



Awareness, Routine Medical Screening Can Minimize Breast Cancer Risks

Pilots who are diagnosed with breast cancer typically are prohibited from performing flight duties while undergoing chemotherapy or radiation therapy; otherwise, each case is assessed individually to determine when the pilot should be permitted to resume normal duties.

—
Stanley R. Mohler, M.D.

More than 1 million new cases of breast cancer are diagnosed worldwide each year, and about 373,000 people die of the disease.¹ Breast cancer is the second-most common cancer among women, after skin cancer, and the second-leading cause of cancer deaths, after lung cancer.

Although breast cancer occurs much more frequently among women, men also can develop the disease; about 1 percent of breast cancer patients are men (see “Breast Cancer Often Is Not Suspected as Cause of Men’s Symptoms,” page 2). Most information about symptoms, diagnosis and treatment of breast cancer is the same for men and women; nevertheless, routine screening for the disease is not recommended for men.

For pilots and cabin crewmembers, the life-threatening and career-ending risks of breast cancer can be minimized through knowledge of the disease and its symptoms, regular self-examination and routine medical screening tests.

Symptoms that may indicate breast cancer include the presence of a lump that feels different than other breast tissue, persistent swelling of the breast or a persistent lump, puckering skin, scaly skin around the nipple, changes in the shape of the breast or in the appearance of the nipple, or fluid — especially bloody fluid — leaking from the nipple.



(These symptoms can indicate one of several noncancerous conditions, including cysts [fluid-filled sacs], which may be drained by insertion of a thin needle, and fibrous lumps containing collagen [a protein usually found in cartilage and other parts of the body], which may be surgically removed. Cysts, noncancerous lumps and pain in the breast also are present in fibrocystic breast disease.)

Breast cancer exists in several forms and is classified according to the kind of tissue in which it begins (the milk glands, milk ducts [lobules], fatty tissue or connective tissue) and by the extent to which it has spread (metastasized; Figure 1, page 3).

Breast cancer “in situ” is a cancer that has not spread beyond the point of origin. There are two forms of breast cancer in situ:

- Ductal carcinoma in situ begins in the milk ducts and can develop before menopause or after menopause. In the earliest stage, ductal carcinoma in situ sometimes can be felt during self-examination as a lump in the breast but more often is detected during a screening mammogram (a routine X-ray examination of the breast). Ductal carcinoma in situ usually is removed by surgery; and,

Continued on page 3

Breast Cancer Often Is Not Suspected as Cause of Men's Symptoms

Although breast cancer occurs most frequently in women, about 1 percent of cases worldwide involve men.¹

Risk factors for male breast cancer include increasing age; a family history of breast cancer; exposure to radiation (usually for treatment of cancer inside the chest); liver disease; genetic changes involving a gene that usually helps prevent tumor development; and Klinefelter's syndrome, a chromosomal abnormality. (A person's sex is determined by two sex chromosomes. Normally, females have two X chromosomes, and males have one X chromosome and one Y chromosome. In Klinefelter's syndrome, the male usually has two X chromosomes and one Y chromosome.)²

Symptoms of breast cancer are the same among men and women, but because the disease so seldom affects men, and because routine screening for breast cancer is not recommended for men, male patients — and their physicians — often do not suspect breast cancer as the cause of the symptoms.

As a result, male breast cancer often is not diagnosed until it has reached an advanced stage. The prognosis for a male breast cancer patient is almost the same as the prognosis for a female patient with the same stage of cancer. Treatment is almost the same, except that men rarely undergo breast-conserving surgery. If the cancer has spread beyond the breast, men typically undergo hormonal therapy or chemotherapy to deprive cancer cells of the hormones that feed their growth.³

Alaska Airlines Capt. Edward J. Wilson, who had a mastectomy in May 2000 at age 47, wrote about the symptoms that preceded his breast cancer diagnosis:⁴

While on a layover [in 1999], I felt a stinging sensation under my left nipple, but this sensation disappeared the following day. A few months later, I felt hardness in the same area, but it was not permanent. In March [2000], I noticed that the hardness was always present and asked my doctor about it. He told me that it might be gynecomastia — enlargement of male breast tissue.⁵

In May, during my next physical, I told my doctor that I wanted the tissue removed. I scheduled the surgery for the first week in June to coincide with my vacation. On June 7, I had the tissue removed. I felt fine, with just a little soreness under my nipple area.

The following week, however, I learned that the pathology report indicated cancerous cells — news that was numbing and overwhelming. The report surprised my doctor, and he wanted to proceed with surgery as soon as possible. My first reaction was that I needed some time to comprehend all of this, and I wanted

to consult with other specialists. ... The diagnosis revealed infiltrating [invasive] ductal carcinoma (the most common type of breast cancer).

Wilson had surgery to remove the cancer and five lymph nodes, one of which also contained cancer cells. When he wrote about his experience in October 2000, he was still undergoing chemotherapy.

In a telephone interview in March 2003, he said that he completed his eighth and final chemotherapy session in December 2000.⁶ The U.S. Federal Aviation Administration (FAA) ordered a nearly six-month waiting period before reviewing his medical records; during that time, he attended flight training ground school. In May 2001, after a variety of medical tests — including magnetic resonance imaging (MRI; a procedure in which a magnet and a computer are used together to produce a detailed picture of an area within the body), a chest X-ray and a liver-function test — showed no sign of the cancer, FAA issued him a first-class medical certificate and he resumed flying Boeing 737s.

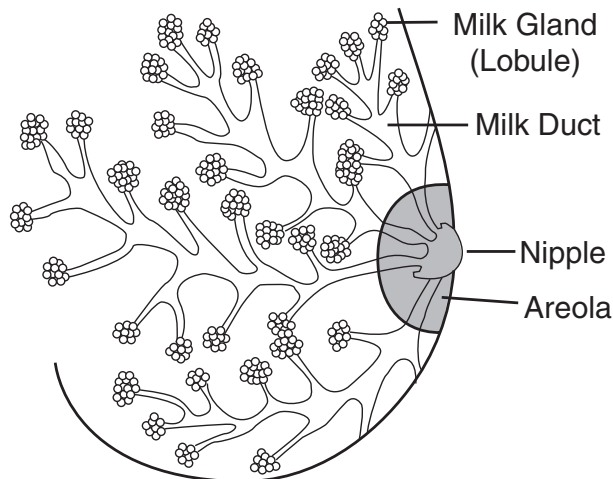
His medical certificate has been re-issued every six months since then, and he has continued to perform his flight duties. He remains free of cancer.♦

— FSF Editorial Staff

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5. Gynecomastia, the most common breast disorder in men, often occurs during puberty and sometimes recurs later because of a change in the body's hormonal balance; diseases of the liver; or use of some types of medication. Symptoms include enlargement of one breast or both breasts, a growth under the nipple and tenderness or pain. The condition usually disappears without treatment or after the cause is eliminated.
6. Wilson, Edward J. Telephone interview by Werfelman, Linda. Alexandria, Virginia, U.S., March 7, 2003. Flight Safety Foundation, Alexandria, Virginia, U.S.

Diagram of the Female Breast



Source: U.S. National Women's Health Information Center

Figure 1

- Lobular carcinoma in situ, also called lobular neoplasia, usually develops before menopause. This form of breast cancer usually cannot be felt during self-examination or seen on a screening mammogram and usually is found during a medical examination of another abnormality involving breast tissue. Some health care professionals do not consider lobular carcinoma in situ to be cancer but rather an indication that the woman is at increased risk of developing cancer.

Women who have these forms of in situ carcinomas sometimes develop — often many years later — invasive breast cancers, also called infiltrating breast cancers, which can spread to other tissues, either within the breast (localized) or in other parts of the body (metastatic). In invasive ductal carcinoma and invasive lobular carcinoma, the cancer cells spread into the breast's fatty tissue; they also can enter the lymphatic system (the vessels and nodes that remove excess fluids from the tissues, filter the fluids and return them to the blood) or blood vessels and can spread to other parts of the body.

Three forms of invasive ductal breast cancer — medullary carcinoma, colloid carcinoma and tubular carcinoma — usually result in less risk of metastasis and a greater likelihood of survival than other forms of invasive ductal breast cancer or invasive lobular breast cancer of the same size. Medullary carcinoma has several unique characteristics, including unusually large cancer cells, a distinct boundary between normal breast tissue and cancerous breast tissue, and the presence of immune-system cells at the edge of the cancer. Colloid carcinoma, also called mucinous carcinoma, is formed by mucus-producing cancer cells.

There are other rare forms of breast cancer, including the following:

- Paget's disease of the breast, also known as mammary Paget's disease, often involves itching, redness and scaling of skin on the nipple and the areola, the area of skin surrounding the nipple, or a discharge from the nipple. (In 30 percent of cases, however, there are no symptoms.) Paget's disease of the breast occurs in 1 percent to 4 percent of breast cancer patients and usually accompanies a lump in the breast.² Treatment typically involves a mastectomy and removal of surrounding lymph nodes (also called lymph glands); and,
- Inflammatory breast cancer is a form of cancer in which cancer cells block the lymphatic system in the skin of the breast, resulting in redness, swelling and unusual warmth of the breast. The skin also may appear to have ridges or pits, and may resemble the skin of an orange. Lymph nodes under the arm or above the collarbone may swell, and a tumor may be visible on a mammogram. Treatment usually involves surgery and/or radiation therapy to remove or destroy the cancer cells in the breast and chemotherapy or hormonal therapy to stop the spread of the disease elsewhere in the body.

Flight Duties Prohibited Because of Some Symptoms, Treatments

Claus Curdt-Christiansen, M.D., chief of the International Civil Aviation Organization (ICAO) aviation medicine section, said that in most of ICAO's contracting states, a pilot who is diagnosed with any cancer — including breast cancer — is prohibited from performing flight duties while he or she undergoes more extensive testing and evaluation.³

"In many cases, the annual risk of incapacitation is too high [during] the first year or years after primary treatment, but often the risk falls to an acceptable level after some years, and recertification — often with some limitation (e.g., 'with or as copilot only') — becomes possible," he said. "Each case is assessed on its own merit — how is the pilot doing; what part of the body is affected; is the cancer likely to spread, and if so, where; what are the risks of recurrence."

Pilots are prohibited from performing flight duties while undergoing chemotherapy or radiation treatment, Curdt-Christiansen said.

"The side effects — nausea, fatigue — would make it unwise to consider flight during a course of treatment," he said. In addition, these treatments often are associated with psychological stresses, he said.

Two weeks to four weeks after treatment, medical authorities typically evaluate pilots to determine whether they should be permitted to resume flight duties, he said.

ICAO has no provisions related to cabin crewmembers with breast cancer; typically, the operator is responsible for ensuring that cabin crewmembers are fit to perform their duties.

Annette Ruge, M.D., Ph.D., medical coordinator for the European Joint Aviation Authorities (JAA), said that the case of a pilot with breast cancer — or any other cancer — is assessed by the JAA Aeromedical Section.⁴

“The decision will be based on the individual case, depending on the stage of the tumor when the diagnosis was made, the therapy (surgery, radiation therapy, chemotherapy), the probability of metastasis and the impact of a metastasis on flight safety, Ruge said. A formula has been developed to calculate the risk that a particular metastasis, especially brain metastasis, will cause incapacitation; if the risk exceeds 1 percent, certification or recertification is not permitted, she said.

The U.S. Federal Aviation Administration (FAA) says that a pilot undergoing intravenous chemotherapy or radiation therapy may not exercise her or his flight duties. If breast cancer has metastasized, medical certification also is denied. After recovery from surgery and/or chemotherapy, a pilot may be recertified, depending on the outcome of an FAA review of medical reports by the treating physicians and of a current FAA medical examination form. If a medical certificate is issued, the pilot may be required to undergo subsequent periodic medical examinations.⁵

Risk Factors Include Age, Family History

The causes of breast cancer are not known, and there is no method of prevention. Risk factors include the following:

- Being female;
- Age. Breast cancer is rare in women younger than 35; about 60 percent of breast cancers occur in women older than 60;⁶
- A personal history of breast cancer. A woman who has had breast cancer is more likely to develop breast cancer in the other breast;
- A family history of breast cancer. A woman is two times to three times more likely to develop breast cancer if her mother, sister or daughter has had breast cancer, especially if they had the disease at a relatively early age. If a more distant relative, such as a grandmother, aunt or cousin, has had breast cancer, a woman’s risk of developing breast cancer increases only slightly;

- Genetics. Changes in some genes increase the risk of breast cancer. Gene-testing sometimes can determine whether such changes have occurred; and,
- Some types of changes in the breasts. For example, a woman with atypical hyperplasia (a noncancerous condition in which cells have abnormal features and are increased in number) may have an increased risk of breast cancer.

Other factors that may increase risk include prolonged exposure to estrogen (a hormone that aids development of female sex characteristics), regardless of whether the estrogen is produced by the body or administered as medication; giving birth to the first child after age 30; relatively high breast density; exposure to radiation therapy before age 30; and consumption of alcohol.

Nevertheless, specialists say that 70 percent of women with breast cancer have none of these risk factors, other than being female and aging.⁷

Some studies have suggested that pilots and cabin crewmembers may have an increased risk of developing breast cancer — and some other forms of cancer — perhaps because of their cumulative exposure to higher levels of cosmic radiation during flights at high altitudes.

In the United States, a 1999 report on a study of 6,000 cabin crewmembers living in California, said that from 1988 through 1995, 175 of the cabin crewmembers were diagnosed with cancer. Of the 175 cancers, 129 were invasive cancers — including 60 cases of invasive breast cancer and 15 cases of malignant melanoma of the skin — and 46 were in situ cancers.⁸

“Breast cancer incidence was over 30 percent higher than expected, and melanoma incidence was roughly twice that expected,” the report said. “Both of these are cancers that ... have been suggestively associated with various sources of radiation. ... Data suggest that follow-up investigations should focus on the potential relative contribution of workplace exposures and lifestyle characteristics to the higher rates of disease for these two cancers.”

A 2000 report said that several studies conducted from 1986 through 1998 found an increased risk of breast cancer among cabin crewmembers.⁹

“Both occupational exposures and well-established non-occupational risk factors may contribute to this increased risk,” the report said. The report said that some of those risk factors might include exposure to pesticides that may have been used in the past in aircraft cabins after the arrival of flights in some countries, disruption of circadian rhythms as a result of flights across numerous time zones (researchers said that disruption of sleep-waking cycles might suppress the body’s secretion of

melatonin, which may protect against cancer), and exposure to cosmic radiation at high altitudes.

Self-examination Detects 75 Percent of Lumps

Early detection is crucial in the successful treatment of and recovery from breast cancer, and chances of a complete recovery are 90 percent or greater when the disease is detected early in its development.¹⁰ Breast cancer typically is detected through one of three methods:

- Breast self-examination is recommended on a monthly basis for all women, beginning about age 20, to detect lumps, swelling, dimpling of the skin, redness or other anomalies. Seventy-five percent of all lumps in the breast — both cancerous and noncancerous — are discovered during self-examination.¹¹ If self-examination results in the discovery of a lump or of changes in how a breast feels, a physician should be consulted as soon as possible;
- Clinical breast examination is performed by physicians and other health care professionals to detect the same types of anomalies that are sought during self-examination. Specialists recommend that women between the ages of 20 and 39 have a clinical breast examination every three years and that women older than 40 have this examination every year. If anomalies are found, a diagnostic mammogram is conducted to help health care professionals further assess the health of the breast; and,
- A screening mammogram, conducted with specially designed X-ray equipment that emits very low levels of radiation, is used to detect breast cancer in women who have no symptoms. The breast is compressed between two plates for several seconds while a health care professional uses the X-ray equipment to produce a black-and-white filmed image that is interpreted by a radiologist.

The X-ray films can reveal several conditions, including calcifications, or mineral deposits in the breast, which appear on film as small white spots. Although they may be caused by breast cancer, they more often are a result of noncancerous breast conditions. Typically, they are monitored with periodic mammograms or a biopsy (removal of a small amount of tissue, either surgically or with a needle, for examination with a microscope). The films also may reveal a mass, which may be cancerous or noncancerous; typically, a biopsy is conducted to determine whether cancer is present. Cysts also can be observed on the films. Cysts usually are not cancerous but are examined with ultrasound (use of ultrasound waves to differentiate between solid masses and fluid-

filled cysts) or aspiration (removal of fluid with a needle) to confirm the absence of cancer cells.

Although a mammogram can show the existence of these conditions, further examination is required to determine whether cancer is present. Further examination usually requires either aspiration or a biopsy.

Specialists disagree on how often women should have screening mammograms and the age at which the screening mammograms should begin. The American Cancer Society recommends an annual screening mammogram for women age 40 and older.¹² Women with a family history of breast cancer should have a “baseline” (first) screening mammogram at age 30.

If breast cancer is detected, the cancer is classified using stages. “Stage zero” breast cancer refers to cancers in situ that are confined to ducts or lobules. Stage 1 breast cancer is cancer that has spread beyond the duct or lobule but not beyond the breast; the cancerous area is no more than one inch (2.54 centimeters) in diameter. Stage 2 breast cancer is cancer that is less than one inch in diameter and has spread to the lymph nodes under the arm, or is between one inch and two inches (5.1 centimeters) in diameter, regardless of whether it has spread to the lymph nodes, or is larger than two inches but has not spread to the lymph nodes under the arm. Stage 3 breast cancer, also called locally advanced breast cancer, is cancer that is more than two inches in diameter and has spread to the lymph nodes under the arm, or has spread to lymph nodes near the breastbone or to tissues near the breast. Stage 4 breast cancer has metastasized beyond the breast — usually to the bones but sometimes to other organs.

Further classification of breast cancer requires tests to assess the characteristics of the cancer, including a measurement of proteins called hormone receptors (estrogen receptors and progesterone receptors) within the cancer. The presence of a large number of hormone receptors may indicate that hormones are helping the cancer grow; in such cases, treatment may include hormonal therapy to deprive the cancer cells of estrogen and slow their growth. (Hormonal therapy also sometimes involves surgical removal of the ovaries, which produce female hormones.) This type of breast cancer occurs most often among older women.

Treatments Usually Include Surgery

Treatment of breast cancer varies, depending on the characteristics of the cancer, how quickly the cancer is expected to grow and the extent to which the cancer already may have spread. Because physicians often have different ideas about the most appropriate type of treatment to be used in particular cases of breast cancer, many specialists recommend that a woman consult more than one physician before beginning treatment.

If the cancer is contained within the breast, treatment typically includes surgery to remove the cancer cells — or as much of the cancer as possible. There are several types of surgery: mastectomy, in which the entire breast — and sometimes the lymph nodes under the arm and the chest muscles beneath the breast — are removed, and breast-conserving surgeries (lumpectomy, wide excision or partial mastectomy, and quadrantectomy), in which the cancer cells and varying amounts of surrounding tissue are removed.

Breast-conserving surgery typically is accompanied by about six weeks of radiation therapy, in which radiation from X-rays and a variety of other sources is used to destroy remaining cancer cells. Radiation therapy is administered as external-beam radiation therapy, in which the radiation comes from a machine outside the body; internal radiation therapy (also called implant radiation, interstitial radiation or brachytherapy), in which a radioactive substance is placed in or near the cancer cells; or systemic radiation therapy (also called radiotherapy, irradiation or X-ray therapy), in which a radioactive substance circulates through the body.

Studies have found that survival rates for women who have had mastectomies are the same as survival rates for women who have undergone breast-conserving surgery with radiation therapy — at least for the first 20 years after surgery.¹³ The primary advantage of breast-conserving surgery, plus radiation, is cosmetic; nevertheless, if a tumor is large, removal of most of the breast may be required, and in many cases, the treatment causes the breast to shrink and change in shape.

If the cancer is an invasive type and has spread to the lymph nodes, surgery often is followed by chemotherapy (administration of cancer-fighting medications) for three months to six months or longer, sometimes for years. Chemotherapy typically involves a combination of medications administered in pills or by injections in varying amounts and on varying schedules.

Chemotherapy may have side effects such as nausea, vomiting or temporary hair loss. Chemotherapy medications in use today, however, have made vomiting relatively rare.

Biological therapy may be used in rare cases to increase the body's natural defenses against cancer. For example, substances known as synthetic interferons may be used to trigger some white blood cells to attack cancer cells, and some medications may be used to inhibit growth of new blood vessels that would support cancer cells.

After a mastectomy, surgery sometimes is performed to reconstruct the breast with a silicone implant, a saline implant or tissue taken from another part of the woman's body. (The safety of silicone implants, however, has been under review for several years.) The type of reconstruction often is determined by the woman's age, body type and the type

of surgery. Other women may wear a prosthesis (an artificial form).

Rehabilitation also is required after a mastectomy to regain motion and strength in the neck, back, shoulders and arms, and to reduce pain. Exercise plans vary according to the extent of the cancer and the type of treatment that was administered.

Breast cancer sometimes can metastasize as long as two decades after the disease is first diagnosed and treated. There is no cure for breast cancer that has spread outside the breast; symptoms can be treated with medication and/or surgery, and women typically live at least two years — sometimes as long as 20 years — with this stage 4 cancer.

New Methods of Detection, Treatment Being Developed

Research is being conducted on a variety of new methods of detecting breast cancer by improving the accuracy of mammograms. One method involves using computers to interpret the results of mammograms (digital mammography).¹⁴ Other methods involve the use of ultrasound devices; magnetic resonance imaging (MRI), a procedure in which a magnet and a computer are used together to produce a detailed picture of an area within the body; and positron emission tomography (PET) scan, in which a computerized image of metabolic activity in the body helps detect disease.¹⁵

Research also is being conducted on new methods of treating breast cancer. The U.S. National Cancer Institute said that researchers are trying to determine the effectiveness of neoadjuvant chemotherapy (using chemotherapy before surgery) and of combining treatments (for example, adding hormonal therapy or radiation therapy to chemotherapy). Researchers also are studying several cancer vaccines that are intended to stimulate the body's immune system to produce a defense against breast cancer cells.

Research has resulted in improved methods of detecting and treating breast cancer early so that women have improved chances of overcoming the disease — enabling female pilots and cabin crewmembers to continue their careers.♦

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Mohler received the 1998 Flight Safety Foundation Cecil A. Brownlow Publication Award for journalism that enhances aviation safety awareness.

Further Reading From FSF Publications

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