Anticoagulation Therapy: Reinforcing Patient Education

In October 2006, Bristol-Myers Squibb announced a box warning regarding tablets and injections of its drug warfarin sodium (Coumadin®). This warning highlighted possible bleeding risks for users of the drug (Bristol-Myers Squibb, 2006). This precautionary notice on a popular and highly utilized drug brings attention to the anticoagulant drugs, their uses and adverse effects, and the need for thorough patient teaching. Anticoagulation therapy that may be continued in the home or in an outpatient setting, and the need for thorough patient education in its use, are discussed.

Anticoagulant drugs have been available for more than 50 years (Schulman, 2003). They have been used for preventive treatment of arterial and venous thromboembolism, as well as primary prevention of myocardial infarction in the high-risk population, and "systemic embolism in patients with rheumatic mitral-valve disease, mitral valve pro lapse, mitral annular calefaction, non rheumatic mitral regurgitation or mobile aortic atheromas or aortic plaques" (Schulman, 2003, p. 675-676). Anticoagulant therapy is used for primary prevention of venous thromboembolism in major orthopedic surgery (Hermans & Claey, 2006). It is prescribed for patients with conditions associated with venous stasis, such as long periods of immobility, obesity, vascular access usage, and hypercoagulability (Wimberley & Wiggins, 2004).

Virchow’s Triad

In 1846, Russian physician Rudolph Virchow described what is now known as Virchow’s triad, which consists of three risk factors for venous thrombosis: venous stasis, hyper-reactivity of the blood coagulation, and vascular trauma (Gaspard, 2004). This triad helps to explain the risks to those who are predisposed to thromboembolic disorders and has led to more research in drug therapy to help prevent and treat these conditions. The issues with the available drugs are proper use, safety, patient teaching, monitoring, and follow up. Patient teaching and safety come to the forefront when a patient is started on anticoagulant therapy or is on anticoagulant therapy for maintenance.

The only oral anticoagulant currently on the market is the drug warfarin sodium (Coumadin). The indications for warfarin cover a great deal of Virchow’s triad: prophylaxis and treatment of venous thrombosis, prophylaxis and treatment of thromboembolic complications associated with atrial fibrillation and/or cardiac valve replacement, and reduction in the risk of death after a myocardial infarction, thromboembolic event, such as nonhemorrhagic stroke, or for systemic embolization after myocardial infarction (Bristol-Myers Squibb, 2006; Turkoski, Lance, & Bonfiglio, 2006).

As the population continues to age and a wider variety of health problems and illnesses is treated, more and more people are being maintained on warfarin. Hospital systems are starting anticoagulation or "Coumadin Clinics" to help manage these patients and prevent adverse effects. The box warning announced by Bristol-Myers Squibb in 2006 discussed major or fatal bleeding risk. The warning included a caution for patients starting at a higher dose and being maintained at an international normalized ration (INR) greater than 4.0. Additional risk factors included age, pre-existing medical problems, such as hypertension, other drug use, trauma, and duration of therapy; affected patients more often experience disease states and/or are treated with pharmacologic agents that can alter the PT/INR response (Bristol-Myers Squibb, 2006).

Treatment for over-anticoagulation with oral agents can follow several courses. The first is correction by simply holding the subsequent doses until the INR falls to a normal value. This can easily be done by the patient at home, but it requires laboratory follow up to check subsequent values. The second is administra-
tation of vitamin K, which can be given in a 1 mg dose by mouth or 0.5 mg intravenous (Comp et al., 2001). However, for over-anticoagulation associated with major bleeding, vitamin K administration would not be the preferred treatment because it can take 12-24 hours to reach its full effect. Plasma is another option, but it would require a large volume for transfusion. Prothrombin-complex concentrates are used and have been found effective, but a possible thrombogenic effect has been reported at times (Comp et al., 2001).

**Patient Education: Teaching Points**

Patient teaching associated with use of oral anticoagulants is lengthy. Patients must be instructed in potential drug interactions, dietary interactions such as vitamin K-rich foods, safety with herbal therapy, the need to watch for signs and symptoms of bleeding, risks associated with trauma, the need for intensive follow up and drug monitoring, and duration of therapy. In a study of adults who were receiving oral anticoagulation therapy and were admitted to a hospital over a 14-day period, findings suggested that very few patients knew their INR target range, the risks of over-anticoagulation or under-anticoagulation, and the dangers of certain foods and drugs (Gras-Champel et al., 2006). What are the important patient teaching indications for oral anticoagulant therapy?

Patients receiving an oral anticoagulant typically are started on the therapy in the hospital after an event that puts them at further risk for harmful clots or as prophylaxis to prevent a thromboembolic event. They are usually discharged home once their INR reaches the desired goal, usually 2.0-3.0 for most patients and 2.5-3.5 for higher-risk patients (Lab Test On Line, 2005). This may give the nurse as little as 1 day, or up to several days, for very intensive patient and family teaching. Anticoagulation education is a team effort between the nurse and the patient and includes several important areas in instruction that help prevent future problems, such as hospital re-admission.

Why the patient is receiving oral anticoagulant therapy is an important part of patient teaching. The patient must understand the pathophysiology of clot formation and how the drug works. This will vary by disease states, pre-existing medical conditions, patient education level, age, and willingness to participate in care (Gras-Champel et al., 2006).

Also important are the potential drug interactions. The package insert for warfarin lists over 50 drugs or drug classes that have potential drug interactions with the anticoagulant (Bristol-Myers Squibb, 2006). These include, but are not limited to, antibiotics, analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), and oral diabetic agents. Patients need detailed instructions on which drugs can raise or lower their INR response and how to alert health care professionals to their anticoagulant therapy. Herbal therapy is another area of potential interaction that requires careful patient teaching. According to a 2006 report (Saw, Bahari, Ang, & Lim), 18% of adults in the United States reported concomitant use of herbal medication or vitamin therapy along with their prescription drugs. Popular herbs, such as ginseng, ginkgo biloba, garlic, chamomile, and ginger, all have the potential to influence the INR or increase bleeding time (Aschenbrenner, 2006; Saw et al., 2006; Turkoski et al., 2006). Nurses should question patients and their families not only about their possible uses of herbal therapy, but also about their feelings and beliefs about the use of complementary and alternative therapy, to form a workable discharge teaching plan.

The need to return to the hospital, clinic, or outpatient office for repeated laboratory monitoring is a key factor in oral anticoagulation management (Spader, 2006). This may create a burden on the patient and/or caregiver in regard to time, transportation, cost of follow-up visits, and the patient’s desire for venipuncture. The ability of the patient to return for follow up must be explored before discharge. Patients who are homebound may qualify for the services of a home health care nurse. Those who are not homebound may find traveling for laboratory follow-up time consuming, expensive, or difficult to schedule. Coumadin clinics have become popular, especially because the INR can be measured through a finger stick. These clinics also can provide further patient teaching, allow development of a rapport with the patients, and create a safety net to prevent patients from being lost to follow up (Spader, 2006).

Diet therapy is an important aspect of oral anticoagulant therapy. Warfarin is considered a vitamin K antagonist. Patients must be taught which foods are high in vitamin K content, and how to properly balance their diets to avoid single episodes of high consumption of vitamin K-rich foods which can change their INR range easily (Schulman, 2003).

Patients also should be instructed about the need for a temporary lower dose of their anticoagulant before surgery, or possibly discontinuing the oral anticoagulant in favor of alternative drugs, such as heparin or low molecular-weight heparin, before elective surgery. Dental protocols also should be followed for extraction of teeth. Dermatologic surgery, and any need for extraction and aspiration from soft tissue, can be done safely without change in dose (Comp et al., 2001).

The last important teaching point is the patient’s need to recognize the signs and symptoms of adverse effects, especially bleeding. Intracerebral hemorrhage (ICH) is the most lethal and serious adverse effect of oral anticoagulation therapy (Gras-Champel et al., 2006). Patients and their families must be taught to recognize the signs and symptoms of possible ICH, such as ataxia, dizziness, new headache, nausea, and vomiting (Fridriksson, Hillman, Landtblom, & Boive, 2001). They must understand the need to seek
medical care immediately. Patients also must be instructed in signs and symptoms of possible gastrointestinal bleeding, such as coffee-ground emesis; dark, tarry, or red stools; weakness; dizziness; thirst; and abdominal pain (Gaspard, 2004).

Patients also need basic teaching about strategies to decrease their potential for bleeding, such as using a soft toothbrush, avoiding flossing their teeth, scheduling appropriate dental follow up, using an electric shaver versus razor blade, and carrying medical identification. They need to be instructed when to alert medical professionals about cuts that do not stop bleeding or fail to heal, or unexplained or prolonged bruising (Aschenbrenner, 2006).

**Low-Molecular Weight Heparin**

Heparin sodium is another anticoagulant, though it usually is used in more acute settings. Unfractioned heparin (UFH) is administered subcutaneously or intravenously. It is given to start antithrombic activity, but because it is difficult and expensive to monitor, it is used primarily in the acute care setting (Applin, 2005; DiDomenico, 2000). Low molecular-weight heparin (LMWH) now is used more frequently. In the United States, currently approved LMWHs are enoxaparin (Lovenox®), dalteparin (Fragmin®), and ardeparin (Normiflo®). “These drugs are derived from UFH through depolymerization to produce much smaller molecules. Like UFH, they exert their pharmacologic actions by enhancing the inactivation of factor Xa and thrombin. However, the smaller size of these molecules results in improved pharmacokinetic and pharmacodynamic properties compared with UFH” (DiDomenico, 2000, p. 65).

LMWH is used primarily in the hospitalized patient. Enoxaparin, dalteparin, and fondaparinux are indicated for prevention of deep vein thrombosis (DVT) after hip arthroplasty and abdominal surgery. Fondaparinux also is indicated to prevent DVT after a hip fracture repair or knee arthroplasty. Both enoxaparin and dalteparin are indicated for unstable angina after a non Q-wave myocardial infarction, as well as restricted mobility during acute illness. Finally, both enoxaparin and fondaparinux can be used with warfarin for treating pulmonary embolism. These drugs are given in one or two daily doses (Aschenbrenner, 2006).

One risk factor for surgical patients is an increased incidence of spinal or epidural hematoma in patients who receive epidural or spinal anesthesia. Also the effects are not reversed easily in any patient if serious bleeding occurs. (DiDomenico, 2000; Raskob & Hirsch, 2003). The American Society of Regional Anesthesia and Pain Medicine Practitioners issued a consensus statement in 2002 listing various anticoagulant drugs, such as heparin, warfarin, and the LMWHs, and discussing management of treated patients both before and after surgery to prevent bleeding risks (Horlocker et al., 2003). Other disadvantages are the cost of the drug, as well as the ability of the patient or caregiver to administer a subcutaneous injection. Anticoagulants also can not be administered interchangeably.

The benefits of LMWH are many. This class of drugs has better diffusion after administration than UFH, and there is less of a need for multiple dosing and laboratory monitoring. LMWH also carries less risk of osteoporosis and heparin-induced thrombocytopenia (HIT) (Wimberley & Wiggins, 2004). HIT occurs in about 8% of the population treated with heparin. It is considered an immune-mediated, adverse drug reaction that results in a hypercoaguable state (Mansan & McCanne, 2006). Unlike oral anticoagulants, LMWH does not require dietary monitoring or restriction. However, as with any drugs, interactions with herbal or other alternative therapies should be evaluated carefully by the nurse. Patients will need information on interaction potential with other drugs, particularly oral anticoagulants, NSAIDs, and aspirin. They also will need to be instructed in signs and symptoms of hemorrhage, bleeding, thrombocytopenia, injection site reactions, fever, nausea, ecchymosis, edema, and skin necrosis (Turkoski et al., 2006).

A major concern for the nurse is providing instruction to the patient who will receive LMWH for home use. Prophylaxis for patients with high-risk orthopedic surgery is 10 days. It continues to be recommended for patients who may be bedridden after 10 days (Hirsh, 1998; Tapson et al., 2005), such as elders, or those who have partial or non-weight bearing orders or are previously disabled. The American College of Chest Physicians guidelines recommend that prophylaxis be given for 28-35 days to patients who have received a high-risk orthopedic procedure (Hermans & Claeyes, 2006). This recommendation was based on the possibility that new asymptomatic DVTs may develop 3-4 weeks after discharge in about 10%-15% of patients.

Patients and their family members will need to be taught how to give a subcutaneous injection, the importance of proper needle disposal, and the reason for the prolonged therapy. Cost of the drug may be prohibitive to some patients and the drug may need to be pre-ordered with a specific outpatient pharmacy to assure availability. Case managers and social workers can help patients and families access prior authorization and funding sources through the individual drug manufacturers to assist patients who are underinsured or uninsured to offset the cost of the treatment.

**Future Management**

When will anticoagulant therapy become easier and safer? A recent study (Heneghan et al., 2006) addressed the self-monitoring activity with home INR equipment of patients in two groups: those that just monitored results, and those that monitored and self-adjusted medication doses based on protocol. An earlier study by Heneghan et al. (2006) demonstrated that self-monitoring reduced risk for thromboembolism, major hemorrhage, and death.
Future research opportunities for nurses will be in the home health care arena, assisting patients and their families to learn how to home monitor and self-adjust doses. Clinical management will include nursing in the homes and outpatient warfarin clinics to help prevent hospitalizations from bleeding or undercoagulation risks.

Ximelagatran (Exanta®) was the first oral thrombin inhibitor developed for anticoagulation (Gustafsson et al., 2004). However, it was removed from the market in February 2006 by AstraZeneca due to reports of serious liver damage beyond 11 days of treatment. It was originally being tested in patients for prevention of VTE following orthopedic surgery. The research was also terminated at this time (AstraZeneca, 2006).

Improved oral anticoagulants are a challenge and will be the goal of many researchers in the next few years. With the latest box warning of Coumadin and the removal of Exanta® (ximelagatran) for reasons of patient safety, health care providers eagerly await their arrival.

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**References**


