

Teledentistry and Rational Pharmacotherapy for Dental Prescribing and Antimicrobial Stewardship

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Abstract

Background: Teledentistry is increasingly used for triage, consultation, follow-up and patient education. These encounters often include advice about analgesics, antimicrobials and other medicines. Remote care may therefore improve prescribing, but limited examination can also encourage empirical treatment.

Objective: To examine how teledentistry may support rational pharmacotherapy, dental antimicrobial stewardship and medication safety, with particular attention to clinical safeguards and the Indian context.

Evidence Review: Teledentistry can structure history-taking, medication reconciliation, allergy checks, risk assessment, electronic prescribing, safety-netting and early review. Embedded guidance, prescription audit and feedback may reduce avoidable antibiotic exposure. Its

most useful role is to distinguish patients who can receive temporary symptomatic care from those requiring prompt procedures or emergency assessment. Remote management is less reliable when image quality is poor, infection severity cannot be assessed, or the patient has rapidly progressive swelling, dysphagia, airway symptoms, severe trismus, systemic toxicity or major comorbidity. A proposed 5-D framework—Diagnose, Decide, Drug-check, Direct, and Document and Review—is presented as a practical structure for remote prescribing.

Conclusion: Teledentistry can improve access to rational pharmacotherapy when it is embedded in a clinical pathway that prioritises diagnosis, source control, definitive dental treatment and follow-up. It

should not become a convenient route for issuing antibiotics in place of examination and treatment.

Keywords: Teledentistry, Rational Pharmacotherapy, Antimicrobial Stewardship, Dental Prescribing, Medication Safety, Pharmacovigilance, Digital Health.

Introduction

Teledentistry uses information and communication technologies to deliver or support oral healthcare when the patient and clinician are separated by distance. It includes synchronous video consultation, telephone consultation, store-and-forward review of images or radiographs, remote monitoring and professional-to-professional advice. Recent evidence syntheses suggest that these models can improve access, referral and continuity of care, although the certainty of evidence for long-term clinical and economic outcomes remains limited.¹⁻⁴ The practical question is therefore not whether teledentistry can replace conventional dentistry, but where it can safely add value within a wider care pathway.

Medicines are frequently discussed or prescribed during remote dental encounters. Analgesics may be recommended while definitive treatment is arranged; antibiotics may be considered for spreading infection or systemic involvement; and antiseptics, antifungals or drugs for oral mucosal disease may occasionally be used. Each decision requires an indication, an appropriate medicine, an individualised dose and duration, and a plan to assess benefit and harm. These requirements are difficult to meet when the history is incomplete or clinical examination is restricted.

Antibiotic prescribing is the clearest stewardship concern. Many painful pulpal and periapical conditions require definitive dental treatment rather than antibiotic therapy. Evidence-based guidance recommends against

routine antibiotics for most immunocompetent adults with pulpal or periapical pain when definitive conservative dental treatment is available; antibiotics are reserved for defined situations such as systemic involvement or spreading infection.⁵ Nevertheless, unnecessary courses, unnecessarily broad agents and prolonged durations remain reported in dental practice.⁶⁻⁹ Teledentistry thus creates both an opportunity and a risk. Digital forms, decision support, allergy alerts and scheduled review can make prescribing more deliberate. Conversely, uncertainty, patient pressure and inability to provide a procedure during the same encounter can make an antibiotic appear to be the easiest interim response. This review examines whether teledentistry can facilitate rational pharmacotherapy without normalising empirical prescribing in the absence of adequate assessment.

Methods: Online Database Literature Review

A structured literature search was conducted using PubMed/MEDLINE as the primary biomedical database, supplemented by targeted searches of relevant systematic reviews, clinical guidelines and policy documents. Search terms covered teledentistry, telehealth, remote dental care, dental prescribing, antimicrobial stewardship, antibiotic prescribing, medication safety and pharmacovigilance. Priority was given to systematic reviews, clinical guidelines, policy analyses, observational studies and intervention studies relevant to dental prescribing and remote dental care. Recent literature was prioritised, while seminal and guideline publications were retained where necessary. Because the available literature was heterogeneous in study design, populations, interventions and outcomes, findings were synthesised narratively rather than quantitatively.

Rational Pharmacotherapy in Dental Practice

Rational pharmacotherapy means that a medicine is used for a valid clinical indication, in a regimen suited to the patient, for an appropriate duration, with acceptable cost and a plan for monitoring. In dental care, a useful sequence is: right indication, right drug, right patient, right dose, right duration and appropriate review. The sequence begins with diagnosis. A well-written prescription cannot compensate for an incorrect assumption that pain alone indicates bacterial infection.

For acute odontogenic pain, non-opioid analgesics are generally preferred. The 2024 American Dental Association guideline concluded that non-steroidal anti-inflammatory drugs (NSAIDs), alone or combined with acetaminophen, provide effective first-line treatment for most acute dental pain, while opioids should be reserved for selected circumstances.¹⁰ The choice still requires patient-specific screening. NSAIDs may be unsuitable in patients with active peptic ulceration, significant renal impairment, hypersensitivity, some cardiovascular conditions, anticoagulant use or particular stages of pregnancy. Acetaminophen requires attention to total daily exposure, hepatic disease, alcohol use and duplicate ingredients in combination products.

Antibiotics are adjuncts, not substitutes for drainage, debridement, extraction, endodontic treatment or other source-control procedures. When an antibiotic is indicated, the narrowest suitable agent should be selected, allergy status should be verified, local guidance should be followed, and treatment should not be extended automatically. Broad-spectrum combinations and multiple antimicrobials add adverse-event and resistance pressure without assuring better dental outcomes. The same discipline applies to antiseptic mouthrinses, antifungals and topical preparations: each

needs a defined indication and review point rather than habitual continuation.

Teledentistry as a Platform for Rational Prescribing

A remote consultation can improve prescribing when it follows a consistent clinical template. The history should establish the site, onset and character of pain; swelling and its progression; fever or malaise; trismus, swallowing and breathing; trauma; recent dental procedures; previous treatment; and current self-medication. Images or video may show facial asymmetry, visible swelling, ulcers, gingival inflammation or a fractured tooth, but their diagnostic value depends on lighting, focus, orientation and the patient's ability to obtain the image. Radiographs and previous records, when available, materially change the quality of assessment.

Medication reconciliation is equally important. The prescriber should record current medicines, recent antibiotics, known allergies and the reaction attributed to each allergy. Comorbid diabetes, renal or hepatic impairment, cardiovascular disease, pregnancy, immunosuppression and anticoagulant or antiplatelet therapy may alter both urgency and drug choice. An electronic prescription can then include the generic name, strength, dose, route, frequency, duration and specific counselling. Automated prompts can identify duplicate analgesics, excessive acetaminophen exposure, interactions and contraindications.

The principal benefit of teledentistry may be direction rather than prescription. After assessment, the clinician can advise temporary analgesia, arrange an early clinic visit, obtain specialist advice, or direct the patient to emergency services. Review within a defined period allows the clinician to detect non-response, adverse effects and failure to obtain definitive care. Such follow-

up is especially useful after a procedure, when healing and medication tolerance can often be checked remotely.¹⁻⁴

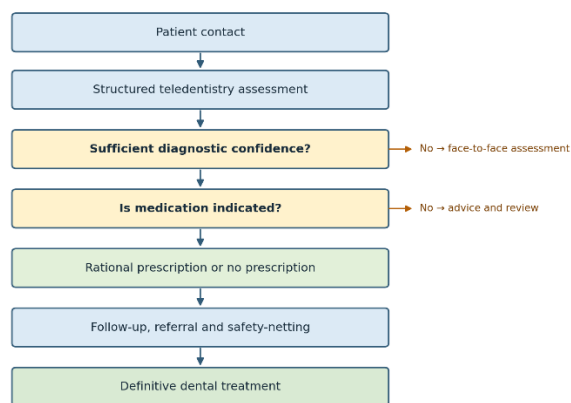


Figure 1: Teledentistry pathway for rational pharmacotherapy

Rational Analgesic Use Through Teledentistry

Pain is the commonest reason for an urgent dental contact, but pain does not by itself establish infection and does not create an automatic indication for an antibiotic. Remote consultation should first identify the likely source and screen for red flags. If definitive treatment cannot be provided immediately, evidence-based non-opioid analgesia may be used as temporary management while an appointment is arranged.¹⁰

Before recommending an NSAID, the clinician should ask about renal disease, peptic ulcer or gastrointestinal bleeding, cardiovascular disease, asthma or previous NSAID hypersensitivity, pregnancy, and treatment with anticoagulants, antiplatelet agents or other medicines that increase bleeding or renal risk. Before recommending acetaminophen, the total dose from all products, liver disease and alcohol exposure should be assessed. Advice should include the dose ceiling, dosing interval, intended duration and warning against using differently branded products that contain the same ingredient.

Teledentistry also offers an opportunity to correct self-medication. Patients may alternate several analgesics, continue an old antibiotic, share medicines, or purchase fixed-dose combinations without recognising duplication. Asking the patient to show medicine strips or upload photographs can improve reconciliation. The consultation should end with a specific plan for definitive care; repeated remote analgesic advice without dental intervention may conceal progression and is not rational treatment.

Teledentistry and Antimicrobial Stewardship

Antimicrobial stewardship seeks to achieve the best clinical outcome while limiting avoidable toxicity, selection of resistance and disruption of the microbiome. In dentistry, this requires more than selecting an antibiotic. It requires the prescriber to determine whether bacterial infection is present, whether systemic antimicrobial therapy is necessary, and whether operative source control can be performed promptly. The dental stewardship literature has emphasised condition, drug, dose and duration together with definitive dental treatment.^{6,11}

Inappropriate use occurs when antibiotics are prescribed for irreversible pulpitis or localised pain without systemic involvement, when a broad-spectrum agent is chosen without justification, when courses are prolonged, or when treatment is repeated because access to a procedure is delayed. Prophylactic prescribing can also be unnecessary; one US claims analysis found that more than 80% of antibiotic prophylaxis prescriptions before dental visits did not meet its criteria for appropriateness.¹² Patient expectations, fear of deterioration, diagnostic uncertainty, limited access to urgent procedures and clinicians' assumptions about what patients want can all sustain this practice.¹³

Teledentistry can support stewardship if safeguards are built into the workflow. A mandatory indication field can prevent an antibiotic prescription from being detached from a diagnosis. Decision support can display red flags, guideline criteria, first-line agents, allergy alternatives and review intervals. The system can require documentation of swelling, systemic features, immune status and the plan for source control. It can also prompt the prescriber to distinguish true immediate hypersensitivity from non-allergic intolerance before defaulting to a broader or higher-risk alternative.

Stewardship is strengthened when electronic prescribing data are reviewed. Dashboards can report antibiotic prescriptions by clinician, indication, drug and duration; outliers can receive confidential feedback; and repeat prescribing without a recorded dental procedure can be examined. Systematic reviews of dental stewardship interventions indicate that audit, feedback, education and multifaceted approaches can improve prescribing, whereas passive circulation of guidance alone is unlikely to be sufficient.^{6,7} The international consensus on outcomes for dental antibiotic stewardship also provides a basis for evaluating such interventions consistently.¹¹

The evidence from telemedicine outside dentistry is instructive but should not be transferred uncritically. A 2025 systematic review found that telemedicine-based interventions could support antibiotic stewardship, but effects varied across settings and intervention types.¹⁴ Earlier comparative evidence found higher prescribing during telemedicine for some respiratory conditions and no clear difference for others.¹⁵ These findings suggest that the technology is not the intervention by itself. Benefit depends on the decision rules, access to examination and testing, clinician accountability, follow-up and availability of definitive care.

Accordingly, a teledentistry stewardship pathway should produce one of four clear outcomes: no medicine with advice; temporary symptomatic treatment with a scheduled dental visit; an antibiotic for a documented indication combined with timely source control; or urgent face-to-face or emergency referral. Antibiotic therapy without immediate source control should be reserved for clearly documented indications when definitive dental treatment is temporarily unavailable or when systemic involvement/spreading infection warrants antimicrobial therapy, with prompt arrangements for definitive care

Medication Safety and Pharmacovigilance

Remote care can function as a medication-safety checkpoint. A structured consultation can document allergies, previous adverse drug reactions, current prescription and non-prescription medicines, pregnancy or lactation, renal and hepatic impairment, age-related vulnerability and relevant comorbidities. The patient can display labels or upload photographs of medicines, reducing errors caused by uncertain brand names. These details should remain visible at subsequent contacts.

Drug choice has measurable safety consequences. Analysis of adverse reactions to oral antibiotics prescribed by dentists in England found marked differences between agents; amoxicillin had a comparatively low reported adverse-reaction rate, while clindamycin had the highest overall and fatal reaction rates, with *Clostridioides difficile* infection contributing importantly.¹⁶ This does not remove the need for individual assessment, but it shows why an unverified penicillin-allergy label and reflexive substitution can cause harm.

Remote follow-up may identify rash, diarrhoea, nausea, dizziness, poor pain control, excessive analgesic use, or

clinical deterioration earlier than waiting for the next routine visit. The clinician should document the suspected reaction, timing, dose, concomitant medicines, action taken and outcome. Serious or unexpected suspected reactions should be reported through the applicable pharmacovigilance system. Patient-generated photographs and time-stamped symptom records may support evaluation, although they do not establish causality.

Safety-netting is essential. Patients should know when to stop a medicine, when to contact the dental team and when to seek urgent care. Communication must be specific: rapidly increasing facial or neck swelling, dysphagia, drooling, breathing difficulty, severe trismus, systemic toxicity, altered consciousness or uncontrolled bleeding should trigger urgent face-to-face or emergency assessment.

Risks and Limitations

Teledentistry cannot reproduce palpation, percussion, periodontal probing, assessment of fluctuation, complete examination of deep oral spaces or immediate radiography. A photograph may underestimate swelling, and a calm patient on video may still have important physiological risk. Diagnostic confidence can also be falsely increased by a clear image of only one part of the mouth. When a reliable assessment cannot be made, the correct outcome is examination or referral, not a speculative prescription.

Remote services may unintentionally separate prescribing from procedures. If access to operative care is poor, clinicians and patients may use repeated antibiotic courses to postpone treatment. This creates short-term reassurance while the source persists. Prescribing pressure may be greater in commercial on-demand services where continuity and access to records

are limited. Protocols should therefore restrict repeat antibiotic prescribing without review and record whether definitive treatment occurred.

Digital exclusion is another concern. Limited connectivity, low-quality devices, language barriers, disability and low digital health literacy can reduce assessment quality and widen inequality. Consent, identity verification, confidentiality, secure transmission of images and appropriate retention of records must be addressed. Teledentistry should be offered as one route within a hybrid system, not as the only route for patients who need urgent oral healthcare.

Indian Perspective

India has a strong rationale for using teledentistry to connect rural and underserved communities with dental expertise, support primary-care triage and reduce avoidable travel. At the same time, easy access to medicines, self-medication, variable prescribing practices and uneven access to definitive dental treatment may magnify the risk of empirical antibiotic use. A systematic review of Indian studies reported antibiotic use in 27% to 88% of audited dental prescriptions and self-medication for dental problems in 5% to 35% of participants, although the underlying studies were of low to moderate quality.⁸ The review also identified broad-spectrum and fixed-dose combinations inconsistent with stewardship principles.

A 2024 analysis of Indian policy documents identified a lack of dental-specific prescribing guidelines or stewardship toolkits and gaps between global recommendations and national documents.⁹ A subsequent India-focused review described continuing knowledge-practice gaps and barriers to structured implementation.¹⁷ These findings support a national or state-level teledentistry prescribing protocol that is

concise enough for routine use and aligned with authoritative antimicrobial guidance.

Such a protocol should define which conditions may be managed temporarily at distance, the minimum history and visual information required, red flags, recommended analgesic checks, indications for antibiotics, standard prescription fields, timelines for review and referral, and documentation of source control. Training should include communication strategies for declining unnecessary antibiotics. Local-language patient information and links to nearby dental services would make the protocol more useful than a guideline stored separately from the consultation platform.

Future Directions

Future systems should integrate teledentistry records with electronic health records and pharmacy data so that allergies, renal function, pregnancy, anticoagulants and recent antibiotic exposure are visible at the point of prescribing. Clinical decision support can then generate patient-specific warnings rather than generic reminders. Prescription dashboards could measure antibiotic rate, broad-spectrum use, course duration, repeat prescriptions and completion of definitive treatment. Implementation can draw on the CDC core elements for outpatient stewardship, the FDI policy position on dental stewardship and the WHO medication-safety agenda.¹⁸⁻²⁰ Artificial intelligence may assist image-quality checks, lesion triage, risk stratification and identification of prescribing patterns, but it should not convert uncertain visual findings into automated antibiotic recommendations. Algorithms require external validation, transparent performance reporting, human oversight and monitoring for inequitable error. Research priorities include pragmatic comparisons of teleconsultation, face-to-face and hybrid pathways;

patient-level safety outcomes; antibiotic appropriateness rather than prescription volume alone; and multicentre Indian studies that link prescribing data with definitive treatment and follow-up. Remote adverse-event surveillance is another promising area, particularly when patients can submit structured symptom reports after starting a medicine.

Proposed 5-D Framework for Teledentistry Prescribing

The following 5-D framework adapts established dental stewardship concepts to the sequence of a remote consultation. It is proposed as a practical aid and has not been clinically validated.

Step	Remote prescribing action
Diagnose	Decide whether the available history, images, records and remote examination support a sufficiently reliable working diagnosis.
Decide	Ask whether medicine is required now, whether symptomatic care alone is appropriate, and what definitive treatment is needed.
Drug-check	Confirm indication, drug, dose, route, duration, allergy, interactions, comorbidities, pregnancy status and recent exposure.
Direct	Continue remotely only when safe; otherwise arrange definitive dental treatment, specialist review or emergency assessment.
Document and Review	Record the assessment and prescription, give safety-net advice, confirm follow-up and detect treatment failure or adverse reactions.

Conclusion

Teledentistry can improve access to advice, early triage, medication reconciliation, rational analgesic use and timely follow-up. It also creates useful opportunities for decision support, prescription audit, feedback and remote identification of adverse drug reactions. These benefits are conditional, not automatic. Limited examination and poor access to procedures can turn remote care into a route for empirical or repeated antibiotic prescribing.

A safe model keeps definitive dental treatment at the centre of the pathway. Medicines are used only for a documented indication, patient-specific risks are checked, red flags lead to examination or emergency referral, and every prescription has a review plan. The proposed 5-D framework offers a concise structure for these decisions, but it requires prospective evaluation. Teledentistry should shorten the route to appropriate care; it should not replace source control with a prescription.

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