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I've got Toothache, I need Antibiotics: a UK Perspective on Rational Antibiotic Prescribing by Dentists

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Antibiotics do not cure toothache. This headline message of the United Kingdom's (UK) Dental Antimicrobial Stewardship (AMS) toolkit's posters and leaflets is aimed at patients; clinicians are expected to know this already. Evidence based clinical guidelines exist to set clear standards for good clinical practice yet there are barriers to compliance. The national AMS audit tool is designed for clinicians to review their management of acute dental conditions, including but not limited to the prescription of antibiotics. In this article we aim to help dental teams protect their patients and themselves from adverse events related to antibiotic prescription. It explores the emergent problem of *Clostridium difficile*, antibiotic resistance and severe sepsis, and considers some of the barriers, which clinicians have suggested, contribute to the unjustified prescription of antibiotics. Dentists must weigh the risks against the benefits before prescribing any antibiotic.

Key Words: antimicrobial stewardship, dental care, drug prescriptions, emergencies, infection.

Introduction

Dental patients have a right to expect that clinicians will examine them thoroughly, ask the right questions, diagnose their needs correctly, provide a clear treatment plan and treat them accordingly (1). A good clinician-patient partnership is central to the decision making process and valid consent is a cornerstone of the provision of dental treatment (2).

But in spite of the need to respect patients' autonomy and views, dentists must be prepared to decline requests for a particular treatment if they judge it would not be of overall benefit to the patient's health (2), such as when a patient requests antibiotics without any real indication for the prescription. To support professional conduct in such a situation, here we present an up-to-date guidance on dental antibiotic prescribing and discuss why antimicrobial stewardship is an increasingly important issue. In this article we aim to help dental teams protect their patients and themselves from adverse events related to antibiotic prescription.

Main Topics

Clinical Guidelines for the Rational use of Antibiotics

Current guidance in the United Kingdom (UK) on treating acute dental conditions is provided by the Faculty of General Dental Practice (FGDP) (3), British National Formulary (BNF) (4) and Scottish Dental Clinical Effectiveness Programme (SDCEP) (5). Their key message is common: antibiotics may be used in conjunction with (but not as an alternative to) other appropriate measures, such as providing drainage or extraction of a tooth. On-

line access to these guidelines is available via the web addresses in Table 1.

A review point two to three days after drainage of an acute dental infection is a key element of the guidance. Those patients whose infections have resolved (and body temperature returned to normal) should be instructed to stop taking the antibiotic (3). Continuing to take antibiotics after the infection has gone serves only to increase the selective pressure driving the spread of bacteria which are resistant to antibiotics within the patient and the wider environment (6).

Toothache: What to Prescribe?

Cochrane systematic reviews exploring antibiotic use for the treatment of toothache have confirmed that antibiotics do not appear to significantly reduce toothache caused by irreversible pulpitis or periapical periodontitis (7,8). The prescription of analgesics for the temporary relief of toothache is a universal evidence-based recommendation. Currently, ibuprofen and paracetamol are the most prescribed analgesics by dentists in the UK (9).

For adults, the maximum dose of ibuprofen is 2.4 g per day and may be prescribed in the UK as 600 mg tablets of ibuprofen (4). This is higher than doses found in over-the-counter analgesic patient information leaflets; BNF should be consulted before prescribing or recommending ibuprofen, however, to ensure that no contraindications to its use exist. For paracetamol, the correct and safe maximum daily dosage is 4.0 g per day.

Towards Global Rational Use of Antibiotics in the Dental Clinic

The consumption of antibiotics is a major driver for the development of bacterial infections which are resistant to them (6, 10). There is an increased awareness among the general public of the population level threat of antimicrobial resistant infections. Indeed currently 700,000 deaths per year world-wide are attributed to drug resistant infections and it is estimated to cause an alarming 10,000,000 deaths by 2050 (11).

The UK Government has committed to reducing the unnecessary use of antibiotics, antifungals and antivirals (collectively known as antimicrobial drugs) in both human and animal health care (10). In 2015, the National Institute for Health and Care Excellence (NICE) published guidance about how health-care prescribers and commissioners should respond to the antimicrobial stewardship agenda. (12). In relation to dentistry this includes setting up systems and processes to allow for the monitoring of dental prescribing at the level of commissioning areas, providers and ultimately individual dental prescribers (13). Further details about how this NICE antimicrobial stewardship guidance relate to dentistry are set out in more detail elsewhere (13).

During 2015, primary care dentists were responsible for 5% of all NHS England antibiotics; GPs accounted for 74%, hospital inpatients 11% and hospital outpatients 7% (14). Both GPs and primary dental care in England have seen recent reductions in antibiotic prescribing rates. For dentistry, the peak was in 2011 with 3.9 million NHS dental prescriptions per year for antibiotics (15); as shown in Figure 1, by 2015 this had reduced to 3.4 million (9).

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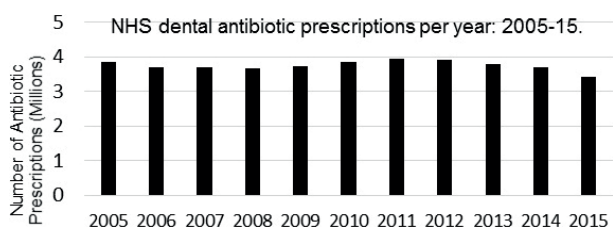


Figure 1. NHS England Dental Antibiotic Prescriptions Dispensed by Community Pharmacists: 2005 to 2015 (9,15).

Dental Antimicrobial Stewardship Toolkit

Reducing antimicrobial use is not necessarily the same as reducing over-prescribing. Ensuring that antibiotics are only prescribed when clinically indicated requires audit against clinical guidelines. For this reason, a dental antimicrobial stewardship toolkit has been produced by a multi-organisational group led by Public Health England and which included the Faculty of General Dental Practice (UK) and British Dental Association (16).

The toolkit provides a set of resources to help primary care practitioners promote the appropriate use of antibiotics in dental care. It includes patient-facing leaflets and posters, links to the latest guidance on antimicrobial prescribing in dentistry and a clinical audit tool to enable the management of acute dental conditions to be reviewed. It is available on line at: www.gov.uk/guidance/dental-antimicrobial-stewardship-toolkit. The headline message of the patient leaflets and posters is shown in Figure 2: "Antibiotics Don't Cure Toothache".

When patients really need antibiotics, they really need them to work. Infection spreading rapidly towards the throat or eye is a potential threat to life. Ludwig's angina can close the airway; orbital cellulitis can result in intracranial spread. Both should be treated promptly by emergency medics. In such cases, intravenous antibiotics are usually administered as treatment; these patients really need them to work (6).

Sepsis

Severe sepsis is a life threatening condition that arises when the body's response to an infection injures its own tissues and organs (17). It can lead to shock, multiple organ failure and death especially if not recognised early and treated promptly. Dentists treating urgent dental patients with an infection need to know how to recognise the signs of sepsis and when to refer to emergency medical care. People aged 12 years and over with suspected sepsis and any of the following signs or symptoms are at high risk of severe illness or death from sepsis; such cases presenting outside of the acute hospital setting should be immediately transferred for emergency medical care [17]:

- Objective evidence of new altered mental state
- Respiratory rate of 25 breaths per minute or above, or new need for 40% oxygen or more to maintain oxygen

Table 1. Summary of UK dental prescribing guidance

Antibiotics may be used in conjunction with (but not as an alternative to) other appropriate measures, such as providing drainage or extraction of a tooth. Access to current guideline antibiotic prescribing is available on line via the following links:
Faculty of General Dental Practice (FGDF): www.fgdp.org.uk/osi/open-standards-initiative
British National Formulary (BNF): www.medicinescomplete.com
Scottish Dental Clinical Effectiveness Programme (SDCEP): www.sdcep.org.uk/public-guidance/drug-prescribing

saturation more than 92% (or more than 88% in known chronic obstructive pulmonary disease)

- Heart rate of 130 beats per minute or above
- Systolic blood pressure of 90 mmHg or less, or systolic blood pressure more than 40 mmHg below normal.

If left untreated, a dental infection may ultimately progress to become severe sepsis. Timely draining and removing the source of a dental infection through extraction of the tooth or removing any decay and clearing the pulp chamber/root canal is generally indicated. Whether an antibiotic is also indicated depends on whether the infection has become systemic (3-5). Full details on how to make that assessment are included in the FGDP guidance. An important element of the decision-making

process is body temperature, which should be recorded in the patient's clinical notes.

When Antibiotics can do More Harm than Good

Diagnosing acute dental conditions such as irreversible pulpitis, apical periodontitis and alveolar osteitis (dry socket) should be straightforward for dentists in the majority of cases. None of these conditions is an indication for antibiotics and selecting appropriate treatment options for these conditions should not usually be challenging. Yet dentists report providing prescriptions rather than the treatment indicated by guidelines because of: diagnostic and prognostic uncertainties; insufficient time during the appointment to provide operative treatment; and patient expectations for antibiotics (18).

Antimicrobial therapy should only be started if there is clear evidence of infection (3-5). Antibiotics act on those bacteria which are sensitive to them. Any bacteria in the body or wider environment which are not affected by the specific antibiotic are left to thrive; this is Darwinian natural selection (19).

Clostridium difficile (*C. diff*) is an anaerobic bacterium which lives in the colon of some patients. Like its relative *Clostridium botulinum*, *C. diff* produces toxins when it grows. In the colon, overgrowth of *C. diff* can occur when an antibiotic targeting aerobic bacteria is taken orally for another condition (such as a dental infection). The bacteria which are sensitive to the antibiotic are killed or disabled by it, leaving behind to flourish those not sensitive to it. This proliferation of *C. diff* bacteria and its production of toxin is the cause of the antibiotic-related colitis, which can be life threatening if not recognised and treated promptly. *C. diff* infection (CDI) is associated with considerable morbidity and risk of mortality (20). Signs and symptoms of CDI are presented in Table 2, together



Figure 2. UK Dental Antimicrobial Stewardship Leaflet Cover (16).

I've got toothache, I need antibiotics!

Table 2. What is a *Clostridium difficile* infection (CDI)?

Signs and symptoms of CDI (20):	
Severe infection includes watery diarrhea 10 to 15 times a day	
Abdominal cramping and pain	
Blood or pus in the stool	
Fever	
Nausea	
Dehydration	
Loss of appetite	
Weight loss	
Swollen abdomen	
Typical cases	
A healthy 48-year-old underwent endodontic therapy and was prescribed a 10-day course of clindamycin. Some eight days after completing the medication, she began having liquid brown diarrhea with some mucus and a small amount of blood. With treatment her symptoms resolved slowly over the next 10 days (23).	A healthy 19 year old patient was given prophylactic antibiotics before maxillofacial surgery she acquired CDI and after a prolonged stay in hospital left was left with life changing abdominal surgery (subtotal colectomy and ileostomy) (24).

with details of two published cases from the United States.

So, giving antibiotics to a patient whose condition does not indicate a need for them clearly puts that patient at unnecessary risk. The UK General Dental Council (GDC) Standards for the Dental Team 7.1 states: "You must provide good quality care based on current evidence and authoritative guidance....If you deviate from established practice and guidance, you should record the reasons why and be able to justify your decision"(21).

Having that Difficult Conversation about no Antibiotics with the Dental Patient

Patients can withdraw their consent at any time, refuse treatment or ask for it to be stopped after it has started. Dentists must acknowledge their right to do this and follow their wishes, respecting their autonomy. Likewise, the professional should explain the consequences and/or risks of not continuing the treatment and ensure that the patient knows that they are responsible for any future problems which arise as a result of not completing the treatment. All this process must be recorded in the patient's notes. This is set out in more detail in the UK GDC Standard for the Dental Team 3.1.5 (21).

The UK General Medical Council (GMC) guidance goes further. It advises medics that if a patient asks for a treatment that the doctor considers would not be of overall benefit to them, the doctor should discuss the issues with the patient and explore the reasons for their request. If, after discussion, the doctor still considers that the treatment would not be of overall benefit to the patient, they do not have to provide the treatment. But they should explain their reasons to the patient, and explain any other options that are available, including the option to seek a second opinion. (2).

Since challenging interactions cause stress and anxiety amongst the dental team leading to a fear of complaints and claims (22), record keeping is fundamental. Guidance on Clinical Examination and Record-Keeping was updated and reissued by FGDP (UK) in 2016 (1). Its section on treating dental emergencies (toothache, swelling, abscess etc) includes a case-study highlighting the medico-legal issue faced by a dentist who provided antibiotics without definitive operative treatment for a patient who frequently attended for unscheduled appointments but never for routine treatment. These situations represent real challenges for dentists; following guidance is the best way to keep everyone safe.

Concluding Remarks

In this article, we introduced the UK Dental Antimicrobial Stewardship toolkit, which provides guidance, audit and patient-facing resources for clinicians. By prescribing

antibiotics only when they are really necessary, dentists are protecting themselves and their patients from the risks associated with unnecessary exposure to antibiotics, including *C. difficile* and other drug resistant infections. The importance of treating dental patients with spreading infections promptly, if necessary through referral for emergency medical treatment, has been also explored. Finally, the thorny issue of dealing with challenging situations and the importance of good clinical records was considered. Our central message: antibiotics don't cure toothache and must be rationally used in the dental practice.

Whilst we presented a synthesis based on UK guidelines, our work may be useful to many other countries since the issue of antibiotic resistance is a global concern. We recommend as key elements of an antimicrobial stewardship strategic programme: (i) a strong statement from the government about the importance it places on guarding antibiotics for future generations; (ii) clear guidance for dental prescribers on appropriate use of antibiotics; and (iii) the introduction of effective systems and processes to monitor dental antibiotic prescribing and provide feedback to dentists if their prescribing is not in line with guidance.

We hope this paper is a significant opportunity for collaborative learning and development across the international dental community to preserve the effectiveness of antibiotics for future generations.

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Resumo

Antibióticos não curam dor de dente. Tal mensagem, encontrada no título dos panfletos e cartazes da caixa de ferramentas Gerenciamento Antimicrobiano Odontológico (AMS) do Reino Unido, é direcionada aos pacientes; os clínicos já deveriam saber disso. Diretrizes clínicas baseadas em evidência existem para estabelecer padrões claros à boa prática clínica, ainda que existam barreiras para sua observância. A ferramenta AMS para monitoramento nacional é voltada para clínicos revisarem sua conduta frente às condições dentais agudas, inclusive mas não limitada à prescrição de antibióticos. Neste artigo, visa-se colaborar com equipes odontológicas a fim de protegerem a si e a seus pacientes contra situações adversas relacionadas ao uso de antibióticos. Explora-se o problema emergente do *Clostridium difficile*, resistência bacteriana a antimicrobianos e sepsis severa, além de considerar algumas das barreiras que clínicos têm sugerido como geradoras de prescrições inapropriadas de antibióticos. Os dentistas devem pesar riscos e benefícios antes de prescrever qualquer antibiótico.

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