Harper Hospital
Detroit Medical Center / Wayne State University

8WS
Cardiology

Table of Contents

Helpful Hints
Dosing Anticoagulation from Central Pharmacy

How should I handle an order which indicates pharmacy to dose (PTD) from central pharmacy?

1. **Complete the anticoagulation PMR with the following info:**
   a. Height and Weight
      - ❖ Call to the floor if the Height and Weight are not available on the physician order sheet.

   b. Indication for Therapy
      - ❖ Can usually make an educated guess based on the information provided on physician order form
      - ❖ **Hint:** Look at the labs and tests ordered by MD and check to see which floors the patient is currently on.
      - ❖ **Pay extra attention to HEPARIN orders written on POST-OP order form. DO NOT BOLUS**
      - ❖ Pay extra attention to Heparin sc orders. Write a formal order to DC Heparin sc.
      - ❖ Verify that patient has not received any LMWH therapy within the last 12-24 hours. Always check inactive orders to ensure no recent LMWH administration. To convert from treatment doses of LMWH sc $\Rightarrow$ IV heparin, determine the time of last LMWH injection.
        - ♦ If patient is on a Q12 dosing regimen, start IV heparin 12 hrs after last dose of LMWH.
        - ♦ If patient is on a Q24h dosing regimen, start IV heparin 24 hrs after last dose of LMWH.
        - ♦ No heparin bolus is recommended for both scenarios.
      - ❖ Examples of common indications:

Potential Indication	Labs ordered	Test ordered	Other Hints
Unstable Angina r/o MI	Cardiac Enzymes: CPK, CKMB, Troponin.	NPO midnight (Could mean for Cardiac Cath or for Stress Test)	Usually written on cardiology pre-printed order form *8WS, 9WS, 6B, ICUs (especially 9ICU)
Atrial fibrillation/ A. flutter			**Check for indication on admission, usually written on the right hand side **May see an order for IV diltiazem or loading of digoxin
R/o Stroke	-	CT Scan or MRI/MRA	4WS **DO NOT BOLUS**
R/O DVT	-	Duplex of extremities	Any floor
R/O PE	-	VQ Scan or Spiral CT	Any Floor
CVVHD			Written on pre-printed order form **ICU only (i.e. 5ICU)

   c. Obtain Labs via CIS or Sunquest:
      - ❖ Get baseline CBC, PTT, PT, Bun/Cr.
      - ❖ Pay attention to low Hgb values. If Hgb < 8 mg/dL—CALL MD to discuss about NO BOLUS dose

   d. Verify the dose based on indication
      - ❖ Calculate the dose based on the weight. Use adjusted body weight if OBESE.
      - ❖ If the physician has written for a dose, and your calculated infusion rate is within 100-200 units/hr of the rate ordered, leave the dose alone. However, if the dose is very low or very high compared to the nomogram, please contact MD to provide a recommendation.

   e. Write for a PTT to be obtained in 6 hours or for AM if close to AM labs. Verify with RN about time of heparin initiation. If on coumadin, be sure a PT/INR is also ordered for AM.
      - ❖ Write the order as: Check PTT in 6 hours. Rush result to pharmacy, #9578. Lab to Draw (if you know that the patient is lab to draw). Could check by calling the floor.

2. **Add the patient to the anticoagulation list on CIS**
3. Enter Yes or NO to Pharmacy to dose in pharmacy note in MsMeds.

Helpful Hints with following up on PTTs from Central

	Things to think about	Action
PTT above target range	1. Check time of PTT draw relative to start of heparin infusion or adjustment. ♦ *It is ideal to wait 6 hours to check levels but 4-5 hours is still ok. Levels drawn immediately after a loading is NEVER reliable thus should be disregarded.* 2. Was it drawn on the opposite arm of heparin infusion? ♦ *PTT should be drawn in the opposite arm. Pay attention to the PMR to see if patient has a central line. PTT is usually not reliable via central line unless flushed well and at least10-15 mL of blood is discarded before collection. Always interpret level with caution. Look at trends.* 3. Verify rate of heparin infusion 4. Ask the RN if patient is having any s/sx of bleeding. ♦ *Document on PMR if any s/sx of bleeding.*	❖ If PTT was drawn at the correct time, in the opposite arm, the heparin rate is accurate, and patient has no s/sx of bleeding, FOLLOW the DMC anticoagulation protocol to hold infusion and decrease rate. ❖ If PTT was drawn on the same arm as heparin infusion, then request RN to redraw and keep the rate the same until result is available. ❖ If patient experiences s/s of bleeding, page MD for further plan.
PTT below target range	1. Check time of PTT draw relative to start of heparin infusion or adjustment. 2. Verify rate of heparin infusion; is it the same as ordered 3. Ask the RN if patient is having any s/sx of bleeding 4. Verify with RN for any interruption in heparin infusion or discontinuation heparin order	❖ If PTT was drawn at the correct time, the heparin rate is accurate, patient has no s/sx of bleeding, and no interruption in heparin infusion, FOLLOW the DMC anticoagulation protocol. Be sure to check PMR carefully to ensure it is safe to BOLUS ❖ If heparin was interrupted, and the rate of heparin is accurate, be sure to check PMR carefully to ensure it is safe to RE-BOLUS. If not ok to BOLUS, maintain the rate the same and reorder PTT in 6 hours. ❖ If patient experiences s/sx of bleeding, page MD for further plan.
If lab not available	1. Ask the RN if blood was drawn	❖ If blood drawn by RN and not available in CIS or Sunquest, call 30714 (anticoagulation lab) and check if sample was lost; may need to request RN to re-draw if sample not found. If pt is LTD, re-order lab for next LTD time (06:30, 09:00, 12:00, 16:00, 22:00) ❖ If INR/PT sample already in lab, tell unit clerk to send transmittal to lab for "add-on PTT to sample in lab and rush result to #9578"; call lab to confirm transmittal received and order can be processed

How should I handle a heparin IV order without a note for PTD (pharmacy to dose) from central pharmacy?

Clarification on when central pharmacy should contact <u>Clinical Pharmacist</u> on the floor with new anticoagulation orders.

- Central pharmacist should call the specialists/clinical pharmacists with **ALL warfarin, IV heparin, and lovenox orders** and leave a copy of the order in appropriate unit bin in drug information. The central pharmacists should document in pharmacy note if pharmacy has been consulted or not, and add to anticoagulation list in CIS.

    1. **During the day shift,** the RPh will take care of all the consults and attempt to contact primary team to get a formal consult on non-consulted patients. If the primary prefers to manage own anticoagulation therapy, the RPh should indicate in MS-MEDS that "Per primary team, MD to f/u" instead of indicating "not consulted"

    2. **During the evening shift (5-9pm),** if the RPh receives a call from central, the RPh should see all consulted patients and patients on the cardiology service (8WS and ICU) since they utilize pharmacy service 100% of the time. If there is time during the evening shift, the RPh will attempt to contact MD to get a formal consult on non-consulted patients.

- Pharmacy doses most of IV heparin in house with the exception of surgery services.

- Services which always utilize pharmacy services include
  Cardiology (8WS; ICUs)
  Medicine (Any floor)
  Neurology (4WS, 4ICU)
  RIM

  <u>Hint:</u> If IV heparin is started on any 8WS or ICU patients, contact MD to get a consult and fill out anticoagulation PMR, and add patient to CIS list.

- Services which do not usually utilize pharmacy services include:
  General Surgery (9WN, 6ICU)-May consult pharmacy for difficult cases
  Cardiothoracic Surgery (9WS)—Starting to use pharmacy a little more now.
  Dr. Melvin Murphy (6B)-If Dr. Ellison is covering for Dr. Murphy, pharmacy usually follows

  <u>Hint:</u> Any IV heparin initiated on these patients could wait until morning, since MD will not consult us, therefore do not need to call.

Helpful Hints
For the pharmacist covering 8WS/Cardiology Service:
Making referral to the Anticoagulation Clinic

** Both anticoagulation clinics will no longer be accepting routine referrals for coumadin therapy. Bridge patients (patients being discharged home on LMWH + warfarin) will be accepted at 8BC clinic. Contact clinic personnel directly with any questions.

****Tips:** 1) Contact ph no. 745-4679 with all questions about referring patients to clinic and obtain an appointment time.

2) If no response, consider contacting the designated pharmacist in the clinic directly and include your pager in the call back number. There may be a delay in the returned calls if the pharmacist is with a patient.

**Be proactive in identifying bridge patients and obtain referrals to the anticoagulation clinics. Do not wait until the day of discharge to recruit patients. All arrangement and counseling MUST be made before weekend shifts. Contact CMS to assist with evaluating insurance coverage for patient.

	Phone/Fax	Comments
4C-UHC	Phone: 53314; Fax: 52962	
8BC-Harper	Phone: 54679: Fax: 59335	
Barb/Denise	Pager:	Physically at 8BC (M –F): support for both clinics
Virginia Tekieli, RPh	Pager: 95790	At 4C
Trupti Mehta, Pharm.D., BCPS	Pager: 95460	At 4C
Bethany Didur, Pharm.D.	Pager: 95698	At 4C
Biljana Popovic, RPh, BCPS	Pager: 9420	At 8BC/4C
Peter Dumo, Pharm.D	Pager: 95817	At 8BC
Jincy John, Pharm.D.	Pager:	At 8BC

To refer a patient to the 4C or 8BC Clinics, the following must be completed:

1. Complete the referral form to the clinic. A copy of the referral form could easily be retrieved from Pharmweb.
   a. To ensure that the referral form is filled out correctly and timely, it is best to complete the referral form and get a verbal order from the physician to refer patient to the clinic. The pharmacist can take a Verbal Order (V.O) order from the physicians on the referral form. Original physician's signature is preferred but NOT required. Based on your clinical judgment, come up with a returned date and contact the clinic to secure an appointment time if space is available.
2. Referrals can be accepted from any physician with an outpatient practice which include interns, residents, fellows, or attending physicians. Referrals can be accepted from the hospitalists group. It is important to make every attempt to identify PCP for these patients, since they will be accepted under the name of the medical director of the clinics and eventually be transferred over to the name of identified PCP.
   a. Fax referral form to clinic and leave the original copy in the coumadin clinic mailbox in pharmacy administration
4. Provide coumadin ± LMWH teaching.
   a. For coumadin counseling, be sure to give a pamphlet and document counseling in patient's chart using pre-printed sticker.
   b. For LMWH teaching, be sure to give the patient a teaching kit (located on the unit; but one can be obtained in DI). Encourage patient to get RX filled at DMC pharmacy at Harper Pro to avoid problem in getting the RX filled post-discharge.

Helpful Hints
Managing Anticoagulation Therapy in Cardiovascular Patients and/or on 8WS

When dosing heparin on 8WS, always keep in mind the following questions:

a. What is the indication for heparin?
b. Is there any procedure being scheduled for the patient?
c. What is plan for this patient with regard to heparin therapy?

The following are common cardiovascular indications for anticoagulation therapy on 8WS:

	Indications	Heparin doses:
Cardiovascular indications	1. Unstable Angina r/o MI 2. Atrial fibrillation or Atrial Flutter (New onset) 3. MVR or AVR 4. Atrial or LV thrombus	60 units bolus, followed by 12 units/kg/hr **Always check if OK to BOLUS**
Non-cardiovascular Indications	1. DVT 2. PE 3. Others	80 units bolus, followed by 18 units/kg/hr **Proactively check the dose, if incorrect call MD to make the change

Patients on anticoagulation therapy may be scheduled for any of the following invasive and non-invasive procedures:

Invasive	Non-invasive	Tips:
Cardiac Cath EP Testing Biventricular Pacemaker ICD implant or repair EGD with potential for biopsy	Stress Test (i.e Adenosine Sestamibi, Dobutamine Stress Echo…) EGD without any biopsy Echocardiogram (Echo) TEE (Transesophageal Echocardiogram) ICD Interrogation Tilt Table Testing for syncope	**Evaluate MD's notes, and actual physician order for date of testing If NPO, it would be for the next day ****Always clarify with team if unsure about plan of action**

When patients are placed on IV heparin, check if a procedure is being scheduled for these patients:

USA r/o MI:	Check for plans for Cardiac Cath or Stress Test
Pre-op	<u>For Cardiac Cath,</u> heparin may be stopped approximately 4-6 hours pre-procedure. However, if a patient is unstable or has persistent chest pain, the physician may elect to continue IV heparin until patient reaches the Cath Lab. Pay attention to when the patient is scheduled for Cardiac Cath to avoid unnecessary repeat PTT draws. <u>Stress Test is non-invasive,</u> thus IV heparin is not required to be discontinued. However, common practice is that IV heparin will be shut off once patient reaches the stress lab. When patient returns to the floor, IV heparin will be off. Thus, need to get clarification from the physician regarding further plans for heparin therapy. If stress test is negative, IV heparin will not be restarted. However if Stress test is positive, IV heparin will be resumed until decision for Cardiac Cath.
Post-procedure	For Cardiac Cath, IV heparin is always off when patient returns to the floor. A POST-CATH pre-printed order form will always be written for these patients. IV Heparin usually does not need to be reinitiated post diagnostic cath or intervention, unless patient develops recurrent chest pain, has multi-vessel disease awaiting CABG, or has an indication for chronic anticoagulation. If no further indication for anticoagulation, IV heparin will be dc'd indefinitely. Verify that an order is written to d/c on the POST-CATH order. If not there, get a formal order to d/c heparin and sign off. If there is an indication for anticoagulation, discuss with MD to start heparin after the FEMSTOP has been removed and patient has no s/s of bleeding. In general, when a patient returns to the floor, the fellow will come up to the floor 3-4 hrs post-op (but may vary) to pull the Arterial Sheath. The FEMSTOP or Sandbag will be applied after the removal of arterial sheath, and it will remain in place for about 6 hours (or more) until hemostasis occur. It is safe to resume heparin once FEMSTOP is removed and patient has no s/s of bleeding. **NEVER BOLUS heparin due to increased risk for groin bleeding. Always verify with MD when in doubt.

AF/AFl, MVR/AVR	**Check if the following procedures are being planned:** **Electrophysiology testing (EP Procedure), TEE (Transesophageal Echocardiogram), Echocardiogram, EGD**
Pre-op:	Patients going for the following procedures will require Heparin to be dc'd about 4-6 hours pre-procedure: a. EP procedure, ICD implant or repair b. Misc: PEG tube, or PICC line placement, EGD… Patients scheduled for the following non- invasive procedures will not require d/c of IV heparin: a. Echo, TEE, stress test
Post-op:	IV Heparin usually does not need to be reinitiated post procedure, unless patient has an indication for chronic anticoagulation. If no further indication for anticoagulation, IV heparin will be dc'd indefinitely. Verify that an order is written to d/c a POST-OP order If not there, get a formal order to d/c heparin and sign off. If there is an indication for anticoagulation, ALWAYS discuss with MD when to start heparin. Time to initiation of IV heparin/and coumadin depends on the procedure and indication for anticoagulation. If patient returns to the floor from the EP lab, a POST-EP order will always be written for these patients. 1. NEVER BOLUS heparin in these patients. Always verify with MD when in doubt. 2. IV heparin is usually restarted 12-24 hours, and up to 48 hours post-procedure without a bolus, provided that there is no hematoma around the surgical site. However if the indication for anticoagulation is MVR, heparin should be started within 6-12 hours post procedure without a BOLUS. Pay extra attention to these patients along with CBC since high risk for bleeding. 3. Team often bridge these patients out if patient is stable, therefore should plan early to avoid last minute bridging. ***Be extra conservative with coumadin, consider avoid loading due to increased risk for bleeding at the surgical site—Discuss plan with team.

Helpful Hints
Post-operative management of anticoagulation therapy

Always ask yourself the following questions when managing anticoagulation therapy in the POST-OP patients:

1. **Will this patient need further anticoagulation therapy?**
   If no, then should sign off
   If yes, then verify with team on when to resume heparin IV.

   Time to initiation of IV heparin depends on the following parameters:
   a. Indication for anticoagulation: If MVR, could restart about 6 hours post procedure. However, should delay up to 12 hours if primary team is concerned about bleeding.
   b. The invasiveness of the procedure: If there was a lot of blood loss during the procedure, and it was cut into the muscle, there may be a delay to initiation of heparin
   c. S/sx of bleeding: The physician should evaluate the surgical sites for s/s of hematoma. Presence of hematoma around incision site and further decrease in Hgb/Hct will delay initiation of heparin therapy.

   In general, IV heparin/warfarin will be delayed between 12-24 hours and up to 48 hours if primary team is concerned about bleeding.

2. **Is it safe to bolus this patient?**
   As a general rule, **NEVER BOLUS these patients**. The risk for bleeding outweighs the benefits. When in doubt, always page the primary team. NEVER Assume. If the physician wrote to bolus the patient, consider calling the physician to recommend discontinuation of the bolus dose otherwise they may bleed later.

   Indicate on the anticoagulation PMR, the date of procedure and mark the box "**DO NOT BOLUS**" to avoid unnecessary bolus dose.

3. **Will this patient need to be restarted back on warfarin and when is it safe to do so?**
   If no other procedures are being scheduled for patient, patient's Hgb/Hct are stable, and no hematoma around the surgical site are noted by the physician's note, contact the primary team to restart warfarin. Would be safe to restart warfarin within 12-24 hours if no s/s of bleeding.

   Avoid loading doses of warfarin. Verify with primary team when in doubt. At times, the team has no intention of reloading these patients due to history of increased sensitivity to warfarin or concern about bleeding. However there are occasions where the physician will load the patient.

4. **Is this patient stable to be discharged home?**
   If the patient is stable post procedure and there are no other acute medical problems, the primary team will often consider bridge-out therapy. Start planning early to avoid a last minute bridging decision by primary team. Could consider planning this before going for procedure. Discuss with CMS to assist with insurance coverage and talk to team regarding the potential for enrolling patient in the anticoagulation clinic.

TIPS:

1. Monitor these patients carefully.
2. Check physician's progress notes and nursing notes for s/s of bleeding daily and every time an adjustment is made
3. Order Hgb/Hct/Plt daily and more frequently if a decreased trend in Hgb/Hct is noted. Notify MD immediately if a decrease in values is noted.
4. Dose these patients conservatively.
5. **DO not BOLUS Heparin IV in post-op patients.**

Heart Failure Maintenance Agreement: Teaching Document

<table>
<tr><td>Ace Inhibitors (ACE-I)</td><td colspan="2">Used for: hypertension, heart failure, myocardial infarction, diabetic nephropathy

Mechanism of Action (MOA):
-Competitive inhibitor of angiotensin-converting-enzyme (ACE), prevents conversion of angiotensin I to angiotensin II, a potent vasoconstrictor, which results in lower levels of angiotensin II and causes vasodilation (↓ preload and afterload) and reduction in aldosterone secretion

Clinical benefits:
-prevent cardiac remodeling, relieve heart failure symptoms, improve exercise tolerance, reduce hospitalizations, reduce mortality</td></tr>
<tr><td>Nursing Implications</td><td colspan="2">Monitoring parameters:
-blood pressure (upon initiation and during titration of therapy)
-BUN, serum creatinine
-Potassium (K^+)

Adverse effects:
-hypotension
-dizziness (avoid driving until response to medication is known)
-hyperkalemia (caution patient to avoid salt substitutes or foods high in K^+)
-↑ BUN, serum creatinine
-renal failure (avoid in renal artery stenosis)
-dry persistent cough (Notify MD if occurs; subsides with discontinuation)
-angioedema (swelling of face, lips, tongue, or throat – notify MD if occurs and discontinue medication)</td></tr>
<tr><td rowspan="11">Ace Inhibitors</td><td>Generic Name</td><td>Trade Name</td></tr>
<tr><td>Benazepril</td><td>Lotensin</td></tr>
<tr><td>Captopril</td><td>Capoten</td></tr>
<tr><td>Enalapril</td><td>Vasotec</td></tr>
<tr><td>Enalaprilat (IV)</td><td>Vasotec (IV)</td></tr>
<tr><td>Fosinopril</td><td>Monopril</td></tr>
<tr><td>Lisinopril</td><td>Prinivil/Zestril</td></tr>
<tr><td>Perindopril</td><td>Aceon</td></tr>
<tr><td>Quinapril</td><td>Accupril</td></tr>
<tr><td>Ramipril</td><td>Altace</td></tr>
<tr><td>Trandolapril</td><td>Mavik</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Angiotensin II Receptor Blockers (ARBs)</td><td colspan="2">Used for: hypertension, heart failure, recommended for patients unable to tolerate ACE inhibitors due to cough

MOA:
-Competes with angiotensin II for tissue binding sites, blocks the effects of angiotensin II, leading to vasodilation and reduction in aldosterone secretion, similar to the effects of ACE inhibitors</td></tr>
<tr><td>Nursing Implications</td><td colspan="2">Monitoring parameters:
-See ACE Inhibitors</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">Adverse effects:
-See ACE Inhibitors
-Reduced occurrence of nonproductive (dry) cough</td></tr>
<tr><td rowspan="8">Angiotensin II Receptor Blockers</td><td>Generic Name</td><td>Trade Name</td></tr>
<tr><td>Candesartan</td><td>Atacand</td></tr>
<tr><td>Eprosartan</td><td>Teveten</td></tr>
<tr><td>Irbesartan</td><td>Avapro</td></tr>
<tr><td>Losartan</td><td>Cozaar</td></tr>
<tr><td>Olmesartan</td><td>Benicar</td></tr>
<tr><td>Telmisartan</td><td>Micardis</td></tr>
<tr><td>Valsartan</td><td>Diovan</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Beta-Blockers</td><td colspan="2">Used for: hypertension, angina pectoris, cardiac arrhythmias, myocardial infarction, heart failure (Other uses: alcohol withdrawal, anxiety states, hyperthyroidism, tremor, migraine prophylaxis, portal hypertension, glaucoma)

MOA:
-Beta-1 receptor sites are located chiefly in the heart, where stimulation results in increased heart rate, contractility, and AV conduction.
-Beta-2 receptor sites are found mainly in bronchial and vascular smooth muscle, where stimulation results in dilation.
-Beta-blockers are competitive inhibitors of beta-adrenergic receptor sites and antagonize the effect of norepinephrine.
-Beta-blockers may be selective for beta-1 receptors (e.g. atenolol and metoprolol), resulting in decreased heart rate, blood pressure, contractility
-Other beta-blockers are considered non-selective, blocking both beta-1 and beta-2 receptors (e.g. carvedilol, labetalol, pindolol)
-Beta-1 selective blockers are preferred in patients with asthma or other bronchospastic disorders

Clinical benefits:
-slow progression of heart failure, improve ejection fraction, reduce hospitalizations, reduce mortality</td></tr>
<tr><td>Nursing Implications</td><td colspan="2">Monitoring parameters:
-blood pressure (upon initiation and during titration of therapy)
-heart rate (if HR < 50, notify MD and hold medication)
-shortness of breath
-bronchospasm

Adverse effects:
-hypotension (caution patient to make position changes slowly to minimize orthostatic hypotension)
-bradycardia
-dizziness (avoid driving until response to medication is known)
-bronchospasm (more likely with nonselective B-Blockers)</td></tr>
</table>

	-may mask signs of hypoglycemia in diabetics (B_1-blockade: mask tachycardia; B_2-blockade of peripheral skeletal muscle: mask tremors; sweating, nausea, and hunger remain intact) -avoid abrupt discontinuation; may precipitate angina if suddenly stopped -may increase sensitivity to cold	
Beta Blockers	Generic Name	Trade Name
	Acebutolol	Monitan or Sectral
	Atenolol	Tenormin
	Betaxolol	Kerlone
	Bisoprolol	Zebeta
	Carteolol	Cartrol
	Carvedilol	Coreg
	Esmolol	Brevibloc
	Labetalol	Normodyne
	Levobunolol	Betagen (eye gtts)
	Metoprolol tartrate	Lopressor
	Metoprolol succinate (long-acting)	Toprol
	Nadolol	Corgard
	Pindolol	Visken
	Propranolol	Inderal
	Sotalol	Betapace
Diuretics	Used for: edema due to heart failure or other causes, hypertension MOA: -Inhibits reabsorption of sodium and chloride in the renal tubules, which results in ↓ preload, leading to ↓ edema and ↓ pulmonary congestion -Loop diuretics act in the ascending loop of Henle and induce a beneficial increase in renal blood flow -Thiazide diuretics act in the distal tubule and are relatively weak diuretics and may only be effective in the early stages of heart failure or used in combination with loop diuretics -Potassium sparing diuretics have weak diuretic and antihypertensive properties and are used mainly to conserve potassium in patients receiving thiazide or loop diuretics. Clinical benefits: -symptom relief, no effect on long-term survival	
Nursing Implications	Monitoring parameters: -fluid status, I/O, urine output, patient weight -signs and symptoms of volume overload (SOB, rales, edema, JVD) (diuretics dosages are titrated according to body weight and severity of symptoms) -blood pressure, heart rate (monitor before and during administration) -electrolytes (monitor signs of electrolyte imbalance, e.g. hypokalemia) Adverse effects: -hypokalemia	

	(most common and serious metabolic disturbance associated with both thiazide and loop diuretics; hypokalemia can precipitate ventricular arrhythmias in heart failure patients, especially if they are also taking digoxin; instruct patient to consult health care professional regarding dietary potassium guidelines) -hypomagnesemia, hypocalcemia, hyperuricemia, gout (loop diuretics) -photosensitivity -hypotension (caution patient to make position changes slowly to minimize orthostatic hypotension) -Avoid thiazide diuretics if patient has sulfa allergy; thiazides may exhibit cross sensitivity with other sulfonamides

Diuretics	Generic Name	Trade Name
Thiazides	Chlorthalidone	Hygroton
	Hydrochlorothiazide (HCTZ)	Hydrodiuril
	Indapamide	Lozol
	Metalozone	Zaroxolyn
Loop	Bumetanide	Bumex
	Ethacrynic Acid	Edecrin
	Furosemide	Lasix
	Torsemide	Demadex
Potassium-Sparing	Amiloride	Midamor
	Triamterene	Dytac
	HCTZ/Triamterene (combo)	Dyazide, Maxzide
	Spironolactone	Aldactone
	Eplerenone	Inspra

Aldosterone Receptor Antagonists	Used for: edema in patients with heart failure (NYHA Class III or IV) or disorders associated with excessive aldosterone excretion MOA: -Competes with aldosterone for receptor sites in the distal renal tubules (potassium-sparing diuretics); increases sodium chloride excretion while conserving potassium Clinical benefits: -relieve heart failure symptoms, reduce hospitalizations, reduce mortality in addition to ACE-I therapy
Nursing Implications	Monitoring parameters: -Potassium (K^+) -BUN, serum creatinine -fluid status, I/O, urine output, patient weight

<table>
<tr><td></td><td colspan="2">Adverse effects:
-hyperkalemia
-gynecomastia (decreased incidence with eplerenone)</td></tr>
<tr><td rowspan="3">Aldosterone Receptor Antagonists</td><td>Generic Name</td><td>Trade Name</td></tr>
<tr><td>Spironolactone</td><td>Aldactone</td></tr>
<tr><td>Eplerenone</td><td>Inspra</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Digoxin</td><td colspan="2">Used for: heart failure, atrial fibrillation/flutter, supraventricular tachycardia

MOA:
-heart failure: inhibits the sodium/potassium ATPase pump which acts to increase the intracellular sodium-calcium exchange to increase intracellular calcium leading to increased myocardial contractility
-supraventricular arrhythmias: direct suppression of the AV node conduction to increase effective refractory period and decrease conduction velocity

Clinical benefits:
-symptom relief, no mortality benefit</td></tr>
<tr><td>Nursing Implications</td><td colspan="2">Monitoring parameters:
-renal function (digoxin primarily undergoes renal elimination)
-digoxin level (if changes in renal function, suspect noncompliance or toxicity, to assess clinical response)
-potassium level (hypokalemia may potentiate digoxin toxicity)
-magnesium level (hypomagnesemia may potentiate digoxin toxicity)
-signs of toxicity (nausea, vomiting, diarrrhea, bradyarrhythmias, visual disturbances-blurred or green-yellow vision)
-drug interactions (e.g. amiodarone, quinidine, verapamil ↑ serum digoxin concentrations)

Adverse effects:
-bradycardia
-heart block
-gastrointestinal effects (toxicity)
-visual disturbances (toxicity)</td></tr>
</table>

Statins	Used for: lowering cholesterol in patients with coronary artery disease or hypercholesterolemia to slow the progression of myocardial infarction. Coronary artery disease is the underlying cause of heart failure in approximately two-thirds of patients with left ventricular systolic dysfunction. MOA: -Inhibit the enzyme HMG-CoA reductase and interrupt the conversion of HMG-CoA to mevalonate, the rate-limiting step in new cholesterol biosynthesis -Total cholesterol, LDL cholesterol ("bad cholesterol") and triglycerides are reduced and HDL ("good cholesterol") is increased in a dose-related manner
Nursing Implications	Monitoring parameters: -liver function tests (at baseline, 6-12 weeks after initiation and any dosage increase and every 6 months thereafter) -CPK levels (creatine phosphokinase) -serum cholesterol (total, LDL, HDL) and triglycerides Adverse effects: -liver enzyme elevations -myopathy (instruct patient to notify health care professional if unexplained muscle pain, tenderness, or weakness occurs) -Advise patient that drug needs to be used in conjunction with dietary restrictions, exercise, and cessation of smoking.

Statins	Generic Name	Trade Name
	Atorvastatin	Lipitor
	Fluvastatin	Lescol
	Lovastatin	Mevacor
	Pravastatin	Pravachol
	Rosuvastatin	Crestor
	Simvastatin	Zocor

Detroit Medical Center
Wayne State University

Nesiritide (Natrecor) Order Sheet

ALLERGIES: ☐ **NKDA**

Estimated or Actual (circle one)
Wt_____lb Ht_____in
Wt_____kg Ht_____cm

☐ CHM
☐ DRH
☐ HUH
☐ HTZ
☐ HVSH
☐ RIM
☐ SGH
☐ TOSH

USE BALL POINT PEN – PRESS FIRMLY

MEDICATION ORDERS ONLY

DATE **TIME**

DMC Guidelines:

- Consider consulting cardiology service during nesiritide use
- Restricted to ICUs, ED/Observation, and specific telemetry units only
- Blood pressure: SBP>90 mm Hg in ICU/ED
  SBP>120 mm Hg on telemetry units
- Failure of appropriate IV diuretic therapy
- NYHA Class IV acutely decompensated heart failure with dyspnea at rest requiring IV therapy
- Elevated cardiac filling pressure (PCWP > 18 mm Hg or by clinical exam)
- No cardiogenic shock or contraindication to vasodilators
- Should concomitantly receive diuretic therapy

Diuretic:

☐ Furosemide _____mg IVP every _____hours

☐ _____

Nesiritide

☐ **Bolus** 2 mcg/kg over one minute = **_____mL**

☐ **Continuous infusion** @ 0.01 mcg/kg/min
or _____mcg/kg/min = **_____mL/hr**

- **Contact MD if SBP <90 mm Hg**
- **Hold Nesiritide if SBP <80 mm Hg or symptomatic hypotension**

Recommended dose:
Bolus: **2mcg/kg** Continuous infusion: **0.01 mcg/kg/min**

Weight (kg)	Bolus dose (mL)	Infusion (mL/hr)
55	18.3	5.5
60	20.0	6.0
65	21.7	6.5
70	23.3	7.0
75	25.0	7.5
80	26.7	8.0
85	28.3	8.5
90	30.0	9.0
95	31.7	9.5
100	33.3	10.0
105	35.0	10.5
110	36.7	11.0

Final nesiritide concentration = 1.5mg/250mL D_5W (6 mcg/mL)
Recommended duration of infusion: 24 to 48 hrs

PHYSICIAN'S SIGNATURE/BEEPER NUMBER	DATE/TIME
NURSE'S SIGNATURE DATE/TIME	UNIT CLERK DATE/TIME

STANDARD TURNAROUND TIMES
STAT 20 MIN NOW 1 HR ROUTINE 4 HRS

ALL OTHER ORDERS

DATE **TIME**

ADMIT SERVICE_____

ADMIT TO

☐ ICU_____

☐ Telemetry Unit: _____

☐ ED/Observation:_____

ATTENDING_____

INTERN/RESIDENT_____

DIAGNOSIS (Check all that apply)

☐ Systolic Dysfunction ☐ Diastolic Dysfunction

☐ New Onset Heart Failure ☐ Acute Exacerbation of Chronic Heart Failure

☐ Heart Failure with Concurrent Chest Pain

☐ _____

CODE STATUS_____

CONSULT

☐ Cardiology: Dr._____

☐ _____

LABS

☐ Electrolytes, Magnesium

☐ _____

MONITORING

☐ ICU monitoring ☐ Telemetry monitoring

☑ Blood pressure monitoring:
- At 15 min, 30 min, 1 hr after initiation of medication
- Every 1 hr for the first 3 hrs
- Every 3 hrs thereafter

☑ Height and weight documented on order sheet

☑ Obtain weight upon admission and daily weights using the same scale

☑ Strict Daily I & O; Record I & O every shift at bedside chart

PHYSICIAN'S SIGNATURE/BEEPER NUMBER	DATE/TIME
NURSE'S SIGNATURE DATE/TIME	UNIT CLERK DATE/TIME

Original- Chart Copy- Pharmacy

Helpful Hints
For the pharmacist dosing dofetilide therapy

For new consults on initiation of dofetilide therapy:

1. Patient must be in ICU or 8WS.
   - MD should be notified to make arrangement for transfer if patient is on another floor.
   - Continuous ECG monitoring is required for a minimum of 3 days, or 12 hrs after conversion, whichever is longer
2. **Work up the patient similar to a consult for anticoagulation therapy**
   - Please note that all these patients are on warfarin as well, so we should get MD to consult us on anticoagulation therapy.
3. **Obtain the following:**
   - Weight and height
   - Baseline labs: electrolytes (potassium, magnesium, serum creatinine)
   - Order baseline 12 lead ECG. Cardiology fellow or attending to evaluate QTc interval
4. **Evaluate for contraindicated medications**
5. **Patient is a candidate to receive dofetilide if meet all the below criteria (4 criteria):**
   - **Baseline QTc** ≤ 440 msec (≤500 msec with ventricular conduction abnormalities, ≤ 540 msec with pacemaker)
     - ECG must be evaluated by cardiology fellow or attending
   - **Baseline K ≥ 4 mEq/L and Mg ≥2 mg/dL**
     - If levels are low—MUST be repleted a few hours before first dose. Repeat levels may not to be necessary, unless K and Mg are very low to start with.
   - **Baseline creatinine clearance** > 20ml/min; Contraindicated in ESRD or CrCL < 20mL/min
   - **Discontinue all contraindicated medications**, including all antiarrhythmic agents.
     - Note: Ideal to discontinue class I and III antiarrhythmics for at least 3 half lives due to potential increased in proarrhythmic effects. The increased in proarrhythmic effect is theorized and has not been documented in clinical practice. The consensus of our electrophysiology service at Harper is to discontinue class I and III antiarrhythmics the night before and start dofetilide the next day. These patients should be monitored closely. The primary team should be communicated about the potential ADRs.
     - If patient came in on amiodarone, discontinue amiodarone, order amiodarone level same day or next morning for baseline purposes (Results will not be available for about 4-5 days). Goal is to have plasma concentration < 0.3.
6. **If patient is a candidate for dofetilide, pharmacist should:**
   - **Calculate CrCl** to determine the first dose, and page Cardiology fellow at #6666 to write the order for the first dose. If CrCl is borderline, consider recommending a higher dose rather than a lower dose (Example: CrCl ~ 50-55mL/min, and the patient appears to be dehydrated –I would consider giving 500mcg rather 250 mcg, and monitor closely daily since efficacy is dose related)
     - To avoid delay in medication being ordered and meds getting to the floor, the pharmacist could offer to help write up the preprinted order sheet and tube the order down to pharmacy ASAP (Optional).
   - **Ensure all the 3 preprinted orders are inserted in the patient's chart** with the first dose being on the top
   - **Insert a dosing monitoring form, dosing algorithm, Stadtlander's Pharmacy Enrollment** form in front of the chart
7. **The pharmacist provides the patient a resource kit and verbal teaching** to patient on the first day or second day. Patient teaching **is mandatory.**
8. **Monitoring parameters during the initiation phase of dofetilide therapy:**
   - Check electrolytes (potassium and magnesium levels) daily to ensure levels are within therapeutic range and serum creatinine is stable.

- If electrolytes are below therapeutic range, consider calling the MD to get a v.o to replete lytes, and consider a scheduled dose of magnesium oxide (MagOx 400mg BID or TID with meals) or K-dur (20meq – 40mEq BID with meals) if on diuretic.
- Once the 3rd preprinted order is written, further physician order is not necessary. The 3rd preprinted order sheet is for the maintenance dose.
- Once the maintenance dose is established (after the 3rd dose), have the fellow write up 2 prescriptions:
  - One Rx to tube to central pharmacy to obtain a 7-day supply for the patient
  - One Rx to fax to the mail order pharmacy for patient to get home supply
  - Check to make sure the enrollment form has been completed and faxed to mail order pharmacy. If not completed by MD, need to fill it out, and obtain signature of fellow or attending and fax it as soon as possible. Always fax the financial sheet along with it for insurance purposes.

For new consults on dofetilide therapy being continued from home:

1. We prefer to keep these patients on 8Ws or ICU. However, it they are on another floor and there is no bed on 8WS, then it's ok for them to receive dofetilide on the regular floor at Harper once OK by cardiology fellow.
2. Ensure the 1st order sheet is filled out to indicate the patient is continuing on home dose of dofetilide therapy.
2. Interview patient to obtain the usual dosing time interval at home. If possible keep patient on the same dosing time.
3. Evaluate admission CrCL to make sure dose it is appropriate for renal function. If dose is higher than calculated CrCl, discuss with MD to decrease dose. If dose reduction need to be made, patient should be transferred to 8WS for monitoring.
4. Evaluate electrolytes (K and Mg) to make sure within normal limits. If not, consider replacement therapy.
5. ECG monitoring is not necessary unless dosage change was made due to decline in renal function. If renal function improves during the course of hospitalization, consider change back to home dose.
6. Write a progress note in patient's chart on the first day.
7. This patient will be on coumadin as well, therefore we should complete a consult for anticoagulation therapy.
8. If the patient is continued on the same dose at home, daily note about dofetilide therapy is not necessary. Just need to monitor on the side to ensure renal function remains unchanged.

For evening shift follow up:

1. If the patient came in during evening shift for initiation of new dofetilide therapy, follow the steps for NEW consults for dofetilide therapy.
   - Ensure patient is on 8WS or ICU, if not inform MD to transfer the patient
   - Order electrolytes and Cr, baseline QTc (Cardiology fellow will evaluate ECG)
   - Calculate CrCL, replace K+ and Mg +2 if below therapeutic range
   - Discontinue all contraindicated medications. If patient was on an absolute contraindicated medications, consider initiating dofetilide next morning.
   - Page cardiology fellow (#6666) to write the initial dose. Base on the request of the fellow, the RPh could write the order for the fellow and have the fellow co-sign the order later (Optional).
   - Ensure the medication get to the floor in a timely manner.
   - Notify the RN when to give the medication and check ECG (2-3 hours post dose)
2. For those that were admitted during the day with the first dose given around 6pm, the pharmacist could consider checking on these patients around 10pm to ensure the next dose has been ordered for these patients. If the order is not there, check with RN if they had called the on call

fellow (pager #6666). If MD was notified, but did not come, could request RN to call again for an order for the morning.

- Note: It's important that the order is written since the morning dose could be missed.

For weekend follow up:

1. Check to make sure MD has supplemented potassium and magnesium if levels are below target range. Please check on K and Mg in AM and notify MD early for replacement. Don't wait until afternoon to check since MD often orders electrolyte replacement late during the day, which may not be appropriate because electrolytes should be normalized before the next dose.
2. Check to make sure the next dose has been written for the patient. There are a total of 3 pre-printed order sheets (First sheet for 1st dose, 2nd sheet for 2nd dose, and 3rd sheet for the maintenance dose). If the 3rd preprinted order sheet has been written in the chart then further physician orders are not necessary.
3. If patient is being discharged on the weekend, check to make sure the discharged was done correctly. These steps should already been taking care by the pharmacist during the weekdays. However should still check to make sure:
   - Pharmacy enrollment forms was filled out and faxed
   - Patient received 7-day supply of dofetilide
   - An RX has been faxed to mail order pharmacy for patient's home supply
   - Patient teaching has been completed and patient has a resource kit

Harper Hospital/ RIM
Detroit Medical Center
Dofetilide (Tikosyn®) Initiation Process

Initial Screening

1. Admit/ transfer to ICUs or telemetry unit. Dofetilide is restricted to ICUs/8WS, cardiology services and certified dofetilide prescribers.

2. All dofetilide orders should be written by authorized dofetilide prescribers, or under supervision of authorized dofetilide prescribers while patient is in the hospital. All new patients initiated on dofetilide therapy or continued on dofetilide from home require clearance from cardiology services.

3. Continuous ECG monitoring is provided for a minimum of 3 days or 12 hours after conversion, whichever is longer.

4. Obtain height, weight and baseline 12-lead ECG, potassium, magnesium, serum creatinine within 24 hours of initiation of dofetilide.

5. Replace low potassium if level is <4.0 mEq/L and low magnesium if level is <2.0 mg/dL prior to initiation of dofetilide. Standing order for daily supplement should be scheduled if necessary.

6. Cardiology attending or fellow evaluates baseline QT/QTc interval. If baseline QTc interval is greater than 440 msec (or 500 msec in patients with ventricular conduction abnormality), dofetilide is CONTRAINDICATED.

7. Once QTc is documented in the chart, call clinical pharmacist at Pager# 9578 for assistance with the following (if needed):
   - To calculate creatinine clearance. If baseline value is <20 mL/min, dofetilide is CONTRAINDICATED.
   - To evaluate drug-drug interactions with dofetilide (see Drug Interaction Sheet)
     a) Contraindicated medications and previous Class I or III antiarrhythmic agents must be discontinued for a minimum of 3 half-lives or, in case of amiodarone, at least 3 months or the plasma level is <0.3 mcg/ml prior to initiation of dofetilide.
     b) Other drugs with potential interaction with dofetilide should be discontinued if possible. If it cannot be discontinued, the potential interaction should be noted and monitored carefully.
   - To write order for appropriate starting dose on Dofetilide Order Sheet#1 if the patient meets all criteria (normal potassium and magnesium, QTc<440 or 500 with ventricular conduction abnormality and CrCl>20 ml/min).

Creatinine Clearance (mL/min)	First dose
>60	500 mcg
40-60	250 mcg
20-<40	125 mcg
<20	Contraindicated

8. MD completes Stadtlander's Pharmacy Service Enrollment and fax to Stadtlander's Pharmacy at 1-800-221-0504. Patient's complete name, home address, insurance, drug interaction information and prescriber's signature are required. Enrollment should be completed as soon as possible, preferably prior to the first dose, to allow sufficient time for Stadtlander's Pharmacy to verify insurance coverage and obtain prior authorization if needed.

First dose

1. When Central Pharmacy receives Dofetilide Order Sheet#1, a pharmacist verifies that all contraindicated medications are discontinued, QTc is documented, dofetilide dose is appropriate based on CrCl provided, and rationale for dofetilide is documented.
   - If dofetilide is being prescribed for cardioversion, the pharmacist will handle the order as a STAT order.
   - If dofetilide is prescribed for maintenance of normal sinus rhythm, the pharmacist will enter the order as "one time only" for the closest dofetilide administration time (either 0600 or 1800) and dispense per usual pharmacy protocol. However, the order should be handled as a STAT order if it is received close to administration time or indicated by MD.

2. At the scheduled time, a nurse administers initial dofetilide dose after verifying that the patient is not receiving any contraindicated medications, has normal potassium and magnesium.

3. A 12-lead ECG and a MCL1 will be obtained 2 to 3 hours after the dose is given. Cardiology attending or fellow will be notified when post-dose ECG is available to determine the QTc interval and document it on the Dofetilide Order Sheet#2 and dofetilide tracking sheet in patient's chart.

4. Based on the QTc interval, the physician prescribes subsequent dofetilide dose using the dofetilide Order Sheet #2. If QTc increases by greater than 15% from baseline or the QTc is greater than 500 msec (or 550 msec in patients with ventricular conduction abnormality), the dofetilide dose should be reduced as listed.

Starting 1st Dose based on CrCl	2nd dose adjusted for QTc prolongation
500 mcg	250 mcg (12 hr after 1st dose)
250 mcg	125 mcg (12 hr after 1st dose)
125 mcg	125 mcg (24 hr after 1st dose)

Second dose

1. When Central Pharmacy receives Dofetilide Order Sheet #2, a pharmacist programs the subsequent "one time only" dofetilide order after verifying that QTc was documented. Next dose is programmed 12 hours (or 24 hours if 2nd dose is decreased from the 1st dose of 125 mcg) after the first dose and dispenses it per usual pharmacy protocol.

2. At the scheduled time, a nurse administers second dofetilide dose after verifying the dose.

3. A 12-lead ECG and a MCL1 will be obtained 2 to 3 hours after the dose is given. Cardiology attending or fellow will be notified when post second-dose ECG is available to determine the QTc interval and document it on the Dofetilide Order Sheet#3 and dofetilide tracking sheet. If QTc interval increases by greater than 15% from baseline or the QTc is greater than 500 msec (or 550 msec in patients with ventricular conduction abnormality), the dofetilide dose should be DISCONTINUED. If the QTc is not prolonged, physician orders the maintenance dose of dofetilide on Dofetilide Order Sheet#3.

Third dose and maintenance dose

1. When Central Pharmacy receives dofetilide order sheet #3, a pharmacist programs the order on 0600-1800 schedule, after verifying that the QTc was documented, and dispenses the next dose per usual pharmacy protocol.

2. Cardiology attending or fellow evaluates the QTc 2-3 hours after each subsequent dofetilide dose up to at least 5 doses. Longer QTc monitoring is at discretion of physician. If QTc interval increases by greater than 15% from baseline or the QTc is greater than 500 msec (or 550 msec in patients with

ventricular conduction abnormality) at any time after 2nd dose, the dofetilide dose should be DISCONTINUED.

Discharge Plan

1. Designated pharmacist or nurse provides a Patient Resorce Kit and medication teaching, and informs the patient regarding follow-up schedule to monitor renal function, electrolytes and QTc interval.

2. When final dofetilide dose is known, physician completes an outpatient prescription for dofetilide on regular prescription order form.
   - Fax a copy of prescription to Stadtlander's Pharmacy for patient's home shipment at 1-800-426-9613. Alternatively, physician may contact Stadtlander's Pharmacy (1-888-671-7465) to prescribe the patient's outpatient dofetilide therapy. Patient's full name, address and insurer is required.
   - The actual outpatient prescription then should be sent to Central Pharmacy to obtain 7-day free supply of dofetilide.
   - If the patient is indigent, physician can consult social worker for assistance with indigent supply. Indigent program phone number is 1-888-609-4375.

3. When Central Pharmacy receives the outpatient dofetilide prescription, a pharmacist dispenses a 7-day free-of-charge supply for patient as the Emergency Fund. The billing code on MS Meds must be manually changed to "EFND". The discharge supply should be sent back to the patient care area as soon as possible.

4. As patient's discharge is planned, discharging physician and nurse verify that the patient has received the 7-day discharge supply of dofetilide, the Tikosyn Resource kit and medication teaching.

5. The patient's general practitioner should be informed that the patient is now on dofetilide and warned of contraindicated medications and necessary monitoring.

6. Follow-up visit should be scheduled to monitor ECG, electrolytes and serum creatinine in 1-2 weeks, 1 month and 3 months after discharge.

TIKOSYN (Dofetilide) DRUG INTERACTIONS

I. ABSOLUTE CONTRAINDICATIONS: Discontinue prior to initiation of dofetilide

1. Cimetidine (Tagamet)
2. Verapamil (Calan, Isoptin, Verelan)
3. Ketoconazole (Nizoral)
4. Trimethoprim (Trimpex, Prolopam)
5. Trimethoprim/ Sulfamethoxazole (Bactrim, Septra)
6. Prochlorperazine (Compazine)
7. Megestrol (Megace)
8. Hydrochlorothiazide (Hydro-Diuril)

II. CAUTION: Notify prescriber if the patient is taking any of the following medications. Consider discontinuing prior to dofetilide therapy if possible.

A. The following medications may prolong QTc intervals

Tricyclic antidepressant class
Antipsychotic agents
Phenothiazine class
Haloperidol (Haldol)
Promethazine (Phenergan)
Thioridazine (Mellaril)
Doxepin (Sinequan)
Desipramine (Norpramin)
Chlorpromazine (Thorazine)
Amitriptyline (Elavil)
Imipramine (Tofranil)
Arsenic trioxide (Trisenox)
Chloroquine (Arelan)
Droperidol (Inapsine)
Erythromycin (EES, E-Mycin, Dynabac)
Clarithromycin (Biaxin)
Sparfloxacin (Zagam)
Gatifloxacin (Tequin)
Moxifloxacin (Avelox)
Itraconazole (Sporanox)
Amantadine (Symmetrel)
Pentamidine (NebuPent, Pentacarinat)
Bepridil (Vascor)
Cisapride (Propulsid)
Terfenadine (Seldane)
Astemizole (Hismanal)
Cocaine
Methadone

B. The following medications may increase dofetilide levels

Drugs that undergo renal cationic secretion
Amiloride (Midamor, Moduretic)
Metformin (Glucophage)
Triamterene (Dyrenium, Maxide, Dyazide)

CYP3A4 Inhibitors
Fluconazole (Diflucan)
Itraconazole (Sporanox)
Ketoconazole (Nizoral)
Metronidazole (Flagyl)
Voriconazole (Vfend)
Protease inhibitors:
Amprenavir (Agenerase)
Fosamprenavir (Lexiva)
Indinavir (Crixivan)
Nelfinavir (Viracept)
Lopinavir/Ritonavir (Kaletra)
Ritonavir (Norvir)
Saquinavir (Invirase, Fortavase)
Atazanavir (Reyataz)
Tipranavir
Clarithromycin (Biaxin)
Erythromycin (EES, E-Mycin, Dynabac)
Norfloxacin (Noroxin)
Citalopram (Celexa)
Fluoxetine (Prozac)
Fluvoxamine (Luvox)
Nefazodone (Serzone)
Diltiazem (Cardizem)
Verapamil (Calan, Isoptin, Verelan)
Amiodarone (Cordarone)
Dronabinol (Marinol)
Quinine (Quinamm)
Zafirlukast (Accolate)
Grapefruit juice
Cyclosporine (Neoral, Sandimmune, Geograf)
Tacrolimus (Prograf)

III. ANTIARRHYTHMIC AGENTS: Should be withdrawn for > 3 half-lives before dofetilide therapy

Drug	$t_{1/2}$	Discontinuation period (~3 $t_{1/2}$)
Class Ia: Quinidine	5-9 hr	30 hr
Procainamide	6-8 hr	24 hr
Disopyramide*	4-10 hr	30 hr
Class Ib: Lidocaine	1-3 hr	12 hr
Mexiletine	10-14 hr	48 hr
Tocainide*	12-15 hr	48 hr
Class Ic: Flecainide*	13-20 hr	60 hr
Propafenone	12-32 hr	96 hr
Class III: Amiodarone	40-55 days	3 months or level <0.3
Sotalol*	12-20 hr	60 hr
Bretylium*	4-17 hr	50 hr

* Drugs that are renally excreted. Half-life is prolonged in renal failure.

PATIENT'S ORDER SHEET
DOFETILIDE (TIKOSYN®)

Detroit Medical Center
Wayne State University

(FOR ADULT PATIENTS)
(Order Sheet #1)

☐ DRH ☐ Hutzel
☐ Harper ☐ Huron Valley-Sinai ☐ Sinai –Grace

MEDICATION ORDERS ONLY

DATE TIME

DISCONTINUE ANY OF FOLLOWING MEDICATIONS <u>NOW</u> & <u>ANY OTHER TIME</u> DURING HOSPITALIZATION

☒ DC verapamil (Calan®, Isoptin®, Covera®, Verelan®)
☒ DC cimetidine (Tagamet®)
☒ DC ketoconazole (Nizoral®)
☒ DC trimethoprim
☒ DC trimethoprim/sulfamethoxazole (Bactrim®, Septra®)
☒ DC megestrol (Megace®)
☒ DC prochlorperazine (Compazine®)
☒ DC hydrochlorthiazide (Hydro-diuril®)

DOCUMENT THE FOLLOWING <u>PRIOR TO</u> INITIATION OF DOFETILIDE:

1) Baseline K + =_____mmol/L (normal ~ 4 – 5.3)
2) Baseline Mg +2 =_____ mg/dL (normal ~ 2 – 3.0)
3) Baseline QRS =_____ QTc = _____msecs

Dofetilide is contraindicated if:

Baseline QTc > 440 msecs and QRS < 120 <u>OR</u>

Baseline QTc > 500msecs and QRS >120

4) Baseline Scr = _____mg/dL; CLCr = _____mL/min

Dofetilide is contraindicated if baseline CLCr < 20mL/min

ELECTROLYTE SUPPLEMENTS

☐ _____

☐ _____

INITIAL DOSE: Based on baseline creatinine clearance

☐ **Dofetilide _____mcg PO x 1,**

first dose @ _____AM / PM

CONTINUATION OF HOME THERAPY: Continue home dose and schedule. ECG monitoring is not necessary.

☐ Dofetilide _____mcg PO q_____ hr.

Next dose @ _____AM / PM

ALL OTHER ORDERS

DATE TIME

ALLERGIES_____

HEIGHT_____ ***WEIGHT***_____

RATIONALE FOR DOFETILIDE USE:

☐ Dofetilide initiation for maintenance of Normal Sinus Rhythm
☐ Dofetilide therapy for cardioversion of Afib/Aflutter
☐ Continuation of home dofetilide therapy

CONSULT

☒ Pharmacy, re: dofetilide medication teaching

RESTRICTION & ENROLLMENT

☒ Only authorized dofetilide prescribers may prescribe dofetilide
☒ Complete & fax Pharmacy Enrollment Form to Stadtlanders for all new patients started on dofetilide therapy

LABS

☐ Electrolytes, Bun, Scr, Mg, CBC, PT --**STAT**
Notify MD if Potassium < 4.0 mEq/L <u>and/or</u> Magnesium < 2.0
☐ Other:_____

CREATININE CLEARANCE (CLCR) CALCULATION:

$$CLCr = \frac{(140 - age) \times weight\ (kg) \times (0.85\ for\ females)}{72 \times Scr\ (mg/dL)}$$

Calculated ClCr (mL/min)	1st Dofetilide Dose
> 60	500 mcg
40 - 60	250 mcg
20 - <40	125 mcg
< 20	**Contraindicated**

TESTS

☒ Baseline 12-lead ECG STAT and notify MD for QTc evaluation
☐ Obtain 12-lead ECG **<u>and</u>** MCL1 at 2 to 3 hours following 1st dofetilide dose. Call Cardiology Fellow or Dr. _____ at Pager # _____to read ECG & write an order for 2nd dose.
☒ Echocardiogram: Obtain copy of report for the chart

ROUTINE NURSING ORDERS

☒ Vital Signs Q8 hours.
☒ Continuous cardiac monitoring
☐ Activity: _____

PHYSICIAN'S SIGNATURE		REG. NO.		PHYSICIAN'S SIGNATURE			
NURSE'S SIGNATURE	Time	U.C.	Time	NURSE'S SIGNATURE	Time	U.C.	Time

Revised 7/02 Original - Chart Copy - Pharmacy

Detroit Medical Center
Wayne State University

PATIENT'S ORDER SHEET
DOFETILIDE (TIKOSYN®)
DOSE TITRATION
(FOR ADULT PATIENTS)
(Order Sheet #2)

☐ DRH ☐ Hutzel
☐ Harper ☐ Huron Valley-Sinai ☐ Sinai – Grace

MEDICATION ORDERS ONLY	**ALL OTHER ORDERS**
DATE TIME	DATE TIME

First dofetilide dose given @ _____AM/PM

QTc @ _____AM/PM = _____msecs

1) Continue same dofetilide dose if:

QTc < 500 msecs and QRS < 120 **or**

QTc < 550 msecs and QRS > 120

2) Decrease 2nd dose by 50% if:

QTc > 500 msecs and QRS < 120 **or**

QTc > 550 msecs and QRS > 120

First Dofetilide Dose		Second Dose
500 mcg	→	250 mcg, 12 hours after first dose
250 mcg	→	125 mcg, 12 hours after first dose
125 mcg	→	125 mcg, 24 hours after first dose

SECOND DOFETILIDE DOSE

☒ **Dofetilide _____mcg PO x 1,**

Next dose @ _____AM / PM

ALLERGIES_____

HEIGHT_____ ***WEIGHT***_____

RESTRICTION

☒ Only authorized dofetilide prescribers may prescribe dofetilide.

LABS

☒ Electrolytes, Mg, CBC--qAM---Send sample to STAT lab.
Notify MD if Potassium < 4.0 mEq/L and /or Magnesium < 2.0

TESTS

☒ Obtain 12-lead ECG **and** MCL1 -- 2 to 3 hours after second dofetilide dose. Page Cardiology Fellow on call or Dr._____Pager #_____ to read ECG and obtain an order for maintenance dofetilide doses on Order Sheet # 3.

PHYSICIAN'S SIGNATURE		REG. NO.		PHYSICIAN'S SIGNATURE			
NURSE'S SIGNATURE	Time	U.C.	Time	NURSE'S SIGNATURE	Time	U.C.	Time

Detroit Medical Center
Wayne State University

PATIENT'S ORDER SHEET
DOFETILIDE (TIKOSYN®)
MAINTENANCE DOSE
(FOR ADULT PATIENTS)
(Order Sheet #3)

☐ DRH ☐ Hutzel
☐ Harper ☐ Huron Valley-Sinai ☐ Sinai – Grace

MEDICATION ORDERS ONLY	**ALL OTHER ORDERS**
DATE TIME	DATE TIME

Second dofetilide dose given @ _____AM/PM

QTc @ _____AM/PM = _____msecs

1) Continue same dofetilide dose if:
   QTc < 500 msecs and QRS < 120 **or**
   QTc < 550 msecs and QRS > 120

2) Discontinue dofetilide therapy if :
   QTc > 500 msecs and QRS < 120 **or**
   QTc > 550 msecs and QRS > 120

3) Downward titration is NOT recommended anytime after the 2nd dofetilide dose.

DOFETILIDE MAINTENANCE DOSE

☐ **Discontinue dofetilide therapy**

☐ **Dofetilide _____mcg PO q_____hr,**
give next dose @_____AM / PM

ALLERGIES_____

HEIGHT__ _____ ***WEIGHT***_____

RESTRICTION

☒ Only authorized dofetilide prescribers may prescribe dofetilide.

LABS

☒ Electrolytes, Mg --qAM--Send sample to STAT lab.
Notify MD if Potassium < 4.0 mEq/L and/or Magnesium < 2.0

TESTS

☒ Obtain 12-lead ECG **and** MCL1 -- 2 to 3 hours after each dofetilide dose, up to the 5th dose. Page Cardiology Fellow or Dr._____Pager #_____ to read ECG

DISCHARGE PREPARATION

☒ For new dofetilide patients or continuation patients that received a dose change, MD to complete an outpatient prescription after maintenance dose has been established. A copy must be faxed to Stadtlanders Pharmacy (1-800-426-9613) **and** a copy must be sent to Central Pharmacy to obtain an initial 7-day supply of dofetilide for the patient.

PHYSICIAN'S SIGNATURE		REG. NO.		PHYSICIAN'S SIGNATURE			
NURSE'S SIGNATURE	Time	U.C.	Time	NURSE'S SIGNATURE	Time	U.C.	Time

PROCESS FOR CONTINUATION OF HOME DOFETILIDE (TIKOSYN®) THERAPY

Emergency Department

1. Admit/Transfer to ICU/8WS ONLY. Dofetilide is restricted to ICU & 8WS

2. Verify dose and time patient takes dofetilide at home. Maintain patient on home dosing schedule.

3. Obtain the following:
   a) Height, Weight
   b) Baseline 12-lead ECG
   c) Baseline K, Mg, Scr

4. MD evaluates QTc.
   Goal: QTc ≤440 msec or ≤500 msec with ventricular conduction abnormalities

5. MD supplements K+, Mg+2 to maintain K ≥4 mEq/L and Mg ≥2 mg/dL

6. If renal function deteriorates, dosage adjustment may be necessary. Call Pharmacy at Pager 9578 for assistance with dosing calculation once QTc is determined. (Goal: CrCL >20ml/min)

7. Ensure contraindicated medications or other class I and III antiarrhythmics are not given concomitantly. Call Pharmacy at 58639 for specific questions about drug interactions.
   Absolute Contraindicated medications:
   a. Verapamil (Calan®, Isoptin®, Covera®, Verelan®)
   b. Cimetidine (Tagamet®)
   c. Ketoconazole (Nizoral®)
   d. Trimethoprim
   e. Trimethoprim/sulfamethoxazole (Bactrim®, Septra®)
   f. Megestrol (Megace®)
   g. Prochlorperazine (Compazine®)

8. Authorized prescribers proceed to ordering maintenance dose on specified dofetilide order labeled as "Dofetilide Order 3". Note: Dofetilide orders not written on the correct order form will not be honored by pharmacy.

During Hospitalization

Meds:

1. Authorized dofetilide prescriber completes dofetilide order #3 to continue home dose as SCHEDULED DOSES. Ensure dofetilide dose is corrected for renal function if renal function deteriorates. Give next dose on the scheduled time patient has been taking at home.

2. If home dose was decreased due to decline in renal function.
   a. Check SCr daily, and increase dose back to home dose once renal function improves. ECG monitoring is necessary if dose is changed.

   b. Follow new initiation dofetilide pathway, and obtain 12-lead ECG for the first 5 doses if dose adjustment is made.

Labs:

1. Order for daily electrolytes, BUN/Scr, and Mg while patient is in the hospital.

2. Verify that K ≥4, and Mg ≥2. Order supplement as needed.

ECG Monitoring:

1. NOT necessary to obtain 12-lead ECG 2-3 hours after each dose if home dosing regimen is continued.

2. If home dose is decreased due to change in renal function, obtain a 12-lead ECG 2-3 hours after each dose for the first 5 doses. Follow pathway for new patient.

2. A 12 lead ECG 2-3 hours after each dose is necessary for the first 5 doses if dofetilide dose was increased back to outpatient doses.

Discharge Plan

An outpatient prescription for dofetilide is **NOT** necessary if dose remains the same as outpatient dose. Simply instruct patient to continue home dose of dofetilide, and call Stadtlander Pharmacy for refills on a monthly basis.

The following applies only if an outpatient dofetilide dose was decreased:

1. A new prescription **MUST** be provided to Stadtlander's Pharmacy and hospital pharmacy. The prescription should be written on the regular prescription order form as follow:

   Dofetilide ___mcg po Q__H
   Refill: _____
   Name/signature of authorized prescriber

2. Fax a copy of prescription to Stadtlander's Pharmacy for patient's home shipment
   Fax # **1-800-426-9613**

3. Tube the actual outpatient prescription to Central Pharmacy to obtain a 7-day free supply for patient

4. If patient is indigent, consult social worker for assistance with indigent supply. Indigent Phone # **1-888-609-4375**

5. Ensure Dofetilide 7-day supply was provided to patient

6. Arrange for follow-up visit with MD in 1-2 weeks to monitor ECG, electrolytes and serum Cr

Only authorized dofetilide prescribers may write dofetilide orders. Maintain dofetilide on a patient's home scheduled, unless significant change in renal function.
Obtain baseline ECG on admission. Subsequent ECG is not necessary, unless dosage adjustment is made. If dosage adjustment is made, follow initiation of dofetilide therapy pathway. Dofetilide orders must be re-written for transfer between ICUs & 8WS on the appropriate dofetilide pre-printed order forms.
Prepared by: Pharmacy Services/Division of Cardiology. Nov 2000. Contact Alison Tran, Pharm.D # 95627 with any questions.