

Instructions

1. Read self-study and take test at the end of the packet.
2. Take online test.
3. Complete online evaluation.

Anticoagulant Therapy Overview

Anticoagulants are key medications in limiting morbidity and improving survival for patients with potentially lethal thromboembolic events such as myocardial ischemia and infarction, mural thrombi, arterial thromboemboli, deep venous thrombosis (DVT), and pulmonary embolism (PE). Anticoagulant therapy is also a key preventative measure in patients who have artificial heart valves and on a short-term basis to patients who have had surgeries, such as knee replacements. The anticoagulants must be carefully monitored to maintain a balance between preventing thrombi and causing excessive bleeding.

Anticoagulant therapy is the administration of medications to stop thrombosis and achieve the following result:

- ❖ Disrupt the blood's natural clotting mechanism when there is a risk of clotting.
- ❖ Prevent formation of a thrombus in immobile and/or postoperative patients.
- ❖ Intercept the extension of a thrombus once it has formed.

For at least fifty years, salicylic acid acetate (Aspirin) has been recognized as an anticoagulant that can significantly reduce platelet count. It is the most common and often used blood thinner, usually taken in doses of 81 mg per day (essentially one baby aspirin). The mechanism of action is platelet aggregation inhibition. Additional types of anticoagulants include coumarin derivatives, such as warfarin (Coumadin) given orally, heparin (Heparin) given subcutaneously or intravenously, or low-molecular-weight heparin (Lovenox), given subcutaneously.

Warfarin (Coumadin)

Introduced almost 60 years ago, warfarin sodium is by far the oral anticoagulant of choice. This is quickly changing as new, improved anticoagulants undergo clinical trials and enter the market. The oral anticoagulants are a class of pharmaceuticals that act by antagonizing the effects of vitamin K. It is important to note that they take at least 48 to 72 hours for the anticoagulant effect to fully develop. In cases when an immediate effect is required, heparin must be given concomitantly. Generally, warfarin is used to treat patients with deep-vein thrombosis (DVT), pulmonary embolism, atrial fibrillation, and mechanical prosthetic heart valves. *Oral anticoagulants can only be used to prevent clots, not to assist in eliminating them.*

Description

Warfarin sodium is an anticoagulant that blocks the regeneration of vitamin K(1) epoxide, thus inhibiting synthesis of vitamin K-dependent clotting factors. Those factors include 2, 7, 9 and 10, and the anticoagulant proteins C and S.

Indications:

- Atrial Fibrillation
- Prophylaxis of Venous Thromboembolism (Deep Vein Thrombosis/Pulmonary Embolism)
- Post-Myocardial Infarction
- Recurrent emboli
- Mechanical and Bioprosthetic Heart Valves
- Cancer
- Knee/hip replacement

Coumadin Tablet Colors

| Tablet strength | Tablet color |
|-----------------|-------------------------|
| 1 mg | Pink |
| 2 mg | Lavender (light purple) |
| 2.5 mg | Green |
| 3 mg | Tan |
| 4 mg | Blue |
| 5 mg | Peach (light orange) |
| 6 mg | Teal (blue-green) |
| 7.5 mg | Yellow |
| 10 mg | White |

Contraindications

- ✚ Pregnancy
- ✚ Hemorrhagic tendencies or blood dyscrasias
- ✚ Recent or contemplated surgery of: (1) central nervous system; (2) eye; (3) traumatic surgery resulting in large open surfaces.
- ✚ Bleeding tendencies associated with active ulceration or overt bleeding.
- ✚ Inadequate laboratory facilities.
- ✚ Unsupervised patients with senility, alcoholism, or psychosis or other lack of patient cooperation and compliance.
- ✚ Spinal puncture and other diagnostic or therapeutic procedures with potential for uncontrollable bleeding.
- ✚ Major regional, lumbar block anesthesia, malignant hypertension and known hypersensitivity to warfarin or to any other components of this product.

Potential Side Effects

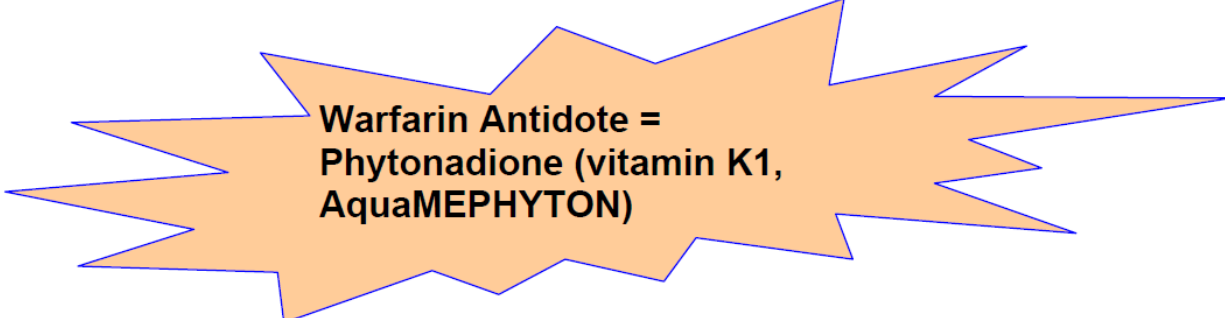
Warfarin sodium can cause major or fatal bleeding. Bleeding is more likely to occur during the starting period and with a higher dose (resulting in a higher INR), or in patients with the risk factors listed above. The most serious risks associated with warfarin sodium treatment are hemorrhage in any tissue or organ and, less frequently, the destruction of skin tissue cells (necrosis) or gangrene. The risk of hemorrhage usually depends on the dosage and length of treatment.

Other side effects of Coumadin include:

- ✓ Easy bruising
- ✓ Blood in stool
- ✓ Tarry stools
- ✓ Blood in urine
- ✓ Blood in vomit
- ✓ Jaundice
- ✓ Abdominal cramps/pain
- ✓ Nausea/vomiting/diarrhea

Overdose Signs and Symptoms

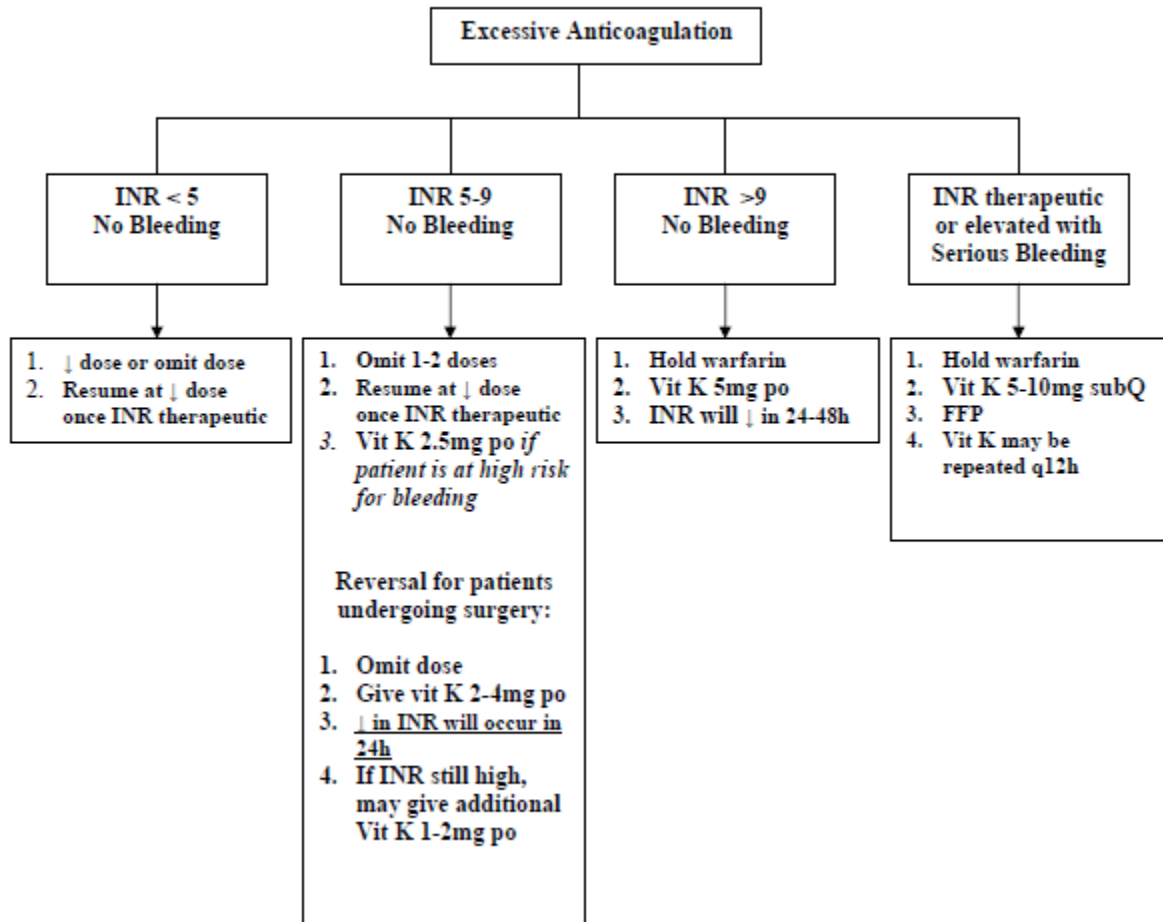
Suspected or overt abnormal bleeding (e.g., appearance of blood in stools or urine, hematuria, excessive menstrual bleeding, melena, petechiae, excessive bruising or persistent oozing from superficial injuries) are early manifestations of anticoagulation beyond a safe and satisfactory level.



**Warfarin Antidote =
Phytonadione (vitamin K1,
AquaMEPHYTON)**

Oral route for vitamin K is preferred due to superior efficacy compared to subcutaneous route. Oral vitamin K is available in tablet and solution formulations[2].

Vitamin K Guidelines for Coumadin Reversal



Treatment

Excessive anticoagulation, with or without bleeding, may be controlled by discontinuing warfarin therapy and if necessary, by administration of oral or parenteral vitamin K₁.

Nursing Alert: Importance of Follow-Up Monitoring

Prothrombin Time (PT) and International Normalized Ratio (INR) are the coagulation tests used to monitor the anticoagulation effects of warfarin on all treated patients. You must obtain a baseline INR prior to initiation of therapy, and a current INR must be available and used to monitor and adjust Coumadin therapy.

Patients should have an INR of 2.0 to 3.0 for basic “blood-thinning” needs. For some patients who have a high risk of clot formation, the INR needs to be higher - about 2.5 to 3.5 times the control. Other laboratory studies to monitor as ordered or if bleeding is suspected:

1. Platelet count
2. Hemoglobin and hematocrit levels

Be aware of drug-drug (including over-the-counter food and herbal supplements) and food-drug interactions that may alter the effects of warfarin.

What Is PT/INR?

Prothrombin Time

The prothrombin time is the time it takes plasma to clot after addition of tissue factor (obtained from animals). This measures the quality of the extrinsic pathway (as well as the common pathway) of coagulation.

International Normalized Ratio

Because of differences between batches from the various manufacturers of tissue factor (it is a biologically obtained product), the INR was devised to standardize the results.

Each manufacturer gives an ISI (International Sensitivity Index) for any tissue factor they make. The ISI value indicates how the particular batch of tissue factor compares to an internationally standardized sample. The ISI is usually between 1.0 and 1.4. The INR is the ratio of a patient's prothrombin time to a normal (control) sample, raised to the power of the ISI value for the control sample used.

$$INR = \left(\frac{PT_{test}}{PT_{normal}} \right)^{ISI}$$

Patient Education

Dietary Restrictions & Potential for Drug Interactions

Warfarin sodium can interact with a very wide variety of drugs, both prescription and over-the-counter. Patients must check with their physician before taking ANY other medication, herbal product, or vitamin/mineral supplement. They must be extremely cautious with complementary and alternative medicine (CAM) products, including herbal remedies and supplements because many of these are known to interact with Warfarin sodium or otherwise affect coagulation. These include St. John's Wort, coenzyme Q10, bromelains, galric, ginkgo biloba, fish oils, and many more. Diet substances for weight loss (such as pills) should also be cautioned as some may contain substances that are contraindicated. Some substances, such as alcohol, can affect the PT/INR test. Antibiotics, aspirin, and cimetidine can increase the PT/INR. Barbituates, oral contraceptives or hormone-replacement therapy (HRT), and vitamin K – either in a multivitamin or liquid nutrition supplement (such as Boost) – can decrease PT. Consumption of vitamin K rich foods in excess of a patient's usual intake can alter PT

results. Vitamin K rich foods are usually frozen/cooked dark green vegetables. Other foods that contribute due to the additive effect of eating too much of them include energy/supplement bars and soybean/canola oil (usually in processed and fast foods). The main dietary concern of taking warfarin has to do with keeping a consistent amount of vitamin K in the diet from week to week.

Substances that Increase INR

| | | |
|---|---|---|
| Anti-Infectives Antibiotics Azithromycin (Zithromax) Clarithromycin (Biaxin) Erythromycin (Ery[®]Tab) Ciprofloxacin (Cipro) Levofloxacin (Levaquin) Moxifloxacin (Avelox) Metronidazole (Flagyl) Isoniazid Antifungals Fluconazole (Diflucan) Itraconazole (Sporanox) Voriconazole (Vfend) Miconazole Gastrointestinal Cimetidine (Tagamet) Omeprazole (Prilosec) | Cardiovascular Amiodarone (Pacerone) Propafenone (Rythmol) Propranolol (Inderal) Diltiazem (Cardizem) Simvastatin (Zocor) Fluvastatin (Lescol) Fenofibrate (Tricor) Gemfibrozil (Lopid) Fish Oil (Lovaza) Central Nervous System SSRIs/SNRI Fluvoxamine (Luvox) Sertraline (Zoloft) Citalopram (Celexa) Herbal Ginkgo Vitamin E Garlic Dong Quai Ginger | NSAIDS Aspirin Diclofenac (Voltaren) Etodolac (Lodine) Ibuprofen (Motrin, Advil) Indomethacin (Indocin) Ketoprofen (Orudis) Naproxen (Anaprox) Piroxicam (Feldene) Sulindac (Clinoril) Nabumetone (Relafen) Celecoxib (Celebrex) Other Acetaminophen (Tylenol) *Limit total intake <2 g/day Other Ticlopidine Thyroxine Heparin Disulfram Fruits Mangoes Grapefruit juice Cranberry juice |
|---|---|---|

Substances that Decrease INR

| | |
|---|--|
| Drugs Carbamazepine (Tegretol) Trazodone (Desyrel) Phenobarbital Phenytoin [®] Nafcillin Rifampin Griseofulvin (Grifulvin V, Gris-PEG) Cigarette smoke Ritonavir Antacids Oral contraceptives and estrogens Corticosteroids | Herbal Coenzyme Q10 Ginseng St John's Wort Excessive intake of Vitamin K-rich foods Grapefruit juice |
|---|--|

Safety Precautions

Patients should be instructed about prevention measures to minimize risk of bleeding and to report immediately to physician signs and symptoms of bleeding. Health conditions must also be reported, including:

1. Bleeding problems.
2. Frequent falls.
3. Liver or kidney problems.
4. High blood pressure.
5. Congestive heart failure.
6. Onset of diabetes.
7. Herbal /CAM and/or vitamin/mineral supplement consumption
8. Alcohol consumption and/or problems with alcohol abuse.
9. Pregnancy or planning to become pregnant.
10. Upcoming surgery, including dental work.

Heparin and Derivatives

In the 1930's, Heparin was hailed as a "miracle blood lubricant" and used widely to decrease the morbidity and mortality of acute care patients. Usually made from pig intestines, it works by activating antithrombin III, which blocks thrombin from clotting blood. Heparin (also described as unfractionated heparin) usually requires hospitalization for careful monitoring of the activated PTT and monitoring for potential side effects. *The anticoagulant action and side effects of heparin are dose dependent.* The two major side effects are bleeding and heparin-induced thrombocytopenia (HIT).

What is heparin-induced thrombocytopenia (HIT)?

It is the development of thrombocytopenia (a low platelet count), due to the administration of various forms of heparin, an anticoagulant. HIT is caused by the formation of abnormal antibodies that activate platelets and can be confirmed with specific blood tests.

Alternative for HIT:

- LEPIRUDIN
- ARGATROBAN
- BIVALIRUDIN

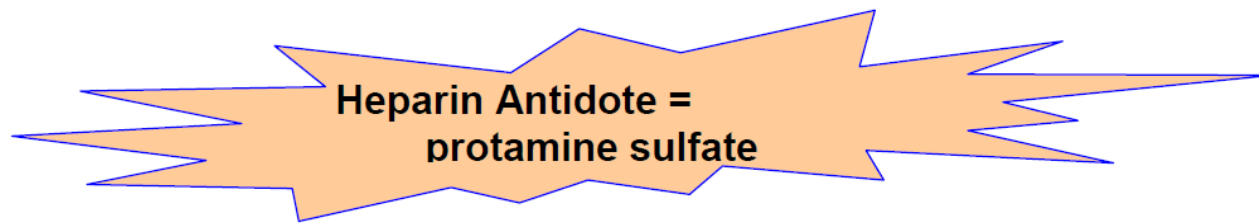
Heparin can be used to treat or prevent a deep vein thrombosis. When used for treatment, heparin prevents new thrombus formation and prevents existing thrombi from getting larger or becoming a pulmonary embolus. This allows the normal body systems to dissolve the clots that are already formed.

NURSING ALERT

1. Obtain baseline coagulation and hematologic studies before initiating anticoagulation therapy to ensure that the patient does not have an underlying bleeding or clotting disorder.

Indication:

- Prevention and treatment of Venous thromboembolism (VTE)
 - Prophylaxis: 5000 units SC q8-12h
 - Treatment: 18 units/kg/h IV



2. Monitor Clotting Profiles:

- Partial thromboplastin time (PTT). Therapeutic is 2 to 2½ times the control.
- Platelet count
- Hemoglobin and hematocrit
- Fibrinogen

Low Molecular Weight Heparins

Low molecular weight heparin (LMWH) is a more highly processed product that has the advantage of not requiring PTT monitoring because it has more predictable plasma levels and has fewer side effects. The benefits over heparin include a longer half-life, less platelet inhibition than unfractionated heparin, and more mobility for the patient (it may be given at home).

The advent of the highly processed low molecular weight heparins such as dalteperin, enoxaparin (Lovenox), nadroperin, and tinzaparin comprised a major step forward in anticoagulation therapy. They can be injected subcutaneously once or twice daily to outpatients, and are as effective as unfractionated heparin for prophylaxis and treatment of DVT/PE and are increasingly administered to patients with acute coronary syndromes. LMWHs have a lower incidence of HIT because they do not interfere as readily with platelet factor 4.

Prophylaxis

| INDICATION | Enoxaparin | Dalteparin | Tinzaparin |
|---|---|---|--|
| Orthopedic Surgery Hip replacement and hip surgery Knee replacement | 30 mg SC initiated 12-24 hr after surgery Or 40 mg SC q 24 h initiated 12 h prior to surgery | 5,000 IU given SC initiated the evening prior to surgery and 5,000 IU subcutaneously the following evenings. Treatment is continued until the patient is mobilized, in general 5-7 days or longer. Alternative 2,500 IU is given subcutaneously 1-2 hours prior to the operation and 2,500 IU subcutaneously 8-12 hours later. On the following days 5,000 IU subcutaneously each morning. | 75 units/kg SC q 24 h initiated the evening prior to surgery or 12 h after surgery or 4,500 unit SC q 24 h initiated 12 h |
| Abdominal/Pelvic Surgery | 40 mg SC q 24 h initiated 2 h prior to surgery | 2,500 units SC initiated 1-2 h prior to surgery or 2,500 units SC 1-2 h prior to surgery then 2,500 units 12 h after surgery followed by 5,000 units SC q 24 h | 4,500 unit SC q 24 h initiated 12 h |
| Acute medical illness | 40 mg SC q 24 h | | |
| Trauma (prophylaxis) | 30 mg SC q 12 h starting 12-36 h after injury | | |
| Treatment | | | |
| Deep vein thrombosis treatment (with or without pulmonary embolism) | 1 mg/kg SC q 12 h Or 1.5 mg/kg SC q 24 h | 100 units/kg SC q 12 h or 200 units/kg SC q 24 h | 175 units/kg SC q 24 h |
| Unstable angina or non-Q-wave myocardial infarction | 1 mg/kg SC q 12 h | 120 IU/kg SC q 12 h (maximum dose 10,000 units) | |

IMPORTANT MONITORING PARAMETERS:

To ensure the safe use of Lovenox® (enoxaparin):

- ❖ Obtain baseline platelet and serum creatine
- ❖ Current platelet and serum creatine must be available to monitor / adjust therapy.

Anticoagulant Therapy in Surgical Patients

Prevention of Deep Vein Thrombosis (DVT)

DVT occurs in pelvic veins or in the deep veins of the lower extremities in postoperative patients. The incidence of DVT varies between 10% and 40% depending on the complexity of the surgery or the severity of the underlying illness. DVT is most common after hip surgery, followed by retropubic prostatectomy, and general thoracic or abdominal surgery. Venous thrombi located above the knee are considered the major source of pulmonary emboli. Those at high risk are patients with obesity, prolonged immobility, cancer, smoking, estrogen use, advancing age, varicose veins, dehydration, splenectomy, and orthopedic procedures.

One way to prevent the formation of DVTs is to use prophylactic strategies such as anticoagulant therapy. Medications such as aspirin, warfarin, enoxaparin, and several types of heparin are often used, along with many others. These medications can be given before, during, or after surgery. Bleeding can be a complication of anticoagulant prophylaxis, however, so it is not always the optimal treatment for surgical patients. Because of this, nurses also must become well versed in using mechanical prophylaxis and ensuring early ambulation to reduce the risk of DVT. Perioperative nurses can make a difference by educating themselves and their patients about DVTs and how to prevent them.

Drug Alert

Oral anticoagulants should generally be discontinued preoperatively to reduce the risk of hemorrhage in the intraoperative phase. Unfractionated heparin I.V. may be prescribed preoperatively as its half-life is short; thus, the anticoagulant effects are reversed within 30 minutes to 1 hour after discontinuation. Be aware that heparin may be continued for 4 to 5 days after oral anticoagulant is initiated due to the delayed onset of therapeutic effectiveness with oral anticoagulants.

Nursing Alert

1. Follow precautions to prevent bleeding:
 - ❖ Handle patient carefully while turning and positioning.
 - ❖ Maintain pressure on I.V. and venipuncture sites for at least 5 minutes.
 - ❖ Assist with ambulation and keep walkways/hallways free from clutter to prevent falls.
2. Observe carefully for any possible signs of bleeding and report immediately
 - ❖ Hematuria — frank blood in urine or microhematuria as detected by lab
 - ❖ Melena -assess for dark tarry stools, occult blood positive detected by lab.

- ❖ Hemoptysis_ assess for frank blood in the sputum , occult blood positive detected by lab
- ❖ Bleeding gums — note any pink saliva or frank bleeding with dental hygiene.
- ❖ Epistaxis — frequent/persistent nosebleeds.
- ❖ Inspect skin carefully for any bruising/hematomas.

Fondaparinux (Arixtra)

Arixtra is a synthetic selective indirect inhibitor of factor Xa. It is more selective than heparin (including both unfractionated heparin and low molecular weight heparins), which inhibits other clotting factors as well. It is the only selective inhibitor of factor Xa which has been approved for use in the treatment and prevention of thrombosis. Fondaparinux is given subcutaneously daily for the prevention of deep vein thrombosis in patients who have had orthopedic surgery as well as for the treatment of deep vein thrombosis and pulmonary embolism. One potential advantage of fondaparinux over LMWH or unfractionated heparin is that the risk for heparin-induced thrombocytopenia is substantially lower.

Prophylaxis of Deep Vein Thrombosis

- Hip fracture surgery, including extended prophylaxis;
- Hip replacement surgery;
- Knee replacement surgery;
- Abdominal surgery for patient at risk for thromboembolic complications.

Treatment

- **Acute Deep Vein Thrombosis**
Treatment of acute deep vein thrombosis when administered in conjunction with warfarin sodium.
- **Treatment of Acute Pulmonary Embolism**
Treatment of acute pulmonary embolism when administered in conjunction with warfarin sodium when initial therapy is administered in the hospital.

| Dosage | |
|---|--|
| Prophylaxis DVT | 2.5 mg subcutaneously once daily after hemostasis has been established. The initial dose should be given no earlier than 6 to 8 hours after surgery and continued for 5 to 9 days. For patients undergoing hip fracture surgery, extended prophylaxis up to 24 additional days is recommended |
| Hip Fracture | |
| Hip Replacement | |
| Knee Replacement Surgery Abdominal Surgery | |
| Treatment DVT/PE | 5 mg (body weight <50 kg), 7.5 mg (50 to 100 kg), or 10 mg (>100 kg) subcutaneously once daily. Treatment should continue for at least 5 days until INR 2 to 3 achieved with warfarin sodium. |

Contraindications

- Severe renal impairment (creatinine clearance <30 mL/min) in prophylaxis or treatment of venous thromboembolism.
- Active major bleeding.
- Bacterial endocarditis.
- Thrombocytopenia associated with a positive in vitro test for anti-platelet antibody in the presence of fondaparinux sodium.
- Body weight <50 kg (venous thromboembolism prophylaxis only).

Warning and Precautions

- Use with caution in patients who have conditions or who are taking concomitant medications that increase risk of hemorrhage.
- Bleeding risk is increased in renal impairment and in patients with low body weight <50 kg.
- Thrombocytopenia can occur with administration of Arixtra.
- Periodic routine complete blood counts (including platelet counts), serum creatinine level, and stool occult blood tests are recommended.
- The packaging (needle guard) contains dry natural rubber and may cause allergic reactions in latex sensitive individuals.
- The potential risk of epidural or spinal hematomas
- Signs and symptoms of possible bleeding

Patient Education and Health Maintenance

Instruct patient to:

- Follow instructions carefully and take medications exactly as prescribed; if a dose is missed, do NOT double up dose.
- Notify all health care providers, including dentist, that you are taking anticoagulants.
- Be consistent with your intake of vitamin K rich foods. Vitamin K rich foods such as greens, leafy vegetables, fish, liver, green tea, and tomatoes should be used in the same quantity every day.
- Take medications at the same time each day and do not stop taking them even if symptoms of thrombus/embolus are not present.
- Wear a medical identification bracelet or carry a card indicating that you are taking anticoagulants; include name, address, and telephone number of health care provider.
- Use soft tooth brush to avoid potential bleeding.

Advise the patient to notify the health care provider of the following:

- Accidents, infections, excessive diarrhea, and other significant illnesses
- Scheduled invasive procedures by other health care providers, including routine dental examinations and other dental procedures, cardiac catheterizations. If surgical care by another health care provider or dentist is needed, inform other provider that anticoagulants are being taken.
- Missed doses — follow instructions of health care provider in case of missed dose.

Advise the patient to avoid taking any other medications without first checking with health care provider, particularly:

- Vitamins, especially if they contain vitamin K
- Herbal supplements
- Nonsteroidal anti-inflammatory drugs (NSAIDs) (including aspirin and acetaminophen)
- Mineral oil
- Cold medicines
- Antibiotics
- Phenylbutazone (Butazolidin)

Caution patients about:

- Excessive use of alcohol and on acceptable limits for social drinking.
- Participation in activities in which there is high risk of injury.
- Foods that may cause diarrhea or upset stomach, rapid changes in diet.
- Shaving with a sharp razor (*alternative*: electric shaver).
- Avoid flossing (*alternative*: waxed dental floss)
- Be very careful using knives and scissors.
- Be careful when you trim your toenails.
- Use of herbal and vitamin supplements that may increase or decrease INR.

Instruct the patient to be alert for these warning signs:

- Excessive bleeding that does not stop quickly (such as following shaving, a small cut, tooth brushing with gum injury, nosebleed)
- Excessive menstrual bleeding
- Skin discoloration or bruises that appear suddenly — particularly on the fingers and toes or deep purple spots anywhere on the body (“blue toe syndrome”)
- Black or bloody stools; for questionable stool discoloration, test for occult blood
- Blood in urine
- Faintness, dizziness, or unusual weakness
- Stress the importance of close follow-up and compliance with periodic laboratory work for blood clotting profiles. Notify health care provider if you are unable to keep scheduled appointments. If the provider has not called with instructions about dosage, call the provider themselves.

| Foods High In Vitamin K | Foods Moderately High in Vitamin K |
|---|--|
| Kale * Endive Collard Greens* Spinach * Beet Greens* Turnip Greens* Mustard Greens* Swiss Chard* Green tea Coriander Parsley Watercress Soybean/Canola oil in processed and fast foods (when consumed in large amounts) | Brussels Sprouts* Broccoli* Basil Chive Coleslaw Canola oil Cabbage Butterhead Lettuce (Boston, Bib) Asparagus* Green apple Onions Dandelion Lettuce Sauerkraut |
| Other Liver Mayonnaise Kiwi Cauliflower | Foods Low in Vitamin K Okra Avocado Beans Eggs Rice Tomato Rhubarb Cow peas Celery Cucumber Squash Radishes Eggplant Bread/ bagels Crackers |

***Vitamin K content in these vegetable is higher when frozen/cooked
Intake of these foods needs to be constant from week to week. Controlled
portions are recommended to assist in monitoring consistent intake.**

Alcoholic Beverages

Alcohol intake greater than 3 drinks per day can increase the effects of Warfarin.

One drink equals

- **5 oz. of wine**
- **12 ounces of beer**
- **1.5 ounces of liquor**

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