

Cancer Screening Overview (PDQ®)–Patient Version

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What Is Cancer Screening?

KEY POINTS

- Cancer screening is looking for cancer before a person has any symptoms.
- There are different kinds of screening tests.
- Screening tests have risks.
 - Some screening tests can cause serious problems.
 - False-positive test results are possible.
 - False-negative test results are possible.
 - Finding the cancer may not improve the person's health or help the person live longer.

Cancer screening is looking for cancer before a person has any symptoms.

Screening tests can help find cancer at an early stage, before symptoms appear. When abnormal tissue or cancer is found early, it may be easier to treat or cure. By the time symptoms appear, the cancer may have grown and spread. This can make the cancer harder to treat or cure.

It is important to remember that when your doctor suggests a screening test, it does not always mean he or she thinks you have cancer. Screening tests are done when you have no cancer symptoms.

There are different kinds of screening tests.

Screening tests include the following:

- **Physical exam and history:** An exam of the body to check general signs of health, including checking for signs of disease, such as lumps or anything else that seems unusual. A history of the patient's health habits and past illnesses and treatments will also be taken.
- **Laboratory tests:** Medical procedures that test samples of tissue, blood, urine, or other substances in the body.
- **Imaging procedures:** Procedures that make pictures of areas inside the body.
- **Genetic tests:** Tests that look for certain gene mutations (changes) that are linked to some types of cancer.

Screening tests have risks.

Not all screening tests are helpful and most have risks. It is important to know the risks of the test and whether it has been proven to decrease the chance of dying from cancer.

Some screening tests can cause serious problems.

Some screening procedures can cause bleeding or other problems. For example, colon cancer screening with sigmoidoscopy or colonoscopy can cause tears in the lining of the colon.

False-positive test results are possible.

Screening test results may appear to be abnormal even though there is no cancer. A false-positive test result (one that shows there is cancer when there really isn't) can cause anxiety and is usually followed by more tests and procedures, which also have risks.

False-negative test results are possible.

Screening test results may appear to be normal even though there is cancer. A person who receives a false-negative test result (one that shows there is no cancer when there really is) may delay seeking medical care even if there are symptoms.

Finding the cancer may not improve the person's health or help the person live longer.

Some cancers never cause symptoms or become life-threatening, but if found by a screening test, the cancer may be treated. There is no way to know if treating the cancer would help the person live longer than if no treatment were given. In both teenagers and adults, there is an increased risk of suicide in the first year after being diagnosed with cancer. Also, treatments for cancer have side effects.

For some cancers, finding and treating the cancer early does not improve the chance of a cure or help the person live longer.

What Is Informed and Shared Decision-Making?

KEY POINTS

- It is important that you understand the benefits and harms of screening tests and make an informed choice about which screening tests are right for you.

It is important that you understand the benefits and harms of screening tests and make an informed choice about which screening tests are right for you.

Before having any screening test, it is important that you discuss the test with your doctor or other health care provider. Every screening test has both benefits and harms. Your health care provider should talk to you about the benefits and harms of a screening test and include you in the decision about whether the screening test is right for you. This is called informed and shared decision-making.

1. Your health care provider will talk to you about the possible benefits, harms, and unknowns of a

screening test. This may include information about the benefits of finding a cancer early or the harms related to false test results, overdiagnosis, and overtreatment. Your health care provider may also give you information in a leaflet, booklet, video, website, or other material.

2. After you understand the benefits and harms of a screening test, you can decide whether or not you want to have the screening test based on what is best for you. Sometimes the harms and benefits are closely matched and the decision about whether to have a screening test is hard to make.
3. Your health care provider will write your decision down in your medical record and order the screening test, if that was your decision.

What Are the Goals of Screening Tests?

KEY POINTS

- Screening tests have many goals.
- Screening tests are not meant to diagnose cancer.

Screening tests have many goals.

A screening test that works the way it should and is helpful does the following:

- Finds cancer before symptoms appear.
- Screens for a cancer that is easier to treat and cure when found early.
- Has few false-negative test results and false-positive test results.
- Decreases the chance of dying from cancer.

Screening tests are not meant to diagnose cancer.

Screening tests usually do not diagnose cancer. If a screening test result is abnormal, more tests may be done to check for cancer. For example, a screening mammogram may find a lump in the breast. A lump may be cancer or something else. More tests need to be done to find out if the lump is cancer. These are called diagnostic tests. Diagnostic tests may include a biopsy, in which cells or tissues are removed so a pathologist can check them under a microscope for signs of cancer.

Who Needs to Be Screened?

KEY POINTS

- Certain screening tests may be suggested only for people who have a high risk for certain cancers.
- Cancer screening research includes finding out who has an increased risk of cancer.

Certain screening tests may be suggested only for people who have a high risk for certain cancers.

Anything that increases the chance of cancer is called a cancer risk factor. Having a risk factor does not mean that you will get cancer; not having risk factors doesn't mean that you will not get cancer.

Some screening tests are used only for people who have known risk factors for certain types of cancer. People known to have a higher risk of cancer than others include those who :

- Have had cancer in the past; or
- Have a family history of cancer.; or
- Have certain gene mutations (changes) that have been linked to cancer.

People who have a high risk of cancer may need to be screened more often or at an earlier age than other people.

Cancer screening research includes finding out who has an increased risk of cancer.

Scientists are trying to better understand who is likely to get certain types of cancer. They study the things we do and the things around us to see if they cause cancer. This information helps doctors figure out who should be screened for cancer, which screening tests should be used, and how often the tests should be done.

Since 1973, the [Surveillance, Epidemiology, and End Results \(SEER\) Program](#) of the National Cancer Institute has been collecting information on people with cancer from different parts of the United States. Information from SEER, research studies, and other sources is used to study who is at risk.

How is Cancer Risk Measured?

Cancer risk is measured in different ways. The findings from surveys and studies about cancer risk are studied and the results are explained in different ways. Some of the ways risk is explained include *absolute risk* , *relative risk* , and *odds ratios* .

- **Absolute risk**

This is the risk a person has of developing a disease, in a given population (for example, the entire U.S. population) over a certain period of time. Researchers estimate the absolute risk by studying a large number of people that are part of a certain population (for example, women in a given age group). Researchers count the number of people in the group who get a certain disease over a certain period of time. For example, a group of 100,000 women between the ages of 20 and 29 are observed for one year, and 4 of them get breast cancer during that time. This means that the one-year absolute risk of breast cancer for a woman in this age group is 4 in 100,000, or 4 chances in 100,000.

- **Relative risk**

This is often used in research studies to find out whether a trait or a factor can be linked to the risk of a disease. Researchers compare two groups of people who are a lot alike. However, the people in one of

the groups must have the trait or factor being studied (they have been “exposed”). The people in the other group do not have it (they have not been exposed). To figure out relative risk, the percentage of people in the exposed group who have the disease is divided by the percentage of people in the unexposed group who have the disease.

Relative risks can be:

- Larger than 1: The trait or factor is linked to an increase in risk.
- Equal to 1: The trait or factor is not linked to risk.
- Less than 1: The trait or factor is linked to a decrease in risk.

Relative risks are also called risk ratios.

• **Odds ratio**

In some types of studies, researchers don’t have enough information to figure out relative risks. They use something called an odds ratio instead. An odds ratio can be an estimate of relative risk.

One type of study that uses an odds ratio instead of relative risk is called a case-control study. In a case-control study, two groups of people are compared. However, the individuals in each group are chosen based on whether or not they have a certain disease. Researchers look at the odds that the people in each group were exposed to something (a trait or factor) that might have caused the disease. Odds describes the number of times the trait or factor was present or happened, divided by the number of times it wasn’t present or didn’t happen. To get an odds ratio, the odds for one group are divided by the odds for the other group.

Odds ratios can be:

- Larger than 1: The trait or factor is linked to an increase in risk.
- Equal to 1: The trait or factor is not linked to risk.
- Less than 1: The trait or factor is linked to a decrease in risk.

Looking at traits and exposures in people with and without cancer can help find possible risk factors. Knowing who is at an increased risk for certain types of cancer can help doctors decide when and how often they should be screened.

Does Screening Help People Live Longer?

KEY POINTS

- Finding some cancers at an early stage (before symptoms appear) may help decrease the chance of dying from those cancers.
- Screening studies are done to see whether deaths from cancer decrease when people are screened.

- Certain factors may cause survival times to look like they are getting better when they are not.

Finding some cancers at an early stage (before symptoms appear) may help decrease the chance of dying from those cancers.

For many cancers, the chance of recovery depends on the stage (the amount or spread of cancer in the body) of the cancer when it was diagnosed. Cancers that are diagnosed at earlier stages are often easier to treat or cure.

Studies of cancer screening compare the death rate of people screened for a certain cancer with the death rate from that cancer in people who were not screened. Some screening tests have been shown to be helpful both in finding cancers early and in decreasing the chance of dying from those cancers. These include mammograms for breast cancer and sigmoidoscopy and fecal occult blood testing for colorectal cancer. Other tests are used because they have been shown to find a certain type of cancer in some people before symptoms appear, but they have not been proven to decrease the risk of dying from that cancer. If a cancer is fast-growing and spreads quickly, finding it early may not help the person survive the cancer.

Screening studies are done to see whether deaths from cancer decrease when people are screened.

When collecting information on how long cancer patients live, some studies define survival as living 5 years after the diagnosis. This is often used to measure how well cancer treatments work. However, to see if screening tests are useful, studies usually look at whether deaths from the cancer decrease in people who were screened. Over time, signs that a cancer screening test is working include:

- An increase in the number of early-stage cancers found.
- A decrease in the number of late-stage cancers found.
- A decrease in the number of deaths from the cancer.

The number of deaths from cancer is lower today than it was in the past. It is not always clear if this is because screening tests found the cancers earlier or because cancer treatments have gotten better, or both. The [Surveillance, Epidemiology, and End Results \(SEER\) Program](#) of the National Cancer Institute collects and reports information on survival times of people with cancer in the United States. This information is studied to see if finding cancer early affects how long these people live.

Certain factors may cause survival times to look like they are getting better when they are not.

These factors include lead-time bias and overdiagnosis.

- **Lead-time bias**

Survival time for cancer patients is usually measured from the day the cancer is diagnosed until the day they die. Patients are often diagnosed after they have signs and symptoms of cancer. If a screening test leads to a diagnosis before a patient has any symptoms, the patient's survival time is increased because

the date of diagnosis is earlier. This increase in survival time makes it seem as though screened patients are living longer when that may not be happening. This is called lead-time bias. It could be that the only reason the survival time appears to be longer is that the date of diagnosis is earlier for the screened patients. But the screened patients may die at the same time they would have without the screening test.

- **Overdiagnosis**

Sometimes, screening tests find cancers that don't matter because they would have gone away on their own or never caused any symptoms. These cancers would never have been found if not for the screening test. Finding these cancers is called overdiagnosis. Overdiagnosis can make it seem like more people are surviving cancer longer, but in reality, these are people who would not have died from cancer anyway.

How do Screening Tests Become Standard Tests?

KEY POINTS

- Results from research studies help doctors decide when a screening test works well enough to be used as a standard test.
- Different types of research studies are done to study cancer screening.
- The following types of studies are used to get information about cancer screening tests:
 - Randomized controlled trials
 - Nonrandomized controlled trials
 - Cohort studies
 - Case-control studies
 - Ecologic studies
 - Expert opinions
- New ways to screen for cancer are being studied in clinical trials.

Results from research studies help doctors decide when a screening test works well enough to be used as a standard test.

Evidence about how safe, accurate, and useful cancer screening tests are comes from clinical trials (research studies with people) and other kinds of research studies. When enough evidence has been collected to show that a screening test is safe, accurate, and useful, it becomes a standard test. Examples of cancer screening tests that were once under study but are now standard tests include:

- Colonoscopy for colorectal cancer.
- Mammograms for breast cancer.
- Pap tests (Pap smears) for cervical cancer.

Different types of research studies are done to study cancer screening.

Cancer screening trials study new ways of finding cancer in people before they have symptoms. Screening trials also study screening tests that may find cancer earlier or are more accurate than existing tests, or that may be easier, safer, or cheaper to use. Screening trials are designed to find the possible benefits and possible harms of cancer screening tests. Different clinical trial designs are used to study cancer screening tests.

The strongest evidence about screening comes from research done in clinical trials. However, clinical trials cannot always be used to study questions about screening. Findings from other types of studies can give useful information about how safe, useful, and accurate cancer screening tests are.

The following types of studies are used to get information about cancer screening tests:

Randomized controlled trials

Randomized controlled trials give the highest level of evidence about how safe, accurate, and useful cancer screening tests are. In these trials, volunteers are assigned randomly (by chance) to one of two or more groups. The people in one group (the control group) may be given a standard screening test (if one exists) or no screening test. The people in the other group(s) are given the new screening test(s). Test results for the groups are then compared to see if the new screening test works better than the standard test, and to see if there are any harmful side effects.

Using chance to assign people to groups means that the groups will probably be very much alike and that the trial results won't be affected by human choices or something else.

Nonrandomized controlled trials

In nonrandomized clinical trials, volunteers are not assigned randomly (by chance) to different groups. They choose which group they want to be in or the study leaders assign them. Evidence from this type of research is not as strong as evidence from randomized controlled trials.

Cohort studies

A cohort study follows a large number of people over time. The people are divided into groups, called cohorts, based on whether or not they have had a certain treatment or been exposed to certain things. In cohort studies, the information is collected and studied after certain outcomes (such as cancer or death) have occurred. For example, a cohort study might follow a group of women who have regular Pap tests, and divide them into those who test positive for the human papillomavirus (HPV) and those who test negative for HPV. The cohort study would show how the cervical cancer rates are different for the two groups over time.

Case-control studies

Case-control studies are like cohort studies but are done in a shorter time. They do not include many years of follow-up. Instead of looking forward in time, they look backward. In case-control studies, information is collected from cases (people who already have a certain disease) and compared with information collected from controls (people who do not have the disease). For example, a group of patients with melanoma and a group without melanoma might be asked about how they check their skin for abnormal growths and how

often they check it. Based on the different answers from the two groups, the study may show that checking your skin is a useful screening test to decrease the number of melanoma cases and deaths from melanoma.

Evidence from case-control studies is not as strong as evidence from clinical trials or cohort studies.

Ecologic studies

Ecologic studies report information collected on entire groups of people, such as people in one city or county. Information is reported about the whole group, not about any single person in the group. These studies may give some evidence about whether a screening test is useful.

The evidence from ecologic studies is not as strong as evidence from clinical trials or other types of research studies.

Expert opinions

Expert opinions can be based on the experiences of doctors or reports of expert committees or panels. Expert opinions do not give strong evidence about the usefulness of screening tests.

New ways to screen for cancer are being studied in clinical trials.

Clinical trials are taking place in many parts of the country. Check the NCI website for NCI's list of [cancer screening trials](#) that are now accepting patients.

About This PDQ Summary

About PDQ

Physician Data Query (PDQ) is the National Cancer Institute's (NCI's) comprehensive cancer information database. The PDQ database contains summaries of the latest published information on cancer prevention, detection, genetics, treatment, supportive care, and complementary and alternative medicine. Most summaries come in two versions. The health professional versions have detailed information written in technical language. The patient versions are written in easy-to-understand, nontechnical language. Both versions have cancer information that is accurate and up to date and most versions are also available in [Spanish](#).

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Purpose of This Summary

This PDQ cancer information summary has current information about cancer screening. It is meant to inform and help patients, families, and caregivers. It does not give formal guidelines or recommendations for making decisions about health care.

Reviewers and Updates

Editorial Boards write the PDQ cancer information summaries and keep them up to date. These Boards are made up of experts in cancer treatment and other specialties related to cancer. The summaries are reviewed regularly and changes are made when there is new information. The date on each summary ("Date Last Modified") is the date of the most recent change.

The information in this patient summary was taken from the health professional version, which is reviewed regularly and updated as needed, by the [PDQ Screening and Prevention Editorial Board](#).

Clinical Trial Information

A clinical trial is a study to answer a scientific question, such as whether one treatment is better than another. Trials are based on past studies and what has been learned in the laboratory. Each trial answers certain scientific questions in order to find new and better ways to help cancer patients. During treatment clinical trials, information is collected about the effects of a new treatment and how well it works. If a clinical trial shows that a new treatment is better than one currently being used, the new treatment may become "standard." Patients may want to think about taking part in a clinical trial. Some clinical trials are open only to patients who have not started treatment.

Clinical trials are listed in PDQ and can be found online at [NCI's website](#). Many cancer doctors who take part in clinical trials are also listed in PDQ. For more information, call the Cancer Information Service 1-800-4-CANCER (1-800-422-6237).

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