Enhancing Rational Use of Antimicrobials in Jordan

Technical Brief | February 2024

Optimizing the use of antimicrobials in Ministry of Health facilities through standardized clinical protocols

Background

Jordan's Ministry of Health (MOH) developed a National Action Plan (NAP) on antimicrobial resistance (AMR) for 2018–2022 (1), which was recently updated for the period of 2023–2025 (2). The NAP emphasizes the One Health approach, with the human health, animal health, and environment sectors contributing towards minimizing the emergence and impact of AMR in Jordan. The NAP's five objectives are aligned with the objectives enunciated in the World Health Organization (WHO) Global Action Plan on AMR (3):

1. Improve awareness and understanding of AMR through effective communication, education, and training.
2. Strengthen knowledge and evidence through surveillance.
3. Reduce the incidence of infection through effective infection prevention and control.
4. Optimize the use of antimicrobial agents in humans, animals, and food.
5. Promote investments for AMR activities, research, and innovations.

The US Agency for International Development (USAID) Medicines, Technologies, and Pharmaceutical Services (MTaPS) program joined forces with key stakeholders from the MOH to facilitate the implementation of the NAP's fourth objective. This collaborative effort aimed to support the rational use of antimicrobials (RUA) and aligned seamlessly with the national antimicrobial stewardship (AMS) program (4).

AMS is one of three pillars of an integrated approach to strengthening health systems, along with infection prevention and control (IPC) and medicine and patient safety (1,2). Linking all three pillars to other key components of infection management and health systems strengthening, such as AMR surveillance and the adequate supply of quality-assured medicines, promotes equitable and quality health care toward the goal of achieving universal health coverage.

MTaPS actively supported the MOH in implementing AMS interventions at both central and facility levels. This cooperative approach involved the development and implementation of key antibiotic prophylaxis and treatment protocols known locally as the RUA protocols, which were specifically developed to help optimize the use of antimicrobial agents in humans. The overarching goal was to enhance patient outcomes and safety for selected clinical conditions.

Problem Statement

Recent studies (5–10) on AMR in Jordan have underscored concerning trends in adherence to antibiotic prophylaxis guidelines. Moreover, challenges in implementing interventions within the AMS program have been identified (5). According to an evaluation of surgical antibiotic prophylaxis adherence through a systematic review spanning 2004–2014, significant variations were observed in key indicators such as appropriate timing, choice, and discontinuation of antibiotics. The findings revealed that inadequate adherence to prophylactic surgical antimicrobial

guidelines and protocols was prevalent. This highlights the urgent need for interventions to improve compliance and enhance the effectiveness of perioperative infection prevention measures.

This issue is a problem globally, particularly in low- and middle-income countries. For instance, in a study examining the utilization of surgical antibiotic prophylaxis (SAP) in endourological surgeries, an audit in two medical centers in Amman, Jordan, identified significant non-compliance with international guidelines (6). Among the 361 patients studied, adherence rates to guidelines for the indication, choice, and dose of pre-operative antibiotics were 90.3%, 2.8%, and 77.8%, respectively. Adherence to the recommended duration was noted in only 3.4% of participants. Among the studied patients, 4.6% developed bacterial urinary tract infections and 0.7% developed bloodstream infections as health care-associated infections. These findings underscore critical issues, including inappropriate antibiotic selection and prolonged use without documented infectious complications.

Moreover, the aggregated results from multiple research projects on AMS programs in Jordanian public hospitals revealed a range of significant problems (7). A major issue is the ineffective execution of those programs, despite longstanding policies backing them, as highlighted in a 2022 survey covering 27 public hospitals. This survey pinpointed critical deficiencies, including insufficient financial support, lack of training, weak collaborative efforts within and outside the hospitals, and limited access to information technology and diagnostic tools. One study specifically emphasized the absence of strong hospital leadership and collaborative efforts as key factors hindering the effectiveness of AMS programs (8). Another study that explored 1,173 cesarian section operations reported compliance with antimicrobial prophylaxis guidelines in only 2.7% of those cases (9). Additionally, one study reported an increasing occurrence of multidrug-resistant bacteria in wound infections and the urgent need to update infection control practices and revise antibiotic usage protocols (10).

Collectively, these studies call for improved implementation strategies, leadership, compliance, and monitoring of AMS programs to effectively address the challenge of antimicrobial resistance in Jordan's health care system.

Technical Approach

Stakeholder Engagement

MTaPS Jordan has been actively supporting the MOH on various interventions aimed at improving the containment of AMR. These interventions are categorized into clinical and awareness interventions. In the realm of clinical interventions, MTaPS has been actively working to address needs in IPC and AMS.

Ensuring the effective implementation, follow-up, and monitoring of these AMR interventions requires the active engagement of key decision-makers and technical stakeholders at different levels, including the central directorates and facilities.

At first, MTaPS provided governance support by engaging the National AMS Committee and the Advisory Committee for Infection and Prevention Control (ACIPC), as well as central-level stakeholders from the Communicable Diseases Directorate, Institutional Development and Quality Control Directorate (IDQCD), Pharmacy and Clinical Pharmacy Directorate (PCPD), Nursing Directorate, Central Laboratories Directorate, Allied Medical Professions Directorate, and Procurement and Supply Directorate.

The engagement approach included scheduling and facilitating meetings and discussions to address the needs and challenges related to AMR. These conversations centered on the MOH's existing antimicrobial guidelines for specific health conditions, including their implementation. MTaPS concentrated on helping implement interventions prioritized within the AMS program, focusing on strategies that are effective and impactful.

MTaPS and representatives from the MOH conducted several visits to various MOH hospitals to assess gaps and needs and identify opportunities based on the hospital's priorities. The MOH selected two main facilities—Al Salt Hospital and Al Mafraq Governmental Hospital—as pilot hospitals to help implement the initiative of RUA protocols development and follow-up through their AMS teams.

Implementation

Development of the RUA protocols was based on a locally led iterative review and involved reducing variations in the practice of antibiotic prophylaxis and

treatment and bringing opportunities for improved pharmaceutical care and cost containment. Using this approach, the activity was designed to standardize protocols and procedures for antibiotic prophylaxis and treatment using evidence-based science and strengthen the monitoring and evaluation system, thus helping improve adherence to these protocols. Such implementation cycles support incremental progress and reduce the misuse and abuse of antimicrobials.

MTaPS supported the MOH in leading the first cycle, while the MOH subsequently held the second one with minimal support from MTaPS.

- The first cycle included the following steps:
  - Relevant stakeholders (the PCPD, IDQCD, Infection Prevention and Control Department [IPCD], and National AMS Committee) were engaged.
  - The central and pilot hospital-based AMS committee terms of reference (TOR), which included the committees' titles, roles, and responsibilities as well as the reporting process and implementation timeline, was updated.
  - The TOR was approved and disseminated to the pilot hospital-based AMS committees.
  - Continuous mutual feedback was provided between the pilot hospital AMS committees and related MOH central directorates.
  - Challenges in implementation were identified.
  - Two technical workshops for the pilot hospitals were organized to develop the RUA protocols.
  - Related protocols adherence monitoring and evaluation tools were developed.
  - The first round of the continuous quality improvement (CQI) cycle for the pilot hospitals was conducted to ensure compliance with the developed protocols.
- The second cycle included the following steps:
  - Relevant stakeholders (PCPD, IDQCD, IPCD, and the facility-based AMS committee) were engaged.
  - The approved hospital-based AMS committee TOR were disseminated to all MOH hospitals.
  - Continuous feedback was provided between the pilot hospitals and the central PCPD and IDQCD.
  - Orientation workshops for pilot hospital service providers were conducted.
  - The related monitoring and evaluation tools and indicators for the selected hospital's AMS teams were disseminated.
  - The second round of the CQI cycle for the Al Salt and Al Mafraq Hospitals was conducted.
  - Continuous feedback and identified implementation challenges were provided through AMS committee monthly meetings.

MTaPS, in collaboration with the central MOH PCPD, Central Laboratories Directorate, Allied Medical Professions Directorate, and IDQCD, engaged health facility AMS teams from the two pilot hospitals to identify priority clinical areas for AMS interventions. Both hospitals focused on high-priority surgeries and infections.

Al Salt Hospital identified surgical antibiotic prophylaxis for arthroplasty surgeries and orthopedic surgeries (including spine) as a priority area to be addressed, along with challenges associated with the management of different urinary tract infection cases leading to an overuse of antibiotics. Al Mafraq Hospital identified surgical antibiotic prophylaxis for hernia repair surgeries and appendectomy as a priority area based on the frequency of these types of surgeries at the hospital.

MTaPS strategically continued facilitating effective engagement with and motivation of stakeholders during the process of protocol development and implementation. Rather than simply importing a protocol from a different institution or country, all related stakeholders were engaged and involved in the development of their local protocols and procedures. To drive local leadership and ownership, the development of protocols and procedures was based on the latest international evidence and local realities and followed MOH-specific processes for developing and updating guidelines and protocols (11). Thus, the protocols were tailored to the local context and processes but rooted in evidence and consensus.

Results and Achievements

Following a series of technical workshops, the AMS committees of both hospitals, in collaboration with central MOH stakeholders and technical support from MTaPS, finalized the antibiotic prophylaxis and treatment protocols and submitted them to the MOH PCPD for final review.

Central and hospital-level AMS committees discuss prophylaxis antibiotic protocols during the protocols review workshop for Al Mafraq Hospital on October 17, 2022, in Amman, Jordan.
Photo credit: MTaPS Jordan.

In March 2023, the Central Pharmacy and Therapeutics Committee approved the protocols, which was an important step towards their institutionalization. The PCPD then shared the protocols with His Excellency the Minister of Health, who approved the protocols for dissemination and supported their implementation across all MOH hospitals. MTaPS supported the MOH IDQCD in developing audit tools, including compliance checklists and key performance indicators, to monitor the adherence of hospital teams to the developed protocols. This will help ensure sustainability and patient safety.

MTaPS worked closely with the PCPD and IDQCD on implementing the CQI approach at both pilot hospitals for auditing protocol adherence using the developed compliance checklist and key performance indicators. MTaPS made onsite visits to both hospitals and provided hands-on technical support for the baseline data collection process to ensure the quality and accuracy of data collection, analysis, and reporting. The subsequent audit rounds, conducted after the protocol orientation sessions, were fully led by the two hospitals' AMS teams, where clinical pharmacists in coordination with the quality department collaborated to report on the adherence results. As of March 2024, both hospitals had completed a baseline and three rounds of audits, including data collection and analysis, with minimal support from MTaPS. Hospital indicators reported to the MOH will enable decision-makers and hospital leadership to institutionalize the protocols, emphasizing the importance of adherence and therefore contributing to rational antimicrobial use at MOH hospitals.

The AMS team discussed the baseline adherence results, first during the protocols orientation session and then during the AMS meetings, which are conducted once or twice per quarter. During the AMS team meetings at the two hospitals, the clinical pharmacists presented the audit results while the quality officers assisted in drafting an action plan for CQI. Representatives from MTaPS, MOH IDQCD, and PCPD attended these meetings, provided feedback on the results, and recommended areas for improvement.

Representatives from Al Salt Hospital participate in the protocols orientation sessions on October 30, 2023, in Amman, Jordan.
Photo credit: MTaPS Jordan.

Protocols adherence audit results

During the audits, a total of 201 medical records were reviewed at Al Salt and Al Mafraq Hospitals (table 1). Data collection commenced with an initial baseline assessment, followed by three subsequent monthly audits. In each audit round, clinical pharmacists at the hospitals retrospectively gathered data from medical records. These records needed to meet certain inclusion criteria, such as they must correspond to the surgical prophylaxis cases outlined in the protocols, patients must have been admitted to the hospital within a month before the data was collected, and the patient national identification numbers included in the surgical ward logbooks must be traceable in the medical records system.

Table 1: Number of medical records reviewed per audit round

Hospital	Baseline	Round 1	Round 2	Round 3	Total
Al Salt	38	31	37	35	141
Al Mafraq	14	16	14	16	60
Total	**52**	**47**	**51**	**51**	**201**

The scope of the data collection covered cases of hernia repair, appendectomy, arthroplasty, and orthopedic surgery at both Al Salt and Al Mafraq. At Al Salt Hospital, clinical pharmacists identified around 30 eligible cases for

inclusion in each round specifically for orthopedic surgeries. For hernia repair, appendectomy, and arthroplasty surgeries, pharmacists from both Al Salt and Al Mafraq hospitals collected data from all cases that met the inclusion criteria in each round.

The collected data represents performance metrics over four rounds (baseline, round 1, round 2, and round 3) for seven parameters related to the administration of prophylactic antibiotics in a clinical setting. Each parameter measures a specific aspect of the antibiotic protocol adherence, including documentation, choice, dosage, method of administration, and timing relative to the surgery. Al Salt Hospital data (table 2) demonstrated a generally increasing trend in adherence to prophylactic measures, with improvements in the dose, method, and time of administration when the correct choice of prophylaxis antibiotic was given and notable improvements in the time of administration prior to skin incision. However, a decrease in the correct choice of prophylactic antibiotic from round 2 to 3 and in the documentation of time of anesthesia induction was observed. These fluctuations were attributed to staff turnover, staff resistance to adopting new protocols, and inadequate documentation practices, as discussed in the Al Salt Hospital AMS team meetings.

While starting from a lower baseline with respect to several parameters, Al Mafraq Hospital data (table 3) showcased improvements in the dose, method, and time of administration when the correct choice of prophylaxis antibiotic was given. An increase in compliance also was noted by round 3 in documenting surgery incision and anesthesia induction time. The decrease in the documentation of prophylactic antibiotic allergy history from round 1 to 3 is attributed to issues with maintaining consistent practices among physicians due to high turnover, as mentioned by the Al Mafraq AMS team during their regular AMS committee meetings.

Table 2: Results of audit main parameters for Al Salt Hospital

Parameter	Baseline	Round 1	Round 2	Round 3
1. Document prophylactic antibiotic allergy history	34%	42%	43%	46%
2. Choice of prophylactic antibiotic according to protocol	53%	58%	81%	69%
3. Prophylactic antibiotic single dose according to protocol	85%	89%	100%	100%
4. Prophylactic antibiotic method of administration (intravenously)	100%	100%	100%	100%
5. Time of administration of prophylactic prior to skin incision	10%	39%	47%	75%
6. Document time of anesthesia induction	42%	16%	62%	49%
7. Document beginning of surgery/incision time	92%	65%	86%	100%

Key: 0% 50% 100%

Table 3: Results of audit main parameters for Al Mafraq Hospital

Parameter	Baseline	Round 1	Round 2	Round 3
1. Document prophylactic antibiotic allergy history	64%	88%	50%	44%
2. Choice of prophylactic antibiotic according to protocol	14%	75%	64%	56%
3. Prophylactic antibiotic single dose according to protocol	0%	83%	89%	100%
4. Prophylactic antibiotic method of administration (intravenously)	0%	100%	100%	100%
5. Time of administration of prophylactic prior to skin incision	0%	58%	22%	100%
6. Document time of anesthesia induction	0%	56%	79%	94%
7. Document beginning of surgery/incision time	86%	63%	93%	100%

Key: 0% 50% 100%

The checklist used for data collection also assessed whether physicians administered extra doses of the prophylactic antibiotic or other antibiotics without a documented indication. The data from Al Salt Hospital (figure 1) demonstrates a notable improvement in the two parameters. Initially, 81.58% of patients received antibiotics other than the designated prophylactic one, without a documented indication. That figure steadily decreased across subsequent rounds, reaching 20% by round 3, which reflects a positive trend toward judicious use of antibiotics. Conversely, all patients received an additional dose of the prophylactic antibiotic without a documented indication at baseline. That figure decreased to 94% in round 1 and dramatically dropped to 19% in round 2, before experiencing a slight increase to 29% in round 3. The fluctuation in controlling unnecessary additional doses highlights areas for ongoing improvement in protocol adherence and antibiotic stewardship. As mentioned in the AMS meetings at Al Salt Hospital, challenges, including frequent turnover of physicians and physicians' hesitancy to adopt new guidelines, have impacted the sustainability of improvements in this parameter.

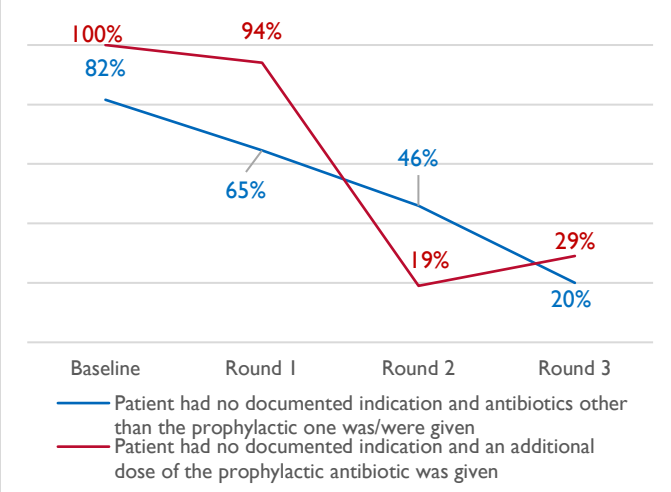

Figure 1: Additional audit parameters per audit round at Al Salt Hospital

At Al Mafraq Hospital, the data reveals a progression toward improved performance over the observed periods, albeit with some variation (figure 2). At baseline, all patients received antibiotics other than the prescribed prophylactic ones without a documented indication. This figure decreased to 75.00% in round 1, slightly increased to 78.57% in round 2, and then further reduced to 56.25% by round 3. This trend indicates a gradual improvement in adherence to guidelines regarding prophylactic antibiotics. At baseline, all patients received an additional dose of the prophylactic antibiotic without a documented indication. This figure decreased to 6.25% in round 1 and remained at a low level of 7.14% in round 2, ultimately reaching 0% by round 3. This improvement at Al Mafraq Hospital reflects robust efforts toward enhancing protocol compliance through the commitment of hospital leadership, the involvement of PCPD and IDQCD, regular field visits and on-the-job training by MTaPS and the MOH, monthly AMS committee meetings involving health care providers from various departments, and the issuance of a policy by the MOH IDQCD that mandates compliance with the protocols.

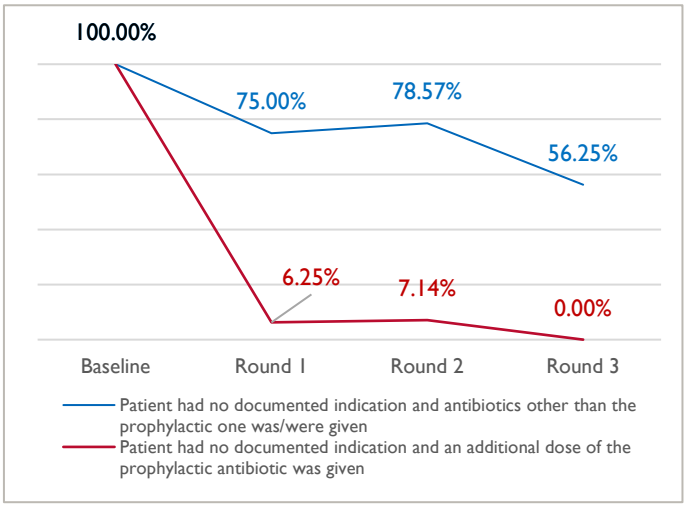

Figure 2: Additional audit parameters per audit round at Al Mafraq Hospital

The key performance indicators for protocol adherence were structured in four progressive levels:

- Indicator Level 1: Ensures the correct prophylaxis antibiotic choice, dose, method, and time of administration.
- Indicator Level 2: Adds to Level 1 by requiring the documentation of surgery and anesthesia start times along with the patient's allergy history.
- Indicator Level 3: Expands on Level 2 by including a requirement precluding the administration of additional doses of the prophylactic antibiotic without a documented indication.
- Indicator Level 4: This level incorporates all criteria from Level 3 and adds the requirement precluding the use of any other antibiotics without a documented indication.

Indicator data from Al Salt Hospital (figure 3) reveal a consistent enhancement in surgical protocol adherence over the audit rounds. Starting from a low baseline adherence of 5% for the Level 1 indicator, the hospital demonstrated steady progress. By round 1, adherence for the Level 1 indicator had increased, though adherence for the other indicators remained unimproved. By round 2, noticeable progress was seen across all indicators, a trend that continued into round 3. By that final round, the hospital achieved over 50% adherence for the Level 1 indicator and showed improvement in all other indicators.

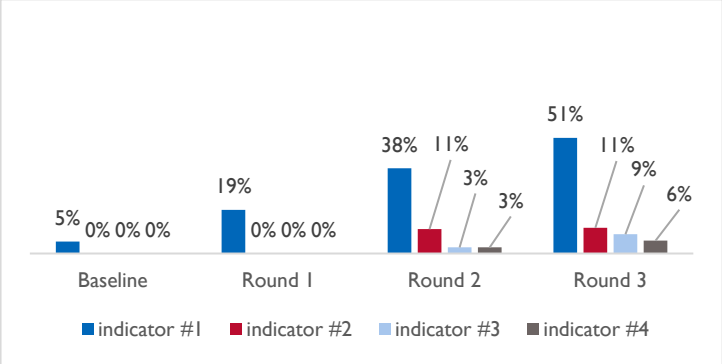

Figure 3: Key performance indicator per audit round (Al Salt Hospital)

Indicator data from Al Mafraq Hospital (figure 4) shows no adherence for any of the indicators at baseline. In round 1, an initial improvement occurred for the first three indicators, followed by a temporary decline in round 2 and then a recovery for all indicators in round 3. That final round reflected substantial progress, particularly in the Level 1 indicator, with emerging improvements across the more complex indicators.

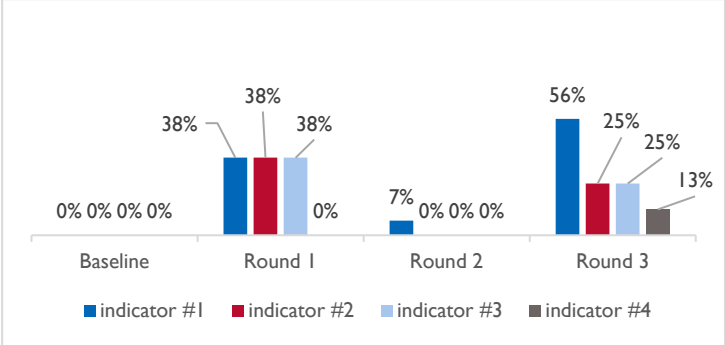

Figure 4: Key performance indicator per audit round (Al Mafraq Hospital)

The performance demonstrated in the indicators of Al Salt and Al Mafraq Hospitals illustrates the facilities' continued commitment to adherence to surgical protocols, despite facing obstacles. Their journey emphasizes the importance of CQI to achieve higher standards of protocol compliance in the future.

Lessons Learned

- The key factors for the success of the AMS interventions are working directly at the health facility level, engaging early on with the MOH stakeholders along with the health facility AMS team, and conducting facility-wide training on the protocols.
- Counterparts express a strong commitment to improvement when provided with robust international and local evidence, clear objectives, locally adapted strategies and tools, and ongoing technical support for follow-up.
- Success relies on the development of clear procedures to ensure the proper and standardized implementation of protocols. Equally vital is the rigorous and continuous monitoring of adherence to these agreed-upon protocols and procedures.
- Commitment to protocol implementation relies on the full engagement of the MOH and the hospitals' AMS teams in the monitoring and evaluation of protocol adherence.
- Integrating CQI techniques into the interventions facilitates data-driven decision-making, a major benefit of CQI. Furthermore, it fosters enhancements in process efficiency, employee engagement, risk management, innovation, cost reduction, compliance, organizational learning, strategic alignment, and performance measurement.

Pathway to Sustainability

- MTaPS Jordan has worked in close collaboration with national and health facility stakeholders to ensure the sustainability of the implemented AMS interventions. The active engagement of the hospital administration, PCPD, IPCD, IDQCD, and the Central Pharmacy and Therapeutic Committee led to the official approval of the developed antibiotic prophylaxis and treatment protocols by the Minister of Health. In addition, MTaPS facilitated the institutionalization of protocol implementation through a policy established by the IDQCD, mandating that health service providers endorse and adhere to the implementation of the protocols. Activation of the hospital-level AMS teams by establishing their terms of reference and engaging

them with the central directorates contributes to commitment and sustainability.

- To ensure a long-term pathway to sustainability, the MOH, in collaboration with MTaPS, will take the lead in organizing a collaborative lessons-learned workshop for all MOH hospital managers that involves AMS committee representatives. The goal is to share the successful experience of piloting the initiatives at Al Mafraq and Al Salt Hospitals, thereby facilitating the widespread application of the protocols across all MOH hospitals in Jordan.

Conclusions

The optimization of current practices in antimicrobial prophylaxis and the treatment of surgical procedures requires using a participatory approach to the development of local hospital protocols. This involves empowering clinical pharmacists with a central role in the administration, monitoring, and intervention processes to improve and streamline these practices. Additionally, fostering collaboration among clinical pharmacists, hospital leadership, physicians, and other relevant stakeholders promotes effective local communication and coordination.

This technical brief underscores the significance of implementing robust AMS interventions, integrating advanced pharmacotherapy principles, and fostering interdisciplinary cooperation. Leveraging the latest advancements in antibiotic management and increasing adherence to locally developed rigorous guidelines enhances AMS, leading to improved patient outcomes and the containment of AMR.

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About USAID MTaPS:

The USAID Medicines, Technologies, and Pharmaceutical Services (MTaPS) Program (2018–2025) 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.