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Improving the Quality of Dental Care through Antibiotic Stewardship

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Abstract

Background: Antimicrobial resistance is a major public health threat, and inappropriate antibiotic use remains one of its most preventable drivers. Dentistry contributes a smaller share of antibiotic use than general medicine, but dental prescribing is important because many prescriptions are issued in outpatient, urgent-care or private-practice settings where

formal stewardship infrastructure is often limited. This makes dental antibiotic stewardship a practical issue of care quality, not only a pharmacological or microbiological problem.

Aim: This narrative review analyzes the main causes of inappropriate antibiotic use in dental practice, discusses the consequences for antimicrobial resistance and patient safety, and identifies interventions that may improve prescribing. The review particularly focuses on the tension between definitive dental treatment and the pressure to provide a rapid prescription during consultations for pain, swelling or suspected infection.

Materials and methods: A narrative literature review was conducted using PubMed and Google Scholar. English-language publications from 2015 to 2025 were selected when they addressed dental antibiotic prescribing, inappropriate use, antimicrobial resistance, clinical guidelines, prophylaxis, or dental antibiotic stewardship. Priority was given to systematic reviews, scoping reviews, clinical practice guidelines, cross-sectional studies, qualitative studies, intervention studies and major institutional reports.

Results: The literature suggests that inappropriate prescribing in dentistry is rarely caused by a single deficit in knowledge. It more often results from an interaction between clinical uncertainty, fear of complications, patient expectations, limited appointment time, delayed access to source-control procedures, uncertainty around prophylaxis and weak feedback on prescribing behavior. Compared with hospitals, stewardship in dentistry is more difficult because dental care is often fragmented, procedure-based, delivered in small practices, and less supported by pharmacists, infectious-disease teams, electronic decision support or routine prescribing audits.

Conclusions: The central conclusion is that antibiotics should not become a substitute for definitive dental treatment. Effective dental antibiotic stewardship requires guidelines, education, audit and feedback, patient communication, decision-support tools and urgent-care pathways that make evidence-based non-prescribing clinically feasible. The narrative design of this review allows broad synthesis but does not provide pooled effect estimates or a formal assessment of the certainty of evidence.

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1. Introduction

Antimicrobial resistance (AMR) is widely recognized as a major threat to modern medicine and public health. The World Health Organization (WHO) identifies the misuse and overuse of antimicrobials in humans, animals, and plants as major drivers of resistance. Global burden estimates published in *The Lancet* reported that bacterial AMR was associated with millions of deaths in 2019, including approximately 1.27 million deaths directly attributable to resistant bacterial infections [1,2]. These figures demonstrate that AMR is not only a microbiological problem but also a clinical, organizational, educational, and policy challenge.

Antibiotic stewardship refers to coordinated actions designed to improve the appropriate use of antibiotics by promoting optimal drug selection, dose, duration, and route of administration. In outpatient settings, the Centers for Disease Control and Prevention (CDC)

describe stewardship as a practical quality-improvement activity based on commitment, action for policy and practice, tracking and reporting, and education and expertise [3]. Although stewardship initiatives have historically focused on hospitals and general medical practice, dental care has increasingly been recognized as a relevant area for stewardship interventions.

Dentistry matters because dental professionals contribute a measurable proportion of outpatient antibiotic prescribing. The FDI World Dental Federation has emphasized the essential role of the dental team in reducing antibiotic resistance and has called for rational antibiotic prescribing in dental practice [4,5]. Recent United States data suggest that general dentists accounted for approximately 9.8% to 12.1% of outpatient antibiotic prescriptions from 2018 through 2022, showing that dentistry remains an important prescribing sector [6].

The clinical issue is particularly important because many dental infections are primarily managed through definitive local treatment rather than antibiotics alone. Drainage, endodontic treatment, extraction, removal of the source of infection, and appropriate pain management are often more clinically relevant than systemic antibiotic therapy. Nevertheless, antibiotics may be used when systemic involvement, spreading infection, or specific prophylactic indications are present. The boundary between necessary and unnecessary use can be difficult in practice, especially under time pressure or when access to operative treatment is limited [7,8].

Despite the availability of evidence-based guidelines, inappropriate dental antibiotic prescribing remains a persistent problem. Antibiotics may be prescribed for dental pain without systemic infection, for localized conditions that require operative treatment, for excessively long durations, or for prophylaxis in patients without a clear indication. Such use exposes patients to avoidable adverse effects and contributes to the broader public health burden of AMR [9,10,11].

The aim of this narrative review is to analyze the main causes of inappropriate or excessive antibiotic use in dental practice, discuss its consequences for antimicrobial resistance and patient safety, and identify possible interventions to improve antibiotic prescribing, including clinical guidelines, dentist education, patient education, audit and feedback, and antibiotic stewardship programs.

The main research question is: What are the main causes of inappropriate antibiotic use in dental practice, and what interventions can reduce this problem?

2. Materials and Methods

A narrative literature review was conducted using PubMed and Google Scholar. The final literature search was conducted in April 2026, and the reference list was checked again in May 2026. The search covered publications from January 2015 to December 2025, which allowed the review to include recent evidence published after the growing international emphasis on antimicrobial stewardship, while still capturing major dental prescribing studies and guidelines from the last decade. Google Scholar was used mainly to identify clinical guidelines, institutional reports, and recently published articles that might not have been easily captured through PubMed alone.

The search focused on antibiotic prescribing in dental practice, inappropriate antibiotic use, antimicrobial resistance, clinical guidelines, and dental antibiotic stewardship interventions. The following keywords and combinations were used: "dentistry", "dental practice", "dentists", "antibiotic prescribing", "antibiotic use", "inappropriate prescribing", "overprescribing", "antimicrobial resistance", "antibiotic stewardship", "clinical guidelines", "pulpal pain", "periapical infection", "antibiotic prophylaxis", "education", and "audit and feedback".

Titles and abstracts were first screened for relevance to the review question. Full texts were then reviewed when the publication addressed dental prescribing patterns, causes of inappropriate prescribing, antimicrobial resistance, patient-safety consequences, guideline adherence, prophylaxis decisions, or stewardship interventions. The search produced a broad set of potentially relevant records; after screening and removal of duplicates or low-relevance publications, 33 sources were included in the final synthesis.

The inclusion criteria were: publication in English; publication between 2015 and 2025; clear relevance to dental antibiotic prescribing, antimicrobial resistance, clinical guidelines, or antibiotic stewardship; and sufficient methodological or practical value for answering the research question. Eligible sources included systematic reviews, scoping reviews, narrative reviews, clinical practice guidelines, cross-sectional studies, qualitative studies, intervention studies, and major institutional reports.

The exclusion criteria were: studies focused exclusively on non-dental antibiotic use; laboratory microbiology papers without a clear connection to clinical dental practice; case reports without broader relevance to stewardship; publications outside the selected time frame

unless needed for contextual background; duplicate records; and opinion articles without sufficient analytical value.

A narrative design was chosen because the aim was not to estimate pooled intervention effects, but to integrate findings from guidelines, observational studies, qualitative studies, surveys, and intervention reports. Therefore, no formal PRISMA flow diagram or quantitative meta-analysis was prepared. The included sources were grouped into six thematic areas: public health context, prescribing patterns, determinants of inappropriate prescribing, consequences for patients and AMR, guideline-based indications, and stewardship interventions.

Table 1. Search strategy and selection approach used for the narrative review.

Review step	How it was handled in this paper
Databases searched	PubMed and Google Scholar were used as the main sources of records.
Search focus	The search combined dental terms with terms for antibiotic prescribing, inappropriate use, antimicrobial resistance, clinical guidelines and stewardship.
Sources given most attention	Systematic and scoping reviews, clinical guidelines, cross-sectional and qualitative studies, intervention studies, and major institutional reports were prioritized.
Basis for inclusion	Papers were included when they addressed dental antibiotic use, reasons for inappropriate prescribing, patient-safety or AMR consequences, or stewardship-based improvements.
Material not used	Studies outside dentistry, isolated case reports, purely laboratory microbiology papers, and opinion pieces without clear relevance to the review question were not used as core sources.
Synthesis approach	The selected literature was grouped thematically rather than pooled statistically, which is consistent with the narrative-review design.

3. Results and Literature Synthesis

3.1. Antimicrobial resistance and outpatient antibiotic stewardship

AMR is produced by many small prescribing decisions rather than by a single visible clinical error. In hospital stewardship, the consequences of antibiotic use are often monitored through microbiology results, pharmacy data, infection-control teams, and formal review procedures. In dentistry, by contrast, the decision is usually made during a short outpatient visit, often without laboratory confirmation and without routine feedback on later resistance patterns. This makes dental stewardship less visible but not less important: each unnecessary dental prescription contributes to population-level selective pressure while offering little or no benefit to the individual patient when the underlying problem requires local treatment [1,3].

The CDC core elements of outpatient antibiotic stewardship are useful for dentistry because they translate a hospital-derived idea into everyday ambulatory practice: commitment, action,

tracking and reporting, and education [3]. However, the dental setting requires a narrower and more practical interpretation of these elements. A hospital ward can rely on multidisciplinary antimicrobial teams, whereas a dental practice often depends on the individual dentist's chairside judgment, appointment availability, and communication with the patient. For this reason, dental stewardship must be simple enough to work during urgent pain visits, not only in policy documents.

The most distinctive feature of dentistry is that many infections have a removable local source. This separates dental prescribing from many medical consultations in which antibiotics may be the main treatment. In pulpal and periapical disease, the decisive intervention is frequently drainage, endodontic treatment, extraction, or another form of source control. The stewardship message is therefore specific: antibiotics are not prohibited, but they should not become a substitute for definitive treatment when systemic involvement or spreading infection is absent [5,9].

3.2. Antibiotic prescribing in dental practice

Antibiotics in dentistry are used mainly for treatment of established infections and for prophylaxis before selected procedures. Therapeutic prescribing is most defensible when infection is spreading, systemic signs are present, or patient-related risk factors increase the likelihood of complications. By comparison, conditions such as symptomatic irreversible pulpitis or localized periapical disease without systemic features are poorly suited to antibiotic-only management because the cause remains inside the tooth or adjacent tissues until it is treated locally [9,12].

Stein et al. [7] showed in a scoping review that dental antibiotic use varies not only by diagnosis, but also by prescriber habits, patient factors, national context, drug choice, dose, and duration. This broad variation is important because it suggests that overprescribing is not a rare deviation in one system, but a pattern reproduced in different ways across healthcare settings. For example, studies from the United Kingdom emphasize prescribing during acute general dental practice visits, while United States studies more often quantify large-scale outpatient prescription patterns and prophylaxis-related use [10,13,14,17].

Inappropriate use can therefore appear in several clinically distinct forms. A dentist may prescribe antibiotics for localized pain without systemic infection; use them as a temporary replacement for drainage, endodontic treatment, or extraction; prescribe prophylaxis without a guideline-based indication; select an unnecessarily broad-spectrum agent; or choose a

duration longer than needed. These forms should not be treated as one problem. A stewardship intervention aimed at prophylaxis decisions may not solve overprescribing for acute pain, and education about drug duration may not address patient pressure during urgent visits [10,17].

3.3. Scale and patterns of inappropriate prescribing

The empirical literature shows different faces of the same problem. In UK general dental practice, Cope et al. [13] documented antibiotic prescribing for acute dental conditions, including cases without clear evidence of spreading infection or systemic involvement. This finding is especially relevant to everyday practice because acute dental pain is common, emotionally charged, and often presented by patients as a need for immediate relief. The clinical risk is that the prescription becomes a visible response to pain even when it does not remove the cause of that pain.

The United States evidence adds a different perspective because it is based on large prescription datasets. Durkin et al. [14] showed that inappropriate prescribing occurred among a large cohort of general dentists, while another study by Durkin et al. [17] pointed to prolonged courses and the use of broad-spectrum agents. Compared with the UK study by Cope et al. [13], these data shift attention from single urgent-care encounters to population-level prescribing habits. Together, the studies suggest that the problem is both clinical and structural: it happens in the consultation room, but it becomes visible only when prescribing patterns are measured.

Prophylaxis studies identify a somewhat different mechanism of inappropriate use. Suda et al. [10] found that many antibiotic prescriptions before dental procedures were unnecessary under contemporary recommendations, whereas Lockhart et al. [18] showed that prophylaxis decisions are shaped by perceived patient risk, professional habits, and uncertainty about guideline interpretation. Unlike acute dental pain, prophylaxis is often driven less by symptoms and more by anticipation of possible harm. This makes it particularly vulnerable to defensive decision-making and advice inherited from older clinical routines.

Recent studies confirm persistence rather than disappearance of the problem. Rodríguez-Fernández et al. [15] linked inappropriate prescribing in Spain to measurable determinants among dentists. Ramanathan et al. [19] and Huynh et al. [6] examined United States prescribing over time, showing that dental antibiotic use remains substantial despite greater awareness of stewardship. Australian survey data, Canadian trend analyses, and studies

focused on endodontic and pediatric contexts add further nuance: overprescribing is not identical everywhere, but the recurring themes are delayed source control, uncertainty, prophylaxis ambiguity, and variable adherence to guidelines [16,20,21,22,23,24].

3.4. Causes of inappropriate antibiotic use in dentistry

The causes of inappropriate dental prescribing are best understood as layered rather than isolated. Lack of knowledge matters, but it rarely acts alone. A dentist may know the guideline and still prescribe when the patient expects antibiotics, when a procedure cannot be performed immediately, when swelling is difficult to assess, or when previous professional habits favor precautionary treatment. This layered explanation is more convincing than attributing the problem only to ignorance or only to patient demand [8,25].

Knowledge gaps and limited guideline familiarity remain important because they create the conditions in which non-clinical pressures can dominate. Vázquez-Cancela et al. [25] emphasized modifiable factors such as knowledge, attitudes, confidence, and perceptions. Compared with studies that simply count prescriptions, this review helps explain why dentists may continue to prescribe against recommendations: some may underestimate harms, overestimate benefits, or feel uncertain about when local treatment alone is sufficient. Still, knowledge is only one part of the mechanism, because a well-informed clinician may face the same appointment constraints and patient expectations as a less-informed one.

Clinical uncertainty and fear of complications are especially influential during acute visits. Thompson et al. [8] highlighted decision-making factors in primary dental care, and Schneider-Smith et al. [26] further emphasized how decisions are made in real practice rather than in idealized guideline scenarios. The conflict is clearest when a patient presents with pain or swelling near the end of a busy clinic session: the evidence may favor diagnosis, source control, safety-netting, and follow-up, but the fastest visible intervention is often a prescription. In that moment, antibiotics can become a tool for managing uncertainty, time pressure, and perceived risk rather than infection itself.

Patient expectations intensify this conflict. Some patients interpret a prescription as proof that the dentist has taken the problem seriously, while non-prescribing may be misunderstood as inaction. This differs from many hospital settings, where treatment decisions are embedded in a broader institutional process and patients may expect monitoring rather than an immediate medication. In dental practice, the dentist often has to explain within minutes why pain can be

severe even when antibiotics are not useful. Appropriate non-prescribing therefore requires communication skills as much as pharmacological knowledge [8,26].

Delayed access to definitive dental treatment is probably the most practical barrier. When drainage, endodontic treatment, extraction, or referral is not immediately available, antibiotics may be used to bridge the gap. This is sometimes clinically reasonable, but it becomes problematic when the bridge replaces the destination. In this sense, stewardship cannot be reduced to telling dentists to prescribe less; it must also address whether the recommended treatment is actually feasible during urgent care pathways [5,7].

Uncertainty around prophylaxis creates another distinct source of overuse. Unlike acute infection, prophylaxis decisions are often made before symptoms exist and are strongly affected by perceived responsibility for preventing rare but serious complications. Comorbidities, cardiac conditions, prosthetic joints, implants, and advice from other clinicians can make the decision feel riskier than the guideline suggests. Clearer interprofessional communication is therefore necessary, because unnecessary prophylaxis may protect the clinician psychologically more than it protects the patient biologically [10,18].

Table 2. Main causes of inappropriate antibiotic prescribing in dentistry and possible stewardship responses.

Factor	Why it can lead to overprescribing	Typical situation in practice	Possible response
Knowledge and guideline familiarity	Recommendations may be known only generally, or not applied consistently during urgent visits.	Antibiotics are prescribed for localized tooth pain even though there are no systemic signs.	Use short, case-based training focused on common dental scenarios and current guidance.
Clinical uncertainty	When the diagnosis or risk of progression is unclear, prescribing can feel like the safer option.	A prescription is given before definitive diagnosis or local treatment, mainly “just in case”.	Use chairside algorithms that make systemic involvement, spread of infection and need for referral explicit.
Concern about complications	Fear that infection may worsen can push clinicians toward precautionary antibiotics.	Antibiotics are used while operative treatment is delayed, even when source control would be preferable.	Combine safety-netting advice, clear return instructions, urgent referral pathways and planned follow-up.
Patient expectations	Some patients expect antibiotics as proof that the problem has been treated.	A patient with toothache asks for antibiotics instead of accepting definitive dental treatment.	Prepare simple explanations showing why antibiotics do not remove the source of most dental pain.
Limited time during appointments	Writing a prescription may seem quicker than explaining non-prescribing or organizing treatment.	An urgent consultation ends with antibiotics but without a clear plan for source control.	Create practice-level pathways for pain, swelling and follow-up so that the default is not a prescription.
Unclear prophylaxis indications	Comorbidities, implants, prosthetic joints or advice from other clinicians may make decisions less straightforward.	Antibiotics are given before a dental procedure despite no clear guideline-based indication.	Keep local prophylaxis guidance updated and use interprofessional consultation for genuinely uncertain cases.

3.5. Consequences for antimicrobial resistance and patient safety

The consequences of inappropriate dental antibiotic prescribing operate at two levels. At the population level, unnecessary exposure increases selective pressure for AMR; at the individual level, it exposes patients to harm without treating the dental source. The comparison with hospitals is useful here: hospitals often monitor resistant organisms and antibiotic consumption more systematically, whereas dental prescriptions may be dispersed across small practices and pharmacies. This dispersion makes the cumulative impact harder to see, but it does not make it negligible [3,4].

For the individual patient, the main concern is an unfavorable risk-benefit balance. Gastrointestinal symptoms, allergic reactions, drug interactions, microbiome disruption, selection of resistant organisms, and *Clostridioides difficile* infection may occur even when the expected dental benefit is minimal. The ADA evidence base is particularly important because it shows that for several pulpal and localized periapical conditions antibiotics add little when definitive conservative dental treatment is available. In such cases, the patient accepts drug-related risks while the actual source of pain remains untreated [9,12].

There is also a direct quality-of-care problem. A prescription can create a false impression that treatment has begun, while drainage, endodontic treatment, extraction, or other source control is postponed. This may lead to recurrence, repeated consultations, and additional antibiotic exposure. From the patient's perspective, the prescription may appear to be the quickest solution; from a quality perspective, it may be a delay in definitive care. This is the point at which stewardship and clinical quality are most closely connected [5,7].

3.6. Clinical guidelines and evidence-based prescribing

Clinical guidelines provide the clearest boundary between appropriate and inappropriate prescribing, but they are most useful when they answer concrete chairside questions. The ADA guideline for urgent management of pulpal- and periapical-related dental pain and intraoral swelling is valuable because it links prescribing to specific clinical scenarios. Its key practical message is that antibiotics generally provide negligible benefit for many target conditions when definitive conservative dental treatment is available, while harm remains possible. Antibiotics become more appropriate when there is systemic involvement, spreading infection, or elevated risk of progression [9].

The systematic review and meta-analysis supporting the ADA guideline strengthens this position by focusing on symptomatic irreversible pulpitis, symptomatic apical periodontitis,

and localized acute apical abscess [12]. Compared with broader prescribing surveys, this evidence is more condition-specific and therefore more useful for clinical decision-making. It supports a simple but often difficult rule: severe dental pain is not, by itself, an indication for antibiotics if the infection is localized and source control is available.

The remaining problem is implementation. Carlsen et al. [27] examined concordance with the ADA acute oral infection guidelines within Veterans' Affairs dentistry, showing that guideline availability does not automatically produce guideline-consistent prescribing. This finding helps explain why stewardship must include practical implementation tools. A guideline that is not embedded into appointment systems, electronic prompts, referral options, or feedback mechanisms may remain intellectually accepted but clinically underused.

3.7. Antibiotic stewardship interventions in dentistry

Dental antibiotic stewardship interventions try to close the gap between evidence and daily prescribing. The earlier systematic review by Löffler and Böhmer [28] showed that interventions to optimize dental antibiotic prescribing were possible, but the evidence base was limited. More recent reviews by Teoh et al. [11] and Mendez-Romero et al. [29] are stronger because they include newer interventions and provide a clearer picture of what appears to work. Across these reviews, the pattern is consistent: single, passive interventions are less convincing than approaches that combine education, feedback, and practical decision support.

Education remains necessary, but its effect depends on how it is delivered. General lectures on AMR may improve awareness without changing what happens during an urgent toothache consultation. In contrast, Goff et al. [30] reported improvement among private practice dentists after education from infectious-disease experts combined with audit and weekly feedback. Gross et al. [31] described implementation in an academic dental practice, a setting with more organizational infrastructure. The comparison is useful: private practice needs low-burden tools, while academic settings can support more formal stewardship programs.

Audit and feedback are especially promising because they make invisible habits visible. A dentist may not realize that most prescriptions are longer than recommended, that prophylaxis is used repeatedly without clear indication, or that one broad-spectrum drug has become the default. Feedback differs from education because it is personal and behavior-specific rather than general. The likely limitation is feasibility: small practices may lack prescribing

dashboards, while larger organizations may have data but struggle to deliver feedback in a non-punitive and clinically credible way [11,29].

Patient education should be treated as an intervention in its own right, not as an optional addition. When patients understand that antibiotics do not remove the source of most dental pain, the dentist has more space to follow evidence-based care. Thompson et al. [32] showed that stewardship tools can be co-developed with stakeholders, which is important because messages designed only by experts may not match patients' expectations or language. The practical goal is not to persuade patients that antibiotics are bad, but to explain when they are useful and when they distract from definitive care.

Decision-support tools and clinical pathways are the most practical way to translate evidence into routine behavior. A brief checklist can require the dentist to document systemic signs, spreading infection, availability of local treatment, allergy status, prophylaxis indication, and follow-up plan. Such tools are especially relevant in urgent-care settings, where the pressure to end the visit with a prescription is strongest. Their success will depend on being short, current, and compatible with the way dental appointments are organized [3,9].

Table 3. Practical stewardship actions that can be used in dental settings.

Stewardship action	How it works in practice	Why it may help	What can limit its impact
Education for dentists	Training links indications, drug choice, dose and duration to everyday dental cases.	It can correct misunderstandings and make guideline-based decisions easier to recall.	On its own, education may not change habits, time pressure or patient demand.
Prescription audit and feedback	Prescribing data are reviewed and dentists receive short, individualized feedback.	Clinicians can see patterns they may otherwise miss, such as long courses or unnecessary prophylaxis.	It requires reliable prescription data and a system for regular, non-punitive feedback.
Patient-facing explanation	Patients are told why local dental treatment, not antibiotics, is usually the key intervention.	It can reduce pressure to prescribe and improve acceptance of evidence-based care.	The message must be brief, clear and adapted to patients with different levels of health literacy.
Chairside decision support	Checklists or electronic prompts remind clinicians to assess systemic signs, allergy status, prophylaxis indications and follow-up.	It supports decisions during busy urgent-care visits, where habitual prescribing is common.	Tools must be easy to use and kept consistent with current guidance.
Urgent-care pathways	Practices define how patients with pain, swelling or suspected spreading infection should be assessed, treated and followed up.	They make definitive treatment and referral more likely than temporary antibiotic use.	Their effectiveness depends on staffing, appointment availability and access to specialist care.
Interprofessional advice	Dentists, physicians, pharmacists	This is especially useful for	Fragmented healthcare systems

Stewardship action	How it works in practice	Why it may help	What can limit its impact
	and infectious-disease specialists agree how to handle complex cases.	prophylaxis decisions and patients with substantial medical risk.	can make communication slow or inconsistent.

4. Discussion

The reviewed literature indicates that inappropriate antibiotic prescribing in dentistry is a persistent and multifactorial problem. The central interpretation emerging from this review is that dental overprescribing should not be understood simply as a failure of knowledge. In many cases, dentists know that source control is clinically preferable, but the conditions of practice make prescribing the faster, more visible and sometimes socially easier response. This explains why guidelines alone may have limited effect unless they are supported by organizational routines, communication tools and feedback systems [8,25,26].

Dental antibiotic stewardship is also more difficult to implement than hospital stewardship in several respects. In hospitals, antibiotic use is often embedded within electronic prescribing systems, formularies, microbiology results, multidisciplinary ward rounds, pharmacy review and infectious-disease consultation. In contrast, dentistry is largely outpatient, fragmented across small practices, and strongly shaped by brief appointments, urgent pain presentations and procedure availability. Many dental settings do not have routine prescribing dashboards, peer comparison reports, or immediate access to specialist antimicrobial advice. As a result, stewardship must be deliberately adapted to the realities of dental work rather than copied directly from hospital models [3,5,11].

The most clinically important conflict occurs at the point where the evidence favors definitive local treatment, but the consultation context favors a quick prescription. For pulpal and periapical conditions without systemic involvement, the source of pain or infection is local and usually requires drainage, endodontic treatment, extraction or another form of source control. These procedures require time, equipment, patient consent, clinical confidence and sometimes follow-up capacity. A prescription, by contrast, can be written quickly and may satisfy the patient's expectation that something active has been done. This creates a practical conflict between what is biologically necessary and what is easiest to deliver during a pressured visit [7,9,12].

This conflict is intensified when access to definitive treatment is delayed. If a patient presents with pain or localized swelling but cannot receive operative care during the same visit,

antibiotics may be perceived as a temporary bridge. In selected high-risk or progressive infections this may be justified, but repeated use of antibiotics as a holding strategy shifts the purpose of prescribing from treatment of systemic infection to compensation for service limitations. In this sense, inappropriate prescribing is partly a symptom of access problems and not only an individual prescriber behavior [7,8].

Patient expectations add another layer. For some patients, antibiotics are associated with strong treatment, rapid relief and professional attention. Refusing to prescribe may therefore be interpreted as doing less, even when non-prescribing is the evidence-based decision. A dentist who does not prescribe must often spend more time explaining why antibiotics will not remove the source of dental pain, what treatment is actually needed, what warning signs require urgent attention and when follow-up should occur. Therefore, good stewardship requires communication skills, not only pharmacological knowledge [8,26,32].

The literature also suggests that prophylaxis is a particularly difficult area because uncertainty is shared across professions. Dentists may receive requests or expectations from patients, physicians or surgeons to prescribe antibiotics before procedures, especially in patients with cardiac histories, prosthetic joints, implants or multiple comorbidities. When the perceived consequences of not prescribing appear severe, clinicians may choose prophylaxis even when guideline-based indications are absent. This illustrates why stewardship must include clear interprofessional guidance and not only chairside decision-making by the dentist [10,18].

The practical implication is that stewardship interventions should be multifaceted. Education is necessary, but it is unlikely to change practice if the clinical environment still rewards fast prescribing. Audit and feedback can make prescribing patterns visible; decision-support tools can reduce uncertainty during urgent visits; patient-facing materials can reduce pressure to prescribe; and urgent-care pathways can make source control more feasible. The most promising interventions are therefore those that connect knowledge with behavior, workflow and accountability [11,29,30,31].

This review also supports a broader interpretation of antibiotic stewardship as a marker of quality in dental care. Appropriate prescribing protects the individual patient from adverse effects and protects the population from cumulative selection pressure for resistance. However, it also reflects whether the patient has received the right type of dental care. If antibiotics are repeatedly used instead of definitive treatment, the prescription may mask unresolved disease and create a cycle of recurrence, repeated appointments and further antibiotic exposure [4,7,9].

Several limitations of this review should be acknowledged. First, it was designed as a narrative review and did not use a registered protocol, duplicate screening, formal PRISMA flow diagram or quantitative meta-analysis. Second, the search was limited to English-language publications from 2015 to 2025, which means that older or non-English studies may have been missed. Third, Google Scholar searches are less reproducible than database searches and may introduce selection bias. Fourth, the included literature covers different countries, healthcare systems, study designs and outcome measures, making direct comparison difficult. Fifth, some studies rely on self-reported knowledge or intended prescribing behavior, which may differ from actual prescriptions. Therefore, the conclusions should be interpreted as a structured synthesis of current themes rather than as a definitive estimate of intervention effectiveness.

Despite these limitations, the review identifies a coherent pattern: dental antibiotic overuse is driven by the mismatch between guideline-based care and the practical pressures of urgent dental decision-making. Future work should therefore evaluate not only whether dentists know the guidelines, but whether clinical systems make the guideline-recommended action realistic at the moment of care. This includes studying long-term sustainability, cost-effectiveness, patient communication, electronic decision support and prescribing feedback in different dental care settings.

Table 4. Practice-oriented recommendations from the reviewed literature.

Practical message	Why it matters	Who it mainly concerns	Key sources
Treat the dental source first whenever possible	Many odontogenic problems need drainage, endodontic treatment, extraction or another form of source control rather than antibiotics alone.	Dentists and dental service organizers	[9,12]
Reserve antibiotics for clear indications	Avoiding unnecessary exposure reduces patient harm and limits selection pressure for resistance.	Dentists	[4,7]
Turn guidelines into usable routines	Guidance has limited value if it is not translated into decisions that fit ordinary appointments.	Professional bodies, clinics and dental educators	[25,27]
Review prescribing patterns regularly	Feedback helps clinicians notice repeated habits, such as prolonged courses or prophylaxis without indication.	Dental organizations and larger practices	[11,29]
Explain non-prescribing to patients	Clear communication can reduce the expectation that every painful dental problem needs antibiotics.	Dentists, hygienists and public health teams	[8,32]

Practical message	Why it matters	Who it mainly concerns	Key sources
Use simple decision aids	Brief algorithms can make it easier to act consistently under time pressure.	Dental practices and electronic health-record teams	[3,9]

5. Conclusions

Inappropriate antibiotic prescribing in dentistry is a relevant patient-safety and public-health problem, but it is also a practical problem of dental service delivery. The main causes identified in the literature include limited adherence to guidelines, knowledge gaps, clinical uncertainty, fear of complications, patient expectations, time pressure, delayed access to definitive dental treatment and uncertainty around prophylactic indications. These factors are modifiable, but they cannot be solved by education alone.

The most important clinical conclusion is that antibiotics should not become a substitute for definitive dental treatment. In most pulpal and periapical conditions without systemic involvement, the key intervention is source control through drainage, endodontic treatment, extraction or another local procedure. The pressure to provide a quick prescription is understandable in urgent dental care, but it may delay appropriate treatment and expose the patient to avoidable risk.

Dental antibiotic stewardship should therefore be designed differently from hospital stewardship. It must fit short outpatient consultations, small-practice workflows, urgent pain presentations and limited access to prescribing surveillance. Practical strategies should include concise guidelines, chairside decision aids, patient explanations, audit and feedback, interprofessional advice for prophylaxis decisions and urgent-care pathways that make definitive treatment more accessible.

Overall, rational antibiotic prescribing should be treated as a marker of quality in dental care. Reducing unnecessary prescriptions can improve patient safety, support evidence-based practice and contribute to broader efforts against antimicrobial resistance. Further research should focus on the long-term effectiveness, sustainability, cost-effectiveness and real-world implementation barriers of dental stewardship interventions across different healthcare systems.

Keywords: antibiotic stewardship; dentistry; antimicrobial resistance; antibiotic prescribing; dental care; patient safety.

Disclosure

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