# Venous Thromboembolism Prophylaxis in the Surgical Patient: A Regional Survey

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*Abstract*

A questionnaire designed to assess actual practice with regard to venous thromboembolism prophylaxis (VTEP) was mailed to 100 general surgeons. Although a majority (78%) of the respondents ($n = 65$) indicated that they used some form of VTEP, the methods used were *inadequate* to protect high-risk and moderate-risk patients from thromboembolic complications. Furthermore, pulmonary embolism was not perceived as a significant problem by most (64%) of the respondents who did not use prophylaxis.

## *Introduction*

Pulmonary embolism and chronic venous insufficiency are major consequences of venous thromboembolic disease. Pulmonary embolism (PE) is the third leading cause of death in the United States; 100,000 to 200,000 fatal cases occur each year.[1] It is the most common cause of preventable hospital deaths.[2] Two of every 1,000 patients who undergo major surgery die postoperatively of PE.[3] The post-thrombotic syndrome causes substantial morbidity. It is estimated that a half million patients in the United States have venous ulcers and that 7 million have stasis changes in the skin of the leg.[1]

Individuals at risk for developing postoperative thromboembolic complications have been well defined,[4–6] and the efficacy of various prophylactic measures has been proved in prospective controlled studies.[7–9] Despite these data supporting the use of venous thromboembolism prophylaxis (VTEP), however, it has been my observation that the practicing general surgeon seldom uses effective prophylactic measures even in high-risk patients.

A questionnaire was formulated to answer the following questions about VTEP:

1. What percentage of general surgeons actually use VTEP?
2. Are the prophylactic methods used appropriate and effective?

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3. What reasons are given by those not using VTEP?
4. Does the type of practice (academic versus private) or number of years in practice affect how VTEP is used?

The results of this survey and a discussion thereof form the basis of this report.

## *Materials and Methods*

The questionnaire (Appendix 4) was mailed to 100 individuals who were listed in the telephone directory or on our department's mailing list as general or vascular surgeons. These included surgeons in private or group practice, those having part-time academic affiliations with our medical school, and those with full-time academic positions. Each questionnaire was numbered so that second mailings went to those who did not return the first.

Ten hypothetical clinical situations were presented to assess whether different prophylactic methods would be used in circumstances of greater or lesser degrees of risk of thrombosis. For purposes of analysis, patients 4, 5, 8, and 9 were considered high-risk, patients 1, 2, 7, and 10 moderate-risk, and patients 3 and 6 low-risk. Data from each returned questionnaire were entered on Stanford Keysort cards for analysis.

## *Results*

Sixty-five questionnaires were returned. Of the respondents, 13 (20%) had been in practice for more than 30 years, 21 (32%) for 20–29 years, 13 (20%) for 10–19 years, and 18 (28%) for less than 10 years. Ten of the respondents were in full-time academic practice, 20 were affiliated on a part-time basis, and 35 were in private practice. Seventy-eight percent indicated that they used some form of VTEP routinely or in high-risk patients. The remainder (22%) very seldom or never used prophylaxis. Younger surgeons (with less than 20 years in practice) and academically oriented surgeons tended to use VTEP more frequently (82 versus 75% and 84 versus 75% respectively) than older surgeons and those in private practice, but these differences were not statistically significant.

Table 1 lists the reasons cited by those who never or very seldom used VTEP. Typical comments in this section of the questionnaire included "stockings and early ambulation have proved adequate through the years," "one death in approximately 8,000 operative procedures due to pulmonary embolism," "on more than one occasion I have had patients develop phlebitis while on heparin," "have not been convinced that such measures are necessary," "what I do and what I should do are two different things," and "bleeding problems make me wary of prophylactically using anticoagulants even in low doses".

The prophylactic methods chosen for each of the three patient groups are shown in Table 2. When compared to recommendations appearing in the literature,[7–10] only 9% of the high-risk patients and 23% of the moderate-risk patients received what is considered to be effective prophylaxis.

## *Discussion*

The results of this survey, if representative of surgeons' attitudes and actual practice elsewhere in this country, suggest a number of problems regarding the prevention of venous thromboembolism.

Pulmonary embolism is not perceived as a significant problem. This is not surprising because the average surgeon may manage relatively few high-risk patients and therefore may encounter only one or two fatal pulmonary emboli every year or so. The difficulty of making a clinical diagnosis of PE is well known, and this low incidence may be more apparent than real. Few surgeons order pulmonary angiography when PE is suspected. Furthermore, there is a tendency, especially in private hospitals, not to perform autopsies to determine the exact cause of death because of medical-legal and other considerations. The incidence of autopsy-proved PE was 38% in a group of patients who died following fractures. In a similar group that was not autopsied, this diagnosis was made in only 2% of the cases antemortem.[12]

Although not specifically addressed in this questionnaire, the cause and effect relationship between deep venous thrombosis (DVT) and chronic venous insufficiency is generally not appreciated. Stasis changes become

TABLE 1

*Reasons Given for not Using Thromboembolism Prophylaxis*

| Reason ($n$ = 14) | Percent |
|---|---|
| *1. Pulmonary embolism not a significant problem | **64** |
| *2. Bleeding risks too high | **23** |
| *3. Available agents not effective | **23** |
| 4. Available agent too complicated to use | 5 |

* Frequently cited together.

TABLE 2

*Prophylactic Methods Chosen by 65 Respondents*

| Method | Patient Groups | | |
|---|---|---|---|
| | High Risk (%) | Moderate Risk (%) | Low Risk (%) |
| None | 40 | 57 | 62 |
| Elastic stockings alone | **12** | **18** | 28 |
| Low-dose heparin | **36** | **22** | 6 |
| Pneumatic compression | **0** | **1** | 0 |
| Aspirin | **3** | **2** | 2 |
| Other* | 9 | 0 | 2 |

* Full heparinization, Coumadin, dextran, or vena cava interruption.

apparent several years after the thrombotic event, which often escapes clinical detection unless phlebography and/or various noninvasive techniques (Doppler ultrasound, plethysomography, $^{125}$I-fibrinogen scanning) are used for diagnosis. In one series of patients with deep venous thrombosis, 89% showed serious sequelae when studied 5 to 31 years later.[13]

There is legitimate concern that bleeding risks are too high with routine use of antithrombotic agents.[14-16] The most commonly used low-dose heparin schedule is 5,000 units injected subcutaneously 2 hours before operation and every 12 hours thereafter until the patient is ambulatory. Another popular schedule calls for administration of this dose three times daily. Both of these regimens ignore the fact that individual heparin tolerance varies with body weight, and with renal and hepatic function. It is illogical to assume that the same dose will be safe, or for that matter effective, in all patients. Furthermore, in some cases fatal PE occurs after hospital discharge, when prophylaxis has usually been discontinued. The bleeding risks associated with oral anticoagulants and dextran are dose related[7, 17] and should be preventable with careful monitoring. External pneumatic compression offers the safest form of prophylaxis in moderate-risk patients.[18, 19] However, its effectiveness in protecting very high-risk patients remains to be evaluated in a well-controlled, prospective trial using phlebographically detected DVT or autopsy proved PE for end points.[20]

One-quarter of the respondents were unconvinced that antithrombotic methods are effective. The oral anticoagulants and dextran have both been shown to be effective in protecting high-risk patients in well-controlled, prospective studies in which death from pulmonary embolism or phlebographically detected DVT is the endpoint.[7, 9, 17] The International Multicentre Trial[21] appeared to prove the effectiveness of low-dose heparin prophylaxis. However, major challenges to the conclusions reached in the Kakkar trial have published.[22]

Preliminary data from an ongoing South African single-center study[10] indicate that in high-risk patients over 40 undergoing major surgery, low-dose heparin significantly reduces the incidence of $^{125}$I-fibrinogen-detected calf vein thrombosis, but does *not* reduce the incidence of phlebographically detected proximal thrombosis or scan detected nonfatal pulmonary embolism. Although the issue of low-dose heparin effectiveness remains unsettled, it was the method most frequently used in the high-risk patients by respondents in the present survey.

Despite the lack of any substantial proof that elastic stockings are effective in preventing DVT and PE, they continue to be used. Twelve percent of he respondents used elastic stockings as the sole means of prophylaxis for high-risk patients. For the moderate and low-risk patients this figure was 18% and 28% respectively. Intraoperative leg elevation and early ambulation cannot

be relied on for protection but are useful as adjunctive measures when other methods are used.

A slightly revised questionnaire was recently sent to a much larger, national sample of randomly chosen general surgeons. Their responses will be compared to those of a selected group of academic surgeons with a demonstrated special interest in venous thromboembolic problems. Analysis of the preliminary data reveals that the responses of the random group are similar to those elicited in the regional survey and reported here.

Until the role of low-dose heparin and external pneumatic compression is better defined by controlled prospective studies, they should probably not be used in high-risk patients, that is, patients over 60, patients undergoing major abdominal, vascular, or orthopedic surgery, patients with sepsis, malignancy, prior thromboembolism, or younger patients with any combination of these factors. A reasonable approach in these high-risk patients is to use oral anticoagulants preoperatively and to keep the prothrombin time approximately 1.5 × control. By maintaining the prothrombin time at this subtherapeutic level, bleeding complications can be minimized.[7] The disadvantages of oral anticoagulation prophylaxis include the need for close monitoring, interference by other drugs, and the time required to reach the desired prophylactic effect (usually 2 to 3 days).

An alternate approach is to give dextran 40 intraoperatively and continue its administration postoperatively with oral anticoagulants, discontinuing the dextran when the prothrombin time is at the desired level. Dextran exerts its antithrombotic effects by reducing blood viscosity and increasing flow rate. Dextran also reduces platelet adhesiveness and alters the structure of clots formed under its influence so that such clots are more easily lysed by endogenous fibrinolysis. Because it is a plasma expander, dextran should be used with caution in patients with limited cardiac reserve and in patients with renal failure. Anaphylactoid reactions to dextran have been reported but are rare.[23]

The risk of death from major thromboembolism must be weighed against the risk of hemorrhage any time prophylaxis is being considered in a surgical patient. Prophylactic anticoagulation is contraindicated in certain patients, including those with active peptic ulcer, intracranial or visceral injury, hemorrhagic diathesis, gastrointestinal bleeding, severe diastolic hypertension, and gross hematuria or hemoptysis.[24] In these patients the options are prophylactic inferior venal cava interruption[25] or frequent monitoring postoperatively with noninvasive techniques[26]; if necessary, thrombosis can be confirmed by phlebography before therapy is begun. This approach reduces the need for prophylactic vena cava interruption. However, if major thrombosis is present at the time of surgery and the risk of bleeding precludes heparin administration, vena cava interruption should be used.

This survey shows that the risk of pulmonary embolism is generally not appreciated by the surgeons polled, and that when prophylaxis is used it is likely to be ineffective. The fear of bleeding complications and skepticism about the effectiveness of antithrombotic measures may account for these attitudes. In response I might conclude by noting that I have never seen exanguination caused by administration of prophylactic antithrombotic agents. However, fatal postoperative pulmonary embolism does occur often enough to warrant *selective* use of the antithrombotic measures described above. Careful monitoring is necessary to minimize bleeding complications.

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## *Appendix A*

## Thromboembolism Prophylaxis

## Questionnaire

1. What is your specialty? _____ Years in practice _____

   Type of practice: Academic _____ Private _____ Mixed _____

2. If you wish to receive results of this survey please include your name and address:

   _____

   _____

   _____

3. Do you employ peri-operative measures (other than elastic stockings and early ambulation) to prevent venous thrombosis in your surgical patients?
   (Check one)

| | | | | |
|---|---|---|---|---|
| **no** | very seldom | only in high risk | in most patients | yes, routinely |

4. If not, why not? (Check all that apply)
   - ____ a. Pulmonary embolism is not a significant problem in my patients
   - ____ b. Bleeding risks are too high with antithrombotic agents.
   - ____ c. Available agents have not been proven to be sufficiently effective.
   - ____ d. Available agents are too complicated to use.

____ e. Other (please state) _____

_____

_____

5. If so, please complete item # 6 on reverse side of this questionnaire.
6. Select the type of prophylaxis you would use in each of the following clinical situations. (More than one may be chosen, e.g., b & f.)

a. None
b. Elastic stockings
c. External pneumatic compression
d. Low-dose heparin
e. Full heparinization
f. Oral anticoagulants (Coumadin)
g. Dextran 40
h. Aspirin
i. Vena cava interruption

| | Age | Sex | Diagnosis | Pertinent History and Associated Findings | Proposed Operation | Urgency |
|---|---|---|---|---|---|---|
| ____ 1. | 50 | F | Uterine fibroids | Obesity | Hysterectomy | Elective |
| ____ 2. | 67 | F | Breast cancer | Mild congestive heart failure | Radical mastectomy | Elective |
| ____ 3. | 37 | M | Varicose veins | Otherwise healthy | Ligation and stripping | Elective |
| ____ 4. | 73 | M | Aortoiliac occlusion | Mild congestive heart failure, hypertension | Aortofemoral bypass graft | Elective |
| ____ 5. | 62 | F | Infected BK stump | Diabetes | AK amputation | Urgent |
| ____ 6. | 31 | M | Adhesive small bowel obstruction | Otherwise healthy | Exploratory celiotomy | Urgent |
| ____ 7. | 27 | F | Cholelithiasis | Oral contraceptive use | Cholecystectomy | Elective |
| ____ 8. | 71 | M | Rectal cancer | Iliofemoral venous thrombosis and pulmonary embolism 1 year previously | Abdominal-perineal resection | Elective |
| ____ 9. | 64 | F | Hip fracture, probable ruptured spleen | Otherwise healthy | Splenectomy, open reduction, internal fixation of hip fracture | Emergency |
| ____10. | 43 | M | Probable pancreatic abscess | Has been in ICU for 2 weeks | Celiotomy, drainage of abscess | |

Additional comments: _____

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Thank you.

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