

Cardiovascular Medication and Your Client

**Support your client's heart health
with appropriate exercise programming
and basic pharmacology knowledge.**

By Trish Muse, MPT, CSCS

Martha, your new client, is 50 years old and has high blood pressure and high cholesterol levels. Her health history questionnaire indicates that she is taking two cardiovascular medications. Does Martha require a physician's clearance to train with you? Do you need to make any modifications when developing her exercise program? Are her medications relevant to her fitness program, or can you simply file the information away?

Given the importance of physical activity for cardiovascular conditions, people with such conditions will continue to seek professional fitness

advice. However, there are many complexities involved in training people on cardiovascular medications. When working with these clients, it is very important that you stay within your scope of practice. Certain conditions even contraindicate exercise entirely, except in a medically supervised environment. Determining whether this is true for your client must be your first priority, before you establish a client-trainer relationship. *Always work within the parameters specified by the client's physician.* For further guidelines, see "Personal Fitness Trainers' Scope of Practice" sidebar.

If you are qualified to work with clients who have special medical needs, the following information on the latest cardiovascular drugs and suggested exercise modifications will help prepare you to guide clients safely through an appropriate regimen. But the article is a good professional reference even if you do not work with this population. By understanding the many complex interactions between medications and exercise, you will expand your awareness of potential side effects, client challenges and the importance of being able to recognize when medical intervention is necessary.

Medication Overview

Cardiovascular medications are indicated for and/or used to treat many different disorders, conditions and diseases affecting the cardiovascular system. Medications are frequently prescribed for hypertension, dysrhythmias (heart rhythm disturbances), hypercholesterolemia (high blood cholesterol), angina (chest pain), myocardial infarction (heart attack) and the post-myocardial-infarction period. To understand a medication's role in exercise and exercise testing, you need to consider the client's physio-

Cardiovascular Medications and Exercise Modifications

Be aware of these guidelines when working with clients on cardiovascular medications. Always obtain a physician's clearance when necessary.

Cardiovascular Drug	Potential Exercise Modification	Potential Target Heart Rate (THR) Adjustment
ACE inhibitors	Perform gradual cool-down.	none
beta-blockers	Perform exercise testing while client is medicated. Exercise several hours after medication is taken. Repeat exercise testing if dosage changes. Note that exercise tolerance may be impaired because heart's response to sympathetic stimulation will be dulled.	Calculate THR ranges using max heart rate (MHR) and resting heart rate, as obtained from physician. Do not use age-predicted THR range, Karvonen formula or MHR formula.
calcium channel blockers	Perform gradual cool-down. Perform exercise testing while client is medicated.	none
diuretics	Maintain proper hydration. Perform gradual cool-down.	none
digitalis preparations	With medical approval, client should stop medications 10–14 days prior to exercise testing.	none
nitrates	Perform gradual cool-down.	none
cholesterol reducers	Limit frequent positional changes; perform longer warm-ups and cool-downs; refrain from stationary standing.	none
antidysrhythmics	Perform exercise testing while client is medicated.	none
vasodilators	Perform gradual cool-down. Perform exercise testing while client is medicated.	Obtain data for calculating THR ranges from exercise testing done while client is medicated.
angiotensin II receptor blockers	Perform gradual cool-down.	none
anticoagulants	Get a physician's approval if client develops back and/or joint pain (indicative of bleeding). Avoid activities that may cause bumps, bruises, falls or other injuries that could cause hemorrhage.	none

logical response. Cardiovascular medications are designed to affect blood pressure, heart rate, heart contractility (cardiac-muscle performance), heart rhythm, vascular resistance, cardiac output (the amount of blood the heart pumps), blood volume, blood cholesterol, exercise capacity and blood clotting, and are likely to warrant program modifications.

An individual's response to a medication is usually dose dependent. As dosage increases, so does the effect. When the appropriate amount is taken and is available to the body, the dose level is therapeutic and the desired response is achieved. Subtherapeutic doses are less than optimal, as they contain drug amounts below what is deemed necessary for effective treatment. Drug levels higher than necessary can produce intensified effects, toxic levels, side effects and/or adverse effects.

When the medication is taken is also important. A small dose taken hours before exercising may produce a small response. Conversely, a larger dose taken just prior to exercising may yield a larger or undesirable response. A medication improves exercise capacity only if the individual is abnormally limited and the drug eliminates or reduces the abnormality.

A client may have more than one condition, disorder or disease and could be taking more than one medication concurrently. This circumstance, known as polypharmacy, may intensify or alter physiological responses. Therefore, you may need to make further exercise modifications. Be aware that this situation may arise, particularly among older clients.

The Medications

Each cardiovascular-medication category has its own characteristics. Drugs within a category usually share the same features, but some medications have their own unique aspects. *Note that this is an overview and not a comprehensive guide.*

ACE Inhibitors

Angiotensin-converting enzyme (ACE) inhibitors reduce blood pressure, increase exercise tolerance and decrease mortality in individuals with congestive heart failure (CHF). ACE inhibitors impede blood vessel vasoconstriction, allowing for increased blood flow, decreasing peripheral resistance and reducing pressure in the arteries. The drugs work by inhibiting an enzyme responsible for converting one form of a protein molecule (angiotensin I) into another form (angiotensin II), which becomes a very potent vasoconstrictor and can cause an increase in blood volume and blood pressure. If this conversion is not blocked in hypertensive individuals, the heart has to work harder to pump blood through the body and may fail if it is diseased and not working properly.

ACE inhibitors can cause postexercise hypotension; dizziness; a dry, persistent, nonproductive cough; and lightheadedness. However, among the whole class of antihypertensive medications taken to reduce blood pressure, ACE inhibitors pose the least risk of postexercise hypotension and are usually tolerated very well by patients.

Beta-Blockers

Beta-blockers have the greatest effect on exercise programming. They lower exercise and resting heart rate as well as blood pressure. Beta-blockers treat cardiac arrhythmias and angina, and are used to prevent myocardial infarctions and vascular headaches.

These drugs allow for increased blood flow against less resistance, thereby lowering blood pressure.

There are two types of beta-blockers: cardioselective and nonselective. Cardioselective beta-blockers compete for beta 1 receptors, thereby blocking catecholamines (hormones secreted by adrenal glands) in the blood from binding to beta 1 receptors in the heart. If catecholamines bind to these receptors, heart rate and blood pressure increase. The nonselective beta-blockers block both beta 1 (heart) and beta 2 (lung bronchioles, smooth muscle in blood vessels) receptors.

Beta-blockers can cause fatigue. This is more often associated with the nonselective type. Individuals not already limited by angina may experience a reduction in exercise capacity if fatigued. Nonselective beta-blockers can cause bronchoconstriction (constriction of the bronchial tubes) and blunt or mask the symptoms of hypoglycemia (low blood sugar) in insulin-dependent diabetes mellitus. Bronchoconstriction is not considered problematic in individuals with normally functioning pulmonary systems. Cardiac failure is a possible side effect in those with pre-existing cardiac disease. Monitor clients for orthostatic hypotension (a drop in blood pressure upon standing), dizziness and syncope (faintness).

Most beta-blocker side effects are dose related. The side effects are temporary and variable, and can be unique to each person, depending on catecholamine levels and other factors. Abrupt withdrawal of the drugs can cause an acceleration of angina, tachycardia (rapid heartbeat), hypertension, myocardial infarction and sudden death. Central nervous system side effects are possible and include fatigue or lethargy, depression, impotence and sleep disorders.

Calcium Channel Blockers

Calcium channel blockers (CCBs) treat hypertension, angina, some arrhythmias and coronary artery spasm. CCB characteristics tend to be unique to each CCB and vary with the effect on maximum exercise heart rate. CCBs disrupt and/or slow the entry of calcium into cardiac and vascular smooth muscle. This prevents muscle contraction and allows for vasodilation (widening of the blood vessels). Vascular resistance is also lowered, as are heart rate and myocardial contraction force. Endurance training and the training response are generally unaffected.

Possible side effects include headaches, nausea, flushing, heart rate abnormalities, reflex tachycardia due to excessive peripheral vasodilation (especially with nifedipine [e.g., Procardia]), orthostatic hypotension, dizziness and faintness.

Diuretics

Diuretics increase the production of urine by causing the excretion of water and electrolytes, generally decreasing sodium reabsorption in the kidneys. When fluid volume is decreased, so is the heart's workload. Diuretics decrease blood pressure and peripheral edema (swelling in the extremities). Thiazide diuretics are most frequently prescribed. Specific characteristics vary based on the site of action and whether or not the drug spares potassium. Diuretics do not directly affect resting or exercise heart rate. However, they influence exercise capacity in those with CHF.

The most serious side effects associated with diuretics are fluid depletion, electrolyte imbalance, sodium depletion and potassium depletion. Potassium depletion is not as much of a concern

when potassium-sparing diuretics are used. However, electrolyte imbalances can lead to dysrhythmias during exercise, so be mindful of drastic changes (increases) in heart rate during exercise with individuals taking this medication. Some people may also experience weakness and fatigue. Diuretics may cause muscle cramping due to an increase in potassium excretion and electrolyte depletion. Other possible side effects include postexercise hypotension and an increased risk of dehydration.

Digitalis Preparations

Digitalis preparations, also classified as cardiac glycosides, include digoxin, digitalis and digitoxin. These drugs increase the vigor of heart contractions. As a result, work capacity increases, specifically in those with poor ventricular function. The heart-beat is strengthened, and the heart is able to supply sufficient blood to the rest of the body.

Digitalis preparations can cause tachycardia, fluttering or palpitations. The potential for digoxin toxicity exists and should be closely monitored by the client's healthcare provider. Signs of digoxin toxicity include dizziness, confusion, nausea and arrhythmias. Other possible digitalis preparation side effects include drowsiness, fatigue and visual disturbances.

Nitrates

Nitrates act to prevent or stop anginal attacks by relaxing vascular smooth muscle. This decreases venous return and the quantity of blood pumped by the heart, lowering blood pressure. Nitrates come in patches, pills, sprays and intravenous forms. These drugs are taken as needed or prophylactically (as prevention) to reduce or prevent angina. Responses are remarkably different depending on the amount required to achieve the desired effect. Side effects include headaches, dizziness, flushing and orthostatic hypotension as a result of the vasodilatory properties.

Cholesterol Reducers

Cholesterol reducers are also known as lipid-lowering agents, or hypolipidemics. They are prescribed for elevated cholesterol and triglyceride levels. Cholesterol reducers generally do not affect heart rate or blood pressure. The exception is nicotinic acid, which can lower blood pressure. Cholesterol reducers, specifically HMG-CoA reductase inhibitors, reduce an enzyme that acts as a catalyst in the conversion of an early precursor of cholesterol synthesis. This leads to decreased production of low-density lipoprotein (LDL) and very low density lipopro-

Personal Fitness Trainers' Scope of Practice

Personal Fitness Trainers <i>Do Not</i> :	Personal Fitness Trainers <i>Do</i> :
<ul style="list-style-type: none"> diagnose 	<ul style="list-style-type: none"> receive exercise or health guidelines from a physician, physical therapist, registered dietitian, etc. follow national consensus guidelines for exercise prescription for medical disorders screen for exercise limitations identify potential risk factors through screening refer clients to a medical practitioner if necessary
<ul style="list-style-type: none"> prescribe 	<ul style="list-style-type: none"> design exercise programs refer clients to a medical practitioner for an exercise prescription
<ul style="list-style-type: none"> prescribe diets or recommend specific supplements 	<ul style="list-style-type: none"> provide general information on healthy eating, according to the USDA MyPyramid refer clients to a dietitian or nutritionist for a specific diet plan
<ul style="list-style-type: none"> treat injury or disease 	<ul style="list-style-type: none"> refer clients to a medical practitioner for treatment use exercise to help improve overall health help clients follow a physician's/therapist's advice
<ul style="list-style-type: none"> monitor progress for medically referred clients 	<ul style="list-style-type: none"> document progress report progress to the medical practitioner follow the physician's/therapist's/dietitian's recommendation
<ul style="list-style-type: none"> rehabilitate 	<ul style="list-style-type: none"> design an exercise program once a client has been released from rehabilitation
<ul style="list-style-type: none"> counsel 	<ul style="list-style-type: none"> coach provide general information refer clients to a qualified counselor or therapist
<ul style="list-style-type: none"> work with patients 	<ul style="list-style-type: none"> work with clients

Source: IDEA Health & Fitness Association. 2002. IDEA Opinion Statement: Benefits of a working relationship between medical and allied health practitioners and personal fitness trainers. *IDEA Personal Trainer*, 13 (6), 23–31.

Modification Tips

Consider the following tips when working with clients on cardiovascular medications. *These are not substitutions for, nor do they supersede, any guidelines set by the client's physician or other healthcare providers.*

- **Take vital signs—such as blood pressure and pulse—before, during and after exercise.** These will serve as an initial guide as to whether you should proceed with exercise, modify the exercise intensity or type, stop the program or arrange for medical intervention.
- **Document all signs, symptoms, changes and complaints of discomfort in response to exercise.** When taking the pulse of a client who is on an antidysrhythmic drug, also note whether the pulse rate and regularity are within normal limits. This might be the first detection of a rhythm change that would require medical intervention.
- **If blood pressure rises to $\geq 250/110$ millimeters of mercury, stop all exercise immediately.**
- **Encourage clients to stay well hydrated before, during and after exercise.** Given the potential for dehydration with antihypertensive medications—coupled with fluid loss from exercising—this is very important.
- **Monitor exercise intensity appropriately based on the medication and the client's physiological response.** Obtain *actual* data from the physician as opposed to predicted or estimated data, when warranted.
- **Note that it may be necessary to decrease exercise duration to allow a client to exercise within her tolerance.** Discontinuous exercise may be the safest option.
- **Do not focus entirely on resistance training with hypertensive clients.** When you do work on strength, use lighter weights and increase the number of repetitions.
- **Teach and promote correct exercise technique to avoid further rises in blood pressure or venous return.** Avoid placing the legs above the heart, placing the arms above the head and doing isometric exercises.
- **Note the times when medications are administered, so you can anticipate dosage effect influences.**
- **Should the need arise, allow participants to take prescribed medications to control symptoms.**
- **Keep cardiopulmonary resuscitation (CPR) certification current, and be prepared to perform CPR in the event that it is necessary.**
- **Use utmost caution when working with individuals on anti-coagulant therapy, to reduce the risk of bumps, bruises and falls that could precipitate a hemorrhage.**
- **Develop exercise programs that facilitate weight loss, when applicable, to encourage an increase in HDL plasma levels.** This will maximize the effects of cholesterol-reducing agents.
- **Provide gradual, longer-than-usual warm-ups and cool-downs for all individuals on cardiovascular medications, to allow the body to acclimate to exercise and prevent the occurrence of postexercise hypotension.**
- **Try to organize exercise sessions with as few positional changes as possible, to increase safety and decrease the likelihood of orthostatic-hypotension episodes.** Remain mindful of activities that may decrease blood pressure or cause widespread vasodilation.
- **Be very cautious if exercising in hot and humid environments, as they increase the risk of dehydration and heat illnesses.** Heat that tends to warm the entire body as opposed to a localized region may elicit a drop in blood pressure if CCBs or some other heart medications are used. Exercise can also cause vasodilation in skeletal muscles and lead to peripheral vasodilation.
- **Encourage participants to engage in activities that promote stress management and relaxation.** These types of activities tend to lower blood pressure and have been found to be beneficial in decreasing the pain of angina and myocardial ischemia (inadequate blood flow to the heart).

tein cholesterol; a moderate decrease in triglycerides; and an increase in high-density lipoprotein (HDL). Other cholesterol reducers, such as fibric acid derivatives and bile acid sequestrants, bind to different compounds, clearing triglyceride-rich particles from the body. Fibric acid derivatives increase the breakdown of triglycerides, LDLs and intermediate-density lipoproteins by increasing the activity of an enzyme in the bloodstream that breaks down these cholesterol compounds. Other cholesterol reducers attach to bile and increase excretion, resulting in lower plasma cholesterol.

With the exception of nicotinic acid, cholesterol reducers are generally not likely to cause side effects warranting exercise program modification. As previously mentioned, nicotinic acid can yield a drop in blood pressure. Individuals taking clofibrate who have also had a myocardial infarction could experience an increase in arrhythmias, angina or claudication (leg pain). General side effects of cholesterol reducers include myalgia (muscle pain), myositis (muscle inflammation), fatigue and weakness (associated more with HMG-CoA reductase inhibitors and fib-

ric acid derivatives). As a side note, if a client experiences any severe muscle soreness that persists for more than 48 hours, refer him to his physician.

Antidysrhythmics

Antidysrhythmics work in different ways depending on the class of drug and typically have little influence on heart rate response to exercise. Class I antidysrhythmics decrease the speed of impulses in the heart as well as the excitability of cardiac muscle. Class II antidysrhythmics consist of beta-blockers whose mechanism of action was previously described. Class III antidysrhythmics slow rest and exercise heart rates. Class IV antidysrhythmics are CCBs whose mechanism of action was also previously described. Antidysrhythmics can increase exercise capacity by promoting proper heart rhythm, thus helping the heart to beat effectively and efficiently.

The most frequent side effect of all antidysrhythmics is the aggravation of cardiac rhythm disturbances. For people prone to this side effect, exercise poses a high risk. Individuals with sig-

nificant dysrhythmias are vulnerable to myocardial infarction and/or heart failure. Therefore, they are at increased risk for cardiovascular morbidity or mortality. Clients on antidysrhythmics should be thoroughly evaluated by a cardiologist and can exercise only with a physician's approval.

Other side effects of antidysrhythmics include dizziness, visual disturbances, and hypotension with sudden postural changes. Class II side effects include heart failure and an increase in arrhythmias. Class IV side effects include excessive bradycardia (slow heart beat), dizziness and headaches. Otherwise, be aware of possible balance issues and be cautious with activities requiring increased skill or dynamic balance.

Vasodilators

Vasodilators are not only a drug category but also a property of other drug classes. Nonadrenergic vasodilators (those not activated by epinephrine) decrease resting and exercise blood pressure without direct action on the sympathetic nervous system. Typically they do not affect exercise capacity except in individuals with CHF. ACE inhibitors are also considered nonadrenergic vasodilators because they produce peripheral vasodilation. Vasodilators cause blood vessels to dilate or widen, allowing more blood to flow with less peripheral resistance and therefore less pressure. Vasodilators can cause postexercise hypotension and dizziness. Postural hypotension can also occur with sudden positional changes.

Angiotensin II Receptor Blockers

Angiotensin II receptor blockers lower blood pressure and are used to treat hypertension and CHF. They are also prescribed to slow the progression of renal disease in hypertensive individuals with diabetes mellitus and to treat patients with hypertension who are in chronic renal failure. Angiotensin II receptor blockers block the effects of a protein molecule and a hormone that cause vasoconstriction. The blocking action lowers blood pressure. Possible side effects include dizziness, headaches, tachycardia, fatigue, low-back pain, peripheral edema (swelling), hypotension and coughing.

Anticoagulants

Anticoagulants are used to treat overactive blood-clotting. There are three categories within this class: anticoagulants, antithrombotics and thrombolytics. Anticoagulants control

blood-clotting function and production. Antithrombotics prevent platelet formation, thereby staving off artery thrombus (clot) formation. Thrombolytics promote the destruction of blood clots and assist in re-establishing normal blood flow through the blocked blood vessels. Possible side effects of anticoagulant therapy include increased hemorrhage risk and a slightly increased stroke risk.

Be Prepared

Fitness professionals have an ethical responsibility, obligation and commitment to do no harm and to provide safe programming for all exercise enthusiasts. Maintaining a solid education foundation and being able to identify cardiovascular medications are important. Become familiar with the basic characteristics of each drug class as it pertains to fitness, and know the potential side effects. Be able to anticipate these effects, and be ready to intervene with modifications. Always refer to the client's physician when appropriate. One variable truly cannot be independent of another without the client being at risk. Understanding this fully is imperative if you are to work safely and responsibly with the increasing number of fitness enthusiasts and the many new exercisers just starting their journey to physical activity and wellness.

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