USAID MEDICINES, TECHNOLOGIES, AND PHARMACEUTICAL SERVICES (MTAPS) PROGRAM

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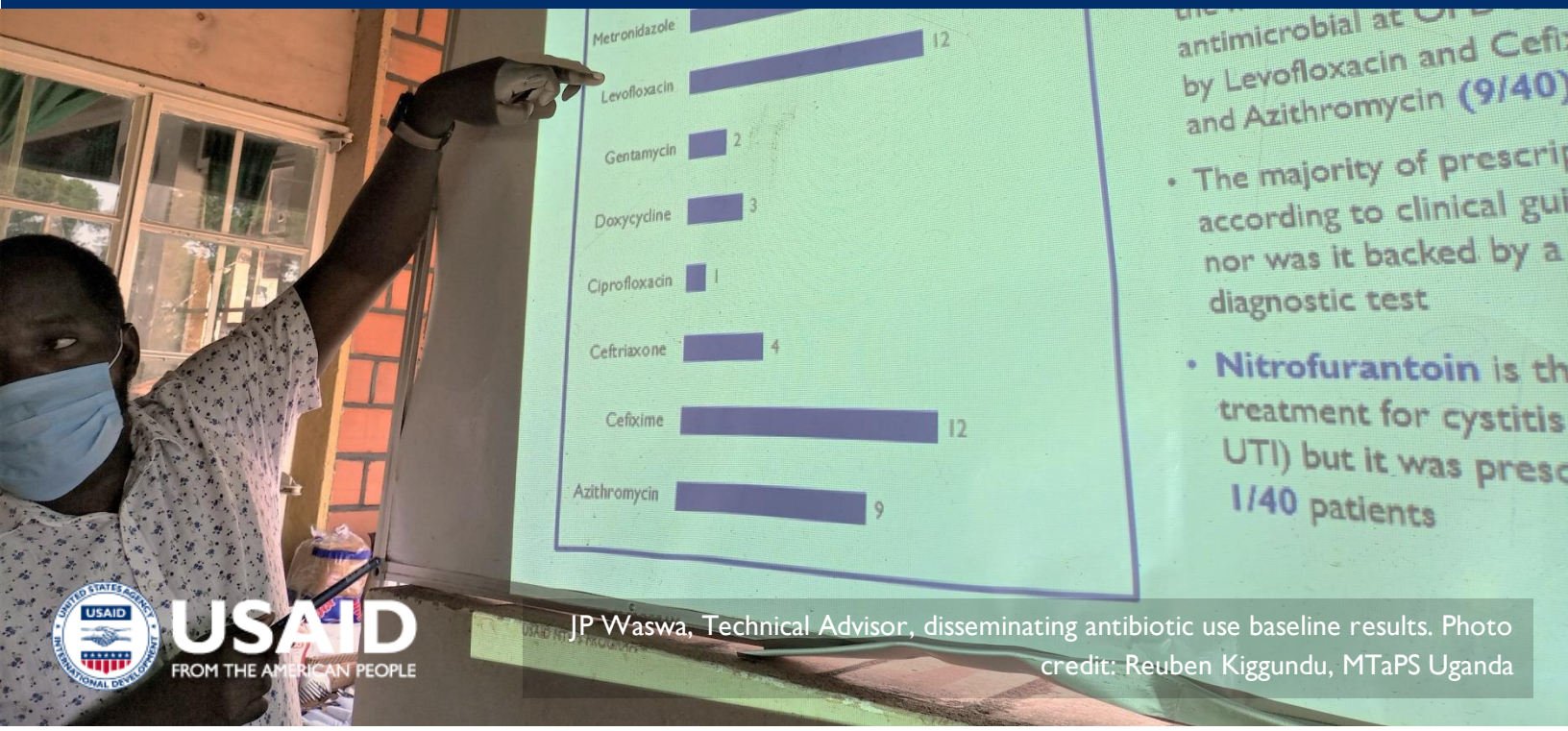

JP Waswa, Technical Advisor, disseminating antibiotic use baseline results. Photo credit: Reuben Kiggundu, MTaPS Uganda

Implementation of Centers of Excellence for AMS in Uganda: Progress to Date and Measurement of the Impact of CQI Interventions

Technical Brief | November 2022 | UGANDA

Background

The US Agency for International Development (USAID) Medicines, Technologies, and Pharmaceutical Services (MTaPS) program, working with the Ministry of Health (MOH), established centers of excellence (CoEs) for antimicrobial stewardship (AMS) in selected hospitals, including both private not-for-profit (PNFP) and public hospitals, with the goal of improving the use of antimicrobials and contributing to efforts to combat antimicrobial resistance (AMR). These CoEs are expected to cascade lessons learned to the lower-level health facilities. This activity is in line with Strategic Objective 3 (promote optimal access and use of antimicrobials) of the Uganda national action plan (NAP) for AMR[1] and contributes to the indicator P.3.4 of the second edition of the Joint External Evaluation tool.[2] An AMS program is a systematic approach to developing coordinated interventions to reduce overuse and inappropriate selection of antibiotics, and to achieve optimal outcomes for patients in cost-efficient ways.

[1] Government of Uganda. Antimicrobial Resistance National Action Plan 2018-2023.
[2] WHO. 2018. Joint external evaluation tool: International Health Regulations (2005), second edition ISBN 978-92-4-155022-2

Through both monitoring and, when necessary, altering current antimicrobial prescribing practices, AMS has been shown to improve patient care, reduce antimicrobial use (AMU), reduce AMR, and reduce pharmacy and overall hospital operating costs.[3]

Objectives and Approach

Objectives of the AMS CoEs

The goal of the MTaPS-supported AMS implementation was to establish AMS CoEs. The AMS program existing within the hospital structure was assembled to supply exceptionally high concentration of AMS expertise and related resources and deliver a comprehensive, interdisciplinary environment to afford the best patient outcomes possible.[4] This was to be achieved by meeting the following objectives:

1. Establishing a culture change in health facilities in relation to AMU
2. Creating knowledge for sustainable use of antibiotics (right drug, dose, and duration)
3. Assisting and encouraging patients to understand AMS
4. Developing a culture of measuring antibiotic use
5. Reducing the inappropriate use of antibiotics in identified common causes of misuse of antibiotics: surgical antibiotic prophylaxis (SAP), urinary tract infection (UTI), and upper respiratory tract infection (URTI) management
6. Building capacity for a pool of AMS experts that can support the lower-level health facilities
7. Establishing a network of AMS CoEs and encouraging a spirit of data collection, information exchange, and mentorship between health facilities

Technical approaches

International best practice guidance from the World Health Organization (WHO)[5] and Centers for Disease Control and Prevention[6] were used as reference materials when building the AMS programs. Activity implementation was based on the WHO multi-modal strategy that encourages the use of multi-faceted interventions when implementing health facility interventions to create sustainable change. The strategy was initially developed for infection prevention and control (IPC) implementation such as hand hygiene, but was found to be a useful approach for AMS implementation. The strategy consists of five approaches: system change (build it), education and training (teach it), monitoring and feedback (check it), reminders and communication (sell it), and culture change (live it). MTaPS applied the multi-modal strategy to ensure we build AMS programs in hospitals that will lead to culture change to ensure the long-term sustainability and impact of the interventions. Additionally, continuous quality improvement (CQI) implementation followed the Plan-Do-Study-Act (PDSA) or Deming cycle as recommended in the MTaPS guidance for CQI implementation.[7]

Gradual implementation

AMS interventions were introduced at health facilities using a gradual implementation approach. The use of a gradual implementation approach ensured systematic capacity building, leveraging on "low-hanging fruits" as programmatic capacity was built at both health facility and national level for future implementation of specific AMS interventions. The intervention was implemented in 2 phases: Phase 1 (April 2020–March 2021) and Phase 2 (April 2021–June 2022).

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[3] Timothy H. Dellit et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship, Clinical Infectious Diseases, Volume 44, Issue 2, 15 January 2007, Pages 159–177, https://doi.org/10.1086/510393

[4] Elrod, J.K., Fortenberry, J.L. Centers of excellence in healthcare institutions: what they are and how to assemble them. BMC Health Serv Res 17 (Suppl 1), 425 (2017). https://doi.org/10.1186/s12913-017-2340-y

[5] World Health Organization. (2019). Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries: a WHO practical toolkit. World Health Organization. https://apps.who.int/iris/handle/10665/329404. License: CC BY-NC-SA 3.0 IGO

[6] CDC. Core Elements of Hospital Antibiotic Stewardship Programs. Atlanta, GA: US Department of Health and Human Services, CDC; 2019. Available at https://www.cdc.gov/antibiotic-use/core-elements/hospital.html.

[7] MTaPS. 2022. A Technical Guide to Implementing Facility Level Antimicrobial Stewardship Programs in MTaPS Program Countries. Arlington, VA: Management Sciences for Health. https://www.mtapsprogram.org/wp-content/uploads/2021/03/USAID-MTaPS-Mini-guide-for-facility-AMS-program.pdf

Phase 1: Getting started

Roadmap for AMS stewardship: Assessment of current practices -> Establish core team -> Planning and implementation -> Outcomes and business case

a. Baseline surveys

Working with the MOH and the USAID-funded Uganda Health Supply Chain program, hospitals for support were identified **(table 1)**, including six public hospitals and seven PNFP hospitals. The focus of the intervention during program year 1 and 2 was to establish a baseline, followed by building hospital AMS programs at the health facilities. To achieve this, a baseline survey was undertaken using the WHO AMS practical toolkit's[8] checklist of 28 items spread over 6 core elements of a health care facility AMS program. The baseline assessment found sub-optimal AMS program capacity with a lack of structures, defined systems, and roles for implementation of AMS programs **(figure 1)** at the 13 health facilities.

Working with the MOH, MTaPS conducted a point prevalence survey (PPS) for antibiotic use in the identified 13 health facilities using the WHO PPS methodology.[9] The results showed 73.7% (794/1,077) of patients were prescribed antibiotics and 61% had more than one antibiotic prescribed, predominantly ceftriaxone, metronidazole, gentamicin, and ampicillin. In addition, considering the WHO Access, Watch, and Reserve (AWaRe) categorization of antibiotics, 46.5% of prescriptions were from the WHO Access group; 43.5% from the Watch group; and 10% were unclassified/non-recommended. Only 30.1% of prescriptions were consistent with clinical guidelines. Community-acquired infections (41.6%), medical prophylaxis (29.1%), and surgical prophylaxis (23%) were the most common indications. Factors associated with higher antibiotic use were age of greater than 50 years, male gender, HIV-positive status, malnutrition, and a public hospital setting.[10] **Table 2** shows the most prescribed antibiotics by indication among admitted patients in the surveyed hospitals.

b. Setting up hospital AMS programs

Interventions implemented during Phase 1 were focused on building the foundation for the hospital AMS programs (i.e., stronger governance and leadership for AMS at the 13 hospitals). MTaPS provided technical assistance to the hospitals to develop facility AMS work plans that focused on defining structures, systems, and roles in which hospital AMS programs would operate. The activities included obtaining hospital management buy-in into the program and taking ownership, the appointment of hospital medicine and therapeutics committees (MTCs), and the appointment of AMS sub-committees of the MTC and IPC committees. Subsequently, the hospitals were supported to develop and implement a CQI plan for AMS. Additionally, a system for the regular meeting of the committees, documentation of meeting proceedings, and taking actions from the meetings and hospital education activities—including continuous medical education (CME) and continuous professional development—were set up. Working with the hospitals, a mentorship guide was developed for use by MTaPS and the hospitals. Activity implementation was done cognizant of the PDSA cycle and local hospital context. Following the findings of the baseline surveys, early experiences, and lessons learned from the AMS implementation in the 13 hospitals, 6 hospitals were prioritized to be the focus of intensified AMS support to develop them into CoEs for AMS **(table 1)**. These hospitals had more interested personnel to implement AMS, strong administrative support, and highly positive response for AMS mentorship and support supervision.

[8] WHO. 2019. Antimicrobial Stewardship Programs in Health-Care Facilities in Low- and Middle-Income Countries: A WHO Practical Toolkit.
[9] WHO. 2018. WHO Methodology for Point Prevalence Survey on Antibiotic Use in Hospitals, version 1.1. Available from: https://apps.who.int/iris/rest/bitstreams/1175969/retrieve
[10] R Kiggundu et al. Point Prevalence Survey of Antibiotic Use across 13 Hospitals in Uganda. Antibiotics 2022, 11, 199. https://doi.org/10.3390/antibiotics11020199

Table 1. Characteristics of hospitals participating in the MTaPS AMS program

	Ownership	Performs antimicrobial susceptibility testing	Hospital bed capacity	Admissions 2018/19	Surgeries 2018/19
Ruharo Mission	PNFP	No	78	2,720	98
St. Anthony	PNFP	No	93	1,431	149
Naggalama*	PNFP	No	100	4,922	256
Moroto	Public	Yes	181	7,476	1,822
Hoima	Public	Yes	317	17,142	10,296
Kagando*	PNFP	No	231	11,987	893
Kiwoko*	PNFP	Yes	204	9,622	1,723
Kumi*	PNFP	No	330	4,434	1,289
Lacor*	PNFP	Yes	482	16,239	9,114
Masaka	Public	No	333	24,177	16,346
Soroti	Public	No	254	12,889	9,987
Lira	Public	No	401	13,221	8,235
Gulu*	Public	Yes	347	17,539	11,998

**CoEs*

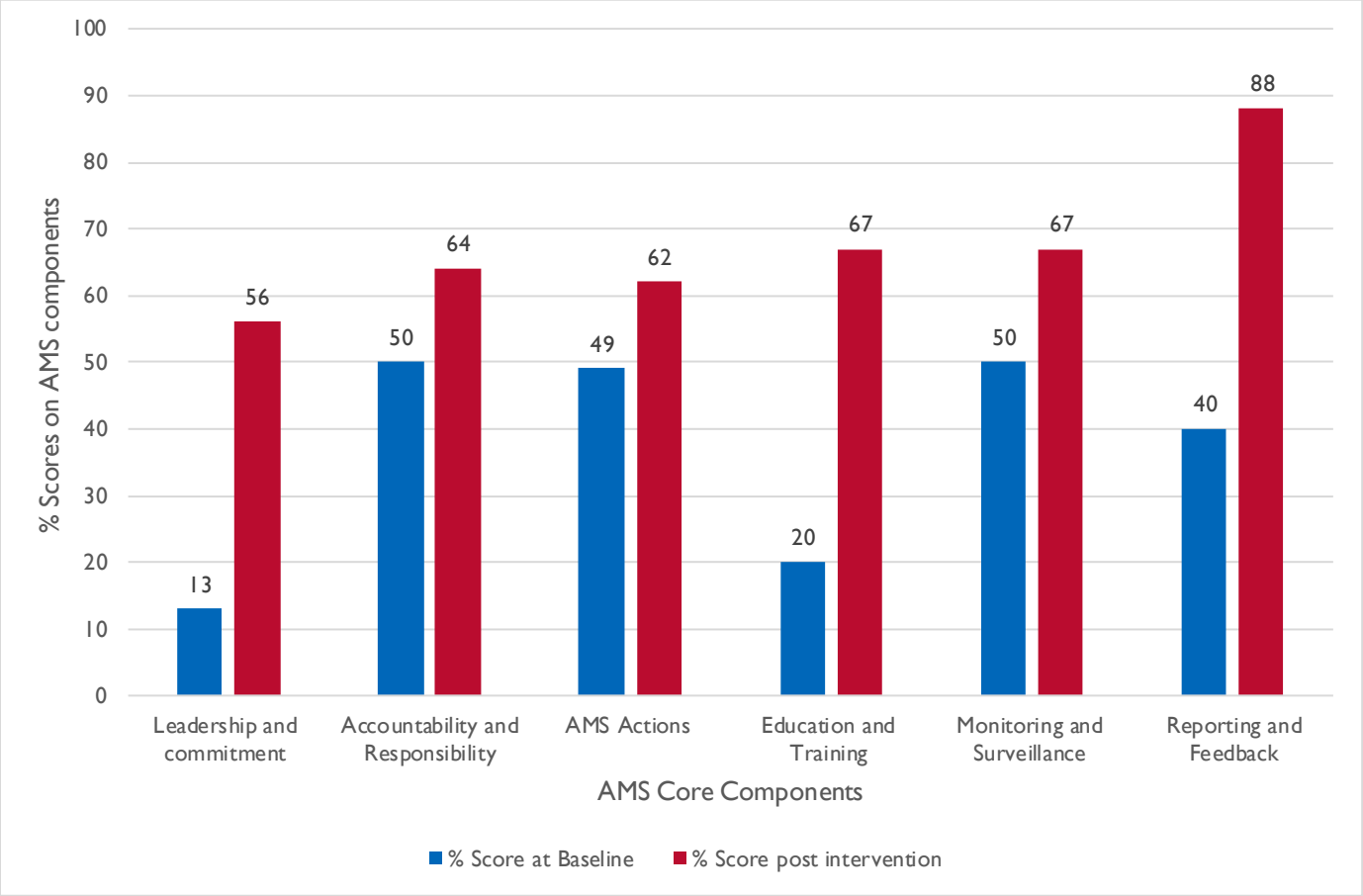


Figure 1. Column graph showing the change in AMS capacity at baseline (March 2020) and after intervention (February 2022)

Table 2. Prevalence of antibiotic use by indication[11]

Antibiotic	All prescriptions (n = 1,387)	Community-acquired infection (n = 577)	Hospital-associated infection (n = 87)	Medical prophylaxis (n = 404)	Surgical prophylaxis (n = 319)
Ceftriaxone	513	183 (35.7%)	21 (4.1%)	177 (34.5%)	132 (25.7%)
Metronidazole	380	121 (31.8%)	26 (6.8%)	98 (25.8%)	135 (35.5%)
Gentamicin	119	70 (58.8%)	12 (10.1%)	22 (18.5%)	15 (12.6%)
Ampicillin	89	55 (61.8%)	5 (5.6%)	27 (30.3%)	2 (2.2%)
Ampicillin- cloxacillin	79	31 (39.2%)	4 (5.1%)	31 (39.2%)	13 (16.5%)
Ciprofloxacin	45	25 (55.6%)	2 (4.4%)	15 (33.3%)	3 (6.7%)
Cloxacillin	27	17 (63%)	1 (3.7%)	5 (18.5%)	4 (14.8%)
Amoxicillin	26	12 (46.2%)	0 (0%)	10 (38.5%)	4 (15.4%)
Azithromycin	19	15 (78.9%)	0 (0%)	3 (15.8%)	1 (5.3%)
Penicillin	16	10 (62.5%)	T0 (0%)	5 (31.3%)	1 (6.3%)
Levofloxacin	15	10 (66.7%)	4 (26.7%)	1 (6.7%)	0 (0%)
Other*	59	28 (47.5%)	12 (20.3%)	10 (16.9%)	9 (15.3%)

**Other category includes the following antibiotics: nitrofurantonin (n = 10), cefotaxime (n = 7), flucamox (n = 7), cef-sulbactam (n = 5), cefixime (n = 4), meropenem (n = 4), piperacillin-tazobactam (n = 4), sulbactam (n = 4), co-trimoxazole (n = 3), erythromycin (n = 3), ceftazidime (n = 2), amoxyclav (n = 1), doxycycline (n = 1), secnidazole (n = 1), tinidazole (n = 1), clindamycin (n = 1), cefazolin (n = 1)*

Phase 2: Strengthening CoEs through implementing CQI plans

Following the successful establishment of hospital AMS programs (foundation building) during Phase 1, MTaPS identified additional areas of support to improve antibiotic use for specific conditions/priority areas in the six selected hospitals.

a. Prioritization of interventions and development of CQI plans

Training on the CQI plan development process for AMS was undertaken for all 13 hospitals. This was guided by baseline, including AMU surveillance. The hospital AMS teams were trained in identification of stakeholders for hospital AMS programs; resource needs assessment; feasibility of AMS intervention implementation at the health facility (ranking); making AMS intervention specific (choosing specific interventions for prioritized actions); Strengths, Weaknesses, Opportunities, Threats analysis for the hospital AMS programs; barriers and mitigation plan for AMS programs; and development of the CQI plan. An example of the AMS CQI plan is shown in **annex 1.**

b. Implementation of CQI plans

MTaPS developed a mentorship and support supervision guide to use for systematic capacity building at the health facilities. To further the transfer of skills, 2,244 health workers cumulatively received mentorships—1,036 (46%) male and 1,208 (54%) female—through 90 mentorship visits and 38 health facility education and training activities including CMEs, since program year 1 (**table 3**).

Table 3. Number of mentorships and support supervision

Health facility mentorships (HCWs reached)				
Program year	**Quarter of implementation**	**Male (%)**	**Female (%)**	**Total**
Oct 2019 to Sept 2020	Q1-Q4	211(45)	254(55)	**465**
	Q1	26(45)	32(55)	**58**
	Q2	205(43)	271(57)	**476**
	Q3	228(45)	275(55)	**503**

[11] Ibid.

Health facility mentorships (HCWs reached)				
Program year	**Quarter of implementation**	**Male (%)**	**Female (%)**	**Total**
Oct 2020 to Sept 2021	Q4	45(60)	30(40)	**75**
Oct 2021 to Sept 2022	Q1	216(43)	286(57)	**502**
	Q2	105(64)	60(36)	**165**
Total		**1,036(46)**	**1,208(54)**	**2,244**
Number of health facility mentorships conducted				
Oct 2019 to Sept 2020	Q1-Q4	12		
Oct 2020 to Sept 2021	Q1	8		
	Q2	26		
	Q3	16		
	Q4	8		
Oct 2021 to Sept 2022	Q1	14		
	Q2	6		
Total		**90**		
Health facility education and training activities				
Oct 2019 to Sept 2020	Q1-Q4	6		
Oct 2020 to Sept 2021	Q1	8		
	Q2	9		
	Q3	4		
	Q4	3		
Oct 2021 to Sept 2022	Q1	6		
	Q2	2		
Total		**38**		

Additionally, MTaPS has provided technical assistance to the CoEs, including printing and distribution of information, education, and communication materials; guidelines; and reminders in the workplace. Copies of the WHO toolkit on AMS in low-and middle-income countries,[12] the MTC manual,[13] AMS posters, and antibiotic use prompts were provided to all MTaPS-supported health facilities in Uganda.

Benchmark and peer-to-peer learning

To foster practical learning, MTaPS supported a peer-to-peer benchmarking and learning activity among the members of the AMS and IPC teams from the CoEs.[14] The aim was to foster practical exchange of knowledge, skills, and best practices for AMS and IPC among the participants. The learning was done at St. Mary's Hospital - Lacor, Gulu, one of the best performing facilities in both IPC and AMS. The participants had interactions on the operation of the committees and teams, rotated in key learning units while involved in the day-to-day activities of the facility guided by the unit heads and the members from the AMS/MTC and IPC committees.

AMU surveillance

AMU surveillance is a key component of hospital AMS programs and is one of the strategic objectives of the global action plan on AMR and Uganda's NAP-AMR. To ensure ownership of the interventions, it was important to use locally generated data to address these challenges. With Uganda currently lacking a system for AMU surveillance, MTaPS trained the hospital staff on application and interpretation of the data collection tools (i.e., the WHO PPS methodology and the WHO daily defined dose methodology [tool modified under the Systems for Improved Access to Pharmaceuticals

[12] World Health Organization. (2019). Antimicrobial stewardship programmes in health-care facilities in low- and middle-income countries: a WHO practical toolkit. World Health Organization. https://apps.who.int/iris/handle/10665/329404. License: CC BY-NC-SA 3.0 IGO
[13] MOH. 2018. Medicine and Therapeutics Committee manual. Available from file: https://health.go.ug/sites/default/files/MTC%20Manual%20FINAL_print%20copy_21st%20Jan_19%20%281%29.pdf
[14] Kasujja, H, Kwikiriza, G, and Kiggundu, R. Facilitating Peer-to-Peer Knowledge Exchange in Uganda to Contain Antimicrobial Resistance. June 8, 2022. https://www.mtapsprogram.org/news-blog/facilitating-peer-to-peer-knowledge-exchange-in-uganda-to-contain-antimicrobial-resistance/

and Services program]). The data and findings were used to develop CQI plans for AMS. MTaPS subsequently disseminated the findings to the health workers. Results were also shared with the health facility leadership to generate further buy-in for the program. Data showed UTIs, URTIs, and SAP as the most common causes of antibiotic overuse in health facilities, a finding that is backed up by literature and data from other countries.[15,16,17]

Key Results

The intervention results for the three indicators—UTI, URTI, and SAP for caesarean section—for the six CoEs are shown below.

1. **Urinary Tract Infection (UTI)**
   Figure 2 shows the change in adherence to standard treatment guidelines (STGs), percentage of injectable antibiotics, and number of antibiotics per patient pre- and post-intervention period. There was demonstrated increase in the adherence to STGs (i.e., Uganda Clinical Guidelines 2016 from 37% to 58%). Additionally, there was a reduction in the average number of antibiotics per patient from 1.66 to 1.26. Further still, there was a small but significant reduction in the percentage of injectable antibiotics prescribed in the two study periods from 7.1% to 6.7%. There was a 5% increase in the prescriptions for Access antibiotics, with a reduction in the prescriptions for Watch and non-recommended antibiotics by 2% as shown in figure 3. Overall, the MTaPS approach significantly reduced the consumption of and improved use of antibiotics for the management of UTI in 6 hospitals over an implementation period of 15 months.
2. **Upper Respiratory Tract Infection (URTI)**
   Overall, the number of URTI patients that were not prescribed antibiotics increased from 32% to 54%, demonstrating a decrease of 22% in the antibiotic prescriptions. Additionally, among patients that received antibiotics, there was a 14% demonstrated reduction in average number of antibiotics per patient from 1.16 to 1.00; however, the percentage of injectable antibiotics doubled to 13.7%. The MTaPS approach reduced consumption of antibiotics for management of URTI.

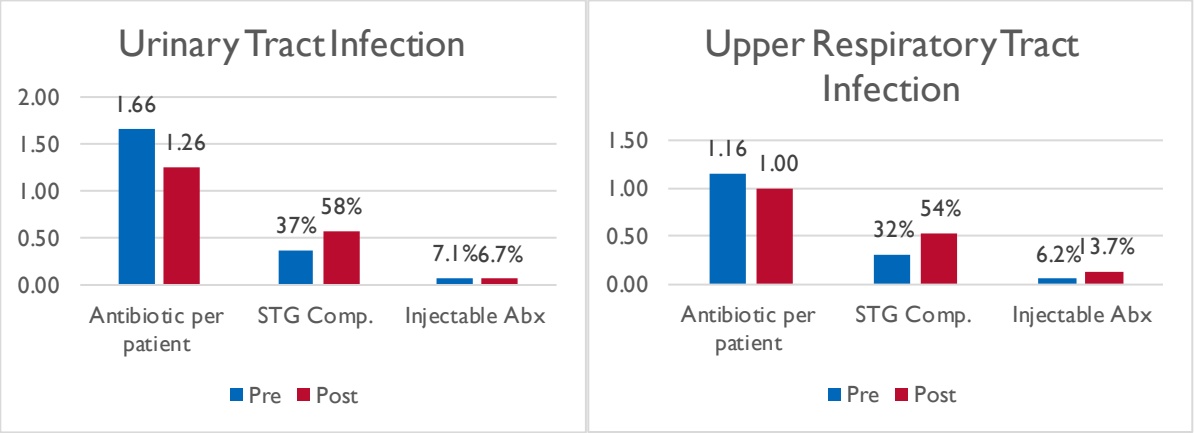


Figure 2. Graph showing the change in antibiotic consumption, adherence to STG, and percentage of injectable antibiotics pre- and post-intervention

[15] Cosgrove SE, Seo SK, Bolon MK, Sepkowitz KA, Climo MW, Diekema DJ, Speck K, Gunaseelan V, Noskin GA, Herwaldt LA, Wong E, Perl TM; CDC Prevention Epicenter Program. Evaluation of postprescription review and feedback as a method of promoting rational antimicrobial use: a multicenter intervention. Infect Control Hosp Epidemiol. 2012 Apr;33(4):374-80. doi: 10.1086/664771. PMID: 22418633. https://pubmed.ncbi.nlm.nih.gov/22418633/

[16] Hersh AL, Jackson MA, Hicks LA; American Academy of Pediatrics Committee on Infectious Diseases. Principles of judicious antibiotic prescribing for upper respiratory tract infections in pediatrics. Pediatrics. 2013 Dec;132(6):1146-54. doi: 10.1542/peds.2013-3260. Epub 2013 Nov 18. PMID: 24249823. https://pubmed.ncbi.nlm.nih.gov/24249823/

[17] ASHP Therapeutic Guidelines on Antimicrobial Prophylaxis in Surgery. American Society of Health-System Pharmacists. Am J Health Syst Pharm. 1999 Sep 15;56(18):1839-88. doi: 10.1093/ajhp/56.18.1839. PMID: 10511234. https://pubmed.ncbi.nlm.nih.gov/10511234/

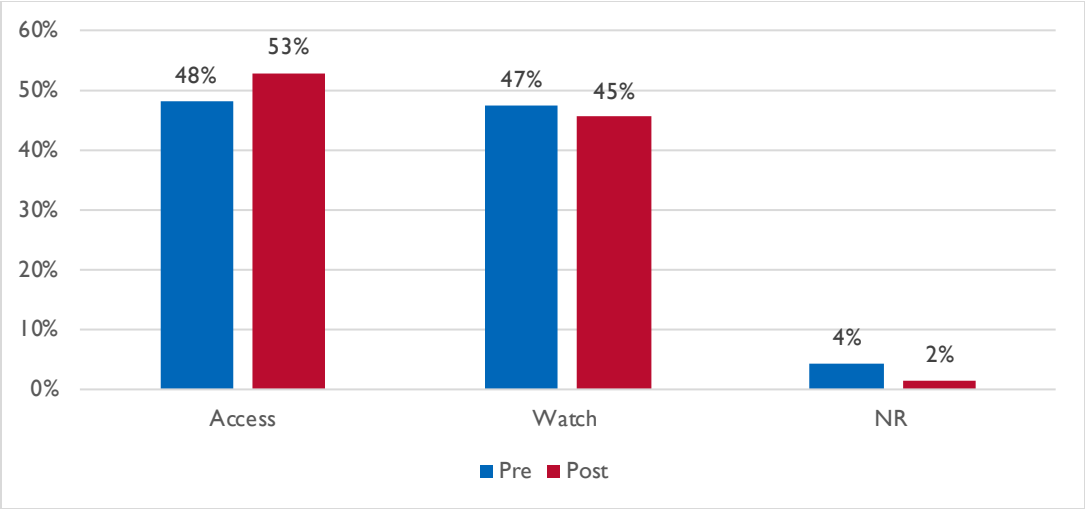


Figure 3. Graph showing the change in prescription of antibiotics for UTI by AWaRe categorization pre- and post-intervention

3. Surgical Antibiotic Prophylaxis (SAP)

Overall, only one hospital demonstrated improvement in adherence to STGs for SAP—an improvement of 13%. The rest of the hospitals did not show any improvement and reduction in antibiotic use and consumption, respectively. However, there was a reduction in the average number of doses administered for gentamicin, ceftriaxone, cefotaxime, and ampicillin as shown in figure 4. For metronidazole, cefixime, ampiclox, and amoxicillin, there was an increase in the average number of doses administered for SAP. The MTaPS approach did not significantly improve and reduce antibiotic use and consumption for SAP, respectively.

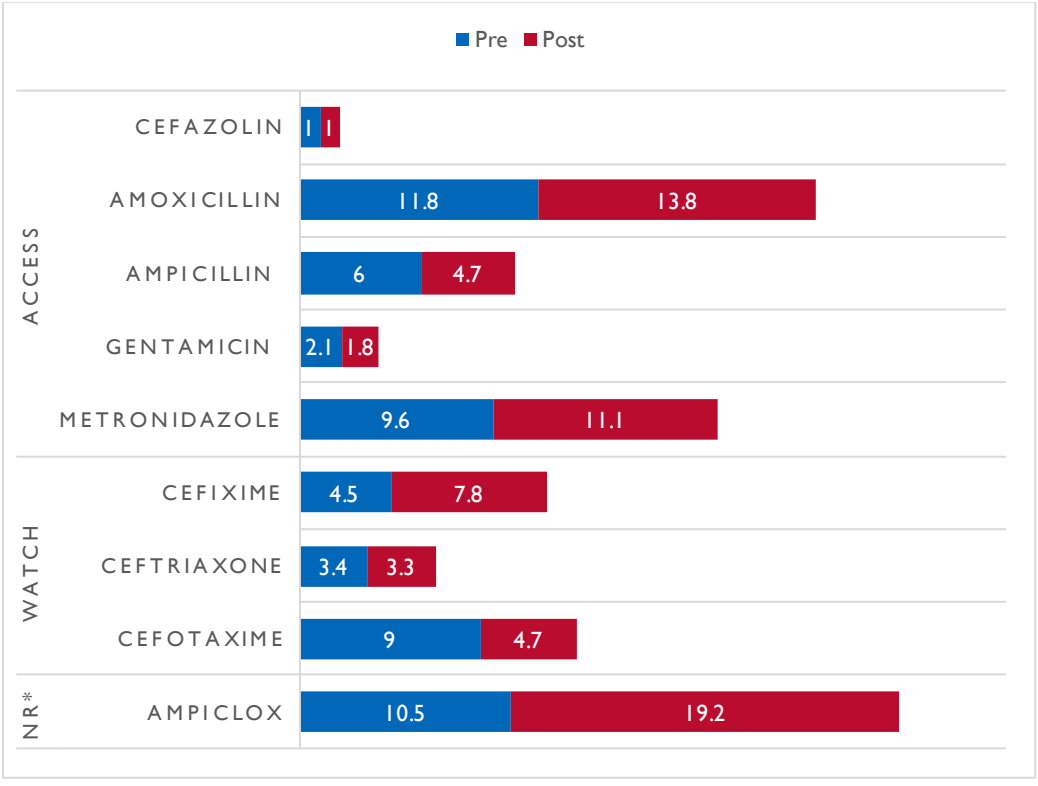


Figure 4. Graph showing the change in the average number of doses of antibiotics administered pre- and post-intervention

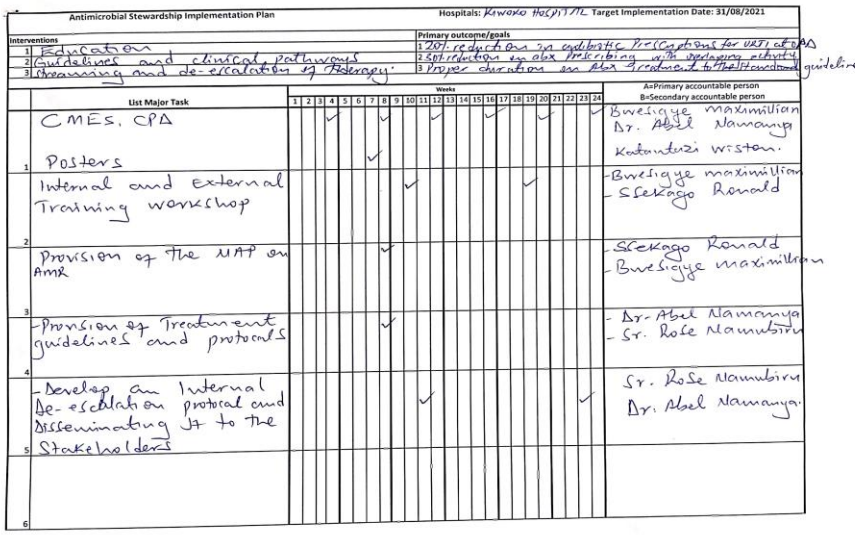
Challenges

1. Thin workforce in the supported health facilities made it harder to fully engage the busy key staff. The MTaPS team re-strategized to continuously engage those who were interested regardless of their seniority and to re-organize the AMS working team to fit this new system.
2. Lack of a dedicated budget for AMS activities in the health facilities with resultant inability to substantially implement some activities. A typical hospital AMS budget would include office and printing supplies, information and communications technology (ICT) support (airtime, internet access), meeting and training logistics (meals and drinks), and technical support (e.g., data analysis). The MTaPS team focused on building the capacity of the hospital AMS teams to identify and prioritize AMS problems that can be solved with the available resources. Techniques such as task-shifting were implemented successfully.
3. The HFs lack the necessary ICT infrastructure to support online trainings and remote mentorship. MTaPS' support does not include the purchase of ICT equipment to boost the infrastructure. Mentorship was done remotely through phone calls, social media platforms (WhatsApp), and physical visits and interactions.
4. There was a significant high turnover of trained staff rendering the hospital AMS teams and activities ineffective to maintain a stable momentum for AMS implementation. The MTaPS team focused on constant and regular trainings and mentorship activities to keep the AMS teams fully equipped with knowledge for AMS implementation.

Lessons Learned

1. The MTaPS AMS approach can improve antibiotic use for UTI and URTI if capacity building and development is done in a stepwise manner. It has been demonstrated how a targeted stepwise approach spaced over time can be harnessed and repurposed for AMS implementation.
2. Health facilities with diagnostic laboratory services increase the likelihood of providing AMS teams with quality-assured results to support diagnosis of the most common infections. Most of the intervention hospitals had access to laboratory services which need significant resources amidst a strained hospital budget. We learned that there is a lot that can be done in the absence of laboratory support for AMS interventions by making significant progress in AMS.
3. SAP requires a more furnished approach since it involves more senior personnel (surgeons and anesthesiologists) who may require a different approach to influence their prescription behavior.
4. Leadership is an important factor for implementation of AMS quality improvement programs. Efficient leadership for AMS empowers frontline health care workers to take direct responsibilities for AMS activities.

Annex 1: Example of an AMS CQI plan



Antimicrobial Stewardship Implementation Plan — Hospitals: Kaweoko Hospital Ltd — Target Implementation Date: 31/08/2021

Interventions	Primary outcome/goals
1 Education	1 20% reduction in antibiotic Prescriptions for URTI at OPD
2 Guidelines and clinical pathways	2 50% reduction in Abx Prescribing with improving clinical outcomes
3 Streaming and de-escalation of Abxtherapy	3 Proper duration on Abx treatment to the Recommended guidelines

	List Major Task	Weeks 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	A=Primary accountable person B=Secondary accountable person
1	CMEs, CPA Posters	✓ ✓ ✓ ✓ ✓ ✓	Bwesigye maximillian Dr. Abel Namanya Katuntuzi Wiston.
2	Internal and External Training workshop	✓ ✓	-Bwesigye maximillian - Sekagga Ronald
3	Provision of the NAP on AMR	✓ ✓	- Sekagga Ronald - Bwesigye maximillian
4	- Provision of Treatment guidelines and protocols	✓ ✓	- Dr. Abel Namanya - Sr. Rose Nambiru
5	- Develop an Internal De-escalation protocol and Disseminating it to the Stakeholders	✓ ✓	Sr. Rose Nambiru Dr. Abel Namanya.
6			

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About USAID MTaPS:

The USAID Medicines, Technologies, and Pharmaceutical Services (MTaPS) Program (2018–2023) enables low- and middle-income countries to strengthen their pharmaceutical systems, which is pivotal to better health outcomes and higher-performing health systems. The program is implemented by a consortium of global and local partners, led by Management Sciences for Health (MSH), a global health nonprofit.