SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Medicine

Antibiotic Stewardship in Primary Care: Practical Strategies for Family Physicians in Qatar

Dr Syed Ehsan Ali[1]*, Dr Mustafa Zaboli[2]

[1]Consultant Family Medicine, Operations - HC Al Waab

DOI: https://doi.org/10.36347/sasjm.2026.v12i11.006 | **Received:** 17.08.2026 | **Accepted:** 21.10.2026 | **Published:** 04.11.2026

***Corresponding author:** Dr Syed Ehsan Ali
Consultant Family Medicine, Operations - HC Al Waab

Abstract **Review Article**

Antimicrobial resistance is a major threat to patient safety and public health, and primary care is a critical setting for antibiotic stewardship because family physicians manage large numbers of respiratory, urinary, skin, and other undifferentiated illnesses. This narrative review synthesizes international guidance, systematic reviews, randomized trials, Qatar national policies and clinical guidelines, and Qatar-based studies relevant to outpatient prescribing. Effective stewardship combines accurate clinical assessment, diagnostic stewardship, clear patient communication, selective point-of-care testing, delayed prescribing when appropriate, narrow-spectrum treatment, guideline-concordant dose and duration, allergy verification, electronic documentation, audit and feedback, and multidisciplinary support. Evidence indicates that communication interventions, behavioral strategies, delayed prescribing, and audit-feedback can reduce unnecessary antibiotic use without compromising clinical outcomes or patient satisfaction. Qatar-based evidence suggests that clinicians generally recognize the relationship between inappropriate antibiotic use and resistance, but patient pressure, complaints, organizational factors, and consultation dynamics remain important barriers. In Primary Health Care Corporation facilities, stewardship should therefore be embedded in clinical governance and electronic prescribing and supported by national policy, local clinical pathways, pharmacy and nursing involvement, clinician feedback, patient education, and outcome monitoring. A coordinated, locally adapted program can improve prescribing quality, reduce avoidable antibiotic exposure, and preserve antibiotic effectiveness in Qatar.

Keywords: Antibiotic stewardship, antimicrobial resistance, primary care, family medicine, Qatar, delayed prescribing, audit and feedback, diagnostic stewardship.

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INTRODUCTION

Antibiotics are among the most important therapeutic advances in modern medicine. They reduce morbidity and mortality from bacterial infections and support complex care, including surgery, cancer treatment, transplantation, and management of immuno-compromised patients. However, their effectiveness is threatened by antimicrobial resistance (AMR), adverse drug reactions, Clostridioides difficile infection, drug interactions, microbiome disruption, and avoidable healthcare expenditure.

AMR occurs when microorganisms no longer respond adequately to antimicrobial medicines. As a result, infections become more difficult or impossible to treat, increasing the risk of severe illness, complications, transmission, and death. Inappropriate antimicrobial use accelerates resistance through selective pressure and remains one of the most important modifiable drivers of the problem. [1]

Antibiotic stewardship refers to coordinated interventions that promote the appropriate use of antimicrobials. The objective is not simply to reduce the number of prescriptions. Rather, stewardship seeks to ensure that antibiotics are used only when clinically indicated, and that the selected agent, dose, route, and duration are appropriate for the individual patient and the suspected infection. Stewardship therefore includes clinical assessment, diagnostic stewardship, patient communication, prescribing systems, surveillance, education, and quality improvement.

Primary care is central to this effort. Family physicians evaluate patients at an early stage of illness, often before a definitive diagnosis is available. Common presentations include cough, sore throat, sinus symptoms, fever, urinary complaints, skin changes, abdominal symptoms, and nonspecific constitutional symptoms. Many of these illnesses are viral, self-limiting, inflammatory, or noninfectious. Nevertheless,

antibiotic prescribing may be influenced by diagnostic uncertainty, limited consultation time, perceived patient expectations, concern about treatment failure, difficulty arranging follow-up, and fear of dissatisfaction.

Qatar has established a national framework to support antimicrobial stewardship. The Ministry of Public Health's National Antimicrobial Stewardship and Prescribing Policy sets standards for antimicrobial-stewardship programs and prescribing across healthcare facilities. [2] Qatar has also developed national clinical guidance for common primary-care conditions, including tonsillitis in adults and children older than three years. [3] These resources provide an important foundation for implementing stewardship within PHCC.

This review summarizes practical strategies for family physicians and discusses their application in the Qatar primary-care context. It also identifies opportunities to integrate stewardship with electronic prescribing, pharmacy services, multidisciplinary governance, audit and feedback, and patient-centered communication.

METHODS

Review design

A narrative literature review was conducted to synthesize evidence relevant to antibiotic stewardship in primary care and its implementation in Qatar. The review was designed to support a practical, clinically oriented manuscript rather than to estimate a pooled treatment effect.

Information sources

Publicly available sources were reviewed from the World Health Organization, the Qatar Ministry of Public Health, the Centers for Disease Control and Prevention, PubMed and PubMed-indexed literature, the Cochrane Library, peer-reviewed primary-care and antimicrobial-stewardship journals, and publicly available PHCC-related publications and Qatar-based studies.

Search approach

Searches focused on combinations of the following terms: "antibiotic stewardship," "antimicrobial stewardship," "primary care," "family medicine," "Qatar," "PHCC," "delayed antibiotic prescription," "audit and feedback," "communication intervention," "tonsillitis," "outpatient prescribing," and "antimicrobial resistance."

Eligibility and selection

Priority was given to systematic reviews and evidence syntheses, randomized or cluster-randomized trials, national policies and clinical guidelines, studies evaluating outpatient stewardship interventions, Qatar-based studies describing barriers or prescribing behavior, and guidance relevant to family medicine and ambulatory care. Sources were selected based on relevance to outpatient prescribing, methodological credibility, practical applicability, and direct relevance to Qatar.

Synthesis

Evidence was synthesized narratively under the following themes: clinical assessment and diagnostic stewardship; communication and shared decision-making; delayed prescribing; guideline-concordant treatment; electronic and organizational interventions; audit, feedback, and measurement; and Qatar-specific implementation in PHCC.

The Primary-Care Stewardship Problem

Primary-care antibiotic prescribing is shaped by a combination of clinical, behavioral, organizational, and patient-level factors. Clinicians may prescribe when bacterial infection is unlikely because they are uncertain about the diagnosis, lack immediate access to diagnostic tests, or want to reduce the possibility of a return visit. Patients may request antibiotics because of previous experiences, family advice, workplace pressures, concerns about worsening illness, or the belief that antibiotics are needed for fever, colored mucus, or prolonged symptoms.

Importantly, the relationship between antibiotic prescribing and patient satisfaction is complex. Patients often value a careful examination, an explanation, symptom-relief advice, and a clear plan. Satisfaction does not necessarily depend on receiving an antibiotic. Communication that validates the patient's concerns and provides a positive treatment plan can reduce the perceived need for an antibiotic.

A Qatar study involving physicians and pharmacists at PHCC found that patients, clinicians, and organizational factors all contributed to barriers to appropriate prescribing. The authors concluded that effective behavior-change interventions should address multiple factors rather than focusing exclusively on clinician knowledge. [4]

A later cross-sectional study of primary-care physicians at four PHCCs found high awareness of the risks of inappropriate prescribing. Among 141 respondents, 97.8% agreed that inappropriate antibiotic use contributes to AMR and 80.8% disagreed with prescribing antibiotics for fever alone. Nevertheless, 40.4% reported experiencing patient pressure to prescribe antibiotics unnecessarily, 13.4% reported frequently prescribing antibiotics solely because of patient requests, and 37.6% had encountered patient complaints or migration to another physician when antibiotics were not prescribed. [5]

These findings suggest that the central implementation challenge in Qatar is not simply a lack of knowledge. Stewardship must also support physicians

in difficult consultations and change the expectations of patients and families.

Core Principles of Appropriate Prescribing

Determine whether an antibiotic is indicated

The first prescribing decision is whether the patient has an illness for which antibiotic treatment is likely to provide meaningful benefit. The clinician should consider:

- The most likely diagnosis.
- The probability of bacterial infection.
- Severity and duration of symptoms.
- Relevant examination findings.
- Risk of complications.
- Patient age and comorbidities.
- Pregnancy or breastfeeding.
- Immune status.
- Recent antibiotic exposure.
- Recent hospitalization or healthcare contact.
- Previous resistant organisms.
- Reliability of follow-up.

Antibiotics should not be used to treat symptoms alone when there is no reasonable evidence of bacterial infection. Fever, purulent secretions, cough, or a positive screening test should not be interpreted in isolation.

Select the appropriate antibiotic

When treatment is indicated, the narrowest effective agent should be selected. The decision should be based on:

- The likely pathogen.
- The infection site.
- Local susceptibility data.
- Relevant Qatar or PHCC guidance.
- Previous microbiology results.
- Recent antibiotic exposure.
- Allergy history.
- Renal and hepatic function.
- Pregnancy and lactation.
- Drug interactions.
- Risk of adverse effects and C. difficile infection.

The WHO AWaRe framework classifies antibiotics into Access, Watch, and Reserve groups. It supports the use of appropriate Access antibiotics when treatment is required and encourages restriction of Watch and Reserve agents to situations in which they are clinically justified. [6] The AWaRe framework should complement, not replace, local Qatar and PHCC guidance.

Use the correct dose and duration

An antibiotic course should have a clearly specified dose and duration. Prolonged or open-ended prescriptions increase exposure without necessarily improving outcomes. Duration should be based on current guidance and the patient's clinical response.

The clinician should avoid automatically extending treatment because symptoms have not completely disappeared. Some symptoms naturally persist after the acute infection begins to improve. Conversely, treatment failure, deterioration, or new systemic features should prompt reassessment of the diagnosis, complications, adherence, and resistance.

Document the clinical rationale

The Qatar National Antimicrobial Stewardship and Prescribing Policy supports documentation of the antimicrobial indication and alignment with relevant prescribing guidance. [2] At minimum, the medical record should include:

- Working or confirmed diagnosis.
- Relevant clinical findings.
- Antibiotic selected.
- Dose and route.
- Duration or review date.
- Allergy status.
- Relevant test results.
- Safety-netting instructions.
- Reason for deviation from guidance, if applicable.

Documentation improves continuity of care and allows meaningful audit. It also reduces inappropriate continuation when another clinician reviews the patient.

Communication as a Stewardship Intervention

The importance of positive prescribing

Communication is a clinical intervention, not an optional addition to prescribing. The consultation should convey that the physician has reached an active management decision.

A useful structure is:

1. Explain the likely diagnosis.
2. State whether an antibiotic is likely to help.
3. Describe the expected course.
4. Provide specific symptomatic treatment.
5. Explain warning signs.
6. Arrange follow-up when needed.

Example: "Your assessment is most consistent with a viral respiratory infection. Antibiotics are not expected to shorten this illness and could cause side effects. I recommend regular fluids, appropriate analgesia, and rest. Cough may take time to settle. Please return if you develop breathing difficulty, persistent high fever, worsening symptoms, or failure to improve as expected."

This approach avoids the impression that the patient has received "nothing." It also reassures the

patient that the decision not to prescribe is based on clinical assessment.

Address expectations directly

Patients may request antibiotics because they believe the illness is severe, because symptoms have lasted longer than expected, or because previous treatment appeared to help. The physician should acknowledge the concern before explaining the treatment plan.

- "I can see why you are concerned about the duration of the symptoms."
- "I have examined you for signs that would suggest a bacterial infection."
- "At this stage, the findings do not suggest that an antibiotic will help."
- "I will explain what to expect and exactly when you should return."

Communication should be adapted to language, health literacy, cultural expectations, and the patient's ability to access follow-up.

Use written and electronic information

Verbal advice may be forgotten, particularly when the patient is unwell or anxious. Written or electronic information should include: [13,18]

- Expected symptom duration.
- Symptomatic treatment options.
- Why antibiotics are not indicated.
- Potential antibiotic harms.
- Warning signs.
- How to arrange review.

PHCC can support this through standardized multilingual patient-information materials, after-visit summaries, patient-portal content, and text-message follow-up.

Evidence for communication interventions

International trials support the value of communication-based stewardship. A large cluster-randomized trial involving primary-care practices in six countries found that enhanced communication training reduced antibiotic prescribing for respiratory-tract infections, with sustained benefit at 12 months. [7] Another randomized clinical trial found that accountable justification and peer comparison reduced inappropriate prescribing among primary-care clinicians. [8] These findings are relevant to Qatar because physician knowledge alone may not overcome patient pressure. Communication training should therefore be incorporated into PHCC stewardship programs.

Delayed Antibiotic Prescribing

Definition and rationale

Delayed prescribing involves postponing antibiotic use until a specified clinical trigger occurs. It can be used when immediate treatment is not clearly necessary but uncertainty remains, or when the clinician anticipates that the patient may worsen or fail to improve.

- Providing a prescription with a specific instruction to wait.
- Arranging later collection of the prescription.
- Asking the patient to recontact the clinic if symptoms persist.
- Providing a written contingency plan.

Delayed prescribing should not be used as a default strategy for every respiratory illness. When bacterial infection is unlikely and follow-up is reliable, no antibiotic with safety-netting generally minimizes antibiotic use. When bacterial infection is probable or the patient is clinically unstable, immediate treatment may be required.

Evidence

The Cochrane review of delayed antibiotic prescribing for respiratory infections found that delayed prescribing substantially reduced antibiotic use compared with immediate prescribing while producing similar outcomes for many symptoms and similar patient satisfaction. Immediate antibiotics were used by the large majority of patients receiving them, whereas use was considerably lower among patients given delayed prescriptions. [9]

Delayed prescribing should include an explicit trigger, such as failure to improve after a defined period, worsening after initial improvement, development of a specified fever pattern, new focal symptoms, or clinical features identified by the physician as requiring treatment.

Instructions such as "take it if you are not better" are too vague and may lead to premature use.

Qatar application

The Qatar national guideline for tonsillitis provides a practical local example. In selected patients, it supports symptomatic management and the use of a standby prescription if symptoms worsen or fail to improve after two to three days. [3] This approach should be incorporated into PHCC clinical pathways with clear documentation and patient instructions.

Delayed prescribing is unsuitable for suspected sepsis, meningitis, severe pneumonia, rapidly progressive infection, significant immunosuppression, or any condition in which delayed treatment could lead to harm. It should also be used cautiously when the patient cannot reliably obtain reassessment.

Diagnostic Stewardship

Diagnostic stewardship involves ordering the right test for the right patient at the right time and interpreting the result in clinical context.

Use tests when they change management

Point-of-care and laboratory testing may be useful when the result is likely to change prescribing. Examples include:

- Rapid group A streptococcal testing in selected patients with sore throat.
- Urinalysis and urine culture when urinary infection is clinically suspected.
- Respiratory viral testing when the result affects treatment, infection control, or further investigation.
- Chest imaging when pneumonia is a realistic diagnostic possibility.
- Microbiological sampling in severe, recurrent, complicated, or treatment-resistant infection.

Testing patients with a very low pretest probability can produce false-positive results and unnecessary treatment. Failure to test high-risk or atypical patients may result in missed or delayed diagnosis.

Avoid treating colonization or contamination

A positive culture does not always indicate infection. Examples include asymptomatic bacteriuria, contaminated urine specimens, colonization of chronic wounds, positive respiratory cultures without compatible disease, and incidental findings unrelated to the presenting symptoms. The decision to prescribe should be based on the complete clinical picture, not on the laboratory result alone.

Verify reported allergy

Reported antibiotic allergy should be clarified whenever possible. The clinician should document the suspected antibiotic, nature of the reaction, timing, severity, whether treatment was required, and whether the patient has subsequently tolerated related antibiotics. Unverified allergy labels may lead to unnecessary use of broader-spectrum, less effective, more toxic, or more expensive alternatives.

Clinical Applications in Primary Care

Acute respiratory infections

Most uncomplicated upper-respiratory infections are viral and should be managed with symptomatic treatment and safety-netting. Antibiotics are not indicated for routine viral upper-respiratory infection or uncomplicated acute bronchitis. [10,19]

The clinician should assess for pneumonia, severe systemic infection, asthma or chronic obstructive pulmonary disease exacerbation, influenza or COVID-19 when clinically relevant, heart failure, pulmonary embolism, and other noninfectious causes.

A cough may persist after the acute infection begins to improve. Patient education about the expected course is essential. Suspected bacterial sinusitis should be assessed according to symptom duration, severity, and trajectory. Colored nasal discharge alone should not determine treatment. A “double-worsening” pattern or severe persistent illness may increase the likelihood of bacterial disease, but diagnosis should remain clinically grounded.

Sore throat and tonsillitis

The Qatar national tonsillitis guideline is directly relevant to PHCC. It applies to adults and children over three years and aims to standardize diagnosis and management while reducing inappropriate antibiotic prescribing and avoidable referral. [3]

A practical pathway includes:

- Assessment of severity and red flags.
- Examination for peritonsillar, parapharyngeal, or retropharyngeal complications.
- Use of Centor or FeverPAIN scoring where appropriate.
- Selective rapid antigen testing.
- Symptomatic treatment for patients with low probability of bacterial infection.
- Immediate treatment for patients in whom bacterial disease is sufficiently likely and treatment benefit is meaningful.
- Delayed prescribing for selected patients.
- Clear referral criteria for airway compromise, deep-space infection, severe systemic illness, or diagnostic uncertainty.

Antibiotic treatment should not be based solely on fever, tonsillar exudate, or patient request.

Urinary symptoms

The probability of urinary infection is influenced by dysuria, frequency, urgency, suprapubic pain, fever, flank pain, vaginal symptoms, pregnancy, sex, age, recurrence, and comorbidities.

Urine culture should be considered particularly in suspected pyelonephritis, pregnancy, recurrent infection, complicated urinary infection, male patients where the clinical context suggests complicated infection, treatment failure, suspected resistant organisms, and atypical or severe presentations.

Asymptomatic bacteriuria should not generally be treated except in evidence-based situations such as pregnancy or before selected urologic procedures.

Skin and soft-tissue infection

Cellulitis should be distinguished from mimics such as venous stasis dermatitis, contact dermatitis, gout, allergic inflammation, and dependent edema. An abscess may require drainage rather than antibiotic treatment alone.

Antibiotic selection should consider the presence of purulence, severity and systemic features,

anatomical location, likely pathogen, local resistance, recent antimicrobial exposure, allergy, and risk of complications. Response should be assessed clinically. A residual change in color or swelling does not automatically indicate treatment failure.

Dental and oral infection

Antibiotics are not a substitute for definitive dental care. They are not routinely indicated for localized dental pain without systemic involvement. Urgent evaluation is required for rapidly progressive facial swelling, dysphagia, trismus, systemic toxicity, suspected deep-space infection, or possible airway compromise.

Qatar's National Policy Framework

National Antimicrobial Stewardship and Prescribing Policy

The Qatar Ministry of Public Health's National Antimicrobial Stewardship and Prescribing Policy provides the principal national framework for antimicrobial use and stewardship. It establishes standards for antimicrobial-stewardship programs and empirical prescribing in healthcare facilities. [2] [16]

For primary care, the policy has several practical implications:

- Healthcare facilities should establish antimicrobial-stewardship structures.
- Prescribing should follow national, local, or facility guidelines.
- The indication for treatment should be documented.
- Antimicrobial use should be monitored.
- Selected antimicrobial agents may require restriction.
- Microbiology and susceptibility information should inform treatment.
- Allergy status should be clarified.
- Therapy should be reviewed and modified when clinical or microbiological information becomes available.
- Resistance and relevant clinical outcomes should be monitored.

The policy should be translated into operational PHCC processes rather than remaining only a governance document.

National clinical guidelines

The Qatar Ministry of Public Health has published national clinical guidelines for selected conditions. These guidelines are important because they provide local recommendations that can be incorporated into PHCC pathways, electronic order sets, patient information, and audit indicators.

The tonsillitis guideline demonstrates how condition-specific guidance can address diagnostic scoring, selective testing, symptomatic treatment, delayed prescribing, antibiotic indications, and referral criteria. [3]

Local implementation

PHCC implementation should distinguish between national policy requirements, Ministry of Public Health clinical guidelines, PHCC clinical pathways and formulary rules, and clinic-level workflows and quality-improvement initiatives. The latest approved internal PHCC policies, document-control versions, formularies, antibiograms, and restricted-antibiotic lists should be checked before implementation or publication. Publicly available national documents may not reflect all internal PHCC processes.

Implementing Stewardship in PHCC Qatar

Establish multidisciplinary leadership

PHCC stewardship should be integrated into clinical governance and quality improvement. A multidisciplinary team may include family physicians, clinical pharmacists, nurses, microbiologists, infectious-disease physicians, infection-prevention personnel, health informatics staff, quality-improvement professionals, PHCC leadership, and formulary and procurement representatives.

The team should identify local priorities, approve clinical pathways, review data, support clinicians, and report progress to the relevant governance structure.

Integrate prescribing into the electronic medical record

Electronic prescribing can support stewardship by making the correct choice easier and by generating reliable data. Useful functions include: [11,12]

- Displaying first-line treatments.
- Providing recommended dose and duration.
- Linking prescriptions to a diagnosis.
- Prompting allergy verification.
- Alerting to drug interactions.
- Flagging duplicate therapy.
- Identifying restricted antibiotics.
- Requiring a review date.
- Providing links to PHCC and national guidelines.
- Recording deviation from guidelines.
- Generating prescribing reports.

Electronic prompts should be targeted and clinically meaningful. Excessive alerts can create fatigue and may lead clinicians to override important warnings.

Manage Access, Watch, and Reserve antibiotics

The AWaRe framework can support the Qatar policy by encouraging appropriate use of Access antibiotics and protecting Watch and Reserve agents. [6] PHCC should maintain a current restricted-antibiotic list

linked to national policy and local formulary decisions. Restrictions should be transparent, clinically justified, and supported by consultation rather than functioning as an administrative barrier.

Exceptions should be possible when clinically indicated, including severe allergy, resistant infection, previous microbiology, or specialist advice. The clinical rationale should be recorded.

Involve pharmacists and nurses

Pharmacists can support audit and feedback, broad-spectrum antibiotic review, allergy clarification, patient counseling, formulary management, antimicrobial-consumption surveillance, education for clinicians, identification of prolonged or repeated courses, and monitoring of supply and substitution issues.

Nurses can support allergy-history clarification, documentation of recent antibiotic use, telephone triage, red-flag identification, patient education, reinforcement of safety-netting, and follow-up for selected patients. This team-based approach reflects the Qatar policy's emphasis on multidisciplinary stewardship.

Provide local resistance information

Empirical prescribing should reflect local susceptibility patterns where available. PHCC should work with microbiology and public-health services to develop relevant antibiograms or prescribing summaries.

Patient-specific risk factors for resistant infection include recent antibiotic exposure, recent hospitalization, prolonged healthcare contact, previous resistant organisms, residence or care in facilities with high resistance, travel history, and recurrent infection. Local data should be updated regularly and incorporated into clinical pathways.

Audit, Feedback, and Performance Measurement

Why measurement matters

Stewardship programs require measurement to identify variation, evaluate interventions, and sustain improvement. The Qatar national policy supports monitoring of antimicrobial prescribing, guideline compliance, consumption, resistance patterns, and relevant clinical outcomes. [2]

Measurement should assess both prescribing process and patient safety. A fall in antibiotic prescriptions is not sufficient if it is accompanied by delayed treatment of serious disease, increased complications, or replacement of first-line agents with broader-spectrum antibiotics.

Suggested PHCC indicators

Domain	Indicator
Documentation	Percentage of prescriptions linked to a documented diagnosis or indication
Guideline adherence	Percentage consistent with PHCC or national guidance
Antibiotic spectrum	Proportion of Access, Watch, and Reserve agents
Duration	Percentage with guideline-concordant duration
Respiratory care	Antibiotic use for uncomplicated bronchitis or viral upper-respiratory infection
Tonsillitis	Documentation of clinical score or appropriate testing
Allergy safety	Percentage with allergy status and reaction documented
Diagnostic stewardship	Percentage of cultures obtained appropriately before treatment when indicated
Feedback	Percentage of clinicians receiving regular prescribing feedback
Patient outcomes	Treatment failure, reconsultation, referral, adverse events, and complications
Resistance	Trends in selected resistant organisms and susceptibility patterns

Audit and feedback

Audit-feedback interventions should be specific, timely, credible, confidential, nonpunitive, linked to practical actions, and repeated over time. Feedback may include individual reports, clinic-level summaries, peer comparison, case review, electronic dashboards, and facilitated discussion. Evidence suggests that behavioral interventions combining accountability, peer comparison, and clear justification can reduce inappropriate outpatient prescribing. [8] [17]

Feedback should avoid simplistic ranking. A clinician with a high prescribing rate may be managing a population with greater complexity or may have better documentation than peers. Data should therefore be interpreted with clinical context and adjusted where feasible.

Patient and Public Engagement

Patient education

Patient education should address common misconceptions identified in studies of public knowledge and communication about antibiotic resistance [14,15]:

- Antibiotics do not treat viruses.
- Fever alone does not establish bacterial infection.
- Colored mucus does not automatically indicate a need for antibiotics.
- Antibiotics can cause adverse effects and contribute to resistance.

- Improvement may be gradual.
- Reassessment is important when symptoms worsen or fail to improve.

Messages should be consistent across the clinic. Receptionists, nurses, pharmacists, and physicians should avoid conflicting advice.

Public-health communication

PHCC can support population-level stewardship through waiting-room materials, seasonal respiratory-illness campaigns, antibiotic-awareness activities, social-media communication, school and community education, patient-portal content, and multilingual resources. Public communication should emphasize that stewardship protects both the individual patient and the wider community.

Safety-netting

Safety-netting should be individualized. Patients should be told what improvement should look like, how long symptoms may reasonably last, which symptoms require recontact, which symptoms require urgent care, how to access PHCC or emergency services, and what to do if an antibiotic was delayed or prescribed conditionally. Safety-netting is particularly important when antibiotics are withheld or delayed.

Special Populations and High-Risk Situations

Stewardship does not mean delaying treatment in patients who require urgent therapy. Immediate evaluation and empiric treatment may be necessary for sepsis, meningitis, severe pneumonia, pyelonephritis with systemic illness, rapidly progressive skin or soft-tissue infection, deep-space infection, severe infection in immunocompromised patients, and infection in clinically unstable or frail patients.

Special attention is required for infants and older adults, pregnancy, renal or hepatic impairment, immunosuppression, recurrent infection, recent hospitalization, recent broad-spectrum antibiotic exposure, previous resistant organisms, and complex drug allergies.

The clinician should balance the risk of unnecessary treatment against the risk of undertreatment. Stewardship is an exercise in optimized prescribing, not maximal restriction.

Challenges and Equity Considerations

Access to follow-up

Delayed prescribing and outpatient monitoring assume that the patient can access care if the condition worsens. Patients with transportation barriers, inflexible work, financial constraints, language barriers, or limited digital access may require a more individualized plan.

Language and health literacy

Qatar's diverse population requires patient information in commonly used languages and in plain language. Professional interpreters should be used when necessary. Written information should avoid technical terms or explain them clearly.

Telemedicine

Telemedicine may reduce examination quality and increase diagnostic uncertainty. Remote consultations should include structured red-flag screening and clear criteria for in-person assessment. Antibiotic prescribing through telemedicine should be supported by reliable documentation and follow-up processes.

Continuity of care

Patients may consult different clinicians for the same illness. Documentation of the diagnosis, treatment rationale, and safety-netting reduces inconsistent prescribing and prevents unnecessary antibiotic escalation.

Supply and formulary issues

Drug shortages or formulary substitutions can influence prescribing. Pharmacy and procurement teams should communicate substitutions clearly and ensure that first-line alternatives remain available whenever possible.

Proposed PHCC 90-Day Stewardship Program

Phase 1: Preparation, weeks 1–2

- Appoint a physician and pharmacist champion.
- Establish a multidisciplinary working group.
- Identify relevant national and PHCC guidelines.
- Measure baseline prescribing.
- Review antibiotic selection and duration.
- Identify documentation gaps.

Phase 2: Intervention design, weeks 3–4

- Develop a clinical pathway for each target condition.
- Create a patient-information leaflet.
- Develop a delayed-prescribing protocol.
- Add electronic documentation prompts.
- Define restricted-antibiotic procedures.
- Agree on audit indicators.

Phase 3: Implementation, weeks 5–8

- Deliver brief case-based education.
- Provide communication-skills training.
- Introduce electronic or paper decision support.
- Engage pharmacists and nurses.
- Display patient-facing stewardship materials.
- Begin prospective or retrospective audit.

Phase 4: Feedback, weeks 9–12

- Provide confidential clinician feedback.
- Review cases with guideline deviation.
- Identify barriers and unintended consequences.
- Assess treatment failure, reconsultation, referral, and adverse events.
- Modify the intervention.

Phase 5: Sustainment

- Repeat measurement quarterly.
- Include stewardship in annual quality-improvement plans.
- Update pathways when policy or resistance patterns change.
- Share successful practices across PHCC centers.
- Incorporate stewardship competencies into staff orientation and professional development.

Strengths and Limitations

This review has several strengths. It combines international stewardship evidence with Qatar-specific policy, clinical guidance, and primary-care studies. It focuses on practical interventions relevant to family physicians and includes clinical, behavioral, organizational, and governance perspectives. It also emphasizes the need to monitor patient outcomes rather than prescribing volume alone.

The review also has limitations. It is a narrative review and does not provide a formal systematic search, risk-of-bias assessment, or quantitative meta-analysis. The availability of public information about PHCC internal workflows, formularies, electronic prescribing rules, and local antibiograms is limited. Some international studies may not be directly transferable to Qatar because healthcare organization, patient expectations, follow-up access, resistance patterns, and prescribing systems differ.

Before formal submission, the manuscript should be checked against the latest PHCC internal policies and the target journal's requirements. The current approved document-control version of the national policy, PHCC clinical pathways, and restricted-antibiotic list should be verified.

CONCLUSION

Antibiotic stewardship is a core responsibility of primary care and an essential component of safe family medicine. The goal is not to reduce prescribing indiscriminately, but to ensure that every prescription has a defensible indication, appropriate agent, correct dose, suitable duration, and clear follow-up plan.

Family physicians can improve stewardship through accurate clinical assessment, selective diagnostic testing, positive communication, realistic symptom counseling, delayed prescribing when appropriate, adherence to local guidance, allergy verification, and reliable documentation. Practice-level interventions, including electronic decision support, pharmacy involvement, audit and feedback, and patient education—are required to make these behaviors sustainable.

For PHCC Qatar, implementation should be aligned with the Ministry of Public Health's National Antimicrobial Stewardship and Prescribing Policy and relevant national clinical guidelines. Qatar-specific evidence demonstrates that physicians generally understand the risks of inappropriate antibiotic use, but patient pressure, complaints, organizational barriers, and consultation dynamics continue to influence prescribing. A multidisciplinary, locally adapted program can address these barriers more effectively than education alone.

Integrating stewardship into PHCC clinical governance, electronic prescribing, pharmacy services, patient communication, and quality-improvement systems could improve prescribing quality, reduce avoidable antibiotic exposure, support family physicians in challenging consultations, and preserve antibiotic effectiveness for the Qatari population.

Declarations

Ethics approval and consent to participate

Ethical approval was not required because this narrative review used only publicly available literature, policy documents, and clinical guidelines and involved no human participants, identifiable patient information, or original patient-level data.

Consent for publication: Not applicable.

Data availability

No original patient-level dataset was generated or analyzed for this review.

Funding

No specific funding was received for the preparation of this manuscript.

Conflicts of interest

Each author should independently complete the target journal's conflict-of-interest disclosure form. If accurate: The authors declare no conflicts of interest related to this manuscript.

Author contribution

- Dr Syed Ehsan Ali: Conceptualization, literature review, clinical interpretation, manuscript drafting, and final revision. Review of Qatar national policies and clinical guidelines, clinical interpretation, critical revision, and approval of the final manuscript.
- Dr Mustafa Zaboli: Literature searching, evidence organization, reference checking,

manuscript editing, and approval of the final manuscript.

All listed authors should review and approve the final manuscript, agree to be accountable for the work, and confirm that their contributions meet the authorship requirements of the target journal.

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