Ann R Coll Surg Engl 1997; 79: 55–57

Audit of thromboembolic prophylaxis in hip and knee surgery

H R Williams BSc(Hons) FRCS
Orthopaedic Registrar

D A Macdonald FRCS
Orthopaedic and Trauma Consultant

St James's University Hospital, Leeds

Key words: Audit; Thromboprophylaxis

An audit of the departmental policy for thromboembolic prophylaxis was undertaken, examining the use of TED stockings, administration of subcutaneous low-dose heparin and inclusion into a multicentre pulmonary embolism prevention (PEP) trial for fractured neck of the femur.

The results showed that despite an established unit policy, only 43% of patients undergoing primary hip replacement and 14% undergoing revision replacement received subcutaneous heparin. All patients undergoing primary and revision total knee replacement received subcutaneous heparin, but 75% of these patients received an incorrect dose.

Use of TED stockings in patients who had sustained a fractured neck of the femur, ranged from 0% to 70% depending on the type of fixation. Use of subcutaneous heparin in these patients ranged between 0% and 20% and inclusion into the PEP trial from 0% to 20%.

The results of this study were presented to the clinicians working in the orthopaedic department and 3 months later the audit cycle was completed by repeating the study. It was found there was a statistically significant improvement in the administration of subcutaneous heparin and in the wearing of TED stockings in the joint arthroplasty group as well as in the inclusion of hip fracture patients into the PEP trial.

This study demonstrates that established protocols are of little value unless audited and that completion of the audit cycle is essential. It does not attempt to show that one prophylactic method is better than another.

Correspondence to: Mr H R Williams, Fellow in Shoulder Surgery, Royal Berkshire Hospital, Reading RG1 5AN

There are many papers in the medical literature demonstrating that one form of thromboembolic prophylaxis is more beneficial than another in reducing the rate of deep vein thrombosis and pulmonary embolism *(1–7)*. However, few of these papers present evidence that administration of the drug, the use of a mechanical device or some other form of prophylaxis has actually occurred. It is recommended that every orthopaedic department should have a written policy for such prophylaxis and that the method of prophylaxis is identified for defined risk groups *(8)*. With junior staff changing every 3 or 6 months within a department, it is important that there are established protocols but, to be efficacious, the protocols must be implemented. It is only by audit that this may be assessed.

An audit within the orthopaedic department at St James's University Hospital, Leeds, was carried out. It examined specifically the implementation of an established policy for thromboembolic prophylaxis in patients undergoing primary and revision hip and knee arthroplasty and patients undergoing surgery for fractured neck of the femur. The policy states that all patients undergoing primary or revision total hip or knee arthroplasty should wear TED compression stockings, be prescribed low molecular weight heparin (provided that there are no contraindications) and that early mobilisation should take place in the postoperative period. Patients with a fractured neck of the femur should wear TED stockings and be mobilised early. Subcutaneous heparin is not prescribed to these patients.

At the time the audit was carried out, the department was collaborating in a multicentre pulmonary embolism prevention (PEP) trial. This is a large international randomised trial of low-dose aspirin for the prevention of pulmonary embolism and other major vascular events after hip fracture surgery. The study is coordinated through the Clinical Trial Service Unit in Oxford and

funded by the British Heart Foundation. Inclusion of patients into the trial, the use of TED stockings and incorrect prescribing of subcutaneous low-dose heparin were also audited.

Method

During the course of one afternoon the authors assessed every inpatient under the care of the department. This was irrespective of the surgery they had undergone or were about to receive. The audit was performed unannounced to patients, nurses or other medical staff within the department.

Data collected included:

Patient name	
Reason for admission	
Preop/postop	
TED stockings	appropriate
	issued
	worn at time of assessment
s/c heparin	appropriate
	administered
PEP trial	appropriate
	administered

The results of this initial audit were presented to the departmental clinical staff at the next monthly audit meeting. Nursing staff were informed of the results at a separate meeting. The audit was repeated 3 months later. None of the medical staff had changed and the study was again performed unannounced and at the same time of day and on the same day of the week as the first phase of the study. The same data were collected.

Results

At the time of the inital audit there were 81 orthopaedic inpatients. Of these, 35 (43%) were included in the audit, having had either a hip or knee arthroplasty or having sustained a fractured neck of the femur. At the 3 month review there was a total of 80 inpatients, 39 (49%) of whom were included in the audit. Table I shows the number of patients undergoing the different operative procedures under examination. Figure 1 demonstrates the combined results of all patients undergoing elective arthroplasty surgery and hip fracture surgery and whether or not the department protocol was followed.

Table I. Number of patients included in audit

	Initial	*Review*
Primary THR	8	6
Revision THR	4	6
Primary TKR	5	5
Revision TKR	1	1
Total	18	18
Hemiarthroplasty	5	11
A/O screws	4	4
DHS	8	6
Total	17	21

THR = Total hip replacement
TKR = Total knee replacement
DHS = Dynamic hip screw

At the 3 month review, most of the results had improved, the only exception was the use of TED stockings in patients who had a hemiarthroplasty, which declined from 70% to 25% at the review. Inclusion into the PEP trial for patients with fractured neck of the femur was low. Only 20% of patients with hemiarthroplasty were included in the initial audit. This improved to 25% at review. None of the patients with A/O screws or dynamic hip screw (DHS) fixation were found to have been included in the trial in the initial audit. At review these improved to 66% and 75%, respectively. At first all primary and revision total knee replacement (TKR) patients received subcutaneous heparin, but 75% received an incorrect dose. The correct dosage was found to have been administered at the 3 month review. The audit also showed that patients who had had a TKR were administered subcutaneous heparin and were included in the PEP trial. This is against the department protocol. Inclusion into the PEP trial was found to be occurring at the 3 month review, despite being highlighted at the audit meeting.

The numbers of patients undergoing each individual procedure were small. The data collected for all the elective hip and knee arthroplasty patients were therefore combined according to whether the protocol had been followed. The hip fracture data were also combined similarly. Statistical analysis using the χ^2 test, Fisher's exact test and the Hypothesis test for the difference between two proportions *(9)* was then applied. The results are shown in Table II. This shows that there was a statistically significant improvement in the implementation of the department protocol regarding the use of TED stockings and administration of subcutaneous heparin to those patients undergoing an elective arthroplasty. The protocol for not including the elective arthroplasty patients into the PEP trial was followed at the initial audit and at the subsequent 3 month follow-up audit to a reasonable level.

There was also a statistically significant improvement in

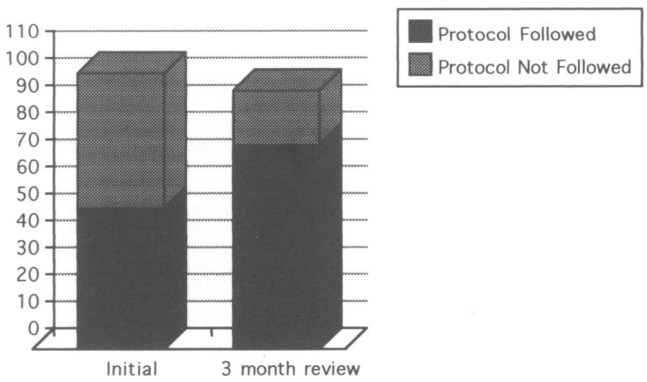

Figure 1. Combined results: audit of protocol.

Table II. Statistics

	Initial	*3/12 Review*	*Z*	Z_c	*P*	χ^2	*P*
Arthroplasty							
TED	5/17	12/16	−2.62	2.564	<0.0088*	5.1546	<0.0232*
HEP	5/17	15/17	−3.485	3.92	<0.0005*	9.8357	<0.0017*
PEP	16/18	15/16	−0.499	0.097	<0.6179	Fisher	*F*=0.4091
Fractured neck of femur							
TED	10/16	11/16	−0.372	0	<0.7097	Fisher	*F*=0.2711
HEP	14/17	14/16	−0.412	0.219	<0.6802	Fisher	*F*=0.3438
PEP	2/17	9/15	−2.867	2.822	<0.0041*	6.2196	<0.0126*

*Statistically significant F=Fisher's exact test *Z*=Hypothesis test
Z_c= Hypothesis test with adjustment for small numbers

hip fracture patients being entered into the PEP trial at the 3 month review. However, there was no statistically significant improvement in the use of TED stockings in the hip fracture patients. The department protocol on the non-administration of heparin was followed for the majority of hip fracture patients; that is, they did not receive subcutaneous heparin. There was no statistical difference between the initial audit and 3 month reviews.

Discussion

This study has shown that, despite the existence of a departmental policy for thromboembolic prophylaxis in patients undergoing major joint arthroplasty or surgery for fractured neck of the femur, the implementation of the policy was generally very poor. The improved implementation of the departmental protocol at the 3 month review, after the initial results were presented at the audit meeting, demonstrates the value of audit.

The improvement in the use of TED stockings in patients with revision total hip replacement (THR) and TKR and patients having A/O screws is probably because of the small numbers involved in the study. The improved results in the use of TED stockings and the use of subcutaneous heparin in patients with primary THR and TKR are likely to be representative of the improvement owing to the presentation of the results of the initial audit at the monthly audit meeting. The overall improved result at the 3 month review, 79%, is just acceptable, as all patients in the study received some form of prophylaxis. For studies of the benefits of one form of prophylaxis over another, the administration rate would have to be further improved, preferably approaching 100%. A greater number of patients would need to be included in such a trial. The purpose of this study was not to demonstrate that one prophylactic method is better than another.

This study has demonstrated that established protocols are of little value unless audited and that completion of the audit cycle is essential. Trials claiming benefit of a particular prophylactic method must include evidence that administration has actually occurred.

The authors thank Amanda Farrin, Medical Statistician, for her advice and assistance with the statistics.

References

1 Parker-Williams J, Vickers R. Major orthopaedic surgery on the leg and thromboembolism. *Br Med J* 1991; **303**: 531–2.
2 Harris WH, Salzman EW, Athanosoulis C *et al.* Comparison of warfarin, low molecular weight dextran, aspirin, and subcutaneous heparin in prevention of venous thromboembolism following total hip replacement. *J Bone Joint Surg* 1974; **56A**: 1552–62.
3 Moskovitz PA, Ellenburg SS, Feffer HL *et al.* Low dose heparin for prevention of venous thromboembolism in total hip arthroplasty and surgical repair of hip fractures. *J Bone Joint Surg* 1978; **60A**: 1065–70.
4 Roberts HR. Prevention of venous thrombosis and pulmonary embolism. *JAMA* 1986; **256**: 744–9.
5 Leyvraz PF, Richard J, Bachmann F *et al.* Adjusted versus fixed dose subcutaneous heparin in the prevention of deep vein thrombosis after total hip replacement. *N Engl J Med* 1983; **309**: 954–8.
6 Lassen MR, Borris LC. Mobilisation after hip surgery, and efficacy of thromboprophylaxis. *Lancet* 1991; **337**: 618.
7 Danish Enoxaparin Study Group. Low molecular weight heparin (enoxaparin) *vs* Dextran 70. *Arch Intern Med* 1991; **151**: 1612–24.
8 McNally MA, Mollan RAB. Venous thromboembolism and orthopaedic surgery. *J Bone Joint Surg* 1993; **75B**: 517–18.
9 Altman DG. *Practical Statistics for Medical Research.* London: Chapman and Hall, 1994: 233–4.

Received 27 June 1996