CRD summary
This review assessed the peri-operative management and outcomes of patients receiving long-term oral anticoagulant therapy. The authors concluded that for invasive and surgical procedures, oral anticoagulation needs to be withheld and further treatment decisions individualised. The review methodology was poorly reported and the authors’ conclusions may be subject to a number of biases.

Authors' objectives
To assess the peri-operative management and outcomes of patients receiving long-term oral anticoagulant (OAC) therapy.

Searching
MEDLINE was searched from January 1966 to June 2001 for publications in the English language; the search terms were reported. The Cochrane Library was also searched and citation searches were undertaken (no search dates were reported). In addition, the references of identified studies and the authors' files were checked.

Study selection
Study designs of evaluations included in the review
No inclusion criteria were specified in relation to the study designs. Case reports were excluded. The specific designs included were unclear, but systematic reviews, reviews of case reports, cohort studies and case series were included.

Specific interventions included in the review
Studies that assessed any form of management strategy involving OAC therapy were eligible for inclusion. The specific strategies assessed (where stated) were: continued oral anticoagulation; discontinued oral anticoagulation without the administration of either intravenous heparin or subcutaneous low molecular weight heparin (LMWH); peri-operative intravenous heparin; peri-operative LMWH; and discontinued warfarin therapy with the administration of pre-operative phytonadione and post-operative intravenous heparin.

Participants included in the review
Patients receiving oral anticoagulants who were undergoing surgery or invasive procedures were included. The specific patient groups included were those undergoing dental procedures, cutaneous surgery, cataract surgery, pacemaker and defibrillator procedures, cardiac catheterisation, gastrointestinal endoscopy, genitourinary surgery, arthrocentesis, and joint and soft tissue injections.

Outcomes assessed in the review
Studies that reported the number of thromboembolic events, or the number of bleeds, were included.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Data were extracted on the management strategy, type of procedure, and number and description of events.
The event rates were reported as the number of patients experiencing the event divided by the number of patients at risk. Binomial and Poisson distributions were used to calculate the 95% confidence intervals (CIs), as appropriate.

**Methods of synthesis**

How were the studies combined?
The studies were grouped according to the type of surgical procedure and were combined in a narrative discussion.

How were differences between studies investigated?
Differences between the studies were discussed according to the type of management strategy.

**Results of the review**

Thirty-one studies were included. The types of study designs included and the numbers of patients were unclear.

The authors stated that the quality of the included studies was poor. In the majority of the studies the sample size was small, there was usually no control group, the timing of anticoagulant administration and discontinuation were generally not described, and the duration of follow-up was typically not reported.

Twenty-nine thromboembolic events occurred among 1,868 patients (1.6%, 95% CI: 1.0, 2.1); this included 7 strokes (0.4%, 95% CI: 0, 0.7). The thromboembolic event rates according to management strategy were 0.4% (1 out of 237) for the continuation of OAC therapy, 0.6% (6 out of 996) for the discontinuation of OAC therapy without administration of intravenous heparin, 0% (0 of 166) for the discontinuation of OAC therapy with administration of intravenous heparin, 0.6% (1 out of 180) for the discontinuation of OAC therapy with administration of LMWH, and 8% (21 out of 263) for unspecified or unclear strategies.

The bleeding rates while receiving OAC were, 0.2% (4 out of 2,014) for dental procedures, 0% (0 out of 32) for arthrocentesis, 0% (0 out of 203) for cataract surgery, and 0% (0 out of 111) for upper endoscopy or colonoscopy with or without biopsy.

**Authors' conclusions**

The majority of patients can undergo dental procedures, arthrocentesis, cataract surgery, and diagnostic endoscopy without alteration of their regimen. For other invasive and surgical procedures, oral anticoagulation needs to be withheld, and the decision whether to pursue an aggressive strategy of peri-operative administration of intravenous heparin or subcutaneous LMWH needs to be individualised. The current literature was substantially limited in its ability to help choose an optimal strategy. Further and more rigorous studies are needed to better inform this decision.

**CRD commentary**

The review question was reasonably clear in terms of the interventions, participants and outcome measures. Only two databases were searched to identify potentially relevant studies, and these were restricted to studies published in English; it is therefore possible that potentially relevant studies might have been missed. Since the methods of conducting the review were not reported, it was not known whether any measures were taken to minimise reviewer bias and errors. In addition, the quality of the included studies was not assessed and the designs of the studies reviewed were unclear. Thus, it was not known how the quality of the included studies might have impacted on the results obtained.

The authors appear to have combined event rates across the types of management procedures. However, this may be inappropriate, and they did not discuss the implications of combining events across different study designs or patient populations. The authors did, however, appropriately discuss the limitations of the review in relation to the paucity of the evidence base reviewed. Overall, the review was poorly reported and, because of this and the paucity of the primary studies, the authors’ conclusions may be subject to a number of biases.

**Implications of the review for practice and research**
Practice: The authors did not state any implications for practice.

Research: The authors stated that randomised controlled trials, or large rigorous cohort studies, are needed to provide reasonable estimates of the peri-operative risks of thromboembolism and bleeding for patients managed with an aggressive strategy of peri-operative intravenous heparin therapy or subcutaneous LMWH therapy and a minimalist strategy of withholding warfarin therapy without the administration of heparin.

Bibliographic details

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Other publications of related interest
This additional published commentary may also be of interest. Perioperative management of patients receiving oral anticoagulants [correspondence]. Arch Intern Med 2003;163:2532-3.

Indexing Status
Subject indexing assigned by NLM

MeSH
Administration, Oral; Anticoagulants /administration & dosage; Clinical Trials as Topic; Drug Monitoring; Humans; International Normalized Ratio /standards; Perioperative Care /methods; Prothrombin Time; Risk Factors; Safety; Surgical Procedures, Operative; Thromboembolism /epidemiology /prevention & control; Warfarin /administration & dosage

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.