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Perceptions, attitudes and factors that influence prescribing by general dentists in Australia: a qualitative study

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Abstract

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Background: Longitudinal studies of dental prescribing in Australia show that dentists make some inappropriate prescribing choices; literature has shown that dentists tend to overprescribe antibiotics and prescribe for incorrect indications. The unnecessary use of antibiotics is a contributing factor towards the development of antibiotic resistance. The aims of the study were to obtain a greater understanding of the perceptions, attitudes and factors that influence dental prescribing for all major relevant drug classes.

Method: Semi-structured interviews of 15 purposively sampled dentists practising in Victoria, Australia were conducted from June-September 2018. Two dentists practised in rural areas and the remainder in urban locations. The range of clinical experience varied from 2.5 to 37 years, with a mean of 13 years. The transcripts were analysed thematically.

Results: Dentists generally preferred amoxicillin as first line therapy for odontogenic infections, with some confusion about the spectrum and uses of antibiotics. Overprescribing was evident, mostly due to basing judgement for use of antibiotics on symptoms rather than clinical signs. Other factors, such as time pressure, patient expectations, pressure from assistant staff, concern about online criticism and medico-legal considerations, influenced prescribing. Of the dentists who prescribed anxiolytics, most did not have a care protocol for their sedated patients.

Conclusion: A variety of prescribing practices were described, and future interventions should target misconceptions around the appropriate use and choice of antibiotics, resources to address the shortfall in knowledge of therapeutics, patient education and staff training, as well as appropriate care and monitoring of sedated patients.

Introduction

Antibiotics, analgesics and anxiolytics are the most common classes of drugs prescribed by general dentists in Australia. The use of drugs has a limited role in dentistry, as they are almost always recommended as an adjunct to dental treatment.¹

Previous literature analysing the prescribing choices of dentists worldwide shows that dental practitioners tend to overprescribe antibiotics and prescribe for incorrect indications. There are few indications for the use of systemic antibiotics in dentistry; the majority of dentoalveolar infections without systemic spread can be managed by local measures only.¹ Surveys of dentists' prescribing choices indicate that clinicians tend to prescribe for many

unnecessary indications, including irreversible pulpitis, alveolar osteitis and localised infections.²⁻⁷ The only study to address dental prescribing in Australia was a relatively small survey of dentists in South Australia prior to the establishment of national guidelines, that showed that 39% of respondents would prescribe antibiotics for localised odontogenic infections, and 49% would prescribe antibiotics for cellulitis, prior to instituting dental treatment.⁸

A survey of endodontists in the USA revealed that around one third would prescribe antibiotics unnecessarily due to patient expectations,⁹ and 39.1% of Swiss dentists would occasionally prescribe antibiotics when they were unsure of a diagnosis.¹⁰ A prospective, cross-sectional survey of dentists in Belgium showed that 40.7% of prescriptions were written to fulfil patient expectations.⁶ The extent to which external pressures influence dental antibiotic prescribing in Australia is unknown.

Previous longitudinal studies assessing patterns of dispensed medicines prescribed by dentists in Australia show that clinicians make some inappropriate choices and show divergence from current guidelines. Dental practitioners inappropriately preference the use of moderate to broad-spectrum over narrow-spectrum antibiotics.^{11, 12} There were also small, but significant numbers of inappropriately prescribed antibiotics, such as erythromycin and trimethoprim with sulfamethoxazole, which have no indication in the current guidelines.¹²

There is limited literature on dental prescribing of other medicines, but two retrospective studies in Australia indicated some divergence from guidelines for analgesic and anxiolytic prescribing, showing increasing dental use of opioids and benzodiazepines.^{13, 14}

It is well established that the use, particularly unnecessary use, of antibiotics is a major contributor to the development of antibiotic resistance. Appropriate prescribing, according to evidence-based indications, is therefore a professional responsibility of all clinicians, as collective use affects not only the individual but also the whole community and entire populations.¹⁵ Antibiotic resistance and stewardship have been given inadequate attention in the dental industry until recently.⁵ A retrospective audit of antibiotic resistance in severe odontogenic infections in the South Australian population showed that the rate of overall antibiotic resistance was 17.8%, with the most resistance to penicillin and amoxicillin.¹⁶

These patients consequently had longer hospital stays and a higher incidence of non-response to initial surgical therapy.¹⁶ Other studies have parallel findings, and have shown that bacteria

which are common isolates from odontogenic infections have proven to have a frequency of penicillin resistance around 5-20%.^{17, 18}

While it is established that dental practitioners in Australia make some inappropriate prescription choices^{11, 12}, to date, no study has investigated the factors that influence clinicians' prescribing habits. Recognising dentists' perceptions and attitudes, as well as factors that influence inappropriate prescribing will influence interventions to address these issues.

The aim of this study, therefore, was to explore dentists' attitudes and perceptions and other aspects that influence their prescribing decisions for all major classes of commonly prescribed medicines in dentistry.

Method

Individual, semi-structured interviews were conducted with a purposive sample of general dental practitioners in Victoria, who were invited by email to participate. The study's final number of participants was determined when saturation of information occurred. The sample was selected to give a range of number of years in practice, Australian- and overseas-trained dentists, and a range of socio-economic index for areas (SEIFA)¹⁹ of workplace locations. Potential informants were identified either through the research team professional's network; or based on their workplace location, where their contact details were obtained from publicly available dental practice websites; or using snowball sampling techniques. Potential participants were notified of the study either via telephone contact or by email, and invited to participate. Once willing participants consented to participate, follow up emails were sent to set up interviews at a convenient time and location. Ethics approval was obtained from The University of Melbourne Human Ethics Sub-Committee (1750768.1).

The interview guide was based on topics from previous surveys of dentists^{2, 3} and the clinical experience of the research team. The semi-structured interviews were conducted at participants' workplaces from June to September 2018 and lasted between 19 and 50 minutes. The identity of the principal researcher (LT) and her status as a dentist and pharmacist were made known and written consent was obtained from each participant before the interview. In addition, the aims of the interview were explained and the anonymity of the participant

assured. Participants received a \$100 voucher in appreciation of their time. Interviews were recorded and transcribed verbatim.

Nvivo (QSR International) was used for data management to assist thematic analysis of the transcripts. Recruitment and analysis continued until data saturation was reached.^{20, 21} Coding was conducted primarily by the interviewer (LT). A second researcher (KS), with experience in qualitative analysis, reviewed the transcripts and confirmed the coding in discussion with LT.

Results

Of the 19 dentists who expressed interest in participating, 15 were interviewed, at which stage data saturation was reached. Previous studies have suggested that 12 interviews in a purposive sample will usually achieve saturation.²¹ Of the 15 participants, eight were male and seven were female. The most recent graduate had 2.5 years of experience and the person with the most experience had practised for 37 years; the mean number of years since qualification was 13. Workplace locations ranged from SEIFA ranking 1 to 10. Two practitioners worked in rural locations. Three participants undertook their undergraduate dental training overseas and the remainder from universities in Victoria.

Six themes emerged: antibiotic choices, clinical indications for prescribing antibiotics, non-clinical pressures affecting prescribing decisions, choices for pain relief, anxiolytic prescribing, and knowledge of therapeutics and adequacy of training.

Antibiotic choices

All participants stated that amoxicillin is currently their first preference for an odontogenic infection, with some participants never having heard of phenoxymethylpenicillin (PMP), even though this is recommended as first line in the Australian therapeutic guidelines.¹ Reasons for this choice were continuing to prescribe what they were taught at university, on advice from colleagues, its increased spectrum of activity and because it was likely to be familiar to their patients. Those who had prescribed PMP in the past expressed concern about its narrow spectrum and patient adherence, as PMP is best administered on an empty stomach and at a higher frequency than amoxicillin. Certainly, nonadherence is recognised as one of the most significant barriers to effective use of medication.²² For penicillin-allergic patients, macrolides were preferred by some, with most appropriately choosing clindamycin. Most

who prescribed erythromycin were not aware of its numerous potential drug interactions and side effects.²³ Common bacterial isolates of odontogenic infections, such as viridans streptococci and fusobacteria have poor susceptibility to erythromycin²⁴ and hence it is not recommended in the guidelines.¹

For more severe infections, where there is evidence of systemic involvement, there was more variation in prescribing preferences, usually involving amoxicillin or the broader spectrum amoxicillin/clavulanic acid in combination with metronidazole. One prescriber indicated that they would refer the patient to their medical doctor, depending on the severity of the infection. Some participants said they would prescribe metronidazole or amoxicillin only, both of which would constitute under-prescribing.

The majority of the dentists used the pack size to indicate duration of treatment, instead of the recommended shortened course of five days. Studies have shown that shorter courses are effective for odontogenic infections as long as drainage and removal of the source of the infection has been established.^{25, 26} In addition, some clinicians used the Pharmaceutical Benefits Scheme (PBS) website as their guide to write the appropriate prescription, being under the impression that they were supposed to prescribe according to standard PBS pack sizes.

“My go to is amoxicillin, 500mg, three times a day, pack of 20...I just get them to take the full pack until completion...it's the one that I feel is the most well-known and just widely accepted.” DP1

...the PBS website. I don't look at it to find out what to prescribe...just what packs (sizes) are...” DP10

Clinical indications for prescribing antibiotics

Prescribing for localised infections

Most participants indicated that they do not prescribe antibiotics for localised infections (such as pulp necrosis with acute apical periodontitis, chronic apical periodontitis and apical abscess), being aware that active dental treatment only is required. However, some would routinely prescribe antibiotics for a localised infection if severe symptoms were present, or on a patient's request.

“If they've come in with a swelling and I've managed to take the tooth out or managed to extirpate the pulp, then I don't prescribe anything.” DP8

Prescribing for other indications

Irreversible pulpitis, when attempts to anaesthetise have not been effective, was sometimes a reason for antibiotic prescription, despite it being well established that antibiotics are not effective for irreversible pulpitis^{27, 28} and anti-inflammatory drugs would be more appropriate. Some explained that they can manage this situation clinically, and others preferred to give medicines for pain relief. Some clinicians indicated that they would occasionally prescribe antibiotics for irreversible pulpitis in addition to concurrent local treatment. These decisions were mostly case-dependent and based on the severity of the patient's symptoms. Most clinicians who prescribed for irreversible pulpitis in these situations were aware that the antibiotics may not be effective since operative interventions had been carried out, but would often do so to help with the patient's symptoms.

"Yeah, so if they're wanting or requesting it...in their mind that it's going to improve their symptoms then sometimes (I prescribe) even though it may not be something that we know is right" DP1

"Most of the time I will try to give LA (local anaesthetic) first, just to get the patient out of pain and discomfort. I will try to proceed with treatment, but in a case where it's just too uncomfortable then yes, I will prescribe them some antibiotics just to settle it down." DP10

Some clinicians would prescribe antibiotics for alveolar osteitis in addition to local treatment. One explained that he would inform patients of the appropriate local treatment required, but would offer antibiotics, and leave it to the patient's decision.

Facilitator: "Do you ever prescribe for dry socket?" Interviewee: "Yeah, I prescribe metronidazole." DP7

"...a dry socket, there's no reason to give them antibiotics, so I'll explain why they don't need it and offer if they do want it...because some people just will get really annoyed if they don't get offered it. But sometimes, once you explain it, they'll be like 'Oh, don't worry'...Or some will be like 'Yeah, I'll have it anyway' and you're like 'Okay, well, sure'." DP15

None of the interviewed dentists would routinely prescribe antibiotics for simple extractions. Several mentioned prescribing a course of antibiotics after a surgical extraction where bone

removal was involved, or prescribing antibiotics for immunocompromised patients only. One prescriber used antibiotics prophylactically for immunocompromised patients, which is the method currently indicated in the guidelines.¹

Severity of symptoms as a basis for prescribing

Some clinicians tended to base their judgement for prescribing on the severity of the patient's symptoms, instead of clinical signs. They confirmed that, even if the infection was localised or if the patient had a clinical condition where antibiotics are not usually warranted, they would prescribe antibiotics. They felt it gave distressed patients the impression that the dentist was doing everything possible to resolve their symptoms, and consequently, patients would feel they were well managed.

"Yes, I guess normally, if they have severe pain where it's throbbing and aching, then ...that would usually be one of the main reasons why I would prescribe....based on the amount of pain that they have would probably be my main thing" DP3

"I think...that's also where patients' expectations come into it. Not just 'I've got treatment', but you would like the patient to, I suppose, psychologically feel that they're being looked after." DP10

Non-clinical pressures affecting prescribing decisions

Participants identified several non-clinical pressures that influenced their decision to prescribe antibiotics. Patient expectations and requests for antibiotics instead of dental treatment was affirmed by the majority of participants. Those who did not encounter this had the most clinical experience, and had regular patients who trust their judgment. One participant explained that she found that patients tended to see their medical doctor for antibiotics prior to attending her appointments if they had dental pain, so there was no expectation on her to prescribe. Participants acknowledged the tension between trying to educate patients on the unnecessary use of antibiotics and maintaining good patient relationships. Fear of criticism online was mentioned by some as a consideration in prescribing antibiotics to satisfy patient requests. Medico-legal considerations further influenced prescribing for certain patients. These dentists acknowledged that, in some cases, dental treatment only was required but they occasionally prescribed antibiotics to ensure there was the perception that they were doing all they could.

“But sometimes, if patients, after extractions, they just feel like they're really keen on antibiotics, then (even) if it's not the right thing then sometimes you'll find yourself almost forced to.” DP1

“Yes, sometimes there are situations where you know you've done everything right and it should be - you just know in your mind that yeah, it will resolve whatever symptoms and stuff there are. But for whatever reason, there's added pressure that you want to make extra sure for yourself and for the patient, then that's when (you prescribe) the antibiotics, just almost as a security blanket.” DP3

“Especially in patients where they...come in expecting antibiotics for this particular problem that they have and they look like they're not going to accept our explanation. Then we don't want to upset the patient because then they might write a bad review on the website.” DP7

Uncertainty of diagnosis was also mentioned as a reason for prescribing antibiotics.

“Sometimes, if I can't find the exact source for whatever reason, but the symptoms are definitely ones that suggest some type of infection there, then yeah, antibiotics would be the thing to do, I would say.” DP1

Time pressure was a common factor in prescribing, due to the difficulty of the practical aspects of managing a busy appointment schedule with unexpected emergency patients. Some dentists also mentioned pressure from assistant staff as a reason for prescribing. Participants explained that certain procedures, such as pulp extirpation, would require more preparation and effort from their chairside assistant and, coupled with the pressure of limited time, prescribing antibiotics, or delaying procedures was the method they occasionally found themselves employing to maintain good relationships with their staff and colleagues. Other participants explained that reception staff occasionally determine the patient's requirements for antibiotics at the time of making the appointment, thereby justifying the shortened appointment time they imposed on the practitioner. Appropriate training and education of assistant and reception staff is perhaps a necessary factor to allow clinicians more autonomy.

“Yes, if they have a swelling, yes, cellulitis, or if they have a really bad toothache. I guess it is also - it shouldn't be but it is - also time dependent as well. So if a patient comes in and they're in pain, then I may prescribe antibiotics rather than taking the tooth out.” DP3

“So if I'm running late, then sometimes I do feel the pressure. I'm like, ‘Oh, we can't open this today...it's not me - it's more like the nurses. The nurses are like, ‘Oh, I don't want to set up for a root canal’. Then you're like - not just I'm running late - the nurse is going to get mad with me. I think I'll take the easy way out.- I'll prescribe.”

DP8

“A lot of the time it's because they (reception staff) squeeze in emergencies for 15 minutes or something like that, saying the patient just wants antibiotics. So the patient has been told they're not getting anything but antibiotics...over the phone, that's what's said, so you kind of look at it and you're like ‘You need this (treatment). I can't do it for you now because they gave me 15 minutes’, which is not even enough for me to take an x-ray and assess what it is.” DP14

Choices for pain relief

For mild pain relief, most prescribers indicated they would usually prescribe ibuprofen and paracetamol, with some recommending paracetamol only or no medicines. More variation was seen for moderate pain relief, where prescribers would recommend combinations of either ibuprofen and paracetamol or paracetamol and codeine (500mg/30mg), or tramadol. Participants indicated that they prescribed tramadol for patients who could not tolerate codeine, found codeine ineffective or had a codeine allergy.

“Occasionally, Tramadol...if they are allergic to, or sensitive to codeine.” DP11

Anxiolytic prescribing

Some participants explained that they prescribe diazepam or temazepam for anxious patients, whereas others would routinely refer their patients to their medical doctor for the prescription of diazepam instead of prescribing it themselves. Some participants used nitrous oxide for anxiolysis. Other choices were methoxyflurane or lorazepam, neither of which is recommended in the guidelines.¹ The dentist who used lorazepam explained that he was taught to use this during his undergraduate course and that its use has also been validated through online Australian dental forums, highlighting the collaborative influence of clinicians on prescribing.

Most participants did not have any monitoring or care regimens for their patients during the procedure, and they dismissed their patients immediately after the procedure was finished.

One dentist, however, said he would advise his patients not to drive for the next 24 hours. It

is probable that most clinicians are not aware of the care regimen in the Australian Therapeutic Guidelines¹ for anxiolysis. One clinician who referred her patients to their respective medical doctor for prescribing of the anxiolytic medication was under the impression that the effects of the drug would therefore be the responsibility of the doctor even if she was treating the patient at that time, a misconception that should be rectified.

Facilitator: "When they are on Valium (diazepam)...do you do any extra monitoring or anything like that?" Interviewee: "Just go with it and hope they leave all right." DP3

Facilitator: "So if you were to use Pentrox (methoxyflurane) or Valium, do you have any particular regimen - do you have any other monitoring of your patients while they are under sedation?" Interviewee: "Not particularly. I think we've got a pulse oximeter somewhere in the back." DP5

Knowledge of therapeutics and adequacy of training

When the participants were asked how they felt about drug knowledge and the impact of drugs in the dental management of patients, most dentists were in strong agreement that there was inadequate training during university, or not enough practical resources to obtain information they required about a patient's drug history and the importance of medications on dental treatment. Some clinicians felt that it was not necessary for dentists to know about medicines, and that it was primarily the role of the pharmacist to check drug interactions. While the majority of participants stated that they use the Australian Therapeutic Guidelines¹ as first preference as a drug resource, they explained that most prescribing choices (such as the use of amoxicillin as first line or erythromycin or tramadol, which are not in the guidelines) were based on advice they received during undergraduate training, or from guidance they obtained from colleagues. This reinforces the concept that guidelines alone, without any other intervention do not produce changes in prescribing,²⁹ as prescribing decisions are complex and multi-factorial.

"I think more importance should be given to it (drug information), not that there isn't because I know from time to time they come out with a new schedule and all that. But it's not made important enough that dentists are sitting up and taking notice. It should be as important as getting your 60 hours of CPD every two or three years." DP3

"The trouble...dentists have so much other stuff I think it's outside their scope, so I don't think it's taught well but I don't think it needs to be taught better. So, I think that

really the reliance on the pharmacist, yeah, it's a full-time job and you can't possibly do it and most things don't impact us.” DP13

“Mainly what we're looking up, though, is what the medication is for, not the interactions with anything that we might do or prescribe, so to a certain degree I do look it up, but probably not as proactively as I should.” DP14

Discussion

While many quantitative studies exist about dental prescribing choices, this is the first qualitative study to investigate factors that influence prescribing decisions by dentists. Some non-clinical factors were revealed by the participants that had not been previously identified as reasons for prescribing, including pressure from assistant staff and concern for online criticism if patient's expectations are not met. In addition, prescribing was sometimes based on the severity of the patient's symptoms, rather than clinical signs, indicating an incorrect and unnecessary use of antibacterials.

Participants' choice of amoxicillin as first line for an odontogenic infection is less appropriate than PMP since its wider spectrum will contribute more towards the development of antibiotic resistance.^{1, 30} This preferential use of amoxicillin by dentists is a worldwide phenomenon, confirmed from longitudinal studies,^{11, 12, 31} surveys,^{6, 9, 32} analysis of clinical records³³ and prospective audits.³⁴ Studies on the susceptibility of bacteria commonly isolated from odontogenic infections show that 85% are susceptible to PMP, with amoxicillin only slightly higher at 91%.¹⁷ PMP is therefore recommended as first line in the guidelines.¹ Metronidazole, while having good efficacy against anaerobes,²³ has a susceptibility of only 45% towards bacteria commonly isolated from dentofacial infections, mostly due to resistance.¹⁷ However, when combined with PMP or amoxicillin, it has an efficacy of 93% and 99% respectively,¹⁷ and therefore this combination, or amoxicillin/clavulanic acid (which has been shown to have 100% efficacy)¹⁷ is recommended for severe spreading odontogenic infections.¹ The use of amoxicillin/clavulanic acid together with metronidazole would be considered overprescribing, and in contrast, metronidazole alone would be insufficient. Both over- and under-prescribing were therefore evident. A recent review on antibiotic resistance highlights the practical methods dentists can employ to restrict prescribing, including prescribing the narrowest spectrum antibiotics for appropriate indications as recommended in

the guidelines,¹ for the appropriate frequency and duration and not according to PBS pack sizes.²⁶

While some dentists routinely prescribed antibiotics in accordance to guidelines and most were aware of the appropriate clinical uses, the severity of the patient's symptoms strongly influenced antibiotic prescribing for some informants, and the decision was patient-driven in some cases. While pain is a physiological process, it has both emotional and cognitive components and is influenced by past experience of the individual, coping behaviour and expectations.³⁵ It is therefore an inappropriate practice to prescribe based on the severity of an individual's symptoms as pain is subjective, multi-factorial and varies between people. There is insufficient evidence to show that antibiotics assist with pain for localised odontogenic infections,^{36, 37} alveolar osteitis¹ or irreversible pulpitis.^{27, 28} Demographic factors may potentially contribute to over-prescription as it is established that patients of lower socio-economic status have significantly more dental disease compared to the general population³⁸ and an increased reporting of pain.³⁹ However, in this sample the practitioners who would prescribe for patient-dependent symptoms and who experienced more patient pressure and medico-legal considerations practiced in a variety of socio-economic regions. Thus, further research would be required to elucidate if this is a factor in overprescribing.

While non-clinical factors, such as time pressure, patients' expectations, medicolegal considerations and uncertainty of diagnosis have been previously established as reasons for unnecessary prescribing,^{2, 3, 5, 9, 40} concern for criticism online was acknowledged as a reason for prescribing in some cases. Fear of negative reviews and defamation online is a relatively recent consideration for clinicians with the surge in popularity of online reviews for many products and services. Lack of accountability for the 'reviewer' is likely to be a major factor. Given that this barrier may hinder some clinicians in practising professionally, it is imperative that accountability of individuals be addressed.

Informants stated that they occasionally prescribed tramadol for patients who were allergic to codeine, or found codeine ineffective. True allergy to opioids mediated by immunoglobulin E (IgE) or a T-cell mediated response is rare.⁴¹ However, codeine is capable of causing pseudoallergic symptoms due to its pharmacological action of inducing histamine release from mast cells, and this response is often mistaken for a true allergy.⁴¹ Tramadol is not recommended in the Australian guidelines¹ due to its numerous drug interactions, propensity to alter seizure threshold and ability to contribute to serotonin syndrome if taken with other

drugs that cause serotonin toxicity.^{23, 42} Furthermore, similarly to codeine, tramadol is a pro-drug and undergoes hepatic transformation by cytochrome P450 2D6 (CYP2D6) to its active metabolite. Dentists therefore need to be mindful of patients who have inherited non-functional alleles of this enzyme as they will likely be at risk of having poor genetic biotransformation and therefore experience ineffectiveness of both codeine and tramadol.^{23, 43}

A strength of this study was that the interviews were semi-structured, which enabled participants to discuss topics freely; therefore, elements arose that had not emerged from previous studies. Purposive sampling achieved dentists of varied experience practising in a range of socio-economic workplaces. There also may be other clinical and non-clinical factors not discussed, clinicians may have given more professionally desirable answers and there also could have been some misinterpretation of the questions and answers, although feedback was periodically given to the interviewees with the option for each dentist to clarify their responses. Anonymity was assured and all dentists seemed honest and unequivocal in their responses.

Conclusion

There is a clear need for more medicines education about appropriate choice and use of antibiotics, the role of the PBS and clarification between guidelines and standard pack sizes, limitations of opioids in treating dental pain, and use of anxiolytics (including suitable care of sedated patients).

Future interventions should target misconceptions about appropriate prescribing, address training of the entire dental team, and provide more dentally relevant resources to address the shortfall in knowledge. Practical resources could also be developed to support clinicians in educating their patients about the appropriate use of antibiotics, especially for those who expect or request antibiotics instead of operative treatment.

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