Rx Management®
The Prescription For Medication Management

MedV©

Dear Dr. Randall,

The available medical data (Demographics, Medications, Labs and Physician Notes) submitted on 01/04/2005 for MAN, SAMUEL T., a 63 year old male reveals the patient to have the following diagnoses:

DIAGNOSIS: Osteoarthritis, Coronary Artery Disease, Diabetes, Hypertension, Pulmonary Disease, CHF, Atrial Fibrillation, Myocardial Infarction, Hyperactive Bladder Syndrome, Alzheimer's Dementia.

PATIENT DEMOGRAPHIC DATA:

Age: 63
Sex: Male
Height: 6'0
Weight: 242 lb
Medication Allergies: UNK

Alcohol use: Yes
Caffeine use: UNK
Smoking: No

Current Listed Medications (based on review of submitted patient records) Be advised that the extracted drug listings may not reflect current patient medications:

Medication/OTC/Herbals Name/Strength	Dose/Freq	Prescribed as/for
Accupril	20 mg, 1qd	
Coreg	25 mg, bid	
Ditropan Xc	10 mg, qd hs	
Glucophage	500 mg, Po Qd	
K-dur	10 mg, 1qd	
Lanoxin	0.25 mg, 1qd	
Lasix	40 mg, 1qd	
Lopid	60 mg, 1qd	
Oxandrin	0.0 mg, as directed	
Reminyl	8 mg, bid	
Zocor	80 mg, QOD	

ESTIMATED RENAL FUNCTION:

Based on the patient's age, sex, actual body weight of 242 lbs, actual height (6'0"), the Cockcroft-Gault estimate of GFR is 82 ml/min (within the normal range for age).

PERTINENT LABORATORY FINDINGS:

Hyperglycemia present: Fasting glucose slightly elevated
Lipid profile abnormality: Elevated triglycerides

PATHOPHYSIOLOGICAL ASSESSMENT and COMMENTS:

The following suggestions are provided for your consideration;

Disease Management Considerations:

1. Recommend periodic hemoglobin A1c to assess overall glycemic control.

2. Continue to monitor digoxin level especially if patient's renal function changes or symptoms or signs of digoxin intoxication become apparent.

3. Consider periodic CBC and CMP with periodic post prandial blood glucose measurements for laboratory testing.

4. Obtain periodic ECGs, CPK, lipid profiles to monitor for possible adverse drug reactions.

Pharmacotherapeutic Considerations:

1. Hepatic and renal function should especially be monitored while the patient is on medications that have the potential to cause hepatic or renal dysfunction (Zocor, Glucophage, Oxandrin and Accupril, Reminyl Lasix).

2. Monitor alcohol consumption and advise patient that alcohol may predispose to hypoglycemia while on hypoglycemic agents.

3. Please clarify Oxandrin dose and indication as well as consider monitoring PSA level if patient is to remain on Oxandrin.

4. The patient's diagnosis of atrial fibrillation may warrant anticoagulation. If coumadin is not utilized for this then aspirin therapy is an accepted alternative for patients with bleeding risk factors.

5. Follow-up laboratory studies necessary to adequately monitor your patient's drug regimen include: Hepatic panel with reminyl therapy and within 3 months of initiation of statin/therapy with concomitant Lopid therapy or with onset of symptoms of possible myositis or renal insufficiency

6. Consider increasing metformin dosage and/or improving dietary control for increased diabetic control.

7. Please list the patient's drug allergies in the chart if present.

DRUG INTERACTION REPORT

(Full report attached, please note high risk interactions)

Gemfibrozil (Lopid®) and Simvastatin (Zocor®)

Severity: *Very High.*

If the patient's medical condition requires this drug combination extreme caution should be exercised with close monitoring of liver and renal function. Concurrent use of gemfibrozil and HMG-CoA reductase inhibitors may be associated with increases in creatine kinase (CK), an increased risk of rhabdomyolysis, and myoglobinuria leading to acute renal failure.[4975]

Galantamine (Reminyl®) and Oxybutynin (Ditropan®, Ditropan® XL, Oxytrol)

Severity: *High*

The therapeutic benefits of galantamine may be diminished when co-administered with the anti-muscarinics [6338], the functional antagonists of the cholinesterase inhibitors.[6002] Atropine has been used to offset bradycardia in cholinesterase inhibitor overdose.

Potassium Salts (K-Care®, K-Dur®, K-Lor®, K-Lyte®, K-Norm®, K-Tab®, Klor-Con®, Klor-Con® M10, Klor-Con® M15, Klor-Con® M20, Klotrix®, Micro-K®, Slow-K®) and Quinapril (Accupril®)

Severity: *High*

Potassium salts [7025] should be used with caution in patients taking drugs that may increase serum potassium levels such as ACE inhibitors [5365]

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Galantamine (Reminyl®)

Severity: *Moderate*

The increase in vagal tone induced by some cholinesterase inhibitors may produce bradycardia, hypotension, or syncope. The vagotonic effect of these drugs may theoretically be increased when given with other medications known to cause bradycardia such as digoxin. These interactions are pharmacodynamic in nature rather than pharmacokinetic.

Ethanol/Alcohol and Oxybutynin (Ditropan®, Ditropan® XL, Oxytrol)

Severity: *Moderate*

Consuming > 400 mg/day caffeine has been associated with the development of urinary incontinence. Although conflicting data exists, daily consumption of alcohol may also be a risk factor for incontinence. Both caffeine and ethanol may aggravate bladder symptoms and counteract the effectiveness of oxybutynin to some degree. Patients may wish to limit their intake of caffeinated drugs, dietary supplements (i.e., guarana) or beverages (i.e., green tea, other teas, coffee, colas) and alcoholic beverages.[5985] In addition, ethanol is a CNS-depressant and may cause additive sedative effects when used concomitantly with oxybutynin.[6541]

Carvedilol (Coreg) and Digoxin (Digitek , Lanoxin®, Lanoxicaps®)

Severity: *Moderate*

Carvedilol increases the bioavailability of oral digoxin by about 14% and trough digoxin concentrations by about 16%.

Carvedilol (Coreg) and Furosemide (Lasix®)

Severity: *Moderate*

Carvedilol's effects are additive with other antihypertensive agents including diuretics.[5267]

Carvedilol (Coreg) and Metformin (Glucophage®, Glucophage® XR, Fortamet®)

Severity: *Moderate*

Although beta-blockers exert complex actions on the body's ability to regulate blood glucose, carvedilol has been shown not to significantly alter glucose tolerance tests or fasting and postprandial glucose levels in patients with non-insulin-dependent diabetes.[1023] [1024]

Carvedilol (Coreg) and Quinapril (Accupril®)

Severity: *Moderate*

Carvedilol's effects are additive with other antihypertensive agents including diuretics.[5267]

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Furosemide (Lasix®)

Severity: *Moderate*

Since electrolyte disorders modify the actions of digoxin, drugs that can affect electrolyte balance potentially can affect the response to digoxin. Hypokalemia, hypomagnesemia, or hypercalcemia increase digoxin's effect.[4999]

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Metformin (Glucophage®, Glucophage® XR, Fortamet®)

Severity: *Moderate*

Certain medications used concomitantly with metformin may increase the risk of lactic acidosis. Cationic drugs that are eliminated by renal tubular secretion (e.g., digoxin)[4999] may decrease metformin elimination by competing for common renal tubular transport systems.[5280] Although most such interactions remain theoretical, careful patient monitoring and dose adjustment of metformin and/or the interfering cationic drug is recommended.

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Simvastatin (Zocor®)

Severity: *Moderate*

Some HMG Co-A reductase inhibitors may increase serum digoxin levels. Due to studies that indicate fluvastatin increases digoxin serum concentrations, the manufacturer recommends closer monitoring of patients stabilized on digoxin if high doses (i.e., 80 mg) of fluvastatin are added. [5045]

Furosemide (Lasix®) and Metformin (Glucophage®, Glucophage® XR, Fortamet®)

Severity: *Moderate*

Furosemide may cause hyperglycemia and glycosuria in patients with diabetes mellitus,[5159] probably due to diuretic-induced hypokalemia

Furosemide (Lasix®) and Quinapril (Accupril®)

Severity: *Moderate*

Additive hypotension is possible if furosemide used in combination with any other antihypertensive agents,[5159] including drugs such as nitroglycerin.

Furosemide (Lasix®) and Ethanol/Alcohol

Severity: *Moderate*

Ethanol interacts with antihypertensive agents by potentiating their hypotensive effect.[5944]

Metformin (Glucophage®, Glucophage® XR, Fortamet®) and Gemfibrozil (Lopid®)

Severity: *Moderate*

Fibric acid derivatives may enhance the hypoglycemic effects of antidiabetic agents through increased insulin sensitivity and decreased glucagon secretion.[7347]

Metformin (Glucophage®, Glucophage® XR, Fortamet®) and Oxandrolone (Oxandrin®)

Severity: *Moderate*

Administration of anabolic steroids or androgens to diabetic patients receiving antidiabetic agents can increase the risk of developing hypoglycemia; androgens have effects on carbohydrate metabolism and may decrease fasting blood glucose levels.[6141]

Metformin (Glucophage®, Glucophage® XR, Fortamet®) and Quinapril (Accupril®)

Severity: Moderate

ACE inhibitors may enhance the hypoglycemic effects of antidiabetic agents by improving insulin sensitivity.[6141] [7347] Patients receiving these drugs concomitantly with antidiabetic agents should be monitored for changes in glycemic control.

Metformin (Glucophage®, Glucophage® XR, Fortamet®) and Ethanol/Alcohol

Severity: Moderate

Alcohol is known to potentiate the effect of metformin on lactate metabolism.[5280] Blood lactate concentrations and the lactate to pyruvate ratio increased with coadministration of ethanol with metformin. Elevated lactic acid concentrations are associated with increased morbidity rates. Ethanol may also increase the risk of hypoglycemia. Patients, therefore, should be warned against excessive alcohol intake, acute or chronic, while receiving metformin.[5280]

In patients on multiple medications or complicated conditions, Medication Utilization Review is a reiterative process.

The value of this consultative service will be enhanced through repetitive consultations over the long term as clinical, therapeutic, laboratory and diagnostic information changes. Thank you for the opportunity to provide information to assist you in the care of your patient.

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Board Certified Internal Medicine/Gerald H. Sokol, MD, MS, FCP
Board Certified Clinical Pharmacologist

DATE: 21 February 2005

DISCLAIMER:
The information in this report is based on data supplied from the patient's medical chart which may or may not contain all pertinent medical information. The suggestions in this consultation may or may not be relevant to an individual patient's medical circumstances. This report is intended to define potential medication associated risks with respect to possible adverse drug reactions, to optimize therapeutic benefit and to identify and prevent potential adverse drug-drug interactions. This report will also serve to document and catalog drug usage during the physicianpatient relationship over the long term. This report will enhance your office and hospital quality assurance and can be shared with all treating physicians.

All therapeutic interventions represent a risk benefit decision making process. No pharmalogical consultation can identify all potential therapeutic interactions and adversities. This report is provided for information purposes only and is not intended to interfere with the physician-patient relationship or to assume patient care responsibilities.

APPENDIX: DRUG INFORMATION:

Drug Interactions report for the following 13 medications:

- Carvedilol (Coreg)
- Digoxin (Digitek , Lanoxin®, Lanoxicaps®)
- Furosemide (Lasix®)
- Galantamine (Reminyl®)
- Gemfibrozil (Lopid®)
- Metformin (Glucophage®, Glucophage® XR, Fortamet®)
- Oxandrolone (Oxandrin®)
- Oxybutynin (Ditropan®, Ditropan® XL, Oxytrol)
- Potassium Salts (K-Care®, K-Dur®, K-Lor®, K-Lyte®, K-Norm®, K-Tab®, Klor-Con®, Klor-Con® M10, Klor-Con® M15, Klor-Con® M20, Klotrix®, Micro-K®, Slow-K®)
- Quinapril (Accupril®)
- Simvastatin (Zocor®)
- Caffeine (Cafcit®, Enerjets®, NoDoz®, Snap Back®, Stay Alert®, Vivarin®)
- Ethanol

include the following in the drug interactions report:

- Caffeine - Ethanol/Alcohol - Food - Grapefruit juice

- Drug-Drug interactions - Drug-Food interactions - Drug-Grapefruit juice interactions - Therapeut Duplication

The following drug-drug interactions are found:

Gemfibrozil (Lopid®) and Simvastatin (Zocor®)

Severity: Very High. This drug combination should be avoided.

Concurrent use of gemfibrozil and HMG-CoA reductase inhibitors may be associated with increases in creatine kinase (CK), an increased risk of rhabdomyolysis, and myoglobinuria leading to acute renal failure.[4975] There is an increased risk of developing myopathy during therapy with HMG-CoA reductase inhibitors if they are administered concomitantly with fibrate derivatives (e.g., clofibrate, gemfibrozil, fenofibrate). The serious risk of myopathy or rhabdomyolysis should be weighed carefully versus the benefits of combined 'statin' and fibrate therapy; in most patients with an inadequate response to either drug alone, any potential benefit of combined therapy does not outweigh the risk of severe myopathy, rhabdomyolysis, and acute renal failure. Myopathy or rhabdomyolysis with or without acute renal failure have been reported as early as three weeks after initiation of combined therapy or after several months. The combined use of cerivastatin and gemfibrozil is absolutely contraindicated. Cerivastatin was voluntarily withdrawn from the US market (August 8, 2001) due to 31 cases of fatal rhabdomyolysis, reported more frequently than with other statins; 12 of these cases involved concomitant gemfibrozil use. When possible, avoid the combined use of HMGCoA reductase inhibitors and gemfibrozil; there is no assurance that periodic monitoring of CK will prevent the occurrence of severe myopathy and renal damage. Since compounds in went yeast, Monascus purpureus are chemically similar to and possess actions similar to the HMG-CoA reductase inhibitors,[5911] clinicians should use went yeast cautiously in combination with gemfibrozil. Cyclosporine, fibric acid derivatives (e.g., gemfibrozil, fenofibrate, clofibrate), and antilipemic

doses of niacin (i.e., vitamin B3 as nicotinic acid) may increase the risk of myopathy, rhabdomyolysis and acute renal failure (see Adverse Reactions);[5336] however, in some cases simvastatin has been used safely in combination with these agents. This risk may be increased at higher doses of simvastatin. In patients taking gemfibrozil or cyclosporine, the simvastatin dose should not exceed 10 mg/day PO to reduce the risk of myopathy (see Dosage section).[5336] The risk of myopathy is increased by gemfibrozil, and to a lesser extent by other fibrates or niacin >= 1 g/day.[5336] Fibrates or doses of niacin >= 1 g/day are independently associated with myopathy.[5336 The serious risk of myopathy or rhabdomyolysis should be weighed carefully versus the benefits of combined 'statin' and fibrate therapy; there is no assurance that periodic monitoring of CK will prevent the occurrence of severe myopathy and renal damage.[5336]

Galantamine (Reminyl®) and Oxybutynin (Ditropan®, Ditropan® XL, Oxytrol)

Severity: High

The therapeutic benefits of galantamine may be diminished when co-administered with the antimuscarinics [6338], the functional antagonists of the cholinesterase inhibitors.[6002] Atropine has been used to offset bradycardia in cholinesterase inhibitor overdose. Other drugs known to exhibit anticholinergic properties that could potentially interfere with the cholinesterase inhibitor activity include: amantadine, amoxapine, clozapine, cyclobenzaprine, disopyramide, sedating H1-blockers, maprotiline, olanzapine, orphenadrine, the antipsychotic phenothiazines, and tricyclic antidepressants. When concurrent use cannot be avoided, monitor the patient for reduced galantamine efficacy.

Pharmacologically, parasympathomimetic drugs enhance muscarinic/cholinergic function. Because oxybutynin is an antimuscarinic,[6541] the muscarinic actions of drugs known as parasympathomimetics, including both direct cholinergic receptor agonists and cholinesterase inhibitors, could be antagonized when used concomitantly with oxybutynin. In addition, preliminary evidence indicates that chronic anticholinergic use in patients with Alzheimer's Disease may possibly have an adverse effect on cognitive function. Therefore, the effectiveness of drugs used in the treatment of Alzheimer's such as memantine, may be adversely affected by chronic antimuscarinic therapy. [5976] The adverse effects of antimuscarinics, such as dry mouth, urinary hesitancy or blurred vision may be enhanced with use of memantine; dosage adjustments of the anticholinergic drug may be required when memantine is coadministered.[6137]

Potassium Salts (K-Care®, K-Dur®, K-Lor®, K-Lyte®, K-Norm®, K-Tab®, Klor-Con®, Klor-Con® M10, Klor-Con® M15, Klor-Con® M20, Klotrix®, Micro-K®, Slow-K®) and Quinapril (Accupril®)

Severity: High

Potassium salts [7025] should be used with caution in patients taking drugs that may increase serum potassium levels such as ACE inhibitors [5365]; angiotensin II receptor antagonists [5339]; cyclosporine [5134]; NSAIDs; eplerenone [4707]; potassium-sparing diuretics (amiloride [5873], spironolactone [5751], or triamterene [5898]); high-doses of IV potassium penicillin G [6826]; trimethoprim (especially high dose) [5073]; or heparin [2173]. Concurrent use can cause hyperkalemia, especially in elderly patients or patients with impaired renal function. Conversely, potassium supplements should be discontinued when hypokalemia-causing agents are discontinued or re-evaluated to avoid the possibility of developing hyperkalemia. Examples of hypokalemia-causing agents include: thiazide diuretics and loop diuretics; amphotericin B; high-dose beta-agonists; and high doses of extended-spectrum penicillins (carbenicillin, mezlocillin, piperacillin, and ticarcillin).

Quinapril decreases aldosterone secretion, leading to small increases in serum potassium levels.

[5895] Other drugs that increase serum potassium concentration, such as potassium-sparing diuretics, potassium salts, and heparin, should be given cautiously to patients receiving quinapril.

Carvedilol (Coreg) and Digoxin (Digitek , Lanoxin®, Lanoxicaps®)

Severity: Moderate

Carvedilol increases the bioavailability of oral digoxin by about 14% and trough digoxin concentrations by about 16%. No pharmacokinetic interaction was seen however, with carvedilol and IV digoxin. While both drugs are used in the treatment of heart failure, clinicians should monitor for additive suppressive effects on AV nodal conduction, independent of a noticeable increase in digoxin serum concentrations. Serum digoxin concentrations should be monitored whenever carvedilol is administered to patients already receiving digoxin.[5267]

Interactions occur between digoxin and a variety of other cardiovascular agents. These can be categorized into two groups: a) pharmacokinetic interactions that reduce the clearance of digoxin and may lead to digoxin toxicity: amiodarone [5802], felodipine [5827], diltiazem [5802], propafenone, quinidine [5802], quinine [6113] and verapamil [5802]; and b) pharmacodynamic interactions that may potentiate the actions of digoxin: amiodarone, dofetilide, sotalol, beta-blockers [5001], diltiazem, and verapamil. Digoxin is a substrate for P-glycoprotein.[4718] Quinidine and verapamil inhibit P-glycoprotein, an energy-dependent cellular drug efflux pump. The inhibition of p-glycoprotein in the intestinal cell wall may lead to increased oral absorption of digoxin; however, it has been shown that both quinidine and verapamil inhibit the secretion of digoxin by pglycoprotein transporters in the kidney leading to decreased renal tubular elimination of digoxin and increased serum concentrations.[6114] It has been recommended that digoxin doses be reduced by 50% when adding quinidine therapy, and serum digoxin levels closely monitored thereafter.[5001] Despite potential for interactions, digoxin sometimes is intentionally used in combination with a beta-blocker, diltiazem, or verapamil to further reduce conduction through the AV node. Nevertheless, these combinations should be used cautiously, and digoxin dosages may need adjustment in some patients.[4999]

Carvedilol (Coreg) and Furosemide (Lasix®)

Severity: Moderate

Carvedilol's effects are additive with other antihypertensive agents including diuretics.[5267] Although this interaction may be desirable in some patients, lower doses of carvedilol should be employed when administered to patients receiving other antihypertensive agents. Diuretics may exaggerate the orthostatic hypotensive effects of carvedilol. Orthostatic hypotension may be more likely if beta-blockers are coadministered with alpha-blockers or dihydropyridine calcium-channel blockers such as nifedipine. Concurrent use of catecholamine-depleting agents (e.g., reserpine, other rauwolfia alkaloids, guanethidine) or monoamine oxidase inhibitors (MAOIs) with carvedilol may result in hypotension and/or severe bradycardia.[5267]

Additive hypotension is possible if furosemide used in combination with any other antihypertensive agents,[5159] including drugs such as nitroglycerin. Hyponatremia or hypovolemia predisposes patients to acute hypotensive episodes following initiation of ACE inhibitor therapy. While ACE inhibitors and loop diuretics are routinely administered together in the treatment of heart failure, if an ACE inhibitor is to be administered to a patient receiving furosemide, initial doses should be conservative.

Carvedilol (Coreg) and Metformin (Glucophage®, Glucophage® XR, Fortamet®)

Severity: Moderate

Although beta-blockers exert complex actions on the body's ability to regulate blood glucose, carvedilol has been shown not to significantly alter glucose tolerance tests or fasting and postprandial glucose levels in patients with non-insulin-dependent diabetes.[1023] [1024] Since a pharmacodynamic interaction can occur between betablockers and antidiabetic agents or insulin (i.e., beta-blockers can enhance the hypoglycemic effect of insulin or antidiabetic agents),[6141] patients receiving carvedilol with antidiabetic agents concomitantly should be closely monitored for an inappropriate response. Beta-blockers, can blunt the tachycardic response to and exaggerate the hypertensive response to hypoglycemia. Selective beta-blockers, such as acebutolol, atenolol, or metoprolol, can cause fewer problems with blood glucose regulation, although these agents can still mask the symptoms of hypoglycemia.

Beta-blockers exert complex actions on the body's ability to regulate blood glucose. Because of this, beta-blockers may cause a pharmacodynamic interaction with antidiabetic agents. Beta-blockers can prolong hypoglycemia by interfering with glycogenolysis (secondary to blocking the compensatory actions of epinephrine) or can promote hyperglycemia (by inhibiting insulin secretion and decreasing tissue sensitivity to insulin). Also, beta-blockers can blunt the tachycardic response to and exaggerate the hypertensive response to hypoglycemia. Although no pharmacokinetic interaction has been observed between beta-blockers and antidiabetic agents, patients receiving betablockers and antidiabetic agents concomitantly should be closely monitored for an inappropriate response. Selective beta-blockers, such as acebutolol, atenolol, or metoprolol, can cause fewer problems with blood glucose regulation, although these agents can still mask the symptoms of hypoglycemia. [6141]

Carvedilol (Coreg) and Quinapril (Accupril®)

Severity: Moderate

Carvedilol's effects are additive with other antihypertensive agents including diuretics.[5267] Although this interaction may be desirable in some patients, lower doses of carvedilol should be employed when administered to patients receiving other antihypertensive agents. Diuretics may exaggerate the orthostatic hypotensive effects of carvedilol. Orthostatic hypotension may be more likely if beta-blockers are coadministered with alpha-blockers or dihydropyridine calcium-channel blockers such as nifedipine. Concurrent use of catecholamine-depleting agents (e.g., reserpine, other rauwolfia alkaloids, guanethidine) or monoamine oxidase inhibitors (MAOIs) with carvedilol may result in hypotension and/or severe bradycardia.[5267]

Quinapril can enhance the effects of other antihypertensive agents including diuretics.[5895] This additive effect can be desirable, but dosages must be adjusted accordingly. Patients with sodium depletion or hypovolemia are more susceptible to developing reversible renal insufficiency when receiving quinapril and diuretic therapy concomitantly.

Carvedilol (Coreg) and Ethanol/Alcohol

Severity: Moderate

Acute alcohol consumption lowers blood pressure; ethanol may interact with antihypertensive agents by potentiating their hypotensive effect.[5944] Ethanol interacts with antihypertensive agents by potentiating their hypotensive effect.[5944]

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Furosemide (Lasix®)

Severity: Moderate

Since electrolyte disorders modify the actions of digoxin, drugs that can affect electrolyte balance potentially can affect the response to digoxin. Hypokalemia, hypomagnesemia, or hypercalcemia increase digoxin's effect.[4999] The following drugs can precipitate digoxin toxicity via their effect on electrolyte balance: amphotericin B [5062], corticosteroids [6115], corticotropin, ACTH, potassium-depleting diuretics (e.g., acetazolamide [4994], loop diuretics [3085], methazolamide [5023], and thiazide diuretics [3085] [5219]), and sodium polystyrene sulfonate [6116]. Calcium salts augment the actions of digoxin. In addition, when calcium is administered via rapid intravenous injection, the risk of serious arrhythmias in digitalized patients is increased.[4999] It is recommended that serum potassium, magnesium, and calcium be monitored regularly in patients receiving digoxin.

Electrolyte disturbances (e.g., hypokalemia, hypomagnesemia, hypercalcemia) may occur with administration of loop diuretics, including furosemide.[5159] Hypokalemia increases the potential for proarrhythmic effects (e.g., torsade de pointes) due to arsenic trioxide, cardiac glycosides, dofetilide [4947], or levomethadyl. Potassium levels should be within the normal range prior and during administration of these agents. In the absence of electrolyte imbalances, furosemide and these agents can be used together safely.

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Galantamine (Reminyl®)

Severity: Moderate

The increase in vagal tone induced by some cholinesterase inhibitors may produce bradycardia, hypotension, or syncope. The vagotonic effect of these drugs may theoretically be increased when given with other medications known to cause bradycardia such as digoxin. These interactions are pharmacodynamic in nature rather than pharmacokinetic.

The increase in vagal tone induced by some cholinesterase inhibitors may produce bradycardia, hypotension, or syncope. The vagotonic effect of these drugs may theoretically be increased when given with other medications known to cause bradycardia such as digoxin. Galantamine had no effects on the pharmacokinetics of digoxin in human drug interaction studies; however, one healthy subject was hospitalized for second and third degree heart block and bradycardia.

Digoxin (Digitek , Lanoxin®, Lanoxicaps®) and Metformin (Glucophage®, Glucophage® XR, Fortamet®)

Severity: Moderate

Certain medications used concomitantly with metformin may increase the risk of lactic acidosis. Cationic drugs that are eliminated by renal tubular secretion (e.g., digoxin)[4999] may decrease metformin elimination by competing for common renal tubular transport systems.[5280] Although most such interactions remain theoretical, careful patient monitoring and dose adjustment of metformin and/or the interfering cationic drug is recommended.

Certain medications used concomitantly with metformin may increase the risk of lactic acidosis. [5280] Cationic drugs that are eliminated by renal tubular secretion (e.g., adefovir [5516], amiloride [5905], cimetidine [5977], digoxin [4999], dofetilide [4947], lamivudine, 3TC [5978], midodrine [5979], morphine [5906], procainamide [4977], quinidine [4976], quinine [5905], ranitidine [5980], triamterene [5905], trimethoprim [5981], trospium [5974], or vancomycin [5974]) may decrease metformin elimination by competing for common renal tubular transport systems.[5280] The antiarrhythmic drug dofetilide is not recommended for use in patients receiving cationic drugs;