

Can audit improve antibiotic prescribing in general dental practice?

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Objective To investigate whether clinical audit can improve general dental practitioners' prescribing of antibiotics.

Design An intervention study carried out in general dental practice in the North West of England.

Method Information was collected over an initial six-week period from 175 general dental practitioners on their current antibiotic prescribing practices. The information collected was the antibiotic prescribed including dose, frequency and duration, the clinically presenting signs and conditions, the medical history (if for prophylaxis), and any other reasons for prescribing. This was compared to the practitioners' antibiotic prescribing for a further six-week period following an audit, which included an educational component and the issuing of guidelines.

Results During the initial period practitioners issued 2316 prescriptions for antibiotics. This was reduced by 42.5% to 1330 during the audit. The majority of the antibiotics (81%) for both periods were prescribed for therapeutic reasons. The most commonly prescribed antibiotics were amoxicillin (57.6%), metronidazole (23.8%), penicillin (9.3%), erythromycin (4.8%) and a combination of amoxicillin and metronidazole (1.7%). The antibiotic regimens used by practitioners were significantly changed by the audit ($P < 0.001$) and there was a significant reduction in the number of prescriptions ($P < 0.05$) which did not conform to national guidelines.

Conclusions The results from this investigation support the conclusion that clinical audit, with the issuing of guidelines and an educational component, can change prescribing practices leading to a more rational and appropriate use of antibiotics in general dental practice.

Clinical audit was introduced into general dental practice in 1995 and has been defined as the systematic, critical analysis of the quality of dental care, including the procedures and processes used for diagnosis, intervention and treatment, the use of resources and the resulting outcome and quality of life as assessed by both professionals and patients.¹ The suggested criteria for undertaking an audit are that the issue to be addressed should be a common, significant or serious problem; any changes following audit should benefit patients and lead to greater effectiveness; that the issue is relevant to professional practice and that there is a realistic potential for improvement.²

There is evidence that antibiotics are prescribed inappropriately in general dental practice.³⁻⁵ With the increasing worldwide problem of antimicrobial resistance and the threat to public health, there is a need to rationalise the prescribing of antibiotics.⁶

Antibiotic use has been the subject of many audits and educational activities within medical practice.⁷⁻¹⁰ In contrast, very few audits on antibiotic prescribing in dental practice have been reported.^{11,12} It has been suggested that the production of guidelines for general dental practitioners (GDPs) along with educational initiatives and audit may encourage safe, effective, rational and economic use of antibiotics and at the same time reduce the likelihood of dentists contributing to the problem of antibiotic resistance.⁵

It has been noted that most audits have focussed on the process, rather than the structure or outcomes.¹³ The aim of this study was to investigate whether clinical audit might change the prescribing of antibiotics by GDPs.

Method

Subjects

All 932 GDPs working within South Cheshire, North Cheshire, Liverpool, Wirral, Sefton and St Helens and Knowsley Health Authorities in the North West of England were invited to participate in the study. The 175 dentists who took part were divided into groups of eight to ten and were assigned a trained audit facilitator to advise and oversee the investigation and audit.

Data collection

A *pro forma* was designed to collect information for each occasion a prescription for antibiotics was issued. The information noted on the *pro forma* included the antibiotic prescribed, dose, frequency, duration, the clinical signs and presenting condition, the medical history (if for prophylaxis), and any other reasons for prescribing the antimicrobial. No identification of the person completing the *pro forma* was made.

Procedure

The study consisted of an initial six-week period of data collection, following which the results were reviewed. Areas of inappropriate prescribing were noted and educational meetings were held for all participants to discuss the results of the data with experts in the field of oral microbiology and antimicrobial prescribing. During these meetings, practitioners were made aware of the principles of appropriate prescribing, both therapeutically and prophylactically, based on the recently published guidelines of the Faculty of General Dental Practitioners, Royal College of Surgeons of England.¹⁴ All the groups then met individually and set standards for antibiotic prescribing based on the guidelines and the educational component.

Practitioners then audited their antibiotic prescribing for a further six-week period, collecting the information for each prescription issued as described above.

Statistical analysis

The anonymous pre-audit and audit data were numerically coded and entered into a Statistical Package for Social Sciences (SPSS) database and analysed.¹⁵ Frequencies were used to examine and describe the distribution of all the variables. Changes in prescribing

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REFEREED PAPER

Received 19.10.00; Accepted 17.04.01

© British Dental Journal 2001; 191: 253-255

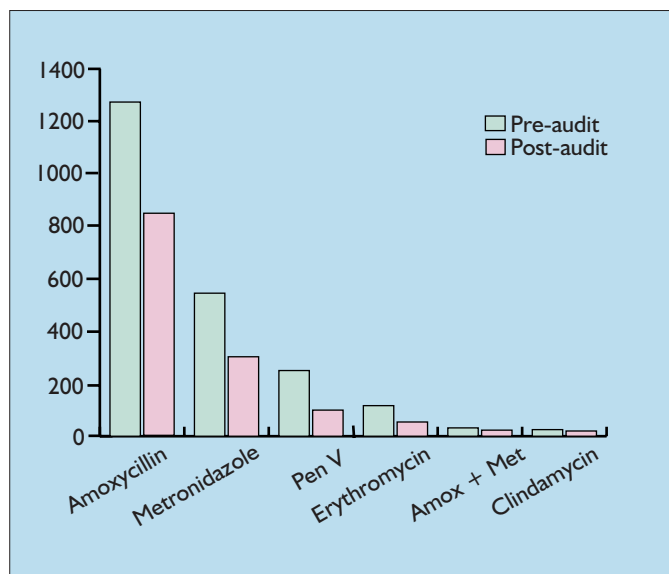


Fig. 1 Number of prescriptions for each antibiotic issued, pre- and post-audit

practices between the pre-audit and audit periods were tested for significance using the chi-square test.

Results

The total number of practitioners who took part in the study was 175. During the pre-audit period 2316 prescriptions for antibiotics were issued. This had reduced by 42.5% to 1330 following the issuing of prescribing guidelines, educational meetings, setting of standards and audit.

Antibiotics prescribed

The antibiotics prescribed before and after the educational component, issuing of guidelines and audit are shown in Figure 1. Amoxicillin was the most commonly prescribed antibiotic (57.6%) followed by metronidazole (23.8%), penicillin (9.3%), erythromycin (4.8%), with a combination of amoxicillin and metronidazole being used in 1.7% of prescriptions. Clindamycin (1.4%) was used primarily in prophylactic doses.

Reasons for prescribing

The majority of the prescriptions (81 %) over the two six-week periods were issued for therapeutic reasons. Table 1 shows the clinical conditions recorded by GDPs for which antibiotics were prescribed, the number of prescriptions issued before and during audit and the percentage reduction between the two periods. Reductions in the number of prescriptions issued following guidelines and the educational component ranged from 17.3% to 100% for the clinical conditions recorded. Table 2 shows the medical conditions for which GDPs prescribed prophylactic antibiotics before and during the audit. The only medical condition which showed a marked reduc-

Table 2 The medical conditions and the number of prescriptions for which GDPs prescribed antibiotics before and during audit

Medical condition	No of prescriptions before the audit	No of prescriptions during the audit
Rheumatic fever	81	70
Murmurs	58	28
Valvular disease	46	46
Congenital heart defects	11	6
Coronary heart disease	16	11
Prosthetic joints	8	1
Radiotherapy/chemotherapy	9	2
Immunocompromised	26	18

Table 1 The clinical conditions and the number of antibiotic prescriptions issued by GDPs before and during the audit, showing the percentage reduction in the number of prescriptions between the two periods

Clinical condition	Number of prescriptions before the audit	Number of prescriptions during the audit	% reduction in number of prescriptions
Acute periapical infection	906	507	44.0
Acute periodontal abscess	237	94	60.3
Pericoronitis	187	124	33.6
Infected socket	69	57	17.3
Acute ulcerative gingivitis	98	68	30.6
Sinusitis	20	6	70.0
Post surgical procedure	140	86	38.0
During root canal therapy	2	1	50.0
After root canal therapy	12	15	25.0*
Periodontitis	51	45	16.6
Cellulitis	5	1	80.0
Pulpitis	46	13	71.7
Trismus	1	0	100.0
Gingivitis	16	7	56.0
Re-implantation of teeth	0	1	100.0*
Salivary gland infection	0	2	200.0*
Oral antral fistula	1	1	0
Others	8	2	75.0

*% Increase in the number of prescriptions between pre- and post-audit periods

tion (51.7%) of prescriptions issued in the second data collection period related to murmurs. The other reasons for prescribing before and during the audit and the percentage reduction between the two data collection periods are shown in Table 3. There was a reduction of 51% of prescriptions issued for localised swelling and 54% for pain following guidelines and the educational component.

Statistical analysis

Chi-square tests showed a significant change in the appropriateness of practitioners' prescribing practices between the two data collection periods when compared to national standards.¹⁴ There was a reduction in the number of prescriptions issued for diagnostic purposes ($\chi^2 = 16.70$, $df = 1$, $P < 0.001$), because of pressure of time ($\chi^2 = 12.46$, $df = 1$, $P < 0.001$), patient expectation ($\chi^2 = 12.99$ $df = 1$, $P < 0.001$) and pain ($\chi^2 = 37.49$, $df = 1$, $P < 0.001$), and patients presenting with localised swelling ($\chi^2 = 8.75$, $df = 1$, $P < 0.001$).

Table 3 Reasons and the number of prescriptions for antibiotics prescribed by GDPs before and during the audit also showing the percentage reduction in the number of prescriptions between the two periods

Reasons for prescribing	Number of prescriptions issued before the audit	Number of prescriptions issued during the audit	% reduction in number of prescriptions
Localised fluctuant swelling	724	354	51.1
Gross diffuse swelling	365	319	12.6
Elevated temperature and evidence of systemic spread	179	177	1.1
Pain	1198	548	54.2
Prophylaxis due to medical history	255	182	28.6
Prophylaxis following surgical procedure	140	86	38.5
Patient expectation	121	36	70.2
Pressure of time/workload	86	22	74.4
Uncertainty of diagnosis	80	16	80.0
Treatment had to be delayed	209	151	27.7
Patient going on holiday/ in case of problems	39	7	82.0
Failed local anaesthesia/ unco-operative patient	26	14	46.1

Antibiotic regimens

A significant improvement was seen between the two data collection periods. The prescribing of amoxycillin was significantly changed in the second data collection period and conformed more closely to national guidelines. Only 57.4% of prescriptions were at the recommended correct dose, frequency and duration before the guidelines were given. This increased to 70.5% following the audit ($\chi^2 = 36.79$, $df = 1$, $P < 0.001$). A significant change was also seen in the prescribing regimen for metronidazole, with an increase from 25% correct prescriptions to 41.6% during the audit ($\chi^2 = 25.56$, $df = 1$, $P < 0.001$).

Discussion

The use of guidelines in audit to set standards is well recognised and it has been shown in medical practice that the publication of guidelines can improve prescribing.¹⁶ For antibiotic prescribing standards, dental practitioners rely on information in the Dental Practitioners Formulary (DPF).¹⁷ Unfortunately, the information available does not provide specific information on when to prescribe and what to prescribe in specific clinical situations and therefore could not be used effectively to set standards for audit. The guidelines given to the practitioners in the audit described were based on recently published guidelines produced by the Faculty of General Dental Practitioners. These guidelines were based on a review of all the available literature, best practice and consultation with many specialist dental societies.¹⁴ Even if a guideline is of high scientific quality, however, clinicians may still not follow it unless it is uncontroversial, specific, evidence based and requires no change to existing routine.¹⁸ It has been shown that guidelines alone are seldom of value¹⁹ but are more effective when linked with educational initiatives.²⁰ The effectiveness of innovation techniques in persuading practitioners to accept guidelines has shown that opinion leaders (100%) and audit with feedback (42%) are more effective than formal continuing education.²¹

This investigation showed that this innovative audit, using guidelines and an educational component with feedback, was effective in reducing inappropriate antimicrobial use by changing GDPs' prescribing practices. It was evident from the pre-audit data that GDPs prescribed inappropriately, at times using the wrong antibiotic at the incorrect dose and duration and in clinical situations where there was little benefit to the patient. This confirmed the results of a questionnaire study carried out in general dental practice in England.^{4,5} There was a significant reduction in the number of inappropriate reasons for prescribing during the audit with fewer practitioners prescribing due to uncertainty of diagnosis, pressure of time, patient expectation, pain and localised swelling. There was also a reduction in the number of prescriptions for periodontal and periapical abscesses, pulpitis, infected sockets, sinusitis and following minor oral surgery. Whether these changes will be sustained requires further investigation after a suitable period of time. The importance of re-audit by GDPs cannot be overemphasized in order to continually improve patient care in this area of clinical practice.

The authors would like to thank the Cheshire LAPRAP for organising the audit, the practitioners for taking part, Dr M Martin and Dr L Longman for providing the educational programme, the audit facilitators who gave valuable assistance and Mrs R Pealing for inputting the data.

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