take antibiotics casually actually, decreased the rate at which they were writing antibiotics</p>	
5	<p>Can you tell me about the WHO AWaRE classification of antibiotics?</p> <p>List of Access, Watch and Reserve categories</p>	<p>No, No, No, yes the category, Yes I remember the idea of this in 3 groups</p> <p>Yes I remember 3 groups,</p> <p>Yes Aware, watch and one other group</p>	<p>Majority of the HCP that attended the earlier training vaguely remembered the WHO classification of antibiotics</p>
6	<p>We had a Global point prevalence survey (GPPS) on antibiotics in July, how has this affected your practice and understanding of antibiotics use?</p>	<p>Yes, improved prescribing</p> <p>Yes, evidence-based prescribing</p> <p>Reduced broad spectrum empirical prescribing</p> <p>Prescribers are more aware</p> <p>Pharmacists provide input in abx prescribing confidently now</p> <p>It has been difficult</p>	<p>The GPPS conducted made prescribers more aware of their prescribing with regards to antibiotics. There was reduce empirical and broad-spectrum antibiotic prescribing</p>
Pharmacist's roles:			
7	<p>In your opinion, how do pharmacists fit in AMS in hospitals?</p>	<p>Nurse, yes, proper administration, Support other HCP with information e.g prescribers</p> <p>Pharmacists: drug custodians, ensure safety/storage and patient counselling</p> <p>Yes, we procure the drugs and can influence the antibiotics in hospital</p>	<p>Pharmacists are the custodians of drugs within the hospital and can ensure safe effective use of antibiotics by providing information to other HCPs, counselling patients</p>
8	<p>Do you feel competent to deliver AMS roles within the hospital as a pharmacist/nurse/doctor/laboratory scientist? [Explore reasons].</p>	<p>Nurse yes- I administer ABX, so I can educate patients about it</p> <p>Yes. With the right resources and support</p> <p>As a nurse-support prescriber especially the junior doctors</p> <p>Nurse- can act as patients advocate and question antibiotics being prescribed</p>	<p>Nurses are competent in abx drug administration and act as patient advocate to question antibiotics being prescribed</p> <p>Pharmacists are also competent to deliver AMS roles and provide medication information needed to rational Abx prescribing</p>

		Yes. I'm very very confident as a pharmacist now	
9	Are there enough resources within the hospital to help pharmacists be more efficient in doing this?	Yes, guidelines and other HCP Labs should be equipped to deliver test results on time The resources are not there to carry out the testing and all that in the lab, Also, staff shortage: the pharmacist too, we are not many.	While there are guidelines and consultation with other colleagues, HCPs confirmed other resources like improved laboratory services, and increase in manpower will increase efficiency in delivery of AMS roles
10	What would you recommend [resources/ structures] to support hospital pharmacists on AMS delivery?	ABX use protocols/ guidelines Training/ lab/diagnostics Continuous training like CPD/workshops Leaflets for patients, flip charts for HCP AMR refresher courses the disc for the culture and sensitivity,	HCPs recommended protocols and guidelines for ABX use, more AMR training courses, improved lab services and availability of patient educational materials to support the delivery of AMS in the local hospital
Knowledge/Awareness on antibiotics use in Ghana			
11	What is your general opinion on antibiotics use in Ghanaian hospitals?	Over usage, improvements in Abx use Broad spectrum, empirical prescribing Still need to work on use, reach people Irrational use, poor IPC practices There is a lot of antibiotic overuse, antibiotics are overused	HCPs were of the perceptions that there is a general there is irrational and overuse of antibiotics in Ghanaian hospitals citing broad spectrum and empirical prescribing of antibiotics
12	Can you explain to me some of the factors that contribute to the current practices?	Poor compliance to guidelines, patient demands, incentives from drug companies Lack of training for HCPs, limited diagnostics Poor knowledge on AMR, staff are overworked and have no time to consult or check before prescribing abx	Factors contributing to irrational use of antibiotics in Ghana include lack of continuous AMR trainings, poor AMR knowledge, limited diagnostic services, understaffing, pressure from patients and pharmaceutical companies
13	To your knowledge are there any interventions put in place or any steps taken to help with	NO, None (only some workshops)	There has been no specific interventions implemented to combat AMR in the hospitals

	antibiotics use in this hospital?		
Prescribing patterns			
14	Tell me about the antibiotics that are commonly used in this hospital, what are the common classes prescribed?	Cephalosporins, penicillins, metronidazole, ciprofloxacin, erythromycin, amoxiclav, cefazolin, cipro	Broad-spectrum antibiotics including penicillin's, cephalosporins aminoglycosides and metronidazole are commonly prescribed
15	Are the prescribed antibiotics in the essential medicines list and hospital formulary?	Yes, yes, yes, yes	Antibiotics prescribed in the hospital are in the EML and hospital formulary
16	What are the common indications requiring antibiotic prescriptions?	UTI, resp. TI, GIT infections, prophylaxis (after surgery), sepsis, STI, typhoid	Common indications for which antibiotics are prescribed include respiratory tract infections, UTI, STI, GIT infections. Others include typhoid and surgical prophylaxis
17	In your hospital practice, do you normally use antibiotics by brand names or by generic names...tell me about any reasons or factors that will affect generic or brand name use?	Both, generic mostly, both, generic, more of generic, both	Antibiotics are prescribed both as the brands and in generics but mostly in generics
Decision making process			
18	What are the factors that influence the choice of antibiotics you prescribed and dispensed?	Disease, cost, availability, severity of infection	The following factors are considered in making choice of antibiotics for a patient: the disease and its severity, cost of the antibiotic and availability.

19	Are there treatment guidelines or antibiotic policies available to guide antibiotics use?	Yes, we have our standard treatment guidelines	Presently, there are standard treatment guidelines in the hospital to guide antibiotics use
20	How often do you consult guidelines/policies/official books when dealing with antibiotics in the hospital?	As often as I need to Yes, I do a lot, I now use the micro-guide app As often as I need to	Most HCP employ the use of guidelines as often as they need to when dispensing, prescribing or administering antibiotics
21	In your opinion, do patients have any role to play in deciding if/ which antibiotic should be prescribed and dispensed to them?	No patients don't have a say No influence from patients Yes, patients do request antibiotics, in the community they buy it	While patients can request for antibiotics, they have no influence in the decision whether they eventually get an antibiotic or which antibiotic should be prescribed for and dispensed to them.
Recommended strategies			
22	In your opinion what interventions should be implemented in this setting to improve antibiotics use? Toolkits or checklists as potential facilitators?	EDUCATION, more public awareness, policies Checks/audits Improved labs for microbe specific treatment, purchase lab items for testing Training for prescribers Monitoring antibiotic use Employ more staff to build workforce, Upgrade laboratory services	This will be presented and discussed using the COM-B model of the BCW framework for behaviour change
23	What would be the likely barriers in implementing this intervention(s)	Staff shortages, failure to enforce laws, funding Staff Workload, lack of funding in healthcare	Same as above
Notes			

File S4: Sample transcript Coding frame

Coding frame for (Transcript T011)		
Questions	Quotes	Codes
Knowledge/Awareness of antimicrobial resistance post training		
Generally, how was this training helpful to you?	<i>"It was very very helpful"</i> <i>"it came to create another opportunity for us to help us with how antimicrobials will be used"</i>	Useful, helpful
How did the training impact on your knowledge of AMR?	<i>"Well, initially I had some knowledge about AMR but it came to increase the knowledge that I had in AMR, it boosted the knowledge that was very very high and I think it was a very good programme"</i>	Increased AMR knowledge
Has your practice with antibiotics changed since the training?	<i>"My practice has changed but it's very difficult, especially in the hospital"</i> <i>"some issues are still not being able to be solved, so there are no... I mean, the lab is not adequately resourced to test for the organisms and then for you to know the antibiotics to give and all that, so there are still some lapses"</i>	Yes, limited by other factors
What are specific changes, what do you do differently?	<i>"Yeah. But I mean, it does actually decrease the rate at which they were writing antibiotics"</i>	Reduction on antibiotic prescribing
Can you tell me about the WHO AWaRE classification of antibiotics? [List of Access, Watch and Reserve categories]	<i>"Yes. The WHO AWaRe. So they have the Access, the Watch and then...I'm trying to remember"</i>	Partially
	<i>"Yes. Yes-yes-yes-yes, it has certainly helped .. In lots of ways. So now, I mean, the prescribers are aware and we also give them... I mean, if they need our</i>	

We had a Global point prevalence survey (GPPS) on antibiotics in July, how has this affected your practice and understanding of antibiotics use?	<i>input, we also give them our input on which antimicrobials are to be used for some conditions, so it has really...</i>	Increase prescriber awareness
Pharmacist's roles:		
In your opinion, how do pharmacists fit in AMS in hospitals?	<i>"Well the pharmacist has a critical role to play because we are the custodians of drugs"</i> <i>"can actually select some drugs, appropriate medications to be procured by the hospital so that they can factor in they want to prescribe an antibiotic and we can still be educating them, the prescribers, on right use of the antimicrobials, so as to prevent any resistant strains from developing"</i>	Support prescribers Procure appropriate antibiotics
Do you feel competent to deliver AMS roles within the hospital as a pharmacist/nurse/doctor/laboratory scientist? [Explore reasons].	<i>"Yes. I'm very very confident. "</i>	Yes, confident
Are there enough resources within the hospital to help pharmacists be more efficient in doing this?	<i>"Like I said, the resources are not there, you go to the lab, there are no agents, they don't have a disc to carry out the testing and all that,</i> <i>"The pharmacist too, we are not many"</i>	Limited lab resources Staff shortage
What would you recommend [resources/structures] to support hospital pharmacists on AMS delivery?	<i>"We need all... I mean the disc for the culture and sensitivity, very very important because if you are advocating that they change from one antibiotic to the other and there is no evidence</i> <i>Now we are going by the evidence, so we need the culture and sensitivity testing to help you, so it's very very... I think"</i>	Improved lab resources
Knowledge/Awareness on antibiotics use in Ghana		
What is your general opinion on antibiotics use in Ghanaian hospitals?	<i>"it's a major problem here in Ghana, a big issue here in Ghana because when you go to the hospital, I mean, almost every patient, at least almost every patient we put on an antibiotic"</i>	Antibiotic overuse

	<i>"Yes. There is a lot of antibiotic overuse and the sad aspect with that, they don't start from... I mean, you know the Accessible, the Watch and then the Reserve"</i>	
Can you explain to me some of the factors that contribute to the current practices?	<i>"as I mentioned earlier, resources are not available"</i> <i>"you have a lot of patients waiting for you, so you just go like working"</i>	Limited lab resources Staff shortages
To your knowledge are there any interventions put in place or any steps taken to help with antibiotics use in this hospital?	<i>"I think more resources should be available to help so that the lab scientists"</i> <i>"Then more pharmacists should also be employed"</i>	
Prescribing patterns		
Tell me about the antibiotics that are commonly used in this hospital, what are the common classes prescribed?	<i>"So Amoxiclav and then Cefazolin"</i> <i>Those two, almost every patient in Ghana who has been admitted at the hospital has been... They've been on that medication."</i>	Broad spectrum antibiotics
Are the prescribed antibiotics in the essential medicines list and hospital formulary?	<i>"Yeah-yeah, they are."</i>	Yes, on the EML
What are the common indications requiring antibiotic prescriptions? <i>{Review the need for this}</i>	<i>"Upper respiratory tract infection and STI"</i>	URTI and STIs
In your hospital practice, do you normally use antibiotics by brand names		

or by generic names...tell me about any reasons or factors that will affect generic or brand name use?	<i>"We use both. We use both brand name and generic".</i>	Both
Decision making process		
What are the factors that influence the choice of antibiotics you prescribed and dispensed?	<i>"So the issue is that I have my colleagues, the other medical doctors who comes to you and say that they think the generic is not working for a patient, they think it doesn't contain the right amount of... I mean the right strength in the medication because they keep giving it to the person but it doesn't work. But the moment they switch from let's say the generic to a brand, then they begin to get some..."</i>	Perceive brands are more effective
Are there treatment guidelines or antibiotic policies available to guide antibiotics use?	<i>"Yes. So from our standard treatment guidelines, for every infection they have their first line that are to be used, they have second line there, sometimes third line they have for that infection, so we try as much as possible to follow."</i>	STG available
How often do you consult guidelines/policies/official books when dealing with antibiotics in the hospital?	<i>"For me every time I'm at the ward I check. I make sure that what you are doing, I mean if they're able to give me the right diagnosis that this infection is let's say pneumonia, bronchial pneumonia, then I'll be able to tell the right antibiotic to be used."</i>	As often as needed
In your opinion, do patients have any role to play in deciding if/ which antibiotic should be prescribed and dispensed to them?	<i>"Well sometimes, yes, a patient can actually push for that" ".... they just want an antibiotic. Sometimes they'll push you to prescribe an antibiotic"</i>	Patient pressure
Recommended strategies		

<p>In your opinion what interventions should be implemented in this setting to improve antibiotics use?</p> <p>Toolkits or checklists as potential facilitators?</p>	<p><i>"I've answered this in a different way but I think the first one should be the resources, the resources should be available, human resources"</i></p> <p><i>"I mean, for them to be able to go by, so that they will be able to do a culture and sensitivity test, so that they'll be able to go for the right antibiotic to be used"</i></p> <p><i>'then as a pharmacist, if I'm doing my... In my role I'll be able to guide them appropriately"</i></p>	<p>Improved labs Manpower</p>
<p>What would be the likely barriers in implementing this intervention(s)</p>	<p><i>"Obviously, I mean money will play a key issue. Yes, so our finances"</i></p>	<p>Funding</p>