Proactive Prophylaxis: Multidisciplinary Prevention of Pulmonary Embolism and Deep Vein Thrombosis
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Prevention of Deep Vein Thrombosis: The Role of the Pharmacist
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The pharmacist's role in clinical care continues to evolve. At many facilities pharmacists have played a pivotal role in the ambulatory treatment of venous thromboembolic disease (1). Since pharmacists dispensed the low molecular weight heparin, it followed that they provide the patient teaching required for self injection. At other facilities the pharmacist role has been to advocate the incremental LMWH drug expense in order recoup savings in hospitalization costs. Since ambulatory use of LMWH has become more established, self injection teaching is often accomplished at presentation. In many physician offices or emergency rooms this task is accomplished by those clinicians readily available; nurses, nurse practitioners, and physicians assistants.

While pharmacists may not be involved in the early VTE anticoagulant management, their roles are established for long term warfarin monitoring for those patients seen through anticoagulation clinics (2-3). Hospital pharmacists are involved in assuring appropriate anticoagulant dosing for the hospitalized critically ill patients. Yet little time in their daily routines focuses on DVT prevention strategies while patients are in the hospital or at the critical time surrounding hospital discharge.

The National Anticoagulation Benchmark Report reviewed anticoagulation practices, in areas where published practice guidelines exist, across 38 hospitals and Veteran Administration Medical Centers across the United States (4). The study included both community and academic medical centers. Brigham and Women's Hospital was a data contributing center. At each facility 25 random medical records were selected to review anticoagulation practices for myocardial infarction, atrial fibrillation, VTE treatment, and VTE prevention in total hip and knee replacement, and hip fracture surgery. For VTE treatment, only 50% of patients had 2 consecutive International Normalized Ratios (INR) before injectable anticoagulant therapy was stopped. In only 26.6% of patients was a LMWH "bridge" strategy incorporated to reduce hospital length of

stay. At discharge, patients with hip, knee and hip fracture surgery failed to receive VTE prophylaxis in, 28.1, 28.5, 47.4% of cases respectively.

The DVT FREE Registry recently reported the clinical history of patients with confirmed DVT (5). Only 33% of patients were treated with a LMWH “bridge” strategy to abbreviate hospital admission. Prophylaxis was omitted in 71% of patients, with 59% of the population comprised of patients with medical illness. While researchers have speculated on why prophylaxis is often omitted, agencies responsible for monitoring hospital performance have now focused on the problem.

The Joint Commission has now included VTE assessment and prophylaxis as a survey topic. The Agency for Health Quality and research has included the provision of VTE prophylaxis as one of their top ten patient safety practices. Recent publications have shown that requiring hospitals to measure their performance relative to evidence based standards results in improved performance. Mandatory reporting may be necessary to improve use of VTE prophylaxis. The role of public reporting and performance based reimbursement may also motivate practice improvements. As hospitals develop care plans for patients at high risk for VTE, pharmacists should play a role in ensuring a cost effective strategy is considered through the hospital stay and at discharge.

Anticoagulant therapy requires close pharmacist supervision for drug selection, to avoid adverse events, ensure compliance and avoid errors. Hylek et al showed the difficulties in delivering, reaching therapeutic levels, and avoiding hemorrhage in patient treated with unfractionated heparin (6). Failure to adjust LMWH doses in the setting of renal insufficiency contributes to excessive anticoagulation and major hemorrhage (7). A pharmacist driven empiric LMWH dosing algorithm for patients with renal dysfunction and failure was able to reach target anti-Xa levels in 60 to 80% of patients (8).

Appropriate drug selection is critical in elderly patients. Anticoagulants with long half lives and reduced clearance are best avoided in the elderly. THE PRINCE Trial, a VTE prevention study in medical patients, reported a high rate of adverse events in both LMWH (45.8%) and UFH (53.8%) treated patients. More than twice the number of patients (13.2%) receiving UFH discontinued the study because of adverse events

as compared to those receiving enoxaparin (5.4%) (9). Errors related to anticoagulant occur frequently in hospitalized patients (10).

Pharmacist must work with Risk Managers to identify and analyze these events, then collaborate with other disciplines in designing strategies to reduce or prevent their reoccurrence. Ensuring appropriate anticoagulant therapy and avoiding hospital admissions for thrombotic and hemorrhagic complications reduces health care costs. Researchers showed a managed care plan incurs $12,326 in hospitalization costs for recurrent VTE and $15,339 for a major bleeding event.

There is enormous media attention and scrutiny of medication costs. Pharmacists are frequently responsible for justifying medication expenses to both patients and administrators, who are frequently oblivious to their benefits. The rise in LMWH use and associated expense has made it a frequent target for cost containment efforts including therapeutic substitution between brands, prior authorization requirements, and mandated use of older, cheaper anticoagulants (11).

Pharmacoeconomic studies have shown LMWH is cost effective in prophylaxis in medically ill patients with only 2% of patients needing to be treated in order to break even with the cost of treatment (12). In model analyses, LMWH is a superior strategy in terms of reducing mortality and costs when compared to no prophylaxis or the traditional use of UFH (13).

At Brigham and Women's Hospital, we compared the total hospitalization costs for LMWH treated patients and compared them to patients treated with UFH. Whether used for VTE prophylaxis in medically ill, hip replacement, abdominal surgery, or for treatment of VTE, total hospital costs were lower in LMWH treated patients. Over a 2 year horizon, while LMWH utilization and expense has risen, costs per diagnostic related group have remained constant. Off label LMWH "bridge" therapy is associated with cost savings in chronically anticoagulated patients. In facilities where bed capacity is limited, the ability to speed patient transit is critical. Both economic models and studies with actual costs have shown significant savings by reducing or eliminating hospital days (14-15).

In summary, there is role for hospital pharmacists in improving VTE prophylaxis utilization, especially as patient transition out of the hospital. Pharmacists can facilitate home VTE treatment with LMWH. For hospitalized patients, constant pharmacist vigilance ensures correct drug

selection, dose adjustment, and avoidance of adverse drug events. Finally pharmacist must play an active role in communicating the benefits of medications and demonstrate the cost savings they may provide to patients and health care plans.

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