MEDICAL LETTER

Review Article
Volume: 3
Issue: 2

Antimicrobial Stewardship in the Era of Antimicrobial Resistance: From Responsible Prescribing to Health-System Transformation

Dr. Amit Sachdeva, Nasim Ahmed, Tamanna Rahman and Anju Sachdeva

[1]*Assistant Professor, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh, India. Email: dramitsachdeva2410@gmail.com*
[2]*Independent Researcher, Guwahati Assam, India Email: nasim@iarcon.org*
[3] *MSc in Herbal Science and Technology, Anandaram Dhekial Phookan College under Guwahati University, Assam*
[4]*Physiotherapist, Shimla, Himachal Pradesh, India*

Received: March. 13, 2026; Revised: April. 11, 2026; Accepted: May. 21, 2026; Published: June. 30, 2026

 Doi: 10.47310/medlet.2026.v0302.003

Abstract: Antimicrobial resistance (AMR) threatens the effective treatment of common infections and the safety of surgery, cancer chemotherapy, transplantation and intensive care. Antimicrobial stewardship comprises coordinated actions that promote the responsible use of antimicrobial agents by ensuring that patients receive treatment only when indicated and, when required, the most appropriate drug, dose, route and duration. Global estimates indicate that bacterial AMR was associated with 4.71 million deaths and directly attributable to 1.14 million deaths in 2021, underscoring the urgency of stewardship alongside infection prevention, vaccination, diagnostics and equitable access to effective therapy. Stewardship programmes can reduce unnecessary antimicrobial exposure, improve guideline adherence and lower treatment costs without compromising clinical outcomes. Nevertheless, implementation remains uneven, especially in low- and middle-income countries, where diagnostic limitations, unrestricted antibiotic access, inadequate staffing and fear of treatment failure encourage empirical broad-spectrum prescribing. The World Health Organization's Access, Watch and Reserve framework offers a practical structure for monitoring and improving antibiotic use, while the 2024 United Nations political declaration established measurable global AMR targets. India's updated National Action Plan on AMR 2025–2029 provides an important policy foundation, supported by national treatment guidelines and the Indian Council of Medical Research surveillance network. However, hospital stewardship remains variable and community, veterinary and environmental stewardship require greater attention. Effective AMR stewardship must move beyond restrictive prescribing towards a people-centred, One Health approach integrating diagnostics, infection prevention, surveillance, behavioural science, digital decision support and uninterrupted access to essential antibiotics.

Keywords: antimicrobial resistance; antimicrobial stewardship; antibiotic use; AWaRe; infection prevention; One Health

Introduction

Antimicrobial medicines have transformed modern healthcare, but their effectiveness is being progressively eroded by resistance. Microorganisms naturally evolve, yet inappropriate and excessive antimicrobial exposure accelerates the selection and spread of resistant strains. Antibiotics prescribed for viral respiratory infections, unnecessarily prolonged surgical prophylaxis, inappropriate broad-spectrum empirical treatment and non-therapeutic antimicrobial use in food-producing animals are among the practices that increase selective pressure.

The most recent Global Burden of Disease assessment estimated that bacterial AMR was associated with 4.71 million deaths in 2021, of which 1.14 million were directly attributable to resistance.[1] Without stronger intervention, attributable deaths are projected to rise substantially by 2050, particularly among older adults and populations with weak access to effective healthcare.

Antimicrobial stewardship is commonly defined as a coherent set of actions that promotes the responsible use of antimicrobials at individual, institutional and population levels. Its purpose is not simply to reduce antibiotic consumption. Excessively restrictive policies may delay lifesaving treatment,

How to cite this Content: *Sachdeva, Amit, and Nasim Ahmed. "Antimicrobial Stewardship in the Era of Antimicrobial Resistance: From Responsible Prescribing to Health-System Transformation" Medical Letter, vol. 3, no. 2, 2026, pp. 30–37.*

particularly in sepsis. Stewardship instead seeks to optimize the balance between immediate patient benefit and the longer-term risks of toxicity, Clostridioides difficile infection, ecological disruption and resistance.

Although the terms are sometimes used interchangeably, antibiotic stewardship focuses on antibacterial agents, whereas antimicrobial stewardship includes antifungals, antivirals and antiparasitic medicines. Most established programmes remain antibiotic-centred because antibacterial resistance contributes substantially to the current global burden and because antibiotic prescribing is frequent across healthcare settings.

Core Principles of Antimicrobial Stewardship

Good stewardship begins with a clear clinical question: is an antimicrobial required? When infection is likely, the prescriber should identify the probable syndrome, likely pathogen, severity, acquisition setting, patient-specific risks and local resistance pattern. Relevant microbiological specimens should be collected before treatment where this does not cause dangerous delay.

Empirical therapy should provide adequate early coverage for serious infection but should not remain broader than necessary. Once clinical and laboratory information becomes available, treatment should be reviewed. The possible decisions include discontinuation when infection is unlikely, narrowing therapy, changing dose, switching from intravenous to oral treatment, addressing source control and defining a stop or review date.

The traditional stewardship formulation of the "right drug, right dose, right route and right duration" remains useful, but contemporary practice adds several elements: right diagnosis, right diagnostic test, right patient and timely reassessment. Stewardship therefore depends on clinical reasoning and health-system capacity, not merely compliance with a formulary.

The WHO AWaRe Framework

The World Health Organization classifies antibiotics into Access, Watch and Reserve groups. Access antibiotics generally have activity against common susceptible pathogens and lower resistance potential and should be widely available for appropriate indications. Watch antibiotics have greater resistance potential and should be prioritized for monitoring. Reserve antibiotics are last-resort options for confirmed or strongly suspected infections caused by multidrug-resistant organisms.

AWaRe is not intended to imply that all Access antibiotics are harmless or that Watch and Reserve agents should never be used. A Watch antibiotic may be appropriate for a specific severe infection, while an Access antibiotic remains inappropriate when no bacterial infection exists.

The WHO AWaRe Antibiotic Book provides syndrome-specific guidance on antibiotic choice, dose, route and duration for more than 30 common infections in children and adults.[2] WHO also uses the proportion of national antibiotic consumption arising from the Access group as a population-level stewardship indicator. The framework offers a common language for formularies, procurement, prescribing audits and public reporting.

However, the Access proportion should not be interpreted in isolation. A health system may achieve a high Access percentage while still overprescribing antibiotics overall. Conversely, tertiary hospitals treating resistant infections may appropriately use more Watch or Reserve agents than primary-care facilities. AWaRe indicators must therefore be interpreted alongside indication, consumption volume, microbiological data and case mix.

Evidence for Stewardship Interventions

A major Cochrane review found that interventions directed at hospital prescribers improved compliance with antibiotic policy and reduced the duration of antibiotic treatment without increasing mortality.[3] Restrictive measures, such as preauthorization, can produce rapid reductions in targeted antibiotic use, while enabling interventions—including education, audit and feedback, clinical decision support and guideline dissemination—may be more acceptable and sustainable.

The strongest hospital programmes combine several elements rather than relying on a single intervention. Core strategies include prospective audit with feedback and formulary restriction or preauthorization. Supplementary components include facility-specific guidelines, dose optimization, intravenous-to-oral switching, diagnostic stewardship, allergy assessment and automatic stop or review orders.

Evidence from low- and middle-income countries indicates that stewardship can improve adherence to surgical prophylaxis guidelines and reduce antibiotic consumption and expenditure.[4] Nevertheless, effects are heterogeneous because programmes differ in staffing, intensity, baseline prescribing and

outcome measurement. A reduction in defined daily doses is valuable only when accompanied by preserved or improved patient outcomes.

Mortality is an essential balancing measure, but it is not the only one. Programmes should monitor treatment failure, readmission, length of stay, adverse drug events, C. difficile infection, resistance patterns and access delays. Stewardship should never discourage prompt treatment of sepsis merely to meet consumption targets.

Components of an Effective Hospital Programme

Leadership and accountability

Institutional leadership must recognize stewardship as a patient-safety function rather than an optional academic activity. A formal policy, defined governance structure, designated programme lead and protected staff time are essential. Leadership should provide microbiology services, information technology, pharmacy support and authority to implement agreed interventions.

A multidisciplinary team commonly includes an infectious-disease physician or appropriately trained clinician, clinical microbiologist, clinical pharmacist, infection-control professional, nurse and data analyst. In resource-limited hospitals, the exact composition may differ, but accountability must remain explicit.

Facility-specific treatment guidelines

National guidelines provide a foundation, but empirical choices should reflect local syndromes, resistance patterns and medicine availability. Facility antibiograms should be stratified where possible by specimen, clinical area and patient population. Combining all isolates can produce misleading recommendations because intensive-care, outpatient and community isolates may differ considerably.

Guidelines must be practical and regularly updated. Excessively complex documents are unlikely to influence urgent bedside decisions. Brief syndrome-based pathways, pocket guides and electronic tools are often more useful.

Prospective audit and feedback

Reviewing antimicrobial prescriptions after 48–72 hours allows the stewardship team to assess clinical response, culture findings and ongoing indication. Feedback is more effective when it is timely, respectful and educational rather than punitive. Repeated interaction can improve prescribing culture and clinical confidence.

Preauthorization and restriction

Selected broad-spectrum or Reserve agents may require approval before use. This can protect last-line drugs but may create dangerous delays if authorization is unavailable around the clock. Policies must include emergency exceptions, rapid review and transparent criteria.

Measurement and reporting

Programmes need reliable data. Useful process measures include guideline concordance, indication documentation, culture collection, review-date recording and duration of surgical prophylaxis. Consumption may be measured using defined daily doses, days of therapy or AWaRe proportions.

Days of therapy are often clinically intuitive but require patient-level electronic data. Defined daily doses are easier to calculate from pharmacy records but may be inaccurate in children, patients with renal impairment or altered dosing. No single metric is universally sufficient.

Diagnostic Stewardship

Diagnostic uncertainty is a major driver of antimicrobial use. Clinicians frequently prescribe “just in case” when laboratory results are delayed or unavailable. Diagnostic stewardship seeks to ensure the right test is ordered, specimens are collected correctly, results are processed promptly and findings are interpreted appropriately.

Blood cultures collected after antibiotics, contaminated specimens and indiscriminate urine cultures can undermine stewardship. A positive culture may represent colonization or contamination rather than infection, leading to unnecessary treatment. Diagnostic stewardship therefore includes education on test indications and result interpretation.

Rapid molecular tests, syndromic panels, biomarkers and automated susceptibility systems may shorten time to targeted treatment. Their impact is greatest when results are linked to active stewardship. A rapid result that remains unnoticed or misunderstood does not improve care. Technology should therefore be evaluated as part of a clinical pathway rather than solely by laboratory turnaround time.

Infection Prevention, Vaccination and Access

Stewardship cannot control AMR in isolation. Preventing infection reduces the need for antibiotics and interrupts the transmission of resistant organisms. Hand hygiene, environmental cleaning, safe water, sanitation, device-care bundles and surveillance of healthcare-associated infections are essential stewardship partners.

Vaccination prevents bacterial infections directly and can reduce antibiotic prescribing for syndromes often treated empirically. Viral vaccines may also reduce inappropriate antibiotic use by preventing febrile respiratory illnesses that are mistaken for bacterial disease.

Access is an equally important dimension. In some settings, the primary problem is excessive antibiotic use; in others, patients die because effective antibiotics, diagnostics or trained professionals are unavailable. Stewardship must avoid creating administrative barriers that disproportionately affect poor or remote populations. The goal is **appropriate access**, not simply lower access.

Table 1. Core domains of antimicrobial stewardship and recommended indicators

Stewardship domain	Principal intervention	Intended benefit	Common implementation problem	Recommended indicator
Diagnostic assessment	Syndrome-based evaluation and appropriate cultures	Reduces treatment without evidence of bacterial infection	Delayed or unavailable diagnostics	Percentage of selected cases with appropriate specimens collected before therapy
Empirical prescribing	Local guidelines linked to antibiograms	Improves initial coverage while limiting unnecessary broad-spectrum use	Outdated or non-representative antibiograms	Guideline-concordant empirical therapy
Review and de-escalation	Mandatory reassessment at 48–72 hours	Enables stopping, narrowing or optimizing therapy	Review occurs informally without documentation	Percentage with documented antibiotic time-out
Dose optimization	Renal adjustment, pharmacokinetic monitoring and indication-specific dosing	Improves efficacy and reduces toxicity	Inadequate pharmacy support	Percentage of eligible prescriptions appropriately adjusted
Route optimization	Intravenous-to-oral switch protocols	Reduces line complications, cost and length of stay	Misconception that intravenous therapy is always superior	Eligible patients switched within the recommended period
Duration control	Stop dates and syndrome-specific durations	Reduces avoidable exposure	"Complete the course" culture and habitual prolonged treatment	Median duration by syndrome
Surgical prophylaxis	Correct drug, timing and discontinuation	Prevents surgical infection without prolonged exposure	Continuation beyond 24 hours	Percentage discontinued within guideline-defined time
Reserve-antibiotic governance	Preauthorization with emergency access	Preserves last-line agents	Delayed approval or inappropriate blanket restriction	Reserve use with documented indication and approval
Measurement	Days of therapy, defined daily doses and AWaRe indicators	Identifies priorities and monitors change	Weak electronic systems and poor denominator data	Consumption per 1,000 patient-days and Access proportion
Outcome surveillance	Mortality, treatment failure, adverse	Ensures reduced use does not harm	Outcomes not linked to	Clinical balancing measures reported

	events, resistance and C. difficile	patients	prescribing data	with consumption
Community stewardship	Delayed prescribing, counselling and pharmacy regulation	Reduces unnecessary outpatient use	Patient expectations and non-prescription sales	Antibiotic prescriptions per defined outpatient encounters
One Health stewardship	Veterinary oversight, farm biosecurity and environmental controls	Reduces selection across sectors	Fragmented governance	Sector-specific antimicrobial consumption and resistance indicators

Stewardship in Primary Care and the Community

Most antibiotic exposure occurs outside hospitals. Acute respiratory infections, diarrhoea, urinary symptoms and dental conditions are frequent drivers. Interventions include clinical decision aids, communication training, delayed prescribing, point-of-care testing, public education and audit with peer comparison.

Patient expectation is often cited as the reason for prescribing, but clinicians may overestimate the desire for antibiotics. Patients frequently seek reassurance, symptom relief and an explanation. Clear communication about the likely diagnosis, expected duration, warning signs and symptomatic treatment can reduce unnecessary prescribing without reducing satisfaction.

In countries where antibiotics are available without valid prescriptions, community pharmacy stewardship is crucial. Pharmacists can triage symptoms, reinforce referral criteria and prevent inappropriate dispensing. Regulation must be accompanied by feasible access to healthcare; strict enforcement without affordable clinical alternatives may push consumers towards informal or unregulated markets.

One Health Stewardship

AMR moves among humans, animals, food systems and the environment. Antimicrobial use in livestock, aquaculture and crop production can select resistant organisms and resistance genes. Pharmaceutical manufacturing, hospitals, farms and municipal waste can release antimicrobial residues and resistant bacteria into water and soil.

One Health stewardship includes veterinary prescription oversight, vaccination and biosecurity on farms, disease-prevention practices that reduce antimicrobial need, elimination of medically important antimicrobials for growth promotion, and improved waste management. Human and animal stewardship should not be framed as competing priorities; both sectors require surveillance, realistic transition support and enforceable standards.

Environmental stewardship remains less developed. Concentration limits for antimicrobial discharge, wastewater treatment and environmental AMR surveillance are emerging policy priorities. Evidence linking specific environmental interventions to human clinical outcomes is still developing, but absence of complete causal quantification should not justify uncontrolled discharge.

Public Health Significance

Stewardship protects the effectiveness of medicines that support nearly every level of healthcare. Resistant infections increase the risk associated with childbirth, surgery, dialysis, transplantation, cancer therapy and neonatal care. The consequences extend beyond infection wards.

AMR also magnifies inequity. Wealthier patients may access newer antibiotics and advanced diagnostics, whereas poorer patients face delayed treatment, unaffordable medicines and greater exposure to uncontrolled transmission. Stewardship that focuses exclusively on reducing prescriptions without strengthening universal health coverage may worsen these disparities.

The 2024 United Nations High-Level Meeting established the first global target to reduce deaths associated with bacterial AMR by 10% by 2030 compared with the 2019 baseline. Countries also committed to stronger financing, surveillance, prevention and appropriate antimicrobial use.[5]

Indian Perspective

India carries a substantial burden of infectious disease, antibiotic consumption and resistant pathogens. The drivers include high empirical use, over-the-counter access, variable diagnostic capacity, prolonged

surgical prophylaxis, fragmented healthcare delivery, antimicrobial use in animals and environmental contamination.

The Indian Council of Medical Research established the Antimicrobial Resistance Surveillance and Research Network to generate standardized susceptibility data across major pathogen groups. Its 2024 report documents continuing resistance challenges among clinically important Gram-negative and Gram-positive organisms and provides essential evidence for empirical-treatment policies.[6] The network is a major national asset, but participating tertiary centres may not represent resistance in district hospitals, primary care or the community.

ICMR's antimicrobial stewardship guideline outlines the establishment of hospital committees, leadership responsibilities, formulary interventions, prescription audit and monitoring.[7] National treatment guidelines provide syndrome-specific recommendations intended to improve consistency and reduce unnecessary use. Yet implementation varies because many facilities lack trained infectious-disease specialists, clinical pharmacists, microbiologists and electronic prescribing data.

India's National Action Plan on AMR 2.0 for 2025–2029 renews the country's multisectoral commitment and emphasizes governance, surveillance, stewardship, infection prevention, research and One Health action.[8] The policy challenge is now implementation: clearly financed state action plans, measurable facility targets and public reporting are needed.

India should avoid adopting a tertiary-care model as the only definition of stewardship. District hospitals require simplified programmes based on local champions, standard treatment guidelines, pharmacy data and tele-mentoring. Primary-care and community stewardship must address non-prescription dispensing, diagnostic uncertainty and public beliefs. Veterinary and environmental action should be integrated rather than treated as peripheral components.

Recent Advances

Digital decision support

Electronic prescribing systems can prompt allergy review, renal-dose adjustment, recommended duration and culture reassessment. Dashboards can identify broad-spectrum use, duplicate therapy and missed review dates. However, excessive alerts lead to alert fatigue, and poorly designed systems may simply automate inappropriate recommendations.

Artificial intelligence and predictive analytics

Machine-learning models are being developed to predict resistance and guide empirical treatment. These tools may support earlier targeted therapy, but models trained in one hospital can perform poorly elsewhere because pathogen prevalence and prescribing practices differ. Transparency, external validation and clinician oversight are essential.

Rapid susceptibility testing

Advances in rapid phenotypic and molecular diagnostics can shorten the interval from specimen collection to organism identification and resistance detection. Their cost-effectiveness depends on prevalence, laboratory workflow and active clinical response.

Behavioural stewardship

Prescribing is influenced by hierarchy, habits, fear, workload and professional identity. Behavioural interventions—peer comparison, accountable justification, social-norm feedback and team-based review—can complement guidelines. Stewardship is more sustainable when clinicians understand the rationale and participate in programme design.

People-centred stewardship

WHO increasingly frames AMR through a people-centred approach that connects prevention, access to diagnosis, appropriate treatment, quality care and protection from resistant infection. This corrects the tendency to treat antibiotic consumption as the sole outcome and places patient experience and equity at the centre of policy.

Challenges and Limitations

Stewardship evidence is heterogeneous. Many studies use before-and-after designs vulnerable to secular trends, outbreaks and simultaneous infection-control changes. Consumption is measured using different

denominators, limiting comparison. Resistance often changes slowly and is influenced by transmission, making it difficult to attribute improvement to a single programme.

Diagnostic uncertainty creates a genuine clinical tension. Prescribers may be criticized for broad-spectrum use but also for delayed sepsis treatment. Stewardship policies must distinguish stable patients from time-critical infection and support reassessment rather than relying on rigid initial restrictions.

Resource limitations remain fundamental. Guidelines cannot compensate for absent microbiology, delayed transport, stock-outs or inadequate staffing. Reserve antibiotics may be overused in some hospitals but unavailable to patients with confirmed resistant infections elsewhere.

Commercial promotion, patient demand and fragmented accountability also undermine programmes. A stewardship committee without access to prescribing data or support from hospital leadership may exist only on paper.

Future Directions and Policy Priorities

Stewardship should become a measurable requirement for healthcare quality and accreditation. Every hospital should have a proportionate programme with accountable leadership, essential diagnostics, treatment guidelines, prescription review and outcome monitoring.

National and state dashboards should report antibiotic consumption by AWaRe group, facility type and clinical setting. Data must be interpreted with resistance patterns and access indicators to prevent simplistic ranking.

Investment in microbiology networks should extend beyond tertiary hospitals. Specimen referral, quality assurance, rapid reporting and district-level antibiograms can improve empirical treatment. Diagnostic capacity should be linked directly to stewardship and infection-control action.

Community strategies should combine pharmacy regulation, clinician communication, affordable diagnostics and public education. Campaigns should avoid the misleading message that all antibiotic use is harmful; the message should be that antibiotics must be used only when needed and exactly as prescribed.

India should operationalize NAP-AMR 2.0 through financed state plans, annual targets and independent evaluation. Human health, animal husbandry, food production, pharmaceuticals, water and environmental agencies should share indicators and accountability.

Research priorities include pragmatic trials in district hospitals, primary care and pharmacies; evaluation of digital decision support; economic analyses; behavioural studies; and assessment of stewardship in veterinary and environmental settings. Outcomes should include equity and timely access, not consumption reduction alone.

CONCLUSION

Antimicrobial stewardship is one of the most immediately actionable strategies for slowing resistance while improving the quality and safety of infection management. Its objective is not simply to prescribe fewer antimicrobials, but to ensure that every patient receives effective treatment when needed and avoids unnecessary exposure when it is not.

Evidence supports hospital interventions such as prospective audit, feedback, guideline implementation, appropriate restriction and duration control. Yet stewardship will remain incomplete unless it extends to primary care, community pharmacies, veterinary practice and the environment.

WHO's AWaRe framework, the 2024 global political commitments and India's National Action Plan on AMR 2025–2029 provide a strong policy foundation. The remaining challenge is translating frameworks into functioning programmes with trained teams, reliable diagnostics, usable data and sustained financing.

The most successful stewardship systems will combine responsible prescribing with infection prevention, vaccination, equitable access, behavioural change and One Health governance. Preserving antimicrobial effectiveness is not the responsibility of an individual prescriber alone; it is a collective obligation of health systems, governments, industries and communities.

REFERENCES

1. Naghavi M, Vollset SE, Ikuta KS, Swetschinski LR, Gray AP, Wool EE, et al. Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050. Lancet. 2024;404(10459):1199-1226. doi:10.1016/S0140-6736(24)01867-1.

How to cite this Content: *Sachdeva, Amit, and Nasim Ahmed. "Antimicrobial Stewardship in the Era of Antimicrobial Resistance: From Responsible Prescribing to Health-System Transformation" Medical Letter, vol. 3, no. 2, 2026, pp. 30–37.*

2. World Health Organization. The WHO AWaRe (Access, Watch, Reserve) antibiotic book [Internet]. Geneva: World Health Organization; 2022 [cited 2026 Aug 6]. Available from: https://www.who.int/publications/i/item/9789240062382

3. Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database Syst Rev. 2017;2(2):CD003543. doi:10.1002/14651858.CD003543.pub4.

4. Siachalinga L, Mufwambi W, Lee IH. Impact of antimicrobial stewardship interventions to improve antibiotic prescribing for hospital inpatients in Africa: a systematic review and meta-analysis. J Hosp Infect. 2022;129:124-143. doi:10.1016/j.jhin.2022.07.031.

5. United Nations General Assembly. Political declaration of the High-Level Meeting on Antimicrobial Resistance: resolution adopted by the General Assembly. A/RES/79/2 [Internet]. New York: United Nations; 2024 [cited 2026 Aug 6]. Available from: https://digitallibrary.un.org/record/4064023

6. Indian Council of Medical Research. Annual report: Antimicrobial Resistance Research and Surveillance Network, January–December 2024 [Internet]. New Delhi: Indian Council of Medical Research; 2025 [cited 2026 Aug 6]. Available from: https://www.icmr.gov.in/icmrobject/uploads/Report/1763981012_icmramrsnannualreport2024.pdf

7. Indian Council of Medical Research. Antimicrobial stewardship program guideline [Internet]. New Delhi: Indian Council of Medical Research; 2018 [cited 2026 Aug 6]. Available from: https://www.icmr.gov.in/icmrobject/custom_data/pdf/resource-guidelines/AMSP_0.pdf

8. National Centre for Disease Control, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. National Action Plan on Antimicrobial Resistance (NAP-AMR) 2.0, 2025–2029 [Internet]. New Delhi: Ministry of Health and Family Welfare, Government of India; 2025 [cited 2026 Aug 6]. Available from: https://ncdc.mohfw.gov.in/includes/About/CentresAndDivision/amr.php

9. World Health Organization. WHO policy guidance on integrated antimicrobial stewardship activities [Internet]. Geneva: World Health Organization; 2021 [cited 2026 Aug 6]. Available from: https://www.who.int/publications/i/item/9789240025530

10. Murray CJL, Ikuta KS, Sharara F, Swetschinski L, Robles Aguilar G, Gray A, et al. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. Lancet. 2022;399(10325):629-655. doi:10.1016/S0140-6736(21)02724-0.

How to cite this Content: *Sachdeva, Amit, and Nasim Ahmed. "Antimicrobial Stewardship in the Era of Antimicrobial Resistance: From Responsible Prescribing to Health-System Transformation" Medical Letter, vol. 3, no. 2, 2026, pp. 30–37.*