A systematic review of strategies to improve prophylaxis for venous thromboembolism in hospitals
Tooher R, Middleton P, Pham C, Fairbridge R, Rowe S, Babidge W, Maddern G

CRD summary
This review assessed the effectiveness of strategies for improving venous thromboembolism prophylaxis in hospitalised patients. The authors concluded that guideline dissemination alone was inadequate. Active strategies, including clinician reminders and assistance for clinicians in providing correct prophylaxis, are needed. Given some methodological flaws in the review process and reliance on weaker evidence, the reliability of the authors' conclusions is unclear.

Authors' objectives
To assess strategies to increase the uptake of venous thromboembolism (VTE) prophylaxis in hospitals, in order to lower the rates of VTE in hospitalised patients.

Searching
MEDLINE, Current Contents, EMBASE, DARE, the Cochrane Database of Systematic Reviews, the Cochrane Controlled Trials Register, ClinicalTrials.gov, the UK National Research Register, NHS EED, HTA and grey literature were searched from 1996 to May 2003; the search terms were reported. The bibliographies of selected articles were examined for further studies. Articles were retrieved without any language restrictions, but subsequently excluded if judged not to add substantially to those studies reported in English.

Study selection
Study designs of evaluations included in the review
All types of studies, including randomised controlled trials (RCTs), case reports, surveys, clinical audit reports and case series, were eligible for inclusion. The included studies did not in general directly compare alternative strategies.

Specific interventions included in the review
Studies of prophylaxis for deep vein thrombosis (DVT) or pulmonary embolism (PE) were eligible for inclusion. The included interventions were guideline dissemination, continuing education, advertising, computer-based decision aids, documentation aids, quality assurance activities, audit and feedback, appointment of specific staff to implement change, and the recruitment of local champions or opinion leaders.

Participants included in the review
Studies related to hospitalised patients were eligible for inclusion. There were no other a priori criteria. The included studies involved surgical and/or medical patients, the examination of hospital prescriptions, and surgeons (who were questioned about their treatment strategies for various clinical scenarios in a survey)

Outcomes assessed in the review
To be eligible for inclusion, a study had to report at least one extractable result related to the prevention of VTE post-intervention. Studies were excluded where post-implementation outcomes for DVT were not reported. The outcomes measured in the included studies were rates of DVT and PE, as well as quality of prophylaxis, guideline adherence and complications. Some studies also measured resource utilisation and costs.

How were decisions on the relevance of primary studies made?
Two reviewers independently assessed the relevance of retrieved studies and resolved any differences by discussion.

Assessment of study quality
Study quality was assessed on the basis of quality of methodological reporting, attempts to minimise bias, sample size,
blinding, method of randomisation and allocation concealment (RCTs), appropriateness of statistical methods, and generalisability of the results. A 'level of evidence' ranking was assigned to each study according to criteria developed by the National Health and Medical Research Council of Australia. The authors did not state how the validity assessment was performed. Study quality was assessed on the basis of quality of methodological reporting, attempts to minimise bias, sample size, blinding, method of randomisation and allocation concealment (RCTs), appropriateness of statistical methods, and generalisability of the results. A 'level of evidence' ranking was assigned to each study according to criteria developed by the National Health and Medical Research Council of Australia. The authors did not state how the validity assessment was performed.

Data extraction
The data were extracted using a pre-developed table. The authors did not state how many reviewers performed the data extraction. The results extracted included DVT and PE rates, rates of adequate prophylaxis, relative risks pre- and post-intervention and p-values.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative.

How were differences between studies investigated?
The authors divided studies into three broad groups: passive strategies (i.e. guideline dissemination), one active strategy, and multiple active strategies. Differences between studies involving prophylaxis for medical and surgical patients were also discussed.

Results of the review
Thirty studies (with more than 22,733 patients) were included. The surgeon survey involved 117 surgeons and the prescription review examined 279 prescriptions.

The majority of the studies were classified as weaker evidence based on their historical design, and no study was adequately powered to evaluate a reduction in the rates of VTE. The authors noted that some improvement was to be expected regardless of intervention due to a 'Hawthorne effect'.

Passive strategies (6 studies).
No study involving simple guideline dissemination achieved a rate of prescription of appropriate prophylaxis of above 50% of patients. There were problems with both patient selection for prophylaxis and appropriate provision of treatment.

One active strategy (12 studies).
These studies involved one of four active strategies used in association with guidelines: documentary aids, active monitoring, computer-based decision aids, or audit and feedback. All strategies produced improvements in guideline compliance post-intervention. Computer-based systems had post-intervention compliance rates ranging from 87 to 99%. Other strategies had post-intervention compliance rates generally over 70%, though one study involving repeated audit cycles achieved a final rate of over 95%.

Multiple active strategies (12 studies).
Most of these studies involved continuing education about guidelines in conjunction with one or more other strategies such as documentation aids (e.g. reminder labels) or audit cycles. All studies that reported before-and-after guideline adherence showed improvement. Repeated audit cycles tended to produce progressively higher adherence.

Cost information
Yes. However, the authors stated that they were unable to make useful cost comparisons of the strategies based on the available evidence.

**Authors’ conclusions**

The evidence indicated that guideline dissemination alone will not result in adequate VTE prophylaxis. The use of several active strategies in combination was more effective.

**CRD commentary**

The reviewers addressed a clear question with clear, but broad, inclusion criteria for the populations, interventions, outcomes and study designs. The search for studies was comprehensive. The methods of combining the studies and investigating differences between them seemed appropriate, and characteristics of the individual studies were presented clearly. The reviewers acknowledged substantial limitations of the available evidence, with most studies uncontrolled and with only one study directly comparing different strategies. In terms of the data extraction and quality assessment, parts of the review process were not transparent. The conclusions appear to reflect the evidence presented, but given some methodological flaws in the review process and reliance on weaker evidence, their reliability is unclear.

**Implications of the review for practice and research**

**Practice:** The authors stated that clinical leadership and institutional supports are needed for adequate VTE prevention, including some type of reminder system for VTE assessment and some way to help clinicians select appropriate prophylaxis. Successful interventions typically include evaluation and iterative refinement of strategies.

**Research:** The authors stated that cluster randomised trials of VTE prophylaxis comparing effectiveness of various active strategies are needed. The relative cost-effectiveness of different strategies should also be addressed. Adequately powered multicentre trials would be required to detect differences in patient outcomes of DVT and PE.

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