Outpatient strategies in the management of deep venous thrombosis (DVT) are gaining acceptance in U.S. health care centers. Observational studies in a variety of routine care settings have validated the efficacy and safety results of clinical trials data supporting the use of a mostly outpatient-based approach to DVT treatment using low-molecular-weight heparin (LMWH) when compared with the traditional approach of using intravenous unfractionated heparin (UFH) in the inpatient setting [1–7]. Pharmacoeconomic data reveal substantial cost savings when this treatment approach is utilized, mostly from avoidance of hospitalization [1,6–9]. Many groups have published specific outpatient DVT treatment algorithms or disease management guidelines that reflect a multidisciplinary approach to outpatient DVT management, including the use of explicit patient selection criteria and anticoagulation management services [6,7,10]. This paper describes our experience at Lovelace Health Systems with an outpatient DVT treatment program.

**Lovelace Health Systems**

Lovelace Health Systems is an integrated healthcare delivery system that includes a staff-model health maintenance organization (HMO) serving over 240,000 members in New Mexico and a 235-bed hospital. The outpatient DVT treatment program began in March 1997 as part of a multidisciplinary disease management guideline for thrombosis and anticoagulation. From its inception, the program relied upon an explicit clinical protocol, the use of a pharmacist-managed anticoagulation clinic with home health service support, a dedicated medical director who had developed expertise in the use of LMWH therapy, and a data tracking system for clinical and pharmacoeconomic outcomes analysis. The anticoagulation clinic is staffed by 3 full-time pharmacists and ancillary personnel serving approximately 1500 patients on chronic anticoagulant therapy; its hours of operation are Monday through Friday from 8:00 AM to 6:00 PM with weekend hours from 8:00 AM to 12:00 noon. The medical director staffs a half-day-per-week thrombosis clinic for high-risk patients with thrombosis and anticoagulation issues.

**Treatment Protocol**

The outpatient DVT treatment protocol at Lovelace (Figure) is similar to other programs in use across the United States and has been described elsewhere [7]. It includes 3 treatment options: (1) complete outpatient treatment using LMWH, (2) initial inpatient treatment with LMWH followed by completion of therapy in the outpatient setting, and (3) traditional inpatient therapy using UFH or LMWH. Following an objective diagnosis of proximal DVT by compression ultrasonography, the treating physician determines whether the patient is eligible for outpatient therapy based on patient risk factors as well as factors such as physician level of comfort and time of presentation of the DVT. The protocol identifies absolute and relative clinical and psychosocial/socioeconomic exclusionary criteria (Table). While risk factors such as active bleeding or high bleeding risk, severe renal insufficiency, and history of heparin-induced thrombocytopenia or heparin allergy still preclude outpatient therapy, many physicians have become more comfortable with treating patients with concomitant conditions such as pregnancy, thrombophilia, borderline obesity, and stable pulmonary embolism with DVT in the outpatient arena, making these relative exclusionary risk factors. If the patient meets any absolute exclusionary criteria, then the patient is deemed high risk and full inpatient therapy is initiated with a weight-based UFH nomogram or LMWH (usually enoxaparin 1 mg/kg subcutaneously [SC] twice daily). If the patient has relative clinical exclusionary criteria, the diagnosis of DVT is made after hours, the physician is not comfortable with outpatient therapy, or third-party payers or psychosocial issues need to be addressed, the patient is deemed moderate risk and is admitted to the hospital to initiate LMWH and warfarin teaching and to further elucidate barriers to outpatient care. The majority of patients treated in this manner are discharged within a 24- to 48-hour hospital length of stay, usually with home health service support.

If the treating physician feels comfortable with outpatient therapy and the patient does not meet any clinical or psychosocial/socioeconomic exclusionary risk factors, then the patient is deemed low risk and is referred to the anticoagulation clinic. A thorough history and physical is performed (including heart, lung, and extremity examinations and stool guaiac and pulse oximetry determination) and baseline laboratory tests are done (including a basic metabolic panel, complete blood count, urinalysis, and
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**Figure.** Lovelace Health Systems protocol for outpatient deep venous thrombosis (DVT) treatment. LMWH = low-molecular-weight heparin. (Adapted with permission from Spyropoulos AC, Kardos J, Wigal P. Outcomes analysis of the outpatient treatment of venous thromboembolic disease using the low-molecular-weight heparin enoxaparin in a managed care organization. J Manag Care Pharm 2000;6:298–304.)
At the anticoagulation clinic, the first dose of LMWH is drawn and administered (either enoxaparin at 1 mg/kg SC twice daily or 1.5 mg/kg SC daily in select patients). The first dose of warfarin is also administered at the suspected maintenance dose (5 to 10 mg). In addition, both LMWH and warfarin teaching is initiated, including patient education on self-administration. When appropriate, patients are referred to an outpatient case manager and home health services. LMWH dosing for 5 days are drawn, warfarin prescriptions arranged, and protime results tracked (the clinic is in the process of evaluating a point-of-care device for routine use). The protocol calls for repeat platelet counts on days 3 and 5. Patients referred to home health services are administered LMWH either once- or twice-daily if the patient is not capable. If the visiting nurse determines that the patient is self-administering injections correctly, then warfarin instructions are reinforced, daily protimes are drawn, and platelet counts on days 3 and 5 are drawn.

The protocol calls for a minimum 5-day overlap between LMWH and warfarin therapy in most instances, and LMWH can be discontinued when the international normalized ratio (INR) is greater than 2.0 for 2 consecutive days. The patient referral to the anticoagulation clinic includes the location and nature of the DVT (ie, proximal versus distal, idiopathic versus postoperative), patient comorbidities, concomitant medications, INR target range (2.0 to 3.0 in most instances), and duration of oral anticoagulant therapy.

The patient is instructed to follow up with their primary care physician within 1 week after the initiation of anticoagulant therapy.

After-Hours Expansion of the Program to the Emergency Department

After approximately 12 months of utilization of the outpatient DVT program within the anticoagulation clinic setting, the program was expanded to include after-hours care within the emergency department (ED). Patients with uncomplicated proximal DVT occurring up to the level of the superficial femoral vein are candidates. The protocol necessitates a careful history and screening examination by the ED physician (to include baseline labs) followed by the administration of enoxaparin 1 mg/kg in conjunction with nonloading dose warfarin. If the patient is deemed suitable for outpatient care by the ED physician, the primary care or on-call physician is contacted prior to discharge and follow-up care is arranged the next morning at the anticoagulation clinic.

Outcomes Data

An 18-month prospective study of consecutively treated patients with the diagnosis of DVT was conducted during the initiation of the outpatient DVT treatment program at Lovelace Health Systems from March 1997 to August 1998. The study included clinical and pharmaco-economic outcomes data, the results of which have been previously reported [7,11]. A total of 167 patients presented with DVT.
during this period; mean age was 61.7 years. 102 of the
167 patients (61%) were treated in the outpatient setting;
70 of these 102 patients received complete outpatient treat-
ment, while 32 were initially admitted to the hospital then
charged to outpatient care. Clinical adverse outcomes
at 90 days were equivalent between the groups treated
within the outpatient DVT treatment program (either
completely on an outpatient basis or with a reduced hos-
pital length of stay) and a comorbid matched retrospective
cohort group of 97 patients in 1996 treated with standard
heparin therapy in-hospital. The rate of thromboembolic
recurrence was 1.9% in the outpatient cohort groups com-
pared with 4.1% in the historical inpatient cohort group.
No major bleeding events occurred in any group, while
2.9% of patients treated as outpatients experienced minor
bleeding events as compared with 1.0% of the inpatient
historical cohort. There were no significant episodes of
thrombocytopenia among cohort groups.

A survey of both patients and providers was conduct-
ed during the study period to assess satisfaction. Eighty-
one percent of patients rated their experience with the
outpatient DVT programs as very good to excellent, citing
avoidance of hospital stay, quick return to work, and less
disruption in routine as major factors in overall satisfac-
tion. Interestingly, patients did not cite injection issues
with LMWH as playing a significant role in the accep-
tance of outpatient DVT therapy, probably as a result of
extensive home health service support. Of providers sur-
veyed, 65% stated that the program had significantly
improved the quality of care for patients with DVT.

Pharmacoeconomic data from the study revealed that
hospital days were reduced from 594 to 81 when compa-
rising the inpatient cohort group in 1996 with patients receiv-
ing outpatient treatment during the study period. Average
hospital length of stay for DVT was reduced from 5.3 days
to 0.79 days. Cost savings, as calculated from actual costs
or cost-to-charge ratios, were significant. When factoring
variable expenses such as personnel, room maintenance,
laboratory testing, and drugs/supplies, per-patient case
expenses per episode of care for DVT were reduced from
$4324 to $1851 (with pre-filled enoxaparin syringes), rep-
resenting a cost savings of $2473 per patient.

Conclusion
Our experience at Lovelace Health Systems, a staff-model
HMO, reveals that outpatient management of DVT using
LMWH in the setting of an integrated healthcare delivery
system is efficacious and safe, provides satisfaction to both
patients and providers, and is associated with significant
per-patient cost savings when compared with standard in-
hospital treatment using UFH. Stepwise expansion of the
program has enabled outpatient DVT treatment in other
hospital settings, such as after-hours care of DVT in the
ED. The successful implementation of our outpatient DVT
treatment program depends on an explicit protocol with
clinical and psychosocial exclusionary factors and patient
risk stratification strategies, a centralized pharmacist-run
anticoagulation management service with home-health
service support, a dedicated medical director with expert-
tise in anticoagulant management and the use of LMWH,
and a data support system. This multidisciplinary ap-
proach to outpatient treatment of DVT represents a win-
win situation: high-quality patient care with significant
cost savings to the health care delivery system.

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References
1. Tillman DJ, Charland SL, Witt DM. Effectiveness and eco-
nomic impact associated with a program for outpatient
management of acute deep vein thrombosis in a group
model health maintenance organization. Arch Intern Med
2000;160:2926–32.
2. Pearson SD, Blair R, Halpert A, et al. An outpatient pro-
gram to treat deep vein thrombosis with low-molecular-
3. Ting SB, Ziegenbein RW, Gan TE, et al. Dalteparin for
dep venous thrombosis: a hospital-in-the home pro-
outpatient treatment of deep-vein thrombosis with low-
molecular-weight heparin. Arch Intern Med 1998;158:
2001–3.
5. Wells PS, Kovacs MJ, Bormanis J, et al. Expanding eligi-
bility for outpatient treatment of deep venous thrombosis
and pulmonary embolism with low-molecular-weight
heparin: a comparison of patient self-injection with
6. Dedden P, Chang B, Nagel D. Pharmacy-managed pro-
gram for home treatment of deep vein thrombosis with
7. Spyropoulos AC, Kardos J, Wijgal P. Outcomes analysis of


