

# Cost-Effectiveness Analysis of Thermography and Venography in the Diagnosis of Deep Vein Thrombosis: Part 2

Philip H. Goodman, M.D.

•Although the economic burden expended on deep vein thrombosis (DVT)-related morbidity and mortality can be reduced by prompt anticoagulation therapy, diagnostic testing with contrast medium venography (VG) is very costly and is associated with significant morbidity. Thermography (TG) is a diagnostic modality that is relatively sensitive to both thigh and leg DVT, and is therefore proposed as a first-line screening test. A decision analysis (presented elsewhere) showed that a physician caring for a patient with findings suggestive of DVT could, from the standpoint of medical utility, opt for either venography-alone or thermography first, followed by VG only if TG is positive, depending on the *cost effectiveness* of the two strategies.

Cost-effectiveness analysis (CEA) is a formal evaluation tool that assigns costs to the outcomes defined in a decision analysis. From a societal perspective, a limited health care budget must be spent in such a way as to provide the greatest overall health benefit. CEA accomplishes this by allowing medical policy makers to select from alternative diagnostic and therapeutic strategies in an explicit and logical manner. Sensitivity analyses are performed to determine how changes in soft cost and medical data can influence the policy decisions. Results of this CEA suggest that:

1. Under the point estimates acquired from the literature and commercial sources, the CEA favors the performance of TG first, with only those with positive TG to undergo VG.
2. This decision is especially sensitive to the cost of VG, since a modest drop in cost would result in a threshold of indifference between the two strategies.
3. There is a linear relationship between each test's costs and the other's threshold, so that overall market pricing fluctuations would not differentially affect the relative thresholds.
4. The marginal C:E could vary from less than \$2000 to more than \$7000 per case diagnosed under reasonable ranges of disease prevalence and/or the cost of diagnostic testing, confounding the difficulty faced by medical policy makers in placing a value on the extra cases detected by the VG-alone strategy.

## Introduction and Statement of the Problem

Deep vein thrombosis (DVT) is a common disorder that may result in pulmonary embolism and lead to

---

*From the Internal Medicine Department, University of Nevada, Reno.*

chronic venous disease. One report estimated the incidence of pulmonary embolism to be over 500,000 in the United States alone; about half of these cases presented initially with evidence of DVT.<sup>1</sup> It has been shown that the economic burden expended on DVT-related morbidity and mortality can be reduced by prompt anticoagulation therapy. Unfortunately, diagnostic testing with contrast medium venography (VG) can be very costly.<sup>2</sup> Several technologic alternatives to VG have been proposed to make treatment decisions in patients with clinically suspected deep vein thrombosis. Thermography (TG) is one technique that is very sensitive to both proximal and distal DVT, and therefore could be considered as a screening test.

The decision analysis shows that a physician caring for a patient with findings suggestive of DVT could, from a medical utility standpoint, opt for either venography alone (VG-alone) or thermography plus venography added only if TG is positive (TG + VG) as a diagnostic approach. The sensitivity analyses suggest that the decision between VG-alone and TG + VG first should be based on factors other than utility or probabilities. It is therefore evident that the *cost effectiveness* of using TG and VG in the diagnosis of DVT is an essential consideration in an economy of limited resources.

In a 1981 journal article, Hull and colleagues<sup>2</sup> compared the cost effectiveness of clinical diagnosis, venography, and impedance plethysmography plus radiofibrinogen scanning. Disease information was obtained from a prospective study of 516 patients in Ontario, Canada, presenting with clinically suspected DVT. Costs were derived from local third-party and operating costs, as well as from an article reporting urban hospital costs in Boston.<sup>4</sup> Their measures of effectiveness were correct identification of any DVT, and correct diagnosis of DVT involving the proximal veins; the latter type of DVT is associated with a greater likelihood of embolic events. They found that clinical diagnosis is cost ineffective, and that either VG or impedance plethysmography plus radiofibrinogen scanning could be cost effective, depending on the inpatient costs.

As discussed earlier,<sup>3</sup> impedance plethysmography plus radiofibrinogen has met with limited acceptance in the United States. Given that VG-alone remains the di-