

Insufficient awareness of endocarditis prophylaxis in patients at risk

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Summary

Objective: To determine whether patients at risk for development of infective endocarditis (IE) have adequate knowledge of IE and the need for endocarditis prophylaxis (EP), and to test the impact of reeducation on subsequent knowledge.

Methods: We assessed awareness of IE and EP in 139 patients at risk. To assess their knowledge of IE and EP, patients were asked to complete a questionnaire. 59 patients underwent education concerning IE and EP.

Results: On the basis of 123 analysed questionnaires, 87 patients were considered high risk and 36 moderate/low risk. Overall, 59% displayed inappropriate knowledge of IE and EP, 15% did not remember receiving IE education, nor had they been given an EP card. The term “endocarditis” was correctly defined by 45%. 63% were aware of the precautions necessary for IE and 55% remem-

bered the need for antibiotic prophylaxis prior to invasive dental procedures. More than two thirds of the patients with prior education and an EP card could not recall having their knowledge of IE and EP “brushed up” by their primary care physicians. Only 21% had not informed their dentist of their risk for IE.

Conclusions: Many patients at risk for IE have an inadequate knowledge of their heart disease, IE, and EP. Most of them are unaware of the need for good dental hygiene. Educational efforts should be intensified and regularly upgraded in adults with valvular disease. Communication between patient, physician and dentist needs to be improved in order to address these issues.

Key words: antibiotic prophylaxis; endocarditis; questionnaire; patient knowledge

Introduction

The incidence of IE is difficult to assess, since published series are retrospective and based on a variety of patient populations. Despite the increasing incidence in defined risk groups such as IVUDU and the elderly, in some series the incidence [1, 2], patient characteristics [1] and the course of IE remains remarkably stable [1]. Also, mortality from IE has remained unchanged despite general preventive measures, prophylactic and therapeutic use of antibiotics, improvement in diagnostic tools and advances in cardiac surgery [1]. The reported mortality for native valve endocarditis ranges from 16 to 27% [1–3] and for prosthetic valve endocarditis (late-onset) up to 40% or 40–80% in early-onset endocarditis [1]. The most commonly isolated pathogens in IE remain *Staphylococcus aureus* and *Streptococcus viridans* [1, 3]. Although prevention is generally recommended, many problems remain. To the best of our knowledge no prospective trial has ever proved the efficacy of antibiotic prophylaxis, since the low incidence of IE seriously limits the feasibility of a prospective randomised trial.

Despite the well known criteria for patients at risk and for events which potentially lead to bacteraemia, blood cultures are negative in 2.5–31% of patients with proven IE [1, 2]. In up to 50% of patients with IE no event associated with bacteraemia is found [4]. Preventing IE by simple measures may, even in a few cases, result in a relevant reduction in deaths. Accordingly, recommendations have been formulated by various working groups with a view to identifying patients at risk and also events which result in bacteraemia [1, 2]. The impact of implementation of these guidelines by physicians caring for patients at risk for IE has not been established.

The goal of our study was to assess awareness of IE and EP among patients with prosthetic heart valves or relevant valvular heart disease. A second goal was to determine the impact of standardised education designed to improve the patient's understanding. All patients were asked about their knowledge of their cardiac condition, infective endocarditis, dental hygiene precautions and bacterial endocarditis prophylaxis five to six months after the first survey using the same questionnaire.

Patients and methods

Between August and October 2000 123 patients of the Triemli Hospital in Zurich requiring prophylaxis for bacterial endocarditis completed a questionnaire containing 15 items addressing knowledge of their heart disease, dental hygiene precautions, IE and EP (table 1). The questionnaire was distributed among 59 outpatients attending our cardiology clinic and 64 patients discharged from the cardiothoracic surgery service. All German-speaking patients who had previously received basic instruction on IE/EP and who attended the cardiology unit as outpatients for regular follow-up visits, or patients recently discharged after valve replacement surgery, were included in the survey. Patients without prior basic education in IE and EP (12 patients) or with incomplete questionnaires (4 patients) or patients who did not wish to participate were excluded from the study and from further analysis. No patient had previously received the questionnaire. A reply defining "endocarditis" as "infection of the heart" or "infection of the heart valves" was considered correct. The patients' valvular disease and history of endocarditis were

ascertained by review of medical records. The need for bacterial endocarditis prophylaxis was determined according to the recommendations of the Swiss Working Group for Endocarditis Prophylaxis [14].

After completion of the questionnaire an oral retraining session in IE and EP using a standardised protocol was administered to the 59 outpatients only (table 2). These patients were sent a mailed request to answer the same questions five to six months later. The follow-up mailing contained a questionnaire and a stamped addressed return envelope (table 1). Of the retraining group (59 patients), 40 returned questionnaires which could be analysed.

For analysis a standard commercially available biostatistics package (stat view, version 5.0) was used. A chi-square test was used for group comparison (high risk – low/moderate risk and primary – secondary survey). The McNemar test was used to compare results at baseline and after education.

Results

The mean age of the study population was 68 ± 11 years, ranging from 31 to 84 years (n = 123, 91% of all patients). 73% of the study population were males. Twelve patients reported they had never received education, and some had no EP card. The reason why these patients had not been given education and why they have no EP card is unclear. They were excluded from the study population and hence from analysis.

The characteristics of cardiac lesions are listed

in table 3. Of the 82 patients who had previously undergone prosthetic mitral or aortic valve replacement, 20 (16%) could identify their diseased heart valve correctly.

Only 45% (n = 55) of all patients correctly defined endocarditis, and 77 (63%) were informed of the necessary dental hygiene precautions for endocarditis prevention. About half of the study patients, 55 (44%) were unaware of the need for antibiotic chemoprophylaxis prior to dental pro-

Table 1
Patient questionnaire
on endocarditis.

Can you name your heart condition?	
Have you a prosthetic heart valve?	yes / no
What is endocarditis?	
How serious is endocarditis?	
(a) minor disease (b) intermediate disease (c) life-threatening disease	
Have you an endocarditis risk card?	yes / no
Do you know whether you are in the low, moderate or high risk group for endocarditis?	
low	moderate
	high
How can you prevent endocarditis?	
Regular dental checkups	yes / no
Good dental hygiene	yes / no
Do you need additional drugs if you have dental work done?	
If YES, what kind?	
Which of the following increase your infective endocarditis risk?	
Infections in the oral cavity	yes / no
Failure to clean teeth	yes / no
When was your last dental checkup?	
When did you last receive education in endocarditis prophylaxis from a physician?	
(a) I don't remember.	
(b) I receive regular reeducation in infective endocarditis and prophylaxis	
Have you informed your dentist of your heart condition?	yes / no
Have you current dental problems?	yes / no
Have you (still) your own teeth?	yes / no

Table 2

Retraining protocol on infective endocarditis, prophylaxis of infective endocarditis and hygiene measures.

The following instructions on *heart valve infection*, known as *endocarditis*, are for you.

It is important for your health, and to enable you to inform your dentist, that you are aware of your heart disease and of the importance of your endocarditis risk card.

You are susceptible to heart valve infection, known as *endocarditis*.

What is infective endocarditis? Infective endocarditis is an infection of the heart's inner lining (endocardium) or the heart valves. The infection can damage or even destroy your heart valves.

How does it occur? Infective endocarditis occurs when bacteria in the bloodstream (bacteraemia) lodge on abnormal heart valves or other damaged heart tissue. Some surgical and dental procedures cause short-lived bacteraemia. Although bacteraemia is common after many invasive procedures, only some bacteria commonly cause endocarditis.

What procedures carry the greatest risk of endocarditis?

These procedures include most dental procedures likely to cause significant bleeding.

- professional teeth cleaning
- tonsillectomy or adenoidectomy
- examination of the respiratory passageways with an instrument known as a rigid bronchoscope
- certain types of surgery of the respiratory passageways, the gastrointestinal tract or the urinary tract
- gallbladder or prostate surgery

Who is at risk?

Endocarditis rarely occurs in people with normal hearts. However, if you have certain preexisting heart conditions, you are at risk of developing endocarditis when bacteraemia occurs. Some of these conditions include having

- an artificial (prosthetic) heart valve
- a history of previous endocarditis
- heart valves damaged (scared) by conditions such as rheumatic fever
- congenital heart or heart valve defects
- mitral valve prolapse with murmur
- hypertrophic cardiomyopathy

Can endocarditis be prevented?

The important thing for you to remember is that penicillin or other antibiotics given before dental work can prevent the infection. Remind your dentist each time you see him that you have a cardiac condition so that he can give you antibiotics. Remember, you need antibiotics for all dental work, even cleaning of the teeth.

There is evidence that people whose teeth and gums are in poor condition are more likely to have germs enter the blood stream (even without dental work) than those who have normal teeth and gums. Therefore, it is important that you take good care of your gums and teeth.

Table 3

Cardiac lesions of study patients.

Lesion	high risk* (n = 87)	moderate / low risk** (n = 36)
Mechanical prosthetic heart valve	59 (68%)	
Bioprosthesis	23 (26%)	
Previous infective endocarditis	3 (6%)	
Congenital heart disease	0 (0%)	
Degenerative aortic stenosis/regurgitation		29 (81%)
Bicuspid aortic valve		2 (5.5%)
Mitral valve prolapse with regurgitation		3 (8%)
Hypertrophic obstructive cardiomyopathy		2 (5.5%)

* Mechanical and bioprosthetic valve, previous infective endocarditis, complex cyanotic heart disease

** Degenerative aortic stenosis/regurgitation, bicuspid aortic valve, mitral valve prolapse with relevant valvular regurgitation, hypertrophic obstructive cardiomyopathy

cedures. With a few exceptions most patients could not remember the name of the recommended antibiotics. One fifth of the surveyed patients (26/21%) had not informed their dentist of their diagnosis. Some of them (20 patients = 16%) were aware of a dental problem to be treated, 22 (19%) had not seen a dentist in the last year and 31 (25%) had not seen the dentist for two years. The replies are summarised in tables 4 and 5.

Two thirds (85/68%) of the study participants who had received basic education and an EP card could not recall when they had last received edu-

cation on IE from a physician. Awareness of the risk of acquiring IE was the same among patients at high and low risk. In addition, 44%/36 of the patients with a mechanical or bioprosthetic valve did not know of their high risk status for IE. Despite our education efforts, only minor, not statistically significant improvements were seen during 5-6 months' follow-up, in particular as regards understanding of hygiene measures. Comparison of the first and the second surveys showed no statistical difference between the high risk group and the moderate/low risk group (table 5).

Table 4
First survey: Replies of all patients to questions on IE and EP.

	Patients	
	High risk* (n = 87)	Low risk** (n = 36)
Cannot name heart condition	75 (86%)	28 (78%)
Unable to provide minimal definition of IE	41 (47%)	27 (75%)
Potential serious risks of the disease unknown	44 (51%)	29 (81%)
Correct wallet card lacking or not given	11 (13%)	8 (22%)
No knowledge of her/his risk group	65 (75%)	15 (42%)
Insufficient knowledge of measures to prevent IE	32 (37%)	14 (39%)
Unaware of antibiotics needed before dental procedures	38 (44%)	17 (47%)
Dentist not seen in the last year	15 (17%)	7 (19%)
Dentist not seen in the last 2 years	22 (25%)	9 (25%)
Did not inform dentist of heart problem	18 (21%)	8 (22%)
Did not recall education by a physician	56 (64%)	29 (81%)

* Mechanical and bioprosthetic valve, previous infective endocarditis, complex cyanotic heart disease

** Degenerative aortic stenosis/regurgitation, bicuspid aortic valve, mitral valve prolapse with relevant valvular regurgitation, hypertrophic obstructive cardiomyopathy

Table 5

Comparison first survey and follow-up in selected group.

	First survey		Follow-up survey	
	High risk* (n = 20)	Low risk** (n = 20)	High risk* (n = 20)	Low risk** (n = 20)
Cannot name heart condition	14 (70%)	14 (70%)	15 (75%)	17 (85%)
Unable to provide minimal definition of IE	10 (50%)	14 (70%)	8 (40%)	7 (35%)
Potential serious risks of the disease unknown	8 (40%)	15 (75%)	11 (55%)	11 (55%)
Correct wallet card lacking or not given	1 (5%)	4 (20%)	2 (10%)	2 (10%)
No knowledge of her/his risk group	13 (65%)	9 (45%)	13 (65%)	14 (70%)
Insufficient knowledge of measures to prevent IE	5 (25%)	6 (30%)	8 (40%)	6 (30%)
Unaware of antibiotics before dental procedures	10 (20%)	9 (45%)	7 (35%)	5 (25%)
Dentist not seen in the last year	3 (15%)	3 (15%)		
Dentist not seen in the last 2 years	9 (45%)	4 (20%)		
Did not inform dentist of heart problem	6 (30%)	5 (25%)	5 (25%)	4 (20%)
Did not recall education by a physician	12 (60%)	15 (75%)	11 (55%)	11 (55%)

* mechanical and bioprosthetic valve, previous infective endocarditis, complex cyanotic heart disease

** degenerative aortic stenosis/regurgitation, bicuspid aortic valve, mitral valve prolaps with relevant valvular regurgitation, hypertrophic obstructive cardiomyopathy

Discussion

In 1997 the American Heart Association Committee on Prevention of Rheumatic Fever and Bacterial Endocarditis published recommendations for prophylaxis of bacterial endocarditis [13]. The Swiss recommendations were last revised in 2000 [14].

Despite education efforts and the serious implications of infective endocarditis, patients with valvular heart disease and artificial valves have inadequate understanding of endocarditis and endocarditis prophylaxis [1–4]. Cetta et al. reported that although 69% of adolescents with congenital heart disease could name their cardiac condition, only 4% correctly defined endocarditis and only 40% knew that an antibiotic was necessary before dental procedures [1].

In agreement with other data, our study showed inadequate knowledge of endocarditis in unselected patients as well. More than half of our

patients could not define endocarditis and only 60% were aware of the precautions necessary to prevent it.

Patients who had been carefully trained by standardised protocol (table 2) showed only slightly improved knowledge of IE and EP. Our findings were similar to other studies [1].

The results of this survey highlight potentially important shortcomings in dental care and antibiotic prophylaxis in moderate/low and high risk patient groups. In view of this poor compliance, we speculate that many patients at risk for endocarditis undergo dental procedures without antibiotic protection but without developing endocarditis.

Moreover, most patients with valvular heart disease or artificial valves are not aware of the need for continuous dental follow-up. 15% had had no dental examination in the last year and 30% had not seen a dentist in the previous two years.

In many patients neither the entry site of bacteria nor the exact time of bacteraemia can be determined. Van de Meer showed that only 7% of IE could be linked to a bacteraemia-producing procedure in patients with known heart disease [1]. This issue was not addressed by our study. Even if potentially preventable events are as low as 7%, it is important to comply with current guidelines. The issues of efficacy and cost-effectiveness will be adapted in the future. Reeducation after short term follow-up results in a heightening – even if not statistically significant – of awareness and understanding. To optimise results it may be sufficient to keep information and education as simple as possible. If we succeed in getting patients to inform their primary care physicians and dentists of their heart disease, the level of correct usage of EP could be raised to 100%. Professional health care providers naturally need detailed knowledge of IE and EP, and existing differences should be reduced [1]. Ideally one would expect a reduction in the overall incidence of IE as a result of effective EP and, accordingly, also a favourable effect on cost-effectiveness. Our data showed no difference in knowledge of IE and EP between moderate/low risk and high risk patients, and therefore risk-adjusted education (duration, frequency) could result in a larger absolute number of prevented IE.

Conclusion

Patients at risk for IE have inadequate understanding of IE and EP after receiving routine education. Despite repeated standardised reeducation protocols, improvement in knowledge is disappointing. Repeated concise education and information programmes on endocarditis and preventive measures should be part of any interaction with patients at risk for IE. In any case patients should receive written documentation detailing their cardiac condition and an instruction pamphlet explaining IE and EP. More frequent and repeated education efforts, particularly in high risk patients, may ultimately be more efficacious.

Routine dental examinations and follow-up should be emphasised. A cardiologist should periodically update other involved health-care providers on the patient's current cardiac status and underscore the continued need for IE prophylaxis prior to nonsterile procedures. Regular dental examination by cardiologists and primary care physicians may help to identify patients in need of referral for dental care.

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