Anticoagulation Therapy: Keeping Patients Safe

Purpose

To provide direct care nurses with the information needed to help reduce the likelihood of harm to patients associated with the use of anticoagulant therapy and to improve patient outcomes in the acute care setting.

Learning Objectives

1. Determine the indications, treatment guidelines, contraindications, side effects, and antidotes of commonly used anticoagulants.
2. Summarize the key aspects of providing safe, quality nursing care to the patient receiving anticoagulation therapy.

Introduction

Anticoagulants are key medications for treatment of thromboembolic events such as myocardial infarction (MI), mural thrombi, arterial thromboemboli, deep venous thrombosis (DVT), and pulmonary embolism (PE). Anticoagulants are also key medications for the prevention of thromboembolic events such as patient with heart valve replacement, patients with atrial fibrillation, medical patients, and patients who have had surgeries, such as knee/hip 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.

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 level.

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.

$$\mathbf{(INR=(PT\ patient/PT\ normal)^{ISI})}$$

Caution Prior to and Post Surgery:

Oral anticoagulants should be discontinued prior to surgery to reduce the risk of hemorrhage in the intra-operative phase. Depending of the oral anticoagulants and the type of procedures the drugs must be held 24 hours to 5 days before surgery. In general oral anticoagulants are re-started 12-24 hours post surgery once hemostasis has been established.

Nursing Alert

For Patients Receiving Anticoagulants

Prothrombin Time (PT) and International Normalized Ratio (INR) are the coagulation tests used to monitor the anticoagulation effects of warfarin on all treated patients.

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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).

Based on the type of anticoagulation agents, monitor the following lab values:

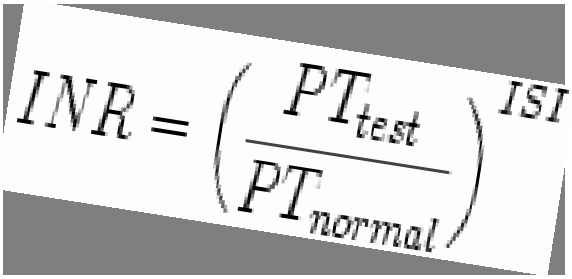
- Coumadin (warfarin) ……PT/INR (get baseline and daily)
- Heparin ……..PTT, platelets (get baseline and daily)
- Lovenox (enoxaparin) ……Platelets (get baseline, daily X 5 days, then every 48hrs)
- Arixtra (fondaparinux) ……Platelets (get baseline, daily X 5 days, then every 48 hours)
- Pradaxa (dabigatran) ……No lab values but assess for signs of bleeding
- Xarelto (rivaroxaban) ……..No lab values but assess for signs of bleeding
- Eliquis (apixaban) ……..No lab values but assess for signs of bleeding

1. **Assess for Bleeding**:

- Nose bleed
- Gum bleeding
- Hematuria or brown urine
- Hemoptysis (coughing blood)
- Melena or hemorrhage
- Vomiting coffee ground materials
- Inspect skin for bruising, hematomas
- Prolonged excessive menses
- Severe persistent back

2. Educate Patients on Recognizing Signs of Hyper/Hypo-Coagulation.

- Tenderness , swelling or pain in extremity
- Sudden chest pain
- New or increased shortness of breath
- Extreme anxiousness or restlessness
- Cough productive of blood-tined sputum
- Unusual bleeding
- Fever



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)?

Heparin-induced thrombocytopenia 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.

Next are the commonly used anticoagulants on formulary:

Oral Anticoagulants

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Eliquis **apixaban**	Reduce the risk of stroke and systemic embolism in patients with nonvalvular atrial fibrillation (A.Fib)	▪ Nonvalvular A.Fib: 5mg PO BID ▪ 2.5mg PO BID for patients with any 2 of the following: Age ≥ 80 YO, body weight ≤ 60kg, or serum creatinine ≥ 1.5mg/dl	Dose adjusted based on: ▪ Renal impairment ▪ Hepatic impairment ▪ Any 2 of the following: Age ≥ 80 years old body weight ≤ 60kg serum Creatinine ≥ 1.5mg/dl	▪ CBC ▪ Creatinine 1.5 mg/dl or Greater ▪ Age ≥ 80 Years or ▪ Weight ≤ 60 Kg ▪ Bleeding Precautions*	None

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Xarelto **rivaroxaban**	▪ Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation ▪ Treatment of DVT and PE ▪ Post-op thromboprophylaxis in patients who have undergone hip or knee replacement	▪ Non-valvular A-Fib = 20mg PO daily ▪ DVT/PE = 15mg PO BID for 3 weeks followed by 20 mg PO daily ▪ Postop DVT thromboprophylaxis for Knee/Hip replacement = 10mg PO daily ▪ Reduction in risk of recurrent DVT/PE = 20mg PO daily	Dose adjusted based on renal and hepatic impairment	▪ Creatinine Clearance ▪ CBC ▪ Hepatic Function ▪ Bleeding Precaution*	None

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Pradaxa **dabigatran**	Prevention of stroke and systemic embolism in patients with non-valvular atrial fibrillation	Nonvalvular A.Fib = 150mg PO BID	Dose adjusted based on renal impairment	▪ Creatinine Clearance ▪ PTT or ECT (Ecarin Clotting Time) ▪ CBC / Thrombin Time ▪ Hemoclot Thrombin Inhibitor ▪ Bleeding Precautions*	None

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Coumadin **warfarin**	❖ Prophylaxis & treatment of thromboembolic disorders and embolic complications arising from A-Fib. or cardiac valve replacement ❖ Adjunct to reduce risk of systemic embolism after MI	❖ Dose based on target INR goals (i.e. 2-3). INR goals based on indication. ❖ Some patient may require different INR goals	No renal/hepatic dosage adjustment provided in manufacturer's labeling	❖ PT/INR ❖ CBC ❖ Bleeding Precaution*	Vitamin K (Phytonadione) (Refer Physician Order Form)

Injectable Anticoagulants

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Heparin 	**Prophylaxis:** ❖ Thrombo-Prophylaxis (low-dose heparin) **Treatment:** ❖ Acute Coronary Syndrome with/without Thrombolytics or GP IIb/IIIa inhibitors. ❖ Deep Venous Thrombosis (DVT) ❖ Pulmonary Embolus (PE) ❖ Atrial Fibrillation (AF) ❖ Acute Ischemic Stroke	❖ 5000 units SQ every 8-12 hours x 7 days or until fully ambulatory Loading Dose: ▪ 60 units/kg IV ▪ (Max 4,000 units) Initial Infusion Dose: ▪ 12 units/kg/hr IV ▪ (Max 1,000 units/hr) Loading Dose: ▪ 70 units/kg IV ▪ (Max 5,000 units) Initial Infusion Dose: ▪ 15 units/kg/hr IV ▪ (Max 1,000 units/hr) Loading Dose: ▪ 80 units/kg IV ▪ (Max 5,000 units) Initial Infusion Dose: ▪ 18 units/kg/hr IV ▪ (Max 1,300 units/hr) No Loading Dose and initiate drip at 1,000 units/hr IV…..**Or**……Recommended weight based dosing range (12-15 units/kg/hr IV)	❖ Dose adjustment as per PTT algorithm (Refer to Adult Intravenous Heparin Physician Order Form) ❖ Dose adjustment as per PTT algorithm (Refer to Intravenous Heparin Guideline for Acute Ischemic Stroke Order Form)	❖ Signs and symptoms of bleeding* ❖ Baseline CBC w/ Platelets within 24 hours prior to 1st dose. ❖ [Platelet count <100,000/mm3 or count dropping more than 50% (notify MD)] ❖ Baseline PTT within 24 hours prior to 1st dose ❖ Daily CBC w/ Platelets ❖ PTT 6 hours after initiation ❖ PTT every 6 hours until 2 consecutive values are therapeutic ❖ Daily PTT ❖ Signs and symptoms of bleeding* ❖ Refer to WINK Heparin PTT Monitoring next page	❖ Protamine Sulfate: 1mg IV neutralizes 90 units of Heparin. ❖ Patient Received Heparin < 2 hours ago: Protamine Sulfate 50 mg/ ❖ NS 50 ml over 15 min STAT ❖ Pt Received Heparin 2-24 hours ago: Protamine Sulfate 12.5mg/NS 25 ml over 15 min STAT ❖ Refer to Physician Order Form

Heparin PTT Monitoring Protocols

WINK: *What I Need to Know*

Column	A	B	C	D	E
	Time Zero	**PTT Draw Time**	**PTT result time *(Action)***	**Infusion updated**	**Repeat PTT draw time**
Scenario-1 (Infusion Maintained)					
Infusion maintained (*first PTT in desired range, column C*)	9:00 am *(Initial infusion time)*	3:00 pm	5:00 pm *(First PTT in desired range-requires no change in infusion rate).* ***Use PTT draw time to start the 6 hr time clock for next PTT level***	N/A	9:00 pm *(6 hours after the* ***last PTT draw time***)
Infusion maintained (*second PTT in desired range, column C)*	3:00 pm *(1st PTT level in desired range-drawn at 3:00 pm & result at 5:00 pm)*	9:00 pm *(6 hours from* ***last PTT draw time****)*	11:00 pm *(second PTT in desired range)*	N/A	Next calendar day with am labs
Scenario-2 (Infusion Changed)					
Infusion rate changed *(PTT not at goal, column C)*	9:00 am *(Initial infusion time)*	3:00 pm *(6 hours after the infusion started)*	4:00 pm *(PTT not at goal requiring change in infusion rate)*	4:00 pm	10 pm *(6 hours after the* ***infusion updated****)*
Scenario-3 (Infusion held)					
Infusion held x 60 minutes *(PTT not at goal, column C)*	9:00 am *(Initial infusion time)*	3:00 pm *(6 hours after initial infusion started)*	5:00 pm *(PTT not at goal requiring hold x 60 minutes)*	6:00 pm *(Infusion held from 5-6p & resumed at 6p)*	12:00 am *(6 hours after the* ***infusion resumed****)*

FOR ANY QUESTIONS, CONTACT THE ANTICOAGULATION PHARMACY SPECIALIST

Injectable Anticoagulants *Continued*

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Lovenox **enoxaparin** 	PROPHYLAXIS: ❖ Post Op Knee and Hip Replacement ❖ Hip Replacement Surgery Alternative ❖ Abdominal/ Pelvic Surgery ❖ Acute Medical Illness ❖ Post Op Bariatric Surgery	❖ 30mg SQ Q12H, with initial dose 12-24 hours **after** surgery ❖ 40mg SQ Q24H, with initial dose 12 hrs **prior** to surgery ❖ 40mg SQ Q24H, with initial dose 2 hrs **prior** to surgery ❖ 40mg SQ Q24H ❖ 40mg SQ Q12H	Creatinine Clearance < 30 ml/min: 30 mg SQ daily	❖ Baseline CBC w/ Platelets within 48 hrs prior to 1st dose ❖ Baseline Serum Creatinine within 48 Hrs prior to 1st dose ❖ Daily CBC w/ Platelets x 5 Days then Weekly thereafter ❖ Serum Creatinine Weekly ❖ Signs and symptoms of bleeding*	❖ Protamine Sulfate: 1mg IV neutralizes 1 mg of Lovenox ❖ Patient Received Lovenox < 8 hours ago: Protamine Sulfate 50 mg/NS 50 ml over 15 min STAT ❖ Patient Received Lovenox >8 hours ago: Protamine Sulfate 12.5mg/ NS 25 ml over 15 min STAT ❖ Refer to Adult Reversal of Anticoagulation Physician Order Form
	TREATMENT: ❖ Deep Venous Thrombosis Treatment (with or without Pulmonary Embolism) ❖ Unstable Angina or Non-ST-Elevation MI (NSTEMI) ❖ ST-Elevation MI (STEMI)	❖ 1mg/kg SQ Q12H ***OR*** 1.5mg/kg SQ Q24H ❖ 1mg /kg SQ Q12H ❖ **Patients <75 yrs**: 30 mg IV Bolus plus 1 mg/kg SQ Q12H (Max: 100 mg for the first 2 doses only) ❖ **Patients ≥75 yrs**: 0.75 mg/kg SQ Q12H (Max: 75 mg for the first 2 doses only)	Creatinine Clearance < 30 ml/min: 1 mg/kg SQ daily		

Creatinine clearance tests are used to estimate glomerular filtration rate (GFR). Normal Results

- Male: 97 to 137 ml/min.
- Female: 88 to 128 ml/min.

Injectable Anticoagulants *Continued*

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
Argatroban	Heparin Induced Thrombo-cytopenia (HIT)	❖ Start Argatroban therapy at least 4 hours after discontinuation of Heparin Therapy…OR..At least 12 hours after discontinuation of Lovenox Therapy ❖ Initiate Argatroban at 1 mcg/kg/min IV for patients without Hepatic Impairment. (Refer to Table 1 in the Argatroban- Dosing and Monitoring Guidelines Physician Order Form) ❖ Initiate Argatroban at 0.5 mcg/kg/min IV for patients with Hepatic Impairment, Heart Failure, Multiple Organ System Failure, Severe Anasarca, or Post Cardiac Surgery. (Refer Physician Order Form for guidelines)	Dose Adjustment as per PTT (Refer to Argatroban- Dosing and Monitoring Guidelines Physician Order Form)	❖ Baseline PTT (Do not start if PTT >45). ❖ Daily CBC ❖ Daily PTT until 2 consecutive PTT levels are in therapeutic range (45-92). ❖ Bleeding Precautions*	No Specific Antidote

*Please see Nursing Alerts

	Indications	Dose	Dose Adjustment	Monitoring	Antidote
ARIXTRA **fondaparinux**	PROPHYLAXIS: ❖ Deep Venous Thrombosis Treatment (DVT) TREATMENT: ❖ Deep Venous Thrombosis Treatment (DVT)/ Pulmonary Embolism (PE)	BODY WEIGHT: ❖ ≥ 50 kg: 2.5 mg SQ once daily BODY WEIGHT: ❖ <50 kg: 5 mg SQ once daily ❖ 50-100 kg: 7.5 mg SQ once daily ❖ >100 kg: 10 mg SQ once daily	CONTRAINDICATION: ❖ Creatinine Clearance: < 30 ml/min…. OR… Body Weight < 50 kg	❖ Baseline CBC w/ Platelets within 48 Hrs prior to 1st dose ❖ Baseline Serum Creatinine within 48 Hrs prior to 1st dose ❖ Daily CBC w/ Platelets x 5 Days then Weekly ❖ Serum Creatinine Weekly ❖ Actual Body Weight ❖ Signs and symptoms of bleeding*	No Specific Antidote

PATIENT EDUCATION

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:

- Bleeding problems.
- Frequent falls.
- Liver or kidney problems.
- High blood pressure.
- Congestive heart failure.
- Onset of diabetes.
- Herbal and/or vitamin/mineral supplement consumption
- Alcohol consumption and/or problems with alcohol abuse.
- Pregnancy or planning to become pregnant.
- Upcoming surgery, including dental work.

Caution Patients About:

- Shaving with a sharp razor (use electric shaver)
- Avoiding flossing
- Using a knife and scissors
- Trimming toenails
- Preventing falls
- Avoiding activities with a high risk of injury
- Avoiding excessive use of alcohol

Educate Patient to Contact a health care provider if notice any signs of:

- Bleeding such as excessive gum bleeding, nose bleeds, heavy menstrual bleeding
- Allergic reaction, such as itching, oral swelling or tingling, or chest tightness.
- Difficulty breathing or swallowing.
- Dizziness, lightheadedness or sudden, severe headache.
- Bruising easily
- Fever, chills, sore throat, cough.
- Bleeding from cuts and wounds that does not stop.
- Prolonged or painful penile erection.
- Purple discoloration of your toes or the soles of your feet.
- Redness, tenderness or pain in your legs or arms.
- Severe stomachache.
- Sudden weakness, especially if only on one side, or difficulty speaking.
- Yellowing of your skin or eyes.

DIETARY RESTRICTIONS & POTENTIAL FOR DRUG INTERACTIONS

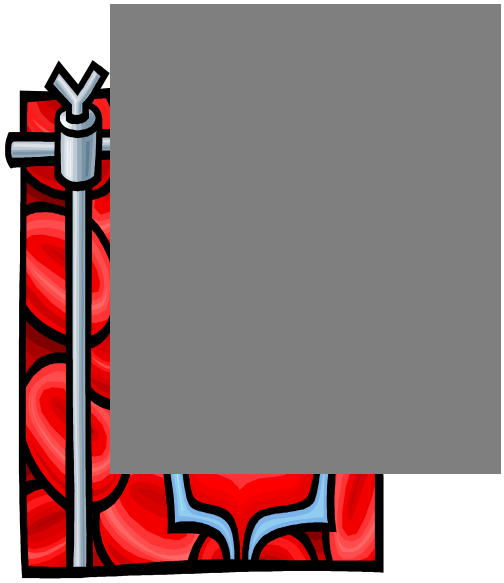
Warfarin sodium can interact with a very wide variety of drugs, both prescription and over-the-counter. Patients must check with their physician before taking ANY other medication, herbal product, or vitamin/mineral supplement. They must be extremely cautious with complementary and alternative medicine (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. Barbiturates, oral contraceptives or hormone-replacement therapy (HRT), and vitamin K – either in a multivitamin or liquid nutrition supplements (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.

Follow the following precautions to Prevent Bleeding:

- Handle patient carefully while turning and positioning
- Maintain pressure on IV and venipuncture sites for at least 5 minutes
- Assist with ambulation and keep walkways /hallways free from cluster to prevent falls.
- Avoid IM injections



Anticoagulants and Drug interactions:

A wide variety of drugs, both prescription and over- the-counter, interact with warfarin and affect its PT/INR. Some of these medications are ibuprofen, naproxen, multi-symptom cold relievers and medications that may contain aspirin, (e.g. as Alka-Seltzer and Pepto-Bismol), stomach acid reducers stomach acid reducers (e.g., Tagamet), antidepressants, antibiotics, and thyroid drugs. Herbal remedies such as garlic, green tea, ginkgo, ginger, St. John's Wort, and fish oil also affects warfarin. Refer to appendix 1 on the next page for a more detailed list.

The other three oral anticoagulants, Pradaxa, Xarelto and Eliquis have less drug-drug interactions than warfarin and no herbal remedies interactions. All anticoagulants must be used in caution when taking concomitantly with antiplatelets such as aspirin, clopidogrel and ticagrelor or NSAIDs such as ibuprofen and ketorolac.

Foods and Anticoagulants:

While diet does affect warfarin and PT/INR levels, the most important thing to remember is that warfarin works best if you keep your diet consistent. Avoid drinking cranberry or grapefruit juice or any cranberry or grapefruit products. Vitamin K is important for blood to clot. Since warfarin works to keep blood from clotting, foods high in vitamin K content decrease the ability of warfarin to thin the blood. Please note that vitamin K should NOT be avoided, but rather, foods high in vitamin K should be consumed in a consistent amount.

Foods Containing Vit. K	Amount	Vit. K (mcg)
Spinach (cooked)	½ cup	444
Kale (cooked)	½ cup	531
Collard greens (cooked)	½ cup	418
Mustard greens (cooked)	½ cup	210
Spinach (raw)	1 cup	145
Broccoli (cooked)	½ cup	110
Brussels sprouts (cooked)	½ cup	109
Lettuce, green leaf (raw)	1 cup	97
Cabbage (cooked)	½ cup	81
Lettuce, romaine (raw)	1 cup	57
Asparagus	4 spears	48
Broccoli (raw)	½ cup	45
Kiwi fruit	1 medium	31
Blackberries, blueberries (raw)	1 cup	29
Pickle, cucumber, dill	1 pickle	25
Grapes (red or green)	1 cup	23
Peas (cooked)	½ cup	19

Appendix 1

Substances that Increase INR

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

Substances that Decrease INR

Drugs	Drugs	Herbals
Carbamazepine (Tegretol)	Ritonavir	Coenzyme Q10
Trazodone (Desyrel)	Antacids	Ginseng
Phenobarbital	Oral Contraceptives	St. John's Wort
Phenytoin (Dilantin)	Estrogens	Excessive intake of Vitamin K
Nafcillin	Corticosteroids	
Rifampin	Quinidine	
Griseofulvin (Grifulvin V, Gris-PEG)	Tamoxifen	

Appendix 2

The Joint Commission National Patient Safety Goal January 13, 2018

Goal 3 Improve the safety of using medications.

NPSG.03.05.01: Reduce the likelihood of patient harm associated with the use of anticoagulant therapy. Note: This requirement applies only to hospitals that provide anticoagulant therapy and/or long-term anticoagulation prophylaxis (for example, atrial fibrillation) where the clinical expectation is that the patient's laboratory values for coagulation will remain outside normal values. This requirement does not apply to routine situations in which short-term prophylactic anticoagulation is used for venous thrombo-embolism prevention (for example, related to procedures or hospitalization) and the clinical expectation is that the patient's laboratory values for coagulation will remain within, or close to, normal values.

Program: Hospital
Chapter: National Patient Safety Goals
Goal 3: Improve the safety of using medications.
Rationale: Anticoagulation therapy can be used as therapeutic treatment for a number of conditions, the most common of which are atrial fibrillation, deep vein thrombosis, pulmonary embolism, and mechanical heart valve implant. However, it is important to note that anticoagulation medications are more likely than others to cause harm due to complex dosing, insufficient monitoring, and inconsistent patient compliance. This National Patient Safety Goal has great potential to positively impact the safety of patients on this class of medications and result in better outcomes. To achieve better patient outcomes, patient education is a vital component of an anticoagulation therapy program. Effective anticoagulation patient education includes face-to-face interaction with a trained professional who works closely with patients to be sure that they understand the risks involved with anticoagulation therapy, the precautions they need to take, and the need for regular International Normalized Ratio (INR) monitoring. The use of standardized practices for anticoagulation therapy that include patient involvement can reduce the risk of adverse drug events associated with heparin (unfractionated), low molecular weight heparin, and warfarin.
Elements of Performance:
1. Use only oral unit-dose products, prefilled syringes, or premixed infusion bags when these types of products are available. Note: For pediatric patients, prefilled syringe products should be used only if specifically designed for children.
2. Use approved protocols for the initiation and maintenance of anticoagulant therapy.
3. Before starting a patient on warfarin, assess the patient's baseline coagulation status; for all patients receiving warfarin therapy, use a current International Normalized Ratio (INR) to adjust this therapy. The baseline status and current INR are documented in the medical record. Note: The patient's baseline coagulation status can be assessed in a number of ways, including through a laboratory test or by identifying risk factors such as age, weight, bleeding tendency, and genetic factors.
4. Use authoritative resources to manage potential food and drug interactions for patients on warfarin.
5. When heparin is administered intravenously and continuously, use programmable pumps in order to provide consistent and accurate dosing.
6. A written policy addresses baseline and ongoing laboratory tests that are required for anticoagulants.
7. Provide education regarding anticoagulant therapy to prescribers, staff, patients, and families. Patient/family education includes the following: - The importance of follow-up monitoring - Compliance - Drug-food interactions - The potential for adverse drug reactions and interactions
8. Evaluate anticoagulation safety practices, take action to improve practices, and measure the effectiveness of those actions in a time frame determined by the organization.

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