# Heart Health

Most cancer survivors do not develop heart problems; however, certain types of cancer treatment given can sometimes result in problems with the heart. Since heart problems may occur many years after cancer treatment, it is important for cancer survivors to be aware of any treatments they may have received that can affect the heart. That way, they can take steps to keep their heart healthy, including regular medical check-ups and tests to monitor heart function. And if a problem develops, it can be detected and treated early.

How does the heart work?

The heart is a muscular organ that is at the center of the body's circulatory system. The heart is responsible for pumping blood with oxygen and nutrients to body tissues. There are four chambers (two atria and two ventricles) within the heart that work together to pump blood. Valves direct the flow of blood through the heart chambers and into the blood vessels. The rhythm of heart contraction and rate of the heartbeat are coordinated by nerves that send electrical impulses to different parts of the heart. A thin membrane (pericardium) surrounds and protects the heart and anchors it within the chest.
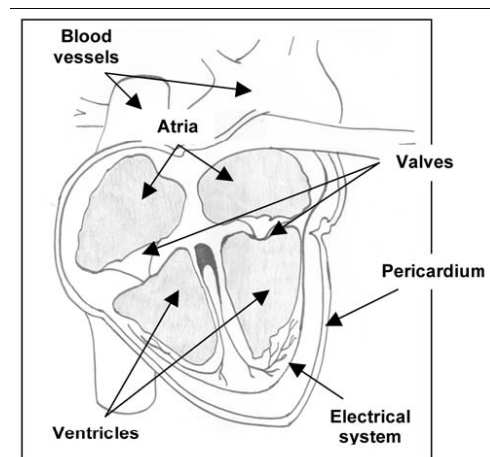
What types of cancer treatments can cause heart problems?

The heart can be affected by certain types of chemotherapy and by radiation therapy.

Anthracycline chemotherapy

The anthracyclines are a type of chemotherapy used to treat many cancers. This type of chemotherapy can sometimes affect the heart. Commonly used anthracyclines include:

- ➢ Doxorubicin (Adriamycin®)
- ➢ Daunorubicin (daunomycin, Cerubidine®)
- ➢ Idarubicin (Idamycin®)
- ➢ Mitoxantrone (Novantrone®)
- ➢ Epirubicin

Radiation therapy

Heart problems may also result from radiation therapy to the heart or surrounding tissues. This includes radiation to the following areas:

➢ Chest or thorax (including mantle, mediastinal, and axillary treatment fields)
➢ Spine (chest or "thoracic" portion)
➢ Whole or upper abdomen

What heart problems can occur after treatment for cancer?

There are several types of heart problems that may result from cancer treatments:

- The muscle cells of the heart may be damaged so that the heart doesn't contract and relax normally (**left ventricular dysfunction, cardiomyopathy**).
- The electrical pathways that conduct impulses to control heart rhythm may be scarred or damaged, resulting in abnormally fast, slow, or irregular heart beats (**arrhythmias**).
- The valves and blood vessels of the heart may be damaged, resulting in stiff or leaky valves (**valvular stenosis or insufficiency**).
- The protective covering of the heart may become inflamed (pericarditis) or scarred (**pericardial fibrosis**).
- The blood vessels of the heart may become scarred or blocked (**coronary artery disease**), preventing delivery of oxygen and nutrients to the heart and other tissues.

In severe cases, these problems may result in the death of heart tissue (heart attack or myocardial infarction), a dangerous heart rhythm (arrhythmia), or an inability of the heart to pump blood properly (congestive heart failure).

Which types of cancer treatment are associated with which heart problems?

- ❖ **Anthracyclines** may cause problems with heart muscle function (left ventricular dysfunction, cardiomyopathy) and abnormal heart rhythms (arrhythmias).
- ❖ Radiation therapy may result in scarring and stiffening of heart tissues, causing abnormal heart rhythm (arrhythmias) and problems with the heart muscle (cardiomyopathy), heart valves (valvular stenosis or insufficiency), blood vessels (coronary artery disease), and membrane surrounding the heart (pericarditis or pericardial fibrosis).

Are there other risk factors for heart problems?

Some other medical conditions may also increase the risk of heart problems from chemotherapy or radiation therapy. These include obesity, high blood pressure, high cholesterol or triglyceride levels in the blood, and diabetes. You may have a higher risk of having heart problems if these conditions run in your family. Heart disease is also more common in women who have gone through menopause, so female survivors who go through an early menopause may be at higher risk. Many health behaviors can add to the risk of heart disease including smoking, having an inactive (sedentary) lifestyle, and eating a diet high in fat.

Who is at risk for developing heart problems?

The risk of developing a heart problem after cancer treatment is related to several factors:

- The age of the patient at the time of cancer therapy
- The total dose of anthracycline chemotherapy
- The total dose of chest radiation
- The amount of the heart tissue included in the radiation treatment field
- Treatment with other medications that affect heart function
- The presence of other conditions that affect heart function

Most cancer survivors who were treated with anthracyclines or chest radiation have no heart damage at all. Some survivors have very mild changes in heart size or function that have not gotten worse over time. Only a small number of survivors have developed severe heart problems leading to heart failure or dangerous heart rhythms. Overall, the risk of developing heart problems after cancer therapy is highest in survivors treated with higher doses of anthracyclines or chest radiation, especially those who received both treatments at a young age.

Since we do not understand why some survivors develop heart problems after treatment for cancer and others do not (even when they have gotten the same treatment), it is important for each cancer survivor treated with anthracyclines or chest radiation to continue to have regular medical check-ups so that if a problem with the heart develops, it can be detected and treated early.

The highest risk factors for anthracyclines and radiation are listed below separately, although there is overlap:

What are the symptoms of heart problems?

No symptoms may be noted with mild to moderate heart problems. Identification of problem may only be noted by cardiac studies such as ECHO, EKG, or MUGA.

- Shortness of breath
- Dizziness
- Lightheadedness, fainting or near-fainting
- Severe fatigue preventing exercise or normal play
- Chest pain that feels like a heavy pressure or fullness and travels to the arm, chin or face.
- Sweating, nausea, or shortness of breath with chest pain
- Sharp piercing pain in the center or the left side of the chest (often worsens with taking a deep breath)
- Very swollen feet or ankles (so swollen that if a finger is pressed firmly on the area for a few seconds it leaves an indentation)
- Cough and wheezing that doesn't go away
- Periods of heart racing or throbbing
- Periods of irregular heartbeat (feeling of the heart skipping beats)

How does exercise affect the heart?

Aerobic exercise (brisk walking, running) is generally safe and actually healthy for the heart. However, some types of exercise are particularly stressful to the heart. These include intensive isometric activities, such as **heavy weight lifting and wrestling**. When a person is squatting to lift a very heavy weight, the heart must work harder because blood pressure increases as a person strains. Using lower amounts of weights to perform limited high repetition weight lifting (lifting a lighter weight with ease no more than 15 to 20 times in a row) is much less stressful to the heart and is more likely to be safe.

Survivors treated with anthracyclines or chest radiation therapy should check with their healthcare provider before beginning any exercise program. Intensive isometric exercises should generally be avoided. Those who choose to engage in strenuous activity or team sports should discuss appropriate guidelines and a plan for ongoing monitoring with their cardiologist.

What other conditions or activities can make heart problems worsen?

A heart affected by anthracyclines and chest radiation may not be able to handle the stress of certain conditions that dramatically increase the heart rate, blood pressure, or blood volume in the circulatory system. These changes may occur during **pregnancy** or during illnesses with **high fevers**. If your cancer treatment included medicines that can affect heart function, be sure that your healthcare provider is aware, so that steps can be taken to reduce the stress on your heart.

Some drugs can increase stress on the heart, including **cocaine, diet pills, ephedra, mahuang, and performance enhancing drugs**. These types of drugs have been

associated with worsening of heart function and even death in cancer survivors who received anthracycline chemotherapy.

Are there any other special precautions?

Survivors with abnormalities of heart valves (leaky or scarred valves) should take an antibiotic prior to any dental or other invasive medical procedures (such as those involving the respiratory, gastrointestinal, or urinary tracts) to prevent a serious infection of the heart (endocarditis) that can result from bacteria entering the blood stream during such procedures. The dentist or healthcare professional performing the procedure generally prescribes the antibiotic. A wallet card for people with heart valve problems (including instructions regarding the types of procedures for which antibiotic prescriptions are necessary) is available from the American Heart Association website at: www.americanheart.org/downloadable/heart/1023826501754walletcard.pdf

What monitoring is required for potential heart problems?

Anyone treated with anthracycline chemotherapy or chest radiation for cancer should have a yearly check-up with special attention to any symptoms relating to the heart. In addition, an electrocardiogram (ECG, EKG) should be done at the time the survivor enters long-term follow-up (usually about 2 years from completion of therapy). An echocardiogram or MUGA scan is also recommended at the first long-term follow-up visit, then according to the following schedule (or as recommended by your healthcare provider):

Age at treatment*	Chest radiation	Total anthracycline dose**	Recommended frequency of ECHO or MUGA***
< 1 year	Yes	Any	Every year
	No	< 200 mg/m2	Every 2 years
		≥ 200 mg/m2	Every year
1 to 4 years old	Yes	Any	Every year
	No	<100 mg/m2	Every 5 years
		≥100 to < 300 mg/m2	Every 2 years
		≥300 mg/m2	Every year
≥ 5 years old	Yes	<300 mg/m2	Every 2 years
		≥ 300 mg/m2	Every year
	No	< 200 mg/m2	Every 5 years
		≥ 200 to < 300 mg/m2	Every 2 years
		≥ 300 mg/m2	Every year

* age at first treatment with anthracycline or chest radiation (whichever was given first)
** based on total doses of doxorubicin/daunorubicin or the equivalent doses of other anthracyclines
***MUGA scans may be used for patients who received anthracycline chemotherapy without radiation; Echocardiograms are the preferred test for those who received radiation involving the heart, since the test provides more detailed information regarding structural issues, including valve structures.

Survivors who received radiation **at a dose of 40 Gy (4000 cGy) or higher** to the heart or surrounding tissues or **radiation at a dose of 30 Gy (3000 cGy) or higher plus anthracycline chemotherapy** may be advised to undergo **evaluation by a cardiologist for stress testing** 5 to 10 years following radiation, with repeat testing as recommended by the cardiologist.

Survivors who received radiation to the heart or surrounding tissues should also have a **blood test to check for other cardiac risk factors** (lipid profile and fasting glucose) every 3 to 5 years.

Additional evaluation by a cardiologist is recommended for female survivors who are pregnant or planning pregnancy and received any of the following therapy:

- Anthracycline chemotherapy at a dose of 300 mg/m2 or more
- Radiation at a dose of 30 Gy (3000 cGy) or higher to the heart or surrounding tissues
- Radiation to the heart (at any dose) in combination with anthracycline chemotherapy or high doses of cyclophosphamide (Cytoxan®)

Heart monitoring may be necessary due to the extra strain on the heart during the later stages of pregnancy and during labor and delivery. Suggested monitoring includes an echocardiogram before and periodically during pregnancy, especially during the third trimester, and cardiac monitoring during labor and delivery.

How are the heart tests done?

An electrocardiogram (ECG, EKG) is a test used to evaluate heart rate and rhythm. Electrodes (small sticky patches) are placed on the chest, arms, and legs. Wires are attached to the electrodes and the electrical impulses of the heart are then recorded. An **echocardiogram** (heart ultrasound) is used to test the muscle function of the heart and how well the heart pumps. The person lies on a table and has conductive jelly applied to the chest. Then a transducer (device that emits the ultrasound waves) is placed on the chest to obtain different views of the heart. Slight pressure is applied on the transducer and can sometimes cause discomfort. The test results are displayed on videotape and photographed for the doctor to study later. Many measurements are done during this test to help find out if the heart muscle is pumping blood well. The ultrasound test also looks at the valves of the heart to see that they open and close normally. Electrodes are usually placed on the chest to monitor the heart's electrical impulses during the test.

A **MUGA** (multiple-gated acquisition) scan is another way of testing the motion of the heart and how well it pumps blood to the body. During this test, a small amount of radioactive isotope is injected into a vein. The person then lies on a table and a special camera moves above the table to obtain pictures of the heart in motion. Electrodes are also placed on the chest to monitor the heart's electrical impulses during the test.

A **cardiac stress test** measures heart function during periods when the heart is working hard. During this test, the heart and blood pressure are usually monitored while the person walks on a treadmill.

What happens if a problem with the heart is detected?

Your healthcare provider will advise you about the follow-up care you need. Sometimes, a referral to a cardiologist (heart specialist) is needed for additional evaluation and/or treatment with medications.

What can be done to prevent heart problems?

With increasing age, the risk of certain types of heart disease (such as heart attacks and hardening of the arteries) also increases. Factors that may increase the risk of heart problems include smoking, being overweight, eating a high fat diet, and not exercising. Medical conditions that increase the risk include diabetes, high blood pressure, and high blood cholesterol. You can reduce your risk of heart problems by:

- Not smoking (or quitting if you currently smoke).
- Staying at a healthy body weight.
- Limiting the fat in your diet to no more than 30% of calories.
- Exercising moderately for at least 30 minutes on most days of the week.

If you have diabetes, high blood pressure, or high blood cholesterol, keep these under good control with diet or medication as recommended by your healthcare provider. Be sure to promptly report any symptoms of heart problems to your healthcare provider.

Works Cited

Adapted from Children's Oncology Group Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers
http://www.survivorshipguidelines.org/