

An infective endocarditis audit illustrates why dental guidelines in general need to be kept clear, simple and unambiguous

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IN BRIEF

- There have been many complex and disparate international guidelines on the dental management of patients at risk of developing infective endocarditis.
- A degree of confusion existed as a consequence among a small number of English hospital orthodontists.
- This study supports the call for international guidelines to follow the example of the straightforward NICE guidelines published in March 2008.

Objective To test the effect complex, multiple dental guidelines have on establishing compliance with ideal clinical practice. **Design** A questionnaire was used to determine the level of knowledge of the British Cardiac Society and Royal College of Physicians 2004 infective endocarditis prophylaxis guidelines which were contemporary at the time the study was initiated, as well as to identify the existence of any written departmental policies on the safe management of patients at risk of developing this disease. **Setting** Hospital Orthodontic Departments in the East of England. **Subjects and methods** Fourteen consultant and nine training grade group hospital orthodontists in the East of England initially answered the questionnaire in November 2005. The results of the survey were then discussed at a subsequent regional audit meeting after which standards were agreed. The original questionnaire was then reissued in June 2006 to 13 and eight of the original consultants and training grade group orthodontists respectively. This was coincidentally three months after the publication of further new infective endocarditis prophylaxis guidance from the working party of the British Society for Antimicrobial Chemotherapy. **Results** The initial results indicated a number of significant deficiencies in the knowledge of which dental procedures either did or did not need antibiotic prophylaxis that the subsequent audit then improved to a variable extent. Nevertheless, the general finding was one of persistent confusion regarding the multiple conflicting contemporaneous guidelines. This lends further support to the concept of converging guidelines which remain disunified, complex and non-evidence based. **Conclusions** The results of this audit confirm that compliance with preferred clinical practice is noticeably compromised when complex conflicting guidelines from either different national or international authoritative bodies exist for the same condition. With particular regard to the dental guidance for infective endocarditis prophylaxis, this has now been largely circumvented in the United Kingdom by the publication of a single, unambiguous guideline from the National Institute of Health and Clinical Excellence (NICE) in March 2008.

INTRODUCTION

Infective endocarditis (IE) is an uncommon but potentially fatal disease, and while antibiotic prophylaxis prior to some dental procedures was conventional in the United Kingdom (UK) until recently, the tenuous, if not over-emphasised link with dental treatment was beginning to be both scientifically challenged,¹⁻³ and acknowledged in civil law.⁴

Nevertheless, throughout the history of IE prophylaxis, professional organisations have sought to identify and stratify

the groups of patients considered to be at risk, as well as list those procedures for which antibiotic cover should be supplied,⁵⁻¹⁰ although none of them have ever reached complete consensus with each other.¹¹

For a long time the UK dental guidelines for IE had been based on the 1993 guidance issued by the British Society of Antimicrobial Chemotherapy (BSAC),⁵ which was published in the British National Formulary (BNF). Nevertheless, by May 2004 extensive new IE guidelines issued jointly by the British Cardiac Society and the Royal College of Physicians (BCS RCP) had emerged.⁶

One of the main changes they introduced was the abandonment of the presumption that all dental procedures that cause significant bleeding would need antibiotic cover in patients susceptible of developing IE. This was because

research had shown that bleeding following dental treatment was a poor predictor of odontogenic bacteraemia.²

Instead the guidance introduced the concept that any dento-gingival manipulation which resulted in a statistically significant different bacteraemia from a pre-procedure baseline reading would require antibiotic cover, whether it was bloodless or not.¹⁰

The aim of this study was therefore to survey the level of knowledge and understanding of these extensive guidelines amongst hospital orthodontists and to audit whether the amount of detail they contained might otherwise have detracted clinicians from achieving full compliance with the recommended IE protocols at the time, and so act as a general indicator of the potential effectiveness for these and any other complex dental guidelines that exist.

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Table 1 Number and percentage of consultants who responded affirmatively to questions on infective endocarditis dental management protocols prior to and during the audit

Dental management protocols for infective endocarditis	Number of the same individuals who answered in each year (Percent)		Relative Percentage Change
	2005 Survey n = 14	2006 Audit n = 13	
Specific written departmental protocols available	3 (21%)	10 (77%)	56%
Patients are supervised taking their pre-treatment antibiotic cover	13 (93%)	10 (77%)	-16%
Pre-treatment 0.2% chlorhexidine mouth rinses are used	13 (93%)	12 (92%)	-1%

Table 2 Number and percentage of training grade group orthodontists who responded affirmatively to questions on infective endocarditis dental management protocols prior to and during the audit

Dental management protocols for infective endocarditis	Number of the same individuals who answered in each year (Percent)		Relative Percentage Change
	2005 Survey n = 9	2006 Audit n = 8	
Specific written departmental protocols available	2 (22%)	3 (37%)	15%
Patients are supervised taking their Pre-treatment antibiotic cover	8 (89%)	8 (100%)	11%
Pre-treatment 0.2% chlorhexidine mouth rinses are used	8 (89%)	8 (100%)	11%

SUBJECTS AND METHODS

In November 2005, 14 consultant and nine training grade group (TGG) East of England hospital orthodontists completed a questionnaire on IE. They were asked whether specific written protocols on the orthodontic management of patients at risk of developing IE were available in their departments, and they were also asked to identify from a list of dental and orthodontic procedures those which according to the BCS RCP IE 2004 recommendations either would or would not require antibiotic cover.

After discussing the findings of the initial survey at a subsequent regional meeting, together with receiving education on the content of these recommendations, it was agreed that an audit would be undertaken. Because it had been previously stated that these guidelines would 'provide dental practitioners with an easily accessible and easy to use method of identifying patients who require antibiotic prophylaxis, confirmation of the dental procedures requiring antibiotic prophylaxis, and the drug regimens required'¹⁰ it was decided to

test this supposition by auditing how well the clinicians performed using their new knowledge of which dental procedures of relevance to the practice of orthodontics either would or would not require antibiotic cover for patients at risk of developing IE.

As a consequence, in June 2006 the same questionnaire was re-issued to the consultants and TGGs to complete. However, in the interim one consultant and one TGG had resigned which left 13 and eight of the original clinicians respectively to audit.

In addition, different new IE guidelines had once again appeared three months earlier in the preceding April, following a publication by the BSAC Working Party. In essence, these de-emphasised the risk of a bacteraemia arising from a single procedure in the causation of IE, placing more emphasis instead on the risk of cumulative exposure to bacteraemias from poor oral health, toothbrushing and chewing,⁷ all of which are shared sentiments that are contained within the current American Heart Association (AHA) guidelines.⁸

RESULTS

Management protocols for patients at risk of developing IE

Tables 1 and 2 illustrate the clinical protocols that were used for managing patients at risk of developing IE both at the time of the initial survey and during the audit for the consultants and the TGGs. In the first instance, about a fifth of the consultants had specific IE departmental policies, of which a similar fraction of the TGGs were cognisant of. Then during the audit, just over three quarters of the consultants had developed such policies, yet at that stage only about a third of the TGGs were aware of them.

With regard to the contemporaneous need to supervise patients taking their pre-treatment antibiotic prophylaxis as well as the use of a pre-procedure mouth rinse of 0.2% chlorhexidine, both predominated amongst the two groups of clinicians on both occasions.

Knowledge of which dental and orthodontic procedures required antibiotic prophylaxis in patients at risk of developing IE

Tables 3 and 4 show that the consultant and TGG understanding of the general concept that not all dental procedures which result in gingival bleeding would require antibiotic cover and *vice versa* both improved during the audit. In addition, these tables demonstrate the number and percentage of consultants and TGGs who correctly identified those procedures which the BCS RCP IE 2004 guidelines recommended would require antibiotic prophylaxis for any resultant bacteraemias that would otherwise be significantly above the pre-procedure baseline levels, as well as those that would not.

In the initial survey, the consultants and TGGs respectively answered an average of 67% and 68% of all of these questions correctly. The performance of these two groups during the audit then improved by just over 10%, as the consultants and TGGs respectively answered a mean of 78% and 80% correctly.

DISCUSSION

While the number of participants in this audit was quite small, some interesting

Table 3 Consultant response to some of the procedures which the 2004 British Cardiac Society infective endocarditis guidelines either did or did not recommend antibiotic prophylaxis for

General and specific procedures	Is antibiotic cover required?	Number of the same individuals who answered correctly in each year (Percent)		Relative Percentage Change
		2005 Survey n = 14	2006 Audit n = 13	
Those which induce gingival bleeding	Not always	6 (43%)	9 (69%)	26%
Those which do not induce gingival bleeding	Sometimes	7 (50%)	11 (85%)	35%
Periodontal probing	YES	9 (64%)	11 (85%)	21%
Dental exam with mirror & probe	NO	14 (100%)	13 (100%)	0%
Polishing with a rubber cup	YES	4 (29%)	5 (38%)	9%
Light scaling	YES	9 (64%)	7 (54%)	-10%
Deep scaling	YES	14 (100%)	13 (100%)	0%
Intra-ligamental LA	YES	10 (71%)	11 (85%)	14%
Infiltration LA	NO	11 (79%)	11 (85%)	6%
Nerve block LA	NO	9 (64%)	11 (85%)	21%
Rubber dam placement	YES	8 (57%)	9 (69%)	12%
Placement of orthodontic separator	YES	10 (71%)	8 (62%)	-9%
Removal of orthodontic separator	NO	7 (50%)	10 (77%)	27%
Seating an orthodontic band	NO	2 (14%)	3 (23%)	9%
Removing an orthodontic band at initial selection	NO	5 (36%)	8 (62%)	26%
Removing sub-gingival composite and cement	YES	14 (100%)	13 (100%)	0%
Alginate impressions	NO	14 (100%)	12 (92%)	-8%
Adjustment of an orthodontic fixed appliance	NO	14 (100%)	13 (100%)	0%
Removal of surgical packs used for tooth exposures	NO	6 (43%)	9 (69%)	26%
Removal of sutures	NO	11 (79%)	12 (92%)	13%
Toothbrushing	NO	14 (100%)	13 (100%)	0%
Overall mean number answered correctly		198/294 (67%)	212/273 (78%)	11%

observations can still be made. It was rewarding to see that 56% more consultants had developed IE departmental policies on how to manage patients at risk as a consequence of knowing they would be audited (Table 1). However, the subsequent communication of this with their postgraduate trainees was somewhat remiss, as only 15% more of the TGGs subsequently became aware of their existence (Table 2).

As recommended by the BNF which was current at the time of the study,¹² the protocol that patients should be witnessed taking their pre-procedure antibiotic cover by either the dentist or the dental nurse predominated at the initial survey and during the audit, although on the second occasion while this

appreciation fell slightly amongst the consultants, it rose in contrast to include all of the TGGs (Tables 1 and 2).

Up until then, even though a number of studies had shown no significant reduction in bacteraemias as a result of using a pre-treatment chlorhexidine mouth rinse,^{13,14} it nevertheless remained a contemporaneous BNF recommendation,¹² as was the case in other publications specifically relating to the orthodontic management of patients at risk of developing IE.^{15,16}

That the practices of witnessing pre-procedure antibiotic administrations together with the use of antiseptic mouth rinses were widespread amongst both the consultants and the TGGs at the initial survey and during the subsequent audit

was therefore good evidence of protocol compliance with simple, clear guidelines (Tables 1 and 2).

In relation to the extensive list of dental procedures which required antibiotic prophylaxis as per the BCS RCP IE 2004 recommendations, two thirds of the consultants and the TGGs overall correctly identified those which would need to be covered in the initial survey, which then rose to over three quarters of them during the audit.

In comparison, this performance was better than that found in a recent study which evaluated the knowledge of 528 Welsh dental practitioners with respect to a different set of IE guidelines, as contained within the BNF that was current at the time. Of the 33 Hospital Dental

Table 4 Training grade group response to some of the procedures which the 2004 British Cardiac Society infective endocarditis guidelines either did or did not recommend antibiotic prophylaxis for

General and specific procedures	Is antibiotic cover required?	Number of the same individuals who answered correctly in each year (Percent)		Relative Percentage Change
		2005 Survey n = 9	2006 Audit n = 8	
Those which induce gingival bleeding	Not Always	1 (11%)	3 (38%)	27%
Those which do not induce gingival bleeding	Sometimes	6 (67%)	6 (75%)	8%
Periodontal probing	YES	9 (100%)	8 (100%)	0%
Dental exam with mirror & probe	NO	9 (100%)	8 (100%)	0%
Polishing with a rubber cup	YES	2 (22%)	5 (63%)	41%
Light scaling	YES	8 (89%)	7 (88%)	-1%
Deep scaling	YES	9 (100%)	8 (100%)	0%
Intra-ligamental LA	YES	9 (100%)	8 (100%)	0%
Infiltration LA	NO	7 (78%)	7 (88%)	10%
Nerve block LA	NO	6 (67%)	6 (75%)	8%
Rubber dam placement	YES	6 (67%)	8 (100%)	33%
Placement of orthodontic separator	YES	5 (56%)	7 (88%)	32%
Removal of orthodontic separator	NO	5 (56%)	5 (63%)	7%
Seating an orthodontic band	NO	1 (11%)	2 (25%)	14%
Removing an orthodontic band at initial selection	NO	2 (22%)	3 (38%)	16%
Removing sub-gingival composite and cement	YES	8 (89%)	8 (100%)	11%
Alginate impressions	NO	9 (100%)	8 (100%)	0%
Adjustment of an orthodontic fixed appliance	NO	9 (100%)	8 (100%)	0%
Removal of surgical packs used for tooth exposures	NO	4 (44%)	5 (63%)	19%
Removal of sutures	NO	5 (56%)	7 (88%)	32%
Toothbrushing	NO	9 (100%)	8 (100%)	0%
Overall mean number answered correctly		129/189 (68%)	135/168 (80%)	12%

Service practitioners within that study's main group, they answered on average 53% of the questions correctly as to which dental procedures would require antibiotic cover.¹⁷

Nevertheless, despite this study's participants having been given specific education on which dental and orthodontic procedures produce profound bacteraemias, such as polishing teeth with a rubber cup, scaling, and placing an orthodontic separator,^{16,18} that the subsequent audit only produced a modest improvement in both groups overall, if not with some isolated examples of actual deterioration, clearly demonstrates the effect complex guidelines have on not being able to reliably achieve complete compliance with preferred

clinical practice, especially if different guidelines exist for the same condition contemporaneously.

As a consequence, this audit and the findings of the other IE study¹⁷ both support the overall observation that when different guidelines are available, confusion amongst clinicians prevails on how best to proceed.¹⁹

However, even though this has now been largely circumvented in the UK by the publication of un-ambiguous IE guidance from the National Institute of Health and Clinical Excellence in March 2008, which recommends nil antibiotic prophylaxis for any dental procedure,²⁰ documented episodes where clinicians are encountering compliance resistance from patients and other colleagues

are now beginning to emerge.²¹ Indeed, under English law, any dentist who decides not to follow up-to-date guidance may be required to justify their decision either to the General Dental Council or a legal court in the event of a complaint or a claim for damages being made.²¹ This is because the test of liability in relation to the outcome of any treatment is set out in the House of Lords decision of *Sidaway*.²² In this regard clinicians have to act in accordance not only with a practice accepted at the time as proper by a responsible body of medical opinion (the *Bolam* test),²³ but also with the *Bolitho* modification,²⁴ that the body of opinion should be reasonable and responsible and the opinion should be logical.²⁵

For those UK clinicians who may choose to adhere to the AHA IE guidelines and still prescribe prophylactic antibiotic cover in limited circumstances, namely for all dental procedures that involve manipulation of the gingival tissue, the periapical region of teeth or the perforation of the oral mucosa, for a number of high risk category patients which are defined,⁸ it could be argued that their practice would still qualify as being in accordance with a responsible body of opinion, even though it would be contrary to the latest NICE guidance. However, if a claim were ever to arise as a consequence of such practice, it would be down to the judiciary to determine if that body of opinion remained reasonable, responsible and logical.

Unfortunately this will provide little solace for dentists who practice outside of the UK's judicial system, as their level of uncertainty as to which IE guideline to follow will most likely have increased, given the polarisation that now exists between the 2007 AHA and the new 2008 NICE guidance.

CONCLUSIONS

The results of this audit confirm that compliance with preferred clinical practice is noticeably compromised when complex, conflicting guidelines from either different national or international authoritative bodies exist for the

same condition.

With particular regard to the dental guidance for IE, these results and those from an earlier study¹⁷ have shown that lack of guideline standardisation results in sub-optimal clinical practice as a result of generalised confusion. Both of these studies therefore support the sense of guideline convergence, and to this end, hopefully other countries will soon adopt a similar IE prophylaxis policy to the one which now prevails in the UK.

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