



# Cancer Simplified

## Understanding the Basics of Cancer

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# **Introduction**

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## **About JASCAP**

JASCAP (Jeet Association for Support to Cancer Patients) is a knowledge based NGO registered with the Societies Registration Act 1860 vide no. 1359/1996 G.B.B.S.D, Mumbai and the Public Charitable Trusts Act, 1950 vide no. 18751, Mumbai. JASCAP strives continuously to impart up-to-date and accurate information on cancer and its management to individuals afflicted with cancer, as well as their caregivers.

Towards this effort, JASCAP manages a bookstall from Tata Memorial Hospital, Parel, Mumbai, as well as runs the JASCAP Cancer Information Centre. The publications of JASCAP contains information on different types of cancer, its diagnoses, treatments and psychological aspects in various Indian languages such as Hindi, Marathi, Kannada, Gujarati, Bengali, Tamil, Malayalam and Telugu besides English.

Besides Tata memorial Hospital, Parel, the distribution of cancer books is also managed from ACTREC, Navi Mumbai, and cancer hospitals in Ahmedabad, Baroda, Navsari, Surat, Kolkatta, Bangalore, Hyderabad and Chennai.

By June 2014, JASCAP has provided 200 titles in nine languages and sold 250,000 copies. JASCAP's publications are also available for free download from its website. For more information regarding JASCAP's activities please visit [www.jascap.org](http://www.jascap.org).

Donations to JASCAP qualify for Income Tax Exemption (under section 80 G(1) of the Income Tax Act, 1961).

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## Understanding the Basics of Cancer

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### Introduction

Cancer is a major healthcare challenge worldwide. In India about 11 lakh new cancer patients are diagnosed every year (Table 1). And our current lifestyle suggests that the incidence will continue to rise. For instance Breast cancer in Maharashtra has increased by 25% from 2001 to 2011 and is projected to increase by a further by 25% till 2021. Fortunately advances in all facets of healthcare management now make it possible to cure increasing number of cancer patients. In fact in some parts of the world, 65% of all cancers are disease free at 5 year follow up and are labeled as cured.

Table 1: Comparison of population, cancer incidence, cancer deaths and cancer prevalence rates in different regions (Noronha V et al: South Asian Journal of Cancer 2012).

	Population	New Cancer Cases/year	Cancer Deaths/year	5 year cancer prevalence (adults)	Cancer prevalence as proportion per 100,000 population
World	6,750,062,000	12,662,554	7,564,802	28,803,200	585.8
South Central Asia	1,728,752,000	1,423,200	979,900	2,682,400	228.7
SAARC Countries	1,659,700,000	1,296,558	887,355	2,439,285	
India	1,247,300,000	948,858	633,455	1,705,085	211.4

What prevents this from being true in India are misconceptions about the disease, the fear of the unknown and the failure to complete the intended treatment. This booklet is intended to dispel the myths that surround cancer and give you a clear idea of what constitutes cancer.

When you complete reading it you should be able to distinguish

between cancerous growths versus non cancerous disease, know that each cancer is different (with respect to symptoms, presentation, growth rate, pattern of spread, propensity for different organs, type of treatment required, response to treatment and chance of cure), what is the principle of investigating and treating a cancer and what you can do to maximize the benefit from your doctor's treatment.

Equip yourself with the right knowledge and you can win this battle against cancer!

## **Cancer is not one disease**

A common mistake that people make is to consider cancer as one disease. This is not true. There are more than two hundred different types of cancer that affects human beings. Each one causes different symptoms and requires a different approach to its management. To understand this better, let us take the example of a common ailment, chest pain. Acute chest pain can be due to a heart attack (myocardial infarction), infection in the lungs (pneumonia), indigestion (reflux oesophagitis) or even broken ribcage (fractured ribs). You will agree that each of these cannot be treated as one disease or expect to have the same outcome.

In a similar manner no patient with cancer is identical to any other one. Hence do not get influenced by what other patients have to say or what experiences they have. Protect yourself from such myths by carefully reading this, understand the disease and refer to the book whenever you have any doubt.

## **What are normal and cancerous cells?**

An adult human body has more than a 100 trillion such cells - each one being a completely independent functional and structural unit. The central nucleus acts like the brain and the rest of the cell is the factory that carries out the various functions. Normally, these cells grow and divide to repair and replace cells lost during normal wear and tear - cells grow old, they die, and new cells take their place. This is an orderly process wherein just the right number of cells is produced. This is possible because there is cell to cell cross talk mediated by chemicals called cytokines. Such cytokines can

act on the same cell (Autocrine) or on neighboring cells (paracrine). Cancer is nothing but normal human cells that have got transformed into diseased ones. So let us first understand what a cell is. The human body is made of organs that consist of tissues and their smallest unit is the cell. The cell is therefore the building block of our body and was named as such way back in 1655.

When disease occurs, this normal systematic process is disturbed. New cells start being produced even when the body does not require them. There is abnormal and excessive proliferation of these abnormal cells that do not die. This is usually because the "switch off" mechanism to stop growth is blocked. Such abnormal cells do not undergo cell death (Apoptosis) and ultimately form a mass of cells that is seen as an unusual growth (called a tumor).

## **What are benign and malignant tumors?**

Not all growths are cancerous. They are generally divided into benign (non cancerous) and malignant (cancerous) growths.

### **Characteristics of Benign (non cancerous) tumors are:**

- They are rarely life-threatening.
- They can be removed easily and usually do not grow back.
- They normally do not invade the tissues around them.
- They do not spread to other parts of the body.

### **Features of Malignant (cancer) tumors are:**

- They are potentially life-threatening.
- Even if removed, they have tendency to grow back.
- They easily invade and damage nearby tissues and organs.
- If the cancer is not diagnosed and treated in time, the cancer will grow and the cells will typically spread (metastasize) to distant parts of the body via the blood stream. Cancer cells break away from the original (primary) tumor and move away. They not only invade neighboring organs but also gain access to the bloodstream or the lymphatic system. These cells then travel to distant organs and/or regional lymph nodes,

and start growing elsewhere. This process of spread far and wide using the blood stream or lymphatic system is called metastasis.

## How is the diagnosis of cancer confirmed?

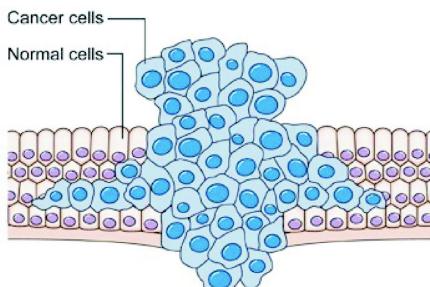
Under the microscope cells usually show a central nucleus, surrounding nuclear membrane, outer cytoplasm and then a cell wall. The cytoplasm also contains several different organelles that help the cell to carry out its intended function.

These normal cells look different from cancerous cells as seen under the microscope.

For instance normal cells will have an orderly layout and uniform shape within the tissues. They will show features of differentiation based on the function they have to carry out. Such characteristics are easily identified. In the figure below, the normal cells are all cuboidal in shape, with a nucleus that is located at one end of the cell and have a similar size and shape.

On the other hand the cancerous cells will be of a different size/shape, will not be distributed uniformly, will have a larger nucleus and will not show typical features of differentiation necessary for organ / tissue function. As they bulge out onto the surface as a group, they can become palpable as tumors.

Special staining, like immunohistochemistry, also helps distinguish normal cells from cancer cells. This is based on a differential expression of protein particles (antigens, receptors, etc.) either on the cell surface or within its cytoplasm. This is how the diagnosis of cancer is made. That is why a tissue biopsy is a must for confirmation of the diagnosis.



## Types of Cancers

There are several ways of dividing the cancers into various types. For instance on the basis of growth (Doubling time), organ of origin, morphological appearance under the microscope, molecular changes (which cannot be seen with the microscope), natural history (as known previously based on study of large populations) and anticipated response to therapy.

Currently, cancers are typically divided into various types based on the organ or tissue of origin.

Cancers that originate from the skin or mucosal lining are commonly classified as carcinomas. Those that arise from the connective tissue, bones or muscles are called sarcomas. And the ones that begin in the hematopoietic or lymphatic system are called leukemias-lymphomas. Thus, these consist of three broad categories – carcinomas, sarcomas and leukemia-lymphomas.

In addition the cancer can be further sub-divided based on the organ or tissue of origin. For instance whether the carcinomas start in the lung or breast can help divide them into Lung Carcinoma or Breast Carcinoma.

Even among the organ specific cancers, it is possible to assign the proper category based on the subtype of origin of the malignant cell – in lung carcinoma, the tumor can be further divided into adenocarcinoma of lung or squamous cell carcinoma of the lung, and so on.

The more detailed the classification of the type of cancer a patient has, the better is your doctor's understanding and hence the better is your chance of getting the right treatment. This is the reason why your doctor may ask for a repeat biopsy, especially when there is some doubt.

If the cancer is not identified and treated in time, it may spread to distant parts of the body. In such circumstances, the tumor cells in the new tumor (metastasis) will still retain the pattern and nature of the original cancer origin and hence will continue to be called by the name of the original (primary) tumor. For instance, if lung cancer has spread to the brain, the tumor in the brain will be called as metastatic lung cancer (and not brain cancer).

## Risk Factors

Why do people get cancer? In most instances it will be difficult to pinpoint the exact cause of cancer in a particular individual. From past experience and research, it is established that certain factors increase the risk of an individual developing cancers (as opposed to the general population that does not have this factor). These are known as "risk factors". It is important to remember two points. The presence of a risk factor does not mean that the individual will surely have cancer, it only makes the chance of getting cancer higher. On the other hand the absence of any risk factor does not ensure that an individual is protected from developing cancer. Sometimes we do not know what has led to cancer in a particular individual. Finally risk factors vary from one cancer to another and can also vary from one region to another.

The common risk factors for cancers in general are:

- a) Tobacco
- b) Growing older
- c) Sunlight
- d) Ionizing radiation
- e) Chemicals and other substances
- f) Viruses and bacteria
- g) Hormones
- h) Family history of cancer
- i) Alcohol
- j) Lifestyle - Poor diet, lack of physical activity, or being overweight

Many of these risk factors can be avoided – like tobacco, chemicals, hormones, alcohol, and lifestyle. Others may not be under your control - such as family history, growing old, viral/ bacterial infections, sunlight. The important thing to remember is to protect ourselves by staying away from known risk factors whenever possible.

If you have any of such risk factors for cancer, please see a cancer doctor or healthcare professional as soon as possible. He can guide you about reducing your risk as well as make a schedule for your

medical checkups (which may be different from that for people who do not have risk factors).

- Not everything causes cancer.
- Having one or more risk factors does not mean that you will get cancer. Most people who have risk factors never develop cancer.
- Some people are more sensitive than others to the known risk factors.
- Not having above risk factors does not mean that you are protected from developing cancers. There are many things that we do not know. Risk factors that are currently unknown may play a role.

## Tobacco

In India, tobacco is the number one cause of cancers. It is responsible for almost half the cancers in men and only a slightly smaller number of cancers in women. It is the most preventable cause of death. Using tobacco products (smoking, chewing, etc.) or being around tobacco smoke (environmental or secondhand smoke) increases the risk of more than 20 different types of cancers. Tobacco users are more likely than nonsmokers to develop cancer of the lung, mouth, larynx (voice box), esophagus, bladder, kidney, throat, stomach, pancreas, or cervix. They also are more likely to develop acute myeloid leukemia (cancer that starts in blood cells). That is why the government has banned use of gutka in major parts of our country. Every six seconds, a person dies due to tobacco consumption globally. In India, every day there are 2500 deaths directly related to tobacco use.

Stopping use of tobacco is beneficial in all cases – both before and after cancer occurs. Even if someone has been using tobacco for many years, quitting will reduce the risk of developing cancers significantly. This risk reduction continues for several years. But remember the risk for ex-tobacco users will remain higher than that for those who have never used tobacco.

For people who already have/ had cancer, stopping further use of tobacco will increase the quality of life, will allow better tolerability

of therapy and will also increase chance of survival. Quitting will also reduce the chance of getting another cancer.

There is a lot of help available for people to stop using tobacco. Doctors and dentists can prescribe medicines or nicotine replacement therapy (gum, patches, lozenges, spray, inhaler). They can refer you to the right local programs or trained professionals who help people stop using tobacco.

### **Growing Older**

Life expectancy of the typical Indian has doubled since independence. Today both men and women in our country have life expectancy exceeding 62 years. Since risk of developing cancer increases with age, it is logical that as we grow older, this risk increases. However, it is crucial to remember that cancer can occur at any age – including during infancy and childhood; during teens and young adulthood; during senior citizenship and after retirement too.

### **Sunlight**

Ultraviolet (UV) radiation that comes naturally (from the sun) or is generated artificially (from sunlamps and tanning booths) can be harmful. It leads to accelerated aging of the skin, causes skin damage and can ultimately cause skin cancer. This is particularly important in the Caucasian population – with white skin. However dark skin (melanin pigmentation) does not completely protect us from such damage. Hence this remains a risk factor for us (brown skin people) too. Common (sensible) precautions recommended to avoid exposure to UV radiation include:

- Avoid the midday sun (from mid-morning to late afternoon) whenever possible. Also protect yourself from reflected UV radiation – from sand, water, snow, and ice. Remember that UV radiation penetrates light clothing, windshields, and even glass windows.
- Thick clothing with long sleeves, long pants, a wide brim headgear and sunglasses that absorb UV are recommended.
- Using sunscreen may help prevent skin cancer, but only if the sun protection factor (SPF) is adequate. And they

protect only as long as they remain uniformly spread on the skin. Remember sunscreens cannot replace avoiding the sun and/or wearing clothing to protect the skin.

- Sunlamps and tanning booths are to be avoided as much as possible. Please note that they are no safer than sunlight.

## **Ionizing Radiation**

Ionizing radiation consists of rays from x-rays (and other radiological imaging), those entering from outer space, radon gas and radioactive fallouts. All of them can lead to cell damage and subsequent cancers.

Medical procedures are necessary and often lifesaving. They can also be the most common source of exposure to radiation (other than ambient exposure to background radiation in the atmosphere).

- X-Ray imaging (X-rays, CT Scans, PET Scans, etc.) help to delineate the existence and/or extent of diseases inside the body. These help the doctors to decide appropriate treatment for cancer patients. They also need to be repeated at varying intervals for different patients.
- Cancers are also treated using radiation therapy (high-dose radiation) from afar (using large machines; teletherapy) or from radioactive substances in direct contact with the patient (brachytherapy). This also leads to exposure of normal cells to high dose radiation. Current treatment techniques allow such exposure to be minimized, but it still exists.

The risk of cancer from low-dose X-rays is extremely small. The risk from radiation therapy is slightly higher. For both, the benefit nearly always outweighs the small risk.

Other rare possibilities include exposure to Radon (radioactive gas sometimes found in mines – it cannot be seen, smelt and has no taste) or radioactive fallout (accidents at nuclear power plants or use of atomic weapons).

## **Chemicals and Other Substances**

Painters, construction workers and those in the chemical industry

exposed to asbestos, benzene, Benzedrine, cadmium, nickel, or vinyl chloride might have higher risk of cancers. The lay public should avoid or be very careful in handling pesticides, used engine oil, paint, solvents or other chemicals.

## **Viruses and Bacteria**

A small fraction of cancers are caused by these or there is increased susceptibility among infected persons having ***Human papilloma viruses*** (HPVs; cervical and oral cancer), ***Hepatitis B and hepatitis C viruses*** (Liver cancer), ***Human T-cell leukemia/lymphoma virus*** (HTLV-1; lymphoma and leukemia), ***Human immunodeficiency virus*** (HIV; lymphoma and ***Kaposi's sarcoma***), ***Epstein-Barr virus*** (EBV; lymphoma), ***Helicobacter pylori*** (stomach cancer and lymphoma). Some of these can be prevented by appropriate vaccination

## **Hormones**

In a few instances, hormones used for illnesses can lead to development of or increase in susceptibility to cancers. Use of ***estrogen, progestin and diethylstilbestrol*** (DES) may lead to such a risk.

## **Family History of Cancer**

It is uncommon for cancer to run in a family. However, certain types of cancer do occur more often in some families than in the rest of the population (about 5% of cancers - breast, ovary, prostate, and colon). It is important to distinguish between inherited cancers/familial cancers (linked to inherited gene changes) versus family history of cancers (which may be due to shared lifestyle, habits, environment – like passive smoking). In most instances multiple cases of cancer in a family are just a matter of chance.

Genetic testing is sometimes recommended to identify whether a family is at higher risk of developing cancers. Remember that just the mere presence of an inherited gene does not mean that the cancer will definitely occur.

## **Alcohol**

Consumption of alcohol increases the risk of cancers of the mouth, throat, esophagus, larynx, liver, and breast. The risk increases with

the amount of alcohol taken as well as with associated habit of using tobacco (in any form). It is recommended that these habits should be avoided or discontinued as soon as possible. Discontinuing even after cancer has developed will increase the chance of responding to therapy and improve survival.

### **Poor Diet, Lack of Physical Activity, or Being Overweight**

These three factors are well established as increasing the risk of many cancers— especially cancers of the colon, uterus, prostate, breast, colon, esophagus, kidney, and uterus.

A healthy diet, regular exercise and keeping normal body weight reduces cancer risk. Eat plenty of foods that are high in fiber, vitamins, and minerals (whole-grain breads, cereals, fruits and vegetables) on a daily basis. Avoid foods that are high in fat or calories (such as sugar, butter, whole milk, fried foods, and red meat). Exercise should be a minimum of brisk walking for at least 30 minutes five or more days a week.

### **Warning signs of cancer**

- A lump somewhere on your body
- Changes in a mole on your skin
- A cough or hoarseness that won't go away
- A change in bowel habits
- Difficulty in swallowing or continuing indigestion
- Any abnormal bleeding
- A sore or ulcer that won't heal
- Difficulty passing urine
- Unexplained weight loss
- Unexplained pain
- Feeling very tired all the time
- Skin changes
- Unexplained night sweats

If you or anyone else develops any of the above and they persist, it is important to consult a doctor immediately. Not all persons with these symptoms or features will have cancer. But the risk is

sufficiently high to seek urgent medical attention. Ignoring these can lead to spread of cancer into an incurable stage.

## Screening

Screening is a process by which the general population with no symptoms or complaints is tested to find out whether they are suffering from cancer or not. This is NOT for a person who has any of the above warning signs. Not all types of cancers can be identified by screening. Screening is commonly recommended after a certain age for cancers of the oral cavity, breast, cervix, colon, rectum and prostate. By detecting such cancers when there are no symptoms, there is a good chance of identifying them in early stage and of curing the patient with less treatment.

**For breast cancer options are:** A **mammogram** is the best tool doctors have to find breast cancer early. A mammogram is a picture of the breast made with x-rays. The NCI recommends that women in their forties and older have mammograms every 1 to 2 years. Women who are at higher-than-average risk of breast cancer should talk with their health care provider about whether to have mammograms before age 40 and how often to have them.

**Cervix:** The **Pap test** (sometimes called Pap smear) is used to check cells from the cervix. The doctor scrapes a sample of cells from the cervix. A lab checks the cells for cancer or changes that may lead to cancer (including changes caused by human papilloma virus, the most important risk factor for cancer of the cervix). Women should begin having Pap tests 3 years after they begin having sexual intercourse, or when they reach age 21 (whichever comes first). Most women should have a Pap test at least once every 3 years. An alternative to pap test is VIA and VILI. These tests use visual inspection after application of a medicinal solution on the cervix. It is easy to do and has been shown to be very useful in India.

**Colon and rectum:** A number of screening tests are used to detect **polyps** (growths), cancer, or other problems in the colon and rectum. People aged 50 and older should be screened. People who have a higher-than-average risk of cancer of the colon or rectum should talk with their doctor about whether to have screening tests before age 50 and how often to have them.

**Fecal occult blood test:** Sometimes cancer or polyps bleed. This test can detect tiny amounts of blood in the stool.

**Sigmoidoscopy:** The doctor checks inside the rectum and lower part of the colon with a lighted tube called a sigmoidoscope. The doctor can usually remove polyps through the tube.

**Colonoscopy:** The doctor examines inside the rectum and entire colon using a long, lighted tube called a colonoscope. The doctor can usually remove polyps through the tube.

**Double-contrast barium enema:** This procedure involves several x-rays of the colon and rectum. The patient is given an enema with a barium solution, and air is pumped into the rectum. The barium and air improve the x-ray images of the colon and rectum.

**Digital rectal exam:** A rectal exam is often part of a routine physical exam. The health care provider inserts a lubricated, gloved finger into the rectum to feel for abnormal areas. A digital rectal exam allows for examination of only the lowest part of the rectum.

**Cologuard:** In August 2014, this test was approved as the first non invasive DNA screening test for colorectal cancer. However its value in Indian patients is yet to be established.

None of the screening tests is foolproof. Doctors consider many factors before they suggest a screening test – some of them are a person's risk for developing certain types of cancer, age, medical history, general health, family history, and lifestyle. In addition, doctors take into consideration whether the screening test can be harmful or have side effects. If you have any doubts, discuss them with your healthcare professional.

## Symptoms

Cancer can cause many different symptoms. These same symptoms can also be caused by other diseases. Hence their presence should be taken seriously and an oncologist should be consulted without wasting time. Some of the important symptoms are:

- A thickening or lump in the breast or any other part of the body

- A new mole or a change in size or color of an existing mole
- A sore that does not heal
- Hoarseness or a cough that does not go away
- Changes in bowel or bladder habits
- Discomfort after eating or during swallowing
- Weight gain or loss with no known reason
- Unusual bleeding or discharge
- Feeling weak or very tired
- Having unexplained fever

Most often, these symptoms are not due to cancer. They may also be caused by benign tumors or other problems. Remember that pain is not a feature of early cancer. Waiting till pain develops can be dangerous.

## **Investigations/ Diagnosis**

If cancer is suspected (either because of a symptom or screening test result or even a routine medical examination), your oncologist / doctor will attempt to confirm the diagnosis. This may involve additional questions about your personal and family medical history, physical examination, blood & other tests (including for tumor markers), imaging (x-rays, sonography, CT Scan, MRI Scan, PET Scan, bone scan, etc.) or other procedures. Remember the confirmation of cancer requires looking at your tissue or cells under the microscope in almost all cases.

### **Lab Tests**

Samples of blood, urine, or other body fluids can tell the doctor whether a specific organ is functioning normally or not. Tumor markers can also suggest that the chance of cancer is high. Such tests allow your oncologist to decide the next course of action – which may include additional tests, a procedure and/or commencement of therapy.

### **Imaging**

**Imaging** provides a visual picture of areas inside your body and can help tell the oncologist whether an abnormality or tumor exists

or not. The tests include one or more of the following:

**X-rays:** X-rays are the traditional way of looking at shadows of solid organs and bones within your body.

**Sonography:** This uses sound waves to get rebound signals (like a radar) to see the echo pattern of various tissues inside the body. These signals are then converted by the computer into images on a screen that your doctor can analyze. Special equipment will also allow measurement of flow through hollow organs.

**CT scan:** This uses x-rays to provide details of organs as if slices have been taken in various directions. This can be done by itself or even after a contrast material (such as dye) has been injected into you.

**MRI:** Here a strong magnet is linked to a computer and different settings are used to provide various images. These can help distinguish details of any abnormality in difficult to visualize places, including near bones. You will see the same organ examined from the same direction showing different images (e.g. T1 and T2 weighted images) based on the settings used.

**PET scan:** This is a functional image. It will show the pattern of metabolic activity within an organ, based on the nature of a small amount of radioactive material given to you. Typically cancer cells show abnormally high activity which persists for a longer time within the abnormal cells. This imaging is often done in conjunction with a CT scan to give a better idea of the nature and extent of the cancer.

**Bone scan:** This test requires injection of a small amount of a specific radioactive material that is picked up by bones. It is particularly useful to detect spread to the bones. Generalized increased activity may also be seen in a few cancers.

Only small amounts of carefully calculated radioactivity are injected into your body – which usually gets excreted quickly.

## **Biopsy**

In almost all cases, doctors will need to do a biopsy to make a proper diagnosis of cancer. For this, the doctor will remove a

sample of tissue which a pathologist will examine under the under a microscope after processing and/ or staining. The sample may be removed in several ways:

With a needle attached to a syringe that is used to suck out cells, tissue or fluid.

With an endoscope (a thin, flexible tube) by which your doctor can look at specific areas inside the body and also remove tissue, cells or fluid for examination.

With surgery wherein a part (incisional) or whole (excisional) of the tumor is removed for evaluation by the pathologist.

## **Staging**

This important step is to identify whether your cancer is in its initial stage or has spread locally and/or to distant places (metastasis). Such information is vital for your oncologist to select the right treatment plan as well as to discuss with you the likely benefit from treatment. Additional tests for proper staging may be required and will vary significantly from cancer to cancer (tumor characteristics) as well as from patient to patient (individual susceptibility). It is important that such tests be done as soon as possible and that you consult your oncologist as soon as these results are available. Delay can result in spread of cancer – making its treatment less effective, more complicated, prolonged and expensive.

## **Treatment**

We encourage all patients with cancer (and their close family members) to discuss actively with their oncologists. It is fully justified to learn and understand all you can about your disease and treatment choices. Because most patients and their family members are often stressed and forget important points of discussion, it is best to make a list of all your concerns and queries and carry a copy of the same for your appointment with the oncologist. Patients also tend to remember only a part of what the healthcare professional has explained. Taking a responsible member of your family with you and taking notes will help in better understanding.

Just as it is your doctor's responsibility to explain to you and answer your questions, it is also your responsibility to pay attention to all that your doctor is saying. Do not focus only on the points that you were hoping to hear. Oncology, like medicine, is not an exact science. Each patient behaves differently. What the doctor explains is what generally happens to the majority of patients. It could be different in your case. Also the oncologist has undergone more than 10 years of training besides his personal experience. Just because you or your family member has read a lot (e.g. from the internet) do not start behaving as if you know everything. After you have stated your thoughts or quoted what you read elsewhere, concentrate on what the oncologist is saying. His opinion is going to be based on significantly more than what information literature is available to you or your family. Finally never compare your condition to any other patient. Doing so could be the most misleading thing for you, since there are so many variables between individual patients (even those with the same disease, same stage and same treatment schedule).

Your healthcare professional will ultimately refer you to a cancer specialist. There are three broad types of such specialists:

1. Surgical Oncologists are involved in doing surgery (including biopsy);
2. Medical Oncologists and HematoOncologists treat patients with cancer directed systemic therapy (drugs, injections, tablets, capsules, etc.); and
3. Radiation Oncologists that use machines that give out radiation to treat cancers (teletherapy and brachytherapy).

## **Getting a Second Opinion**

It is not unusual for patients to have doubts when faced with the diagnosis of cancer. Several patients do not want to accept the diagnosis or its implications. Others are unable to trust their doctor. When in doubt, it is reasonable to ask for a second opinion before starting treatment. However, time is the essence. Any delay might allow your cancer to grow, spread and hence affect your outcome and/or chance of cure. Discuss with your oncologist if you want a second opinion. Usually your oncologist will be able to recommend

another oncologist/ specialist in the same or a different hospital. If you have a preference for a specific oncologist or hospital, please share this with your oncologist. Do not hesitate to ask your oncologist for such a reference letter. This will help ensure that the most important points related to your illness are conveyed appropriately.

## **Cancer Treatment Planning**

Your cancer treatment plan will depend on several factors, including but not limited to the type/subtype of cancer, stage of the disease, predisposing factors, prior treatment and any other existing illnesses (co-morbidities). Oncologists also factor in your age and general health.

The goal of treatment also varies. It can be to cure the cancer, control it or to reduce its symptoms for as long as possible. The treatment plan is also dynamic and needs to be revised from time to time.

Almost all patients with cancer will require one or more of the treatment strategies mentioned below. In rare cases, the oncologist may also advise to “wait and watch”. This is also a well-accepted strategy under specific conditions.

Broadly treatment strategies can be divided into local therapy and systemic therapy:

- A. Local Therapy(removes or destroys cancer in just one part of the body) includes:
  1. Surgical Therapy (domain of Surgical Oncologist).
    - a) Biopsy for diagnosis (incisional/ excisional)
    - b) Removal of tumor as treatment (conservative/ radical)
  2. Radiation Therapy (domain of Radiation Oncologist)
    - a) Teletherapy (radiation given through machines from a little distance)
    - b) Brachytherapy (radiation given by source in direct contact with the body)
- B. Systemic Therapy (sends drugs or substances through the

bloodstream to destroy cancer cells all over the body) includes (domain of Medical Oncologist).

1. Chemotherapy,
2. Hormonal therapy
3. Targeted therapy
4. Biological therapy
5. Stem Cell Transplantation that includes very high doses of chemotherapy.
6. Related drugs/ medications.

Some cancers respond best to a single type of treatment. Others may respond best to a combination of treatments.

Your oncologist can explain to you treatment choices and the likely expected results. You and your doctor can then together agree on the treatment plan that is best for you.

No treatment is possible that will not do some damage to normal or healthy tissue. Hence some side effects may occur. These side effects depend mainly on the type and extent of the treatment. Side effects may not be the same for each person, and they may change from one treatment cycle to the other even in the same patient and with the same treatment.

Your treatment plan may also include ways to minimize or avoid common side effects. Supportive care is used not only to address side effects of therapy, but also to control symptoms (like pain, fatigue, nausea) as well as emotional and practical problems. Therefore supportive care is an integral part of the cancer treatment plan for patients.

You may want to talk to the doctor about taking part in a clinical trial (a research study of new treatment methods). Several new ways of treating cancer are being studied and their value evaluated under strict regulatory, legal and ethical framework. You may want to explore if such an ongoing trial is applicable in your case.

## **Surgical Treatment**

In most cases, the surgical oncologist will remove the tumor and some normal tissue around it. Removing surrounding normal tissue

may help prevent the tumor from recurring or regrowing. The surgeon may also remove some nearby lymph nodes, since cancer has the propensity to spread by lymphatics as well as blood stream. Remember that it takes time to heal after such a surgery. The time needed to recover varies from person to person as well as from surgery to surgery. The time taken for the surgery or the time taken to recover from it has no bearing on your outcome.

While recovering from surgery, you may feel pain or other uncomfortable symptoms. Please discuss this with your healthcare professional as early as possible. Taking medicines to control them is important and can also help in faster recovery from the surgery. Do not tolerate such symptoms on your own without bringing them to the notice of your doctors or nurses.

Some people have the misconception that surgery (or even a biopsy) for cancer can lead to spread the disease – with or without exposure to air. Cancer progresses on its own at its own pace, which can change without any outside factors. Besides, biopsy is a must for the correct diagnosis of cancer. Also remember that surgeons use special methods and take many steps to prevent cancer cells from spreading.

## Radiation Therapy

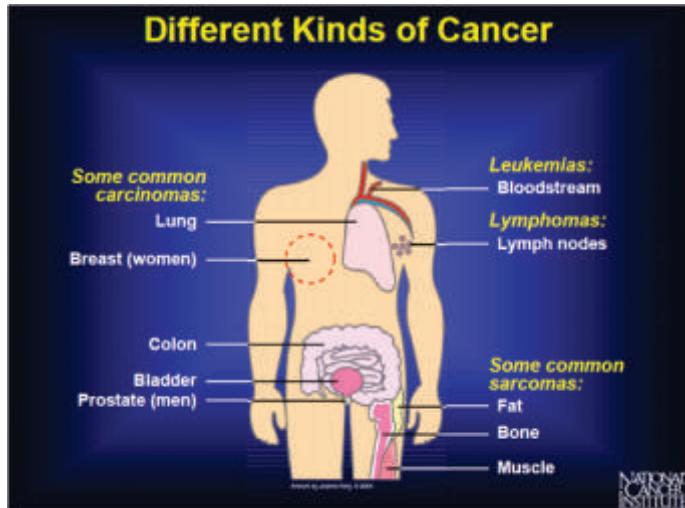
Radiation therapy (or radiotherapy) uses high-energy rays to kill cancer cells. Most patients needing radiation therapy are given external radiation. The first two mentioned below are common and the third one is used less often and only in specific cases.

**Teletherapy (External radiation):** The radiation comes from a large machine outside the body. Most people go to a hospital or clinic for treatment 5 days a week for several weeks.

**Brachytherapy (implant or contact radiation):** The radiation comes from radioactive material placed in seeds, needles, or thin plastic tubes that are put in or near the tissue. The patient usually stays in the hospital. The implants generally remain in place for several days.

**Systemic (internal) radiation:** Here liquid or capsules containing very carefully calculated dose of radioactive material is given to be swallowed or injected into the body. It then travels throughout

## Different Kinds of Cancer



Cancer can originate almost anywhere in the body.

**Carcinomas**, the most common types of cancer, arise from the cells that cover external and internal body surfaces. Lung, breast, and colon are the most frequent cancers of this type in the United States.

**Sarcomas** are cancers arising from cells found in the supporting tissues of the body such as bone, cartilage, fat, connective tissue, and muscle.

**Lymphomas** are cancers that arise in the lymph nodes and tissues of the body's immune system.

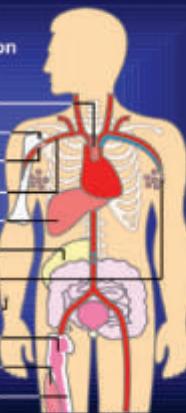
**Leukemias** are cancers of the immature blood cells that grow in the bone marrow and tend to accumulate in large numbers in the bloodstream.

## Naming Cancers

### Cancer Prefixes Point to Location

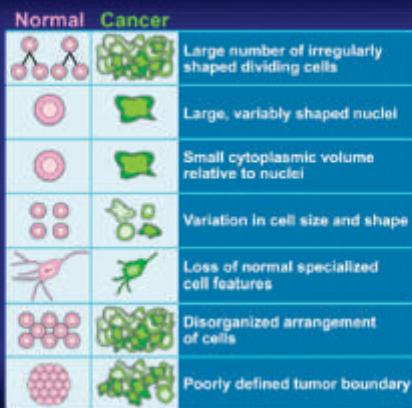
#### Prefix      Meaning

adeno-	gland
chondro-	cartilage
erythro-	red blood cell
hemangio-	blood vessels
hepato-	liver
lipo-	fat
lympho-	lymphocyte
melano-	pigment cell
myelo-	bone marrow
myo-	muscle
osteо-	bone



Scientists use a variety of technical names to distinguish the many different types of carcinomas, sarcomas, lymphomas, and leukemias. In general, these names are created by using different Latin prefixes that stand for the location where the cancer began its unchecked growth. For example, the prefix "osteо" means bone, so a cancer arising in bone is called an osteosarcoma. Similarly, the prefix "adeno" means gland, so a cancer of gland cells is called adenocarcinoma—for example, a breast adenocarcinoma.

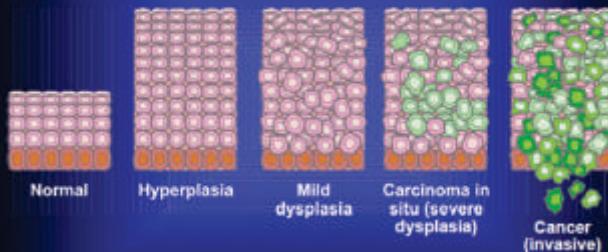
## Microscopic Appearance of Cancer Cells



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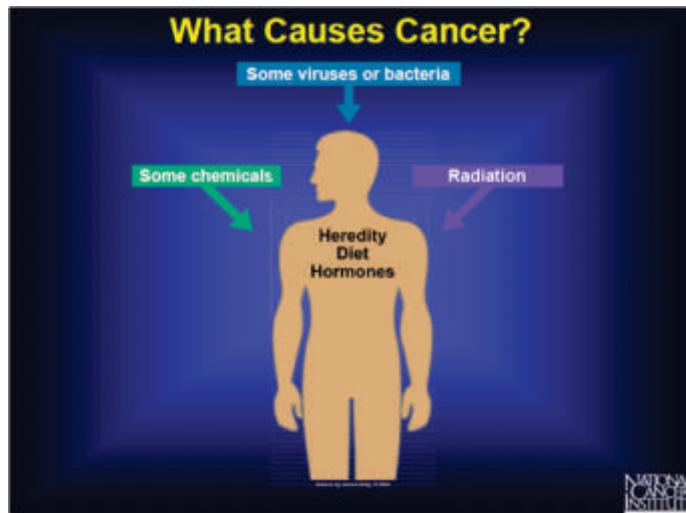
Cancer tissue has a distinctive appearance under the microscope. Among the traits the doctor looks for are a large number of irregularly shaped dividing cells, variation in nuclear size and shape, variation in cell size and shape, loss of specialized cell features, loss of normal tissue organization, and a poorly defined tumor boundary.

## Carcinoma in Situ

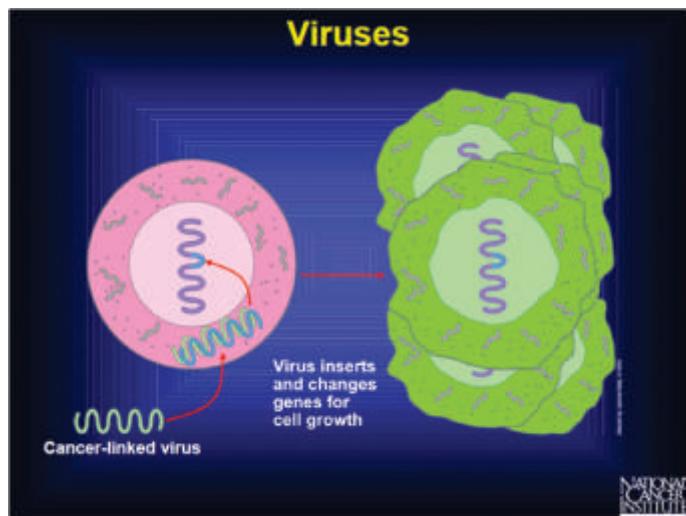


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The most severe cases of dysplasia are sometimes referred to as "carcinoma in situ". In Latin the term "in situ" means "in place", so carcinoma in situ refers to an uncontrolled growth of cells that remains in the original location. However, carcinoma in situ may develop into an invasive, metastatic malignancy and, therefore, is usually removed surgically, if possible.



Cancer is often perceived as a disease that strikes for no apparent reason. While scientists don't yet know all the reasons, many of the causes of cancer have already been identified. Besides intrinsic factors such as heredity, diet, and hormones, scientific studies point to key extrinsic factors that contribute to the cancer's development: chemicals (e.g., smoking), radiation, and viruses or bacteria.



In addition to chemicals and radiation, a few viruses also can trigger the development of cancer. In general, viruses are small infectious agents that cannot reproduce on their own, but instead enter into living cells and cause the infected cell to produce more copies of the virus. Like cells, viruses store their genetic instructions in large molecules called nucleic acids. In the case of cancer viruses, some of the viral genetic information carried in these nucleic acids is inserted into the chromosomes of the infected cell, and this causes the cell to become malignant.

## Examples of Human Cancer Viruses

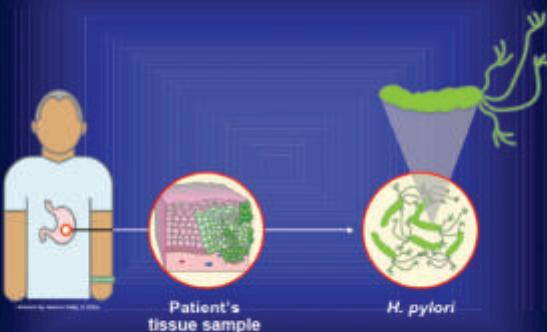
Some Viruses Associated with Human Cancers

Virus	Type of Cancer
Epstein-Barr virus	Burkitt's lymphoma
Human papillomavirus	Cervical cancer
Hepatitis B virus	Liver cancer
Human T-cell lymphotropic virus	Adult T-cell leukemia
Kaposi's sarcoma-associated herpesvirus	Kaposi's sarcoma

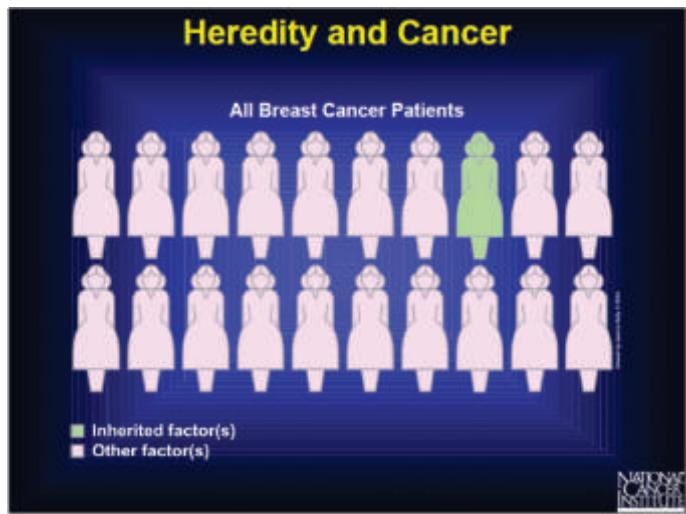


Only a few viruses that infect human cells actually cause cancer. Included in this category are viruses implicated in cervical cancer, liver cancer, and certain lymphomas, leukemias, and sarcomas. Susceptibility to these cancers can sometimes be spread from person to person by infectious viruses, although such events account for only a very small fraction of human cancers. For example, the risk of cervical cancer is increased in women with multiple sexual partners and is especially high in women who marry men whose previous wives had this disease. Transmission of the human papillomavirus (HPV) during sexual relations appears to be involved.

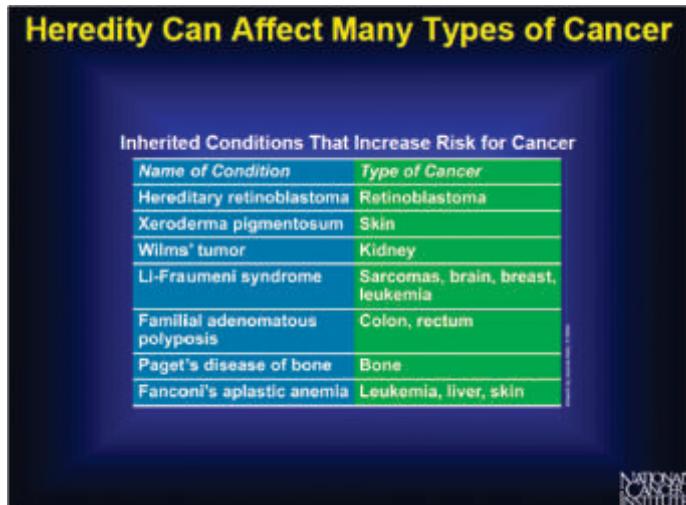
## Bacteria and Stomach Cancer



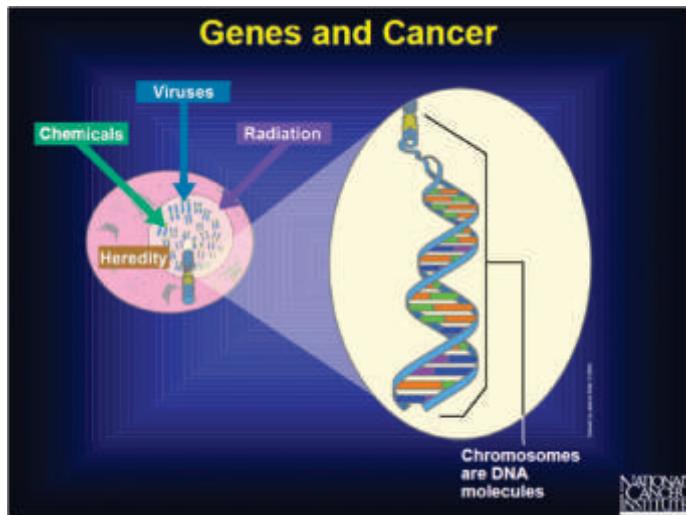
Viruses are not the only infectious agents that have been implicated in human cancer. The bacterium Helicobacter pylori, which can cause stomach ulcers, has been associated with the development of cancer, so people infected with *H. pylori* are at increased risk for stomach cancer. Research is under way to define the genetic interactions between this infectious agent and its host tissues that may explain why cancer develops.



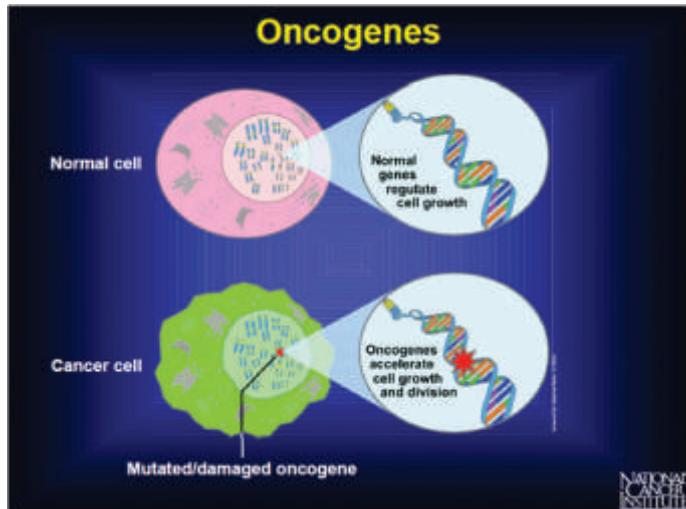
Cancer is not considered an inherited illness because most cases of cancer, perhaps 80 to 90 percent, occur in people with no family history of the disease. However, a person's chances of developing cancer can be influenced by the inheritance of certain kinds of genetic alterations. These alterations tend to increase an individual's susceptibility to developing cancer in the future. For example, about 5 percent of breast cancers are thought to be due to inheritance of particular form(s) of a "breast cancer susceptibility gene".



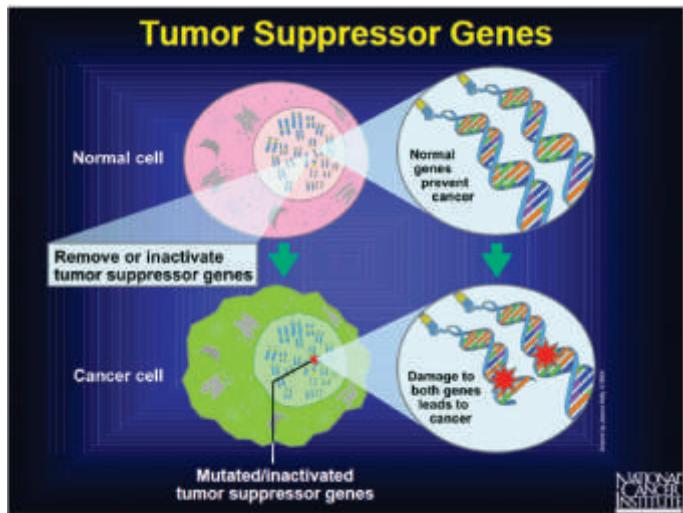
Inherited mutations can influence a person's risk of developing many types of cancer in addition to breast cancer. For example, certain inherited mutations have been described that increase a person's risk of developing colon, kidney, bone, skin or other specific forms of cancer. But these hereditary conditions are thought to be involved in only 10 percent or fewer of all cancer cases.



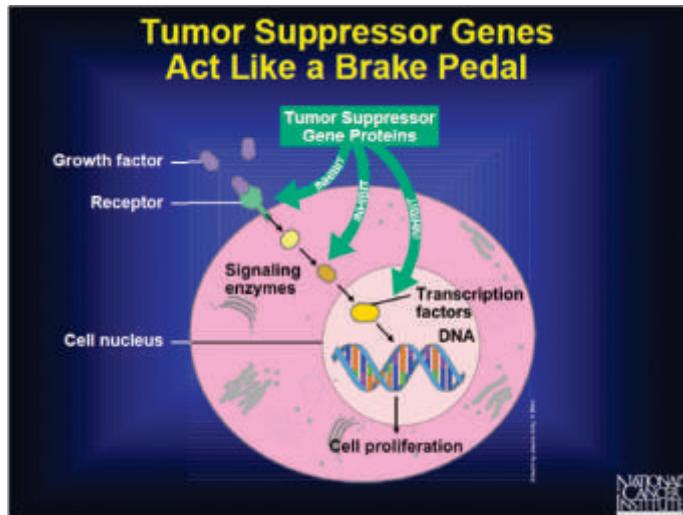
Chemicals (e.g., from smoking), radiation, viruses, and heredity all contribute to the development of cancer by triggering changes in a cell's genes. Chemicals and radiation act by damaging genes, viruses introduce their own genes into cells, and heredity passes on alterations in genes that make a person more susceptible to cancer. Genes are inherited instructions that reside within a person's chromosomes. Each gene instructs a cell how to build a specific product--in most cases, a particular kind of protein. Genes are altered, or "mutated", in various ways as part of the mechanism by which cancer arises.



One group of genes implicated in the development of cancer are damaged genes, called "oncogenes". Oncogenes are genes whose PRESENCE in certain forms and/or overactivity can stimulate the development of cancer. When oncogenes arise in normal cells, they can contribute to the development of cancer by instructing cells to make proteins that stimulate excessive cell growth and division.

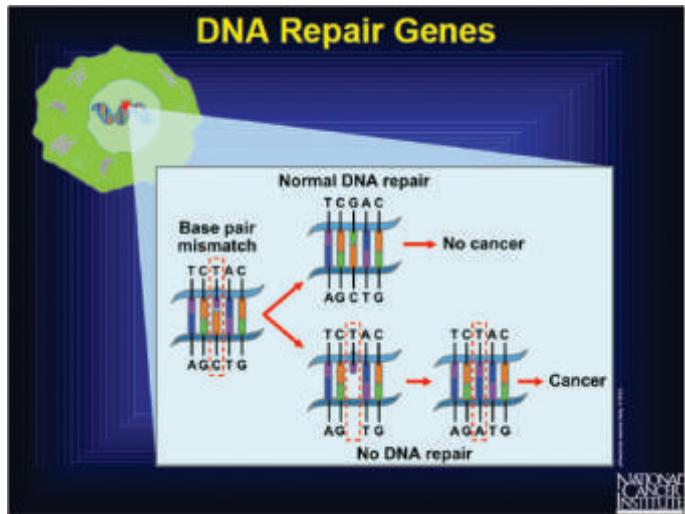


A second group of genes implicated in cancer are the "tumor suppressor genes". Tumor suppressor genes are normal genes whose ABSENCE can lead to cancer. In other words, if a pair of tumor suppressor genes are either lost from a cell or inactivated by mutation, their functional absence might allow cancer to develop. Individuals who inherit an increased risk of developing cancer often are born with one defective copy of a tumor suppressor gene. Because genes come in pairs (one inherited from each parent), an inherited defect in one copy will not lead to cancer because the other normal copy is still functional. But if the second copy undergoes mutation, the person then may develop cancer because there no longer is any functional copy of the gene.

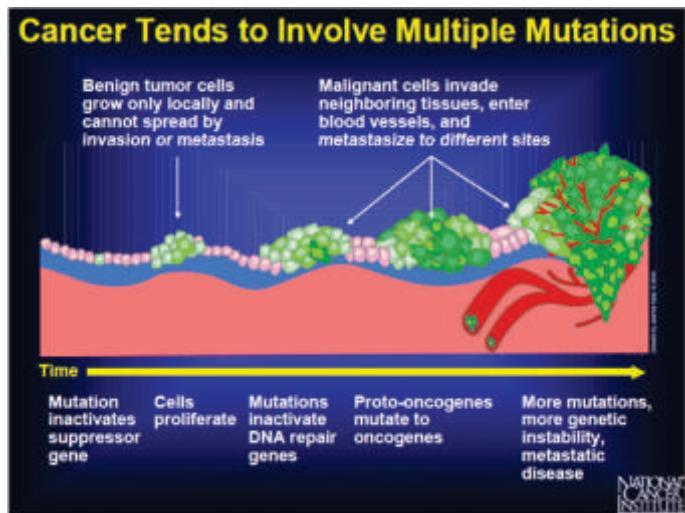


Tumor suppressor genes are a family of normal genes that instruct cells to produce proteins that restrain cell growth and division. Since tumor suppressor genes code for proteins that slow down cell growth and division, the loss of such proteins allows a cell to grow and divide in an uncontrolled fashion. Tumor suppressor genes are like the brake pedal of an automobile. The loss of a tumor suppressor gene function is like having a brake pedal that does not function properly, thereby allowing the cell to grow and divide continually.

## DNA Repair Genes



A third type of genes implicated in cancer are called .DNA repair genes.. DNA repair genes code for proteins whose normal function is to correct errors that arise when cells duplicate their DNA prior to cell division. Mutations in DNA repair genes can lead to a failure in repair, which in turn allows subsequent mutations to accumulate. People with a condition called xeroderma pigmentosum have an inherited defect in a DNA repair gene. As a result, they cannot effectively repair the DNA damage that normally occurs when skin cells are exposed to sunlight, and so they exhibit an abnormally high incidence of skin cancer. Certain forms of hereditary colon cancer also involve defects in DNA repair.



Cancer may begin because of the accumulation of mutations involving oncogenes, tumor suppressor genes, and DNA repair genes. For example, colon cancer can begin with a defect in a tumor suppressor gene that allows excessive cell proliferation. The proliferating cells then tend to acquire additional mutations involving DNA repair genes, other tumor suppressor genes, and many other growth-related genes. Over time, the accumulated damage can yield a highly malignant, metastatic tumor. In other words, creating a cancer cell requires that the brakes on cell growth (tumor suppressor genes) be released at the same time that the accelerators for cell growth (oncogenes) are being activated.

the body and helps treat cancer or control its pain (especially caused by cancer that has spread to the bones).

Radiation therapy is commonly given daily for five days a week for several weeks. It can also be given in a single fraction or multiple exposures in a day. There is a lot of computerization to ensure that the beam of radiation is administered accurately. Typically this requires accurate positioning of the patient on a special table and careful focusing of the beam - which takes time.

In teletherapy, the actual duration of each fraction of radiation is only a few minutes. While the radiation is being administered, the patient normally does not feel, hear, see or smell the radiation. Some patients may hear the hum of the machinery and a few may even feel warmth at the site of the radiation – but nothing else.

Side effects of radiation therapy depend mainly on the dose and type of radiation given as well as the part in the body treated. For example, radiation to abdomen may cause nausea, vomiting or diarrhea. The skin overlying the treated area may become red, dry, and tender. All hair in the treated area is likely to be lost – maybe even permanently.

Weakness may be experienced by some patients. This can increase a few weeks after the commencement of the radiation. Drinking plenty of liquids and adequate rest is important. At the same time, it is important to remain active as much as possible.

Other side effects may also occur. Your radiation oncologist will be able to discuss this further as well as give you advice on how to avoid, minimize or reduce their effect. Fortunately, most side effects go away gradually after the radiation ends.

## **Systemic Therapy**

### **Chemotherapy**

Chemotherapy is the use of drugs (either singly or more often in combination) that are used to kill cancer cells anywhere in the body. These drugs can be given by various routes – the most common being by injection (either as a push or in IV fluids) or orally. The drug then enters the circulation and reaches all over the body. Chemotherapy drugs are given with careful selection of

dose, duration of infusion, days of administration and frequency of repeating them. These details make up the chemotherapy protocol schedule and it gets repeated in what are called cycles. Cycles can be of different durations as well. Generally there is rest/recovery period within cycles as well as in between cycles. This allows the normal cells in the body to recover. Based on patient, drug and schedule factors, chemotherapy may be administered in day care or after hospitalization.

Side effects depend mainly on the specific drugs and the dose – being mostly on normal rapidly dividing cells:

- Blood cells: Hemoglobin (weakness, fatigue), WBCs (infections) and Platelets (bleeding).
- Cells in Skin, Mucosa and Hair: Hair loss, ulcers in mouth, change in color of skin.
- Digestive system Cells: loss of appetite, nausea and vomiting, diarrhea.
- Cells involved in fertility: Some drugs lead to infertility.

No matter how severe or difficult such side effects are, they are usually temporary. The medical oncologist will use means to prevent, reduce or minimize risk of such side effects.

### **Hormone Therapy**

Cancers dependent on hormones for their growth, may respond to hormonal manipulation. Hormone therapy can be given using drugs or surgery:

**Drugs:** The doctor gives medicine that stops the production of certain hormones or prevents the hormones from working.

**Surgery:** The surgeon removes organs (such as the ovaries or testicles) that make hormones.

The side effects of hormone therapy are also highly variable and may include one or more of the following - weight gain, hot flashes, nausea, menstrual irregularity, vaginal dryness (in women) and impotence, loss of sexual desire, breast growth or tenderness (in men).

### **Targeted Therapy**

Currently several drugs are available that specifically target the

cancer cells, with minimal effect on normal cells. This is possible due to better understanding of the mechanism of how genetic changes are driving the growth of cancers. Their use requires careful testing in the blood or tumor tissue to identify biomarkers/ molecular signals of what is the genetic change that is making the tumor cell grow. Such treatment increases chance of cure/ response and is often combined with other therapy, especially chemotherapy.

### **Hematopoietic (Blood) Stem Cell Transplantation (HSCT)**

Sometimes the cancer needs very high dose systemic therapy to be killed. Such high doses will also kill all normal blood forming cells and immune cells in the bone marrow. Hence, for the patient to recover, normal healthy blood forming stem cells will need to be given. This process is called HSCT. The cells to be taken from the patient's own body (autologous) before the high dose therapy or from another person (allogeneic). These new cells are given like a blood transfusion through a large vein. Over several weeks, new blood cells develop from these transplanted stem cells and patients stay in the hospital in isolation till recovery is complete.

Side effects of HSCT include infection, bleeding and related complications. If the stem cells are allogeneic, a disease called graft-versus-host disease (GVHD) may occur, wherein the donated stem cells "identify" the patient's body as "foreign" and mount an immune response against it. GVHD usually affects the liver, skin, or digestive tract. GVHD can be severe or even fatal. Doctors use drugs to help prevent, treat, or control GVHD.

### **Follow-up Care**

Today, with proper and timely detection and care, more than half the patients with cancer can be cured. Once the main treatment is over and the investigations show that there is no cancer left in the body, a follow up plan is necessary. This is because undetected cancer cells may still remain in the body after treatment. Hence doctors can never be sure that the cancer will not come back. Although the cancer seems to be completely removed or destroyed, it can return. This is called *recurrence*.

Follow up plan is to be tailored to each patient and can be different

for patients with the same cancer and the same stage – due to individual differences. By finding out whether the cancer has returned in a timely manner, second line therapy can be administered to improve the chance of response. Your doctor will therefore make a follow up plan that may include one or more of the following – history of symptoms, physical examination, laboratory blood tests, imaging tests like x-rays and other special tests. During follow-up exams, the doctor will also keep an eye for other problems like side effects from cancer therapy that can arise long after treatment.

Checkups help ensure that patients have the best possible outcome. In case patients develop a new health problem before the next scheduled visits, they should contact their doctor immediately.

## **Complementary and Alternative Medicine(CAM)**

Some people with cancer use non allopathic (non modern systems of medicine). This includes ayurvedic, herbal, homeopathic, sidha, unani, naturopathy, yoga, acupuncture, meditation, spiritual healing, etc.

- An approach is generally called complementary medicine when it is used along with standard treatment with modern medicine.
- An approach is called alternative medicine when it is used in place of standard modern medicine treatment.

Many people say that CAM helps them feel better. However, some types of CAM may change the way standard treatment works. These changes could be harmful. Other types of CAM could be harmful even if used alone. The doctor from modern medicine (Allopathy) should not be expected to know about how these other systems of medicine are supposed to work. However it is of utmost importance that patients share all the information about any other medicine they are taking/ planning to take while consulting the cancer specialist. Unless this is done, patients may be exposed to serious harm that could occur by the interactions between medicines of different systems.

## **Nutrition and Physical Activity**

People with cancer have a vital role to play in taking care of themselves by eating well and also by maintaining sufficient physical activity.

Maintaining strength and weight of the body requires proper intake of calories. Cancer is a major disease and usually increases the caloric requirement for patients. Hence eating well is an integral part of making sure patients feel better and have sufficient energy.

Sometimes, especially during or soon after treatment, patients may not feel like eating – due to nausea, vomiting or loss of appetite. Patients may also be uncomfortable or tired. Foods may also taste different. Mouth sores can be an additional problem in others. The oncologist, family doctor, dietitian, or other health care provider can show what and how to eat well even under such circumstances.

Cancer patients should try to remain active within the limits permitted by their disease and advice of their cancer specialist. Walking, yoga, swimming, etc. can keep patients fit and energetic. Exercise can even help by reducing nausea, stress and pain. Patients should ensure that the level of physical activity does not cause them to have pain or feel tired. Patients should discuss with their doctors before commencing physical exercise as well as if the exercise is causing any problems.

## **Psychological Support**

It is very common for patients faced with cancer to have anxiety and/ or depression. Some patients also go through phases of anger and frustration. Most such problems are temporary. Having someone to talk to during these times is vital. If the level of these problems is high, proper evaluation by a psychologist/ psychiatrist is also valuable. There are special questionnaires that can identify whether patients need additional help or not. This could be in the form of reassurance, explanation about what to expect during the course of treatment, relaxation measures and even medication. The earlier such expert help is sought, the faster it will work and the quicker can there be complete recovery.

## **Ancillary Support**

Patients with cancer sometimes have a lot of questions not related directly to their illness or its treatment. Such thoughts can also cause concern and anxiety. For instance worrying about the family, job, finances and daily routine; concerns about managing side effects, hospital stays, and medical bills are also common. Doctors, nurses, and other healthcare professionals can answer some of these questions – those that are directly related to the treatment, side effects and physical activity. Additional help is available from psychologists, counselors and social worker. Friends and relatives can also be very supportive. In the hospital, talking to other cancer patients and their family members may also provide details of other support groups that may be available, especially NGOs. In these groups, patients or their family members share their experience and skills/ resources developed for coping with cancer. While doing this, it is vital to remember that each patient is different – what works for one patient does not necessarily work for another patient.

## **The Promise of Cancer Research**

Not all patients with cancer can be cured today. Hence there is an unmet need for improvement. This is possible only by doing medical research. All over the world attempts are ongoing to find new and better ways to prevent, detect, diagnose, and treat cancer. Their true value can only be proven by doing clinical trials in patients. This is the most important tool to improve the care and cure of cancer patients.

A clinical trial is the final stages of a very systematic, long and careful research process. The potential new drugs/ methods will have passed several years of rigorous evaluation in the laboratory and animals before being approved for study in human subjects. This step is essential to demonstrate whether treatments that work well in the lab or in animals will also prove to be of benefit to people. Hence clinical trials are needed to find out whether new approaches to cancer prevention, detection, diagnosis, and treatment are safe and effective.

It is only through such clinical trials that the chance of cure in

cancers has improved dramatically. For instance the five year survival of childhood leukemia was 10% in 1960s and currently it is more than 95%. Such knowledge and progress against cancer would not have been possible without clinical trials. There are several lakh patients with cancer who are alive and cured of their disease thanks to clinical trials on new drugs.

People who join clinical trials may be among the first to benefit if a new approach turns out to be effective. Studies have clearly shown that survival of patients participating in clinical trials is better than those who do not participate in such trials. Such participation also makes an important contribution by helping medical science learn more about cancer and how to prevent, detect, and control it. Clinical trials deal with the unknown and hence may pose some risks. Researchers will explain such details at the time of offering entry into a clinical trial to patients. Patients will have the right to ask questions, clarifications and then take a decision on whether they want to enroll into a clinical trial or not. The patient's decision is always respected by the entire healthcare team. Irrespective of what decision is taken about clinical trial participation, each patient continues to receive the best of the treatment.

People are encouraged to talk to their oncologist whether they are eligible for any clinical trial.

## **Common myths about cancer**

1. Cancer is not contagious. Cancer itself cannot spread from a patient to others. Although being infected with certain viruses or bacteria may increase the risk of some types of cancer, no one can "catch" cancer from another person. Hence it is perfectly safe to share the same room, eat from the same plates and use the same towel as any cancer patient. There is no risk of getting cancer in this manner.
2. Hereditary cancers form less than 5% of all cancers. In most instances cancer is not due to inherited genes. Family history of cancer is different from hereditary cancers. This is because families may be sharing other risk factors that can increase risk of cancer – like sedentary lifestyle, exposure to smoke/tobacco and eating habits (high fat/ caloric food).

3. Cancer is not caused by an injury, such as a bump or bruise. However a long standing scar (like a keloid) or repeated injuries (for example due to constant rubbing by a sharp tooth) can lead to a precancerous or cancerous condition. Often an injury will first draw attention to the site where injury has occurred and hence a pre-existing cancer gets detected.

## **Resources**

Besides our website ([www.jascap.org](http://www.jascap.org)), additional information can also be found at the following websites:

[www.oncologyindia.org](http://www.oncologyindia.org)  
[www.ismpo.org](http://www.ismpo.org)  
[www.sajc.org](http://www.sajc.org)  
[www.indiancancersociety.org](http://www.indiancancersociety.org)  
[www.aroi.org](http://www.aroi.org)  
[www.indiansocietyofoncology.org](http://www.indiansocietyofoncology.org)  
[www.iasoindia.in](http://www.iasoindia.in)  
[www.oncologygoldstandard.com](http://www.oncologygoldstandard.com)  
[www.lcca.com](http://www.lcca.com)  
[www.jdhc.info](http://www.jdhc.info)  
[www.indianjcancer.com](http://www.indianjcancer.com)

## Glossary

**Acupuncture** (AK-yoo-PUNK-cher): The technique of inserting thin needles through the skin at specific points on the body to control pain and other symptoms. It is a type of complementary and alternative medicine.

**AIDS**: Acquired immunodeficiency syndrome (ah-KWY-erd im-YOON-o-de-FISH-en-see SIN-drome). A disease caused by the human immunodeficiency virus (HIV). People with AIDS are at an increased risk for developing certain cancers and for infections that usually occur only in individuals with a weak immune system.

**Bacteria** (bak-TEER-ee-uh): A large group of single cell microorganisms. Some cause infections and disease in animals and humans. The singular of bacteria is bacterium.

**BCG solution**: A form of biological therapy for superficial bladder cancer. A catheter is used to place the BCG solution into the bladder. The solution contains live, weakened bacteria (bacille Calmette- Guérin) that activate the immune system. The BCG solution used for bladder cancer is not the same thing as BCG vaccine, a vaccine for tuberculosis.

**Benign** (beh-NINE): Not cancerous. Benign tumors do not spread to tissues around them or to other parts of the body.

**Biological therapy** (by-o-LAHJ-i-kul): Treatment to stimulate or restore the ability of the immune system to fight infections and other diseases. Also used to lessen certain side effects that may be caused by cancer treatment. Also known as immunotherapy, biotherapy, or biological response modifier (BRM) therapy.

**Biopsy** (BY-op-see): The removal of cells or tissues for examination by a pathologist. The pathologist may study the tissue under a microscope or perform other tests. When only a sample of tissue is removed, the procedure is called an incisional biopsy. When an entire lump or suspicious area is removed, the procedure is called an excisional biopsy. When a sample of tissue or fluid is removed with a needle, the procedure is called a needle biopsy, core biopsy, or fine-needle aspiration.

**Bone marrow**: The soft, sponge-like tissue in the center of most

large bones. It produces white blood cells, red blood cells, and platelets.

**Brachytherapy** (BRAKE-ih-THER-a-pee): A procedure in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called internal radiation, implant radiation, or interstitial radiation therapy.

**Cancer:** A term for diseases in which abnormal cells divide without control. Cancer cells can invade nearby tissues and can spread through the bloodstream and lymphatic system to other parts of the body. There are several main types of cancer. Carcinoma is cancer that begins in the skin or in tissues that line or cover internal organs. Sarcoma is cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue. Leukemia is cancer that starts in blood-forming tissue such as the bone marrow, and causes large numbers of abnormal blood cells to be produced and enter the bloodstream. Lymphoma and multiple myeloma are cancers that begin in the cells of the immune system.

**Cell:** The individual unit that makes up the tissues of the body. All living things are made up of one or more cells.

**Chemotherapy** (kee-mo-THER-a-pee): Treatment with drugs that kill cancer.

**Clinical trial:** A type of research study that tests how well new medical interventions work in people. Such studies test new methods of screening, prevention, diagnosis, or treatment of a disease. Studies may be carried out in a clinic or other medical facility. Also called a clinical study.

**Colonoscopy** (ko-lun-AHS-ko-pee): An examination of the inside of the colon using a thin, lighted tube (called a colonoscope) inserted into the rectum. If abnormal areas are seen, tissue can be removed and examined under a microscope to determine whether disease is present.

**Complementary and alternative medicine:** CAM.

Forms of treatment that are used in addition to (complementary) or instead of (alternative) standard

treatments. These practices generally are not considered standard medical approaches. Standard

treatments have gone through a long and careful research process to prove they are safe and effective, but less is known about CAM. CAM may include dietary supplements, megadose vitamins, herbal preparations, special teas, acupuncture, massage therapy, magnet therapy, spiritual healing, and meditation.

**CT scan:** Computed tomography scan. A series of detailed pictures of areas inside the body taken from different angles; the pictures are created by a computer linked to an x-ray machine. Also called computerized tomography and computerized axial tomography (CAT) scan.

**Diethylstilbestrol** (dye-ETH-ul-stil-BES-trol): DES. A synthetic form of the hormone estrogen that was prescribed to pregnant women between about 1940 and 1971 because it was thought to prevent miscarriages. DES may increase the risk of uterine, ovarian, or breast cancer in women who took it. DES also has been linked to an increased risk of clear cell carcinoma of the vagina or cervix in daughters exposed to DES before birth.

**Dietitian:** A health professional with special training in nutrition who can help with dietary choices. Also called a nutritionist.

**Digestive tract** (dye-JES-tiv): The organs through which food and liquids pass when they are swallowed, digested, and eliminated. These organs are the mouth, esophagus, stomach, small and large intestines, and rectum.

**Digital rectal exam:** DRE. An examination in which a doctor inserts a lubricated, gloved finger into the rectum to feel for abnormalities.

**Double-contrast barium enema:** A procedure in which x-rays of the colon and rectum are taken after a liquid containing barium is put into the rectum. Barium is a silver-white metallic compound that outlines the colon and rectum on an x-ray and helps show abnormalities. Air is put into the rectum and colon to further enhance the x-ray.

**Epstein-Barr virus:** EBV. A common virus that remains dormant in most people. It has been associated with certain cancers, including

Burkitt's lymphoma, immunoblastic lymphoma, and nasopharyngeal carcinoma.

**Estrogen** (ES-tro-jin): A hormone that promotes the development and maintenance of female sex characteristics.

**Excisional biopsy** (ek-SI-zhun-al BY-op-see): A surgical procedure in which an entire lump or suspicious area is removed for diagnosis. The tissue is then examined under a microscope.

**External radiation** (ray-dee-AY-shun): Radiation therapy that uses a machine to aim high-energy rays at the cancer. Also called external-beam radiation.

**Fecal occult blood test** (FEE-kul o-KULT): FOBT. A test to check for blood in stool. (Fecal refers to stool; occult means hidden.)

**Fertility** (fer-TIL-i-tee): The ability to produce children.

**Gene**: The functional and physical unit of heredity passed from parent to offspring. Genes are pieces of DNA, and most genes contain the information for making a specific protein.

**Genetic testing**: Analyzing DNA to look for a genetic alteration that may indicate an increased risk for developing a specific disease or disorder.

**Helicobacter pylori** (HEEL-ih-ko-BAK-ter pye-LOR-ee): *H. pylori*. Bacteria that cause inflammation and ulcers in the stomach and small intestine.

**Hematologist** (hee-ma-TOL-o-jist): A doctor who specializes in treating blood disorders.

**Hepatitis B virus**: A virus that causes hepatitis (inflammation of the liver). It is carried and passed to others through blood or sexual contact. Also, infants born to infected mothers may become infected with the virus.

**Hepatitis C virus**: A virus that causes hepatitis (inflammation of the liver). It is carried and passed to others through blood or sexual contact. Also, infants born to infected mothers may become infected with the virus.

**Hormone:** A chemical made by glands in the body. Hormones circulate in the bloodstream and control the actions of certain cells or organs. Some hormones can also be made in a laboratory.

**Hormone therapy:** Treatment that adds, blocks, or removes hormones. For certain conditions (such as diabetes or menopause), hormones are given to adjust low hormone levels. To slow or stop the growth of certain cancers (such as prostate and breast cancer), hormones may be given to block the body's natural hormones. Sometimes surgery is needed to remove the gland that makes hormones. Also called hormonal therapy, hormone treatment, or endocrine therapy.

**Human herpes virus 8:** HHV8. A member of the herpes family of viruses. It is a risk factor for Kaposi's sarcoma, a rare cancer that can cause skin lesions.

**Human immunodeficiency virus:** HIV. The cause of acquired immunodeficiency syndrome (AIDS).

**Human papilloma virus** (pap-ih-LO-ma-VYE-rus): HPV. A virus that causes abnormal tissue growth (warts) and is associated with some types of cancer.

**Human T-cell leukemia virus type 1:** A retrovirus that infects T cells (a type of white blood cell) and can cause leukemia and lymphoma. HTLV-1 is spread by sharing syringes or needles used to inject drugs, through sexual contact, and from mother to child at birth or through breast-feeding.

**Imaging procedure:** A method of producing pictures of areas inside the body.

**Implant radiation** (ray-dee-AY-shun): A procedure in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called brachytherapy, internal radiation, or interstitial radiation.

**Incisional biopsy** (in-SIH-zhun-al BY-op-see): A surgical procedure in which a portion of a lump or suspicious area is removed for diagnosis. The tissue is then examined under a microscope.

**Infection:** Invasion and multiplication of germs in the body.

Infections can occur in any part of the body, and can spread throughout the body. The germs may be bacteria, viruses, yeast, or fungi. They can cause a fever and other problems, depending on where the infection occurs. When the body's natural defense system is strong, it can often fight the germs and prevent infection. Cancer treatment can weaken the natural defense system.

***Infertility:*** The inability to produce children.

***Internal radiation*** (ray-dee-AY-shun): A procedure in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near a tumor. Also called brachytherapy, implant radiation, or interstitial radiation therapy.

***Ionizing radiation*** (EYE-ah-NIZE-ing ray-dee-AYshun): A type of high-frequency radiation produced by x-ray procedures, radioactive substances, rays that enter the Earth's atmosphere from outer space, and other sources. Ionizing radiation can enter cells and lead to health risks, including cancer, at certain doses.

***Leukemia*** (loo-KEE-mee-a): Cancer that starts in blood-forming tissue such as the bone marrow, and causes large numbers of blood cells to be produced and enter the bloodstream.

***Leukocyte*** (LOO-ko-site): A white blood cell. Refers to a blood cell that does not contain hemoglobin. White blood cells include lymphocytes, neutrophils, eosinophils, macrophages, and mast cells. These cells are made by bone marrow and help the body fight infection and other diseases.

***Local therapy:*** Treatment that affects cells in the tumor and the area close to it.

***Lymph node*** (limf node): A rounded mass of lymphatic tissue that is surrounded by a capsule of connective tissue. Lymph nodes filter lymph (lymphatic fluid), and they store lymphocytes (white blood cells). They are located along lymphatic vessels. Also called a lymph gland.

***Lymphatic system*** (lim-FAT-ik SIS-tem): The tissues and organs that produce, store, and carry white blood cells that fight infections and other diseases. This system includes the bone marrow, spleen,

thymus, lymph nodes, and lymphatic vessels (a network of thin tubes that carry lymph and white blood cells). Lymphatic vessels branch, like blood vessels, into all the tissues of the body.

**Lymphoma** (lim-FO-ma): Cancer that begins in cells of the immune system.

**Malignant** (ma-LIG-nant): Cancerous. Malignant tumors can invade and destroy nearby tissue and spread to other parts of the body.

**Mammogram** (MAM-o-gram): An x-ray of the breast.

**Medical oncologist** (MED-i-kul on-KOL-o-jist): A doctor who specializes in diagnosing and treating cancer using chemotherapy, hormonal therapy, and biological therapy. A medical oncologist often is the main health care provider for someone who has cancer. A medical oncologist also provides supportive care and may coordinate treatment provided by other specialists.

**Melanoma** (MEL-ah-NO-ma): A form of skin cancer that arises in melanocytes, the cells that produce pigment. Melanoma usually begins in a mole.

**Menopausal hormone therapy:** Hormones (estrogen, progesterone, or both) given to women after menopause to replace the hormones no longer produced by the ovaries. Also called hormone replacement therapy or HRT.

**Menopause** (MEN-o-pawz): The time of life when a woman's menstrual periods stop permanently. Also called "change of life."

**Metastasis** (meh-TAS-ta-sis): The spread of cancer from one part of the body to another. A tumor formed by cells that have spread is called a "metastatic tumor" or a "metastasis." The metastatic tumor contains cells that are like those in the original (primary) tumor. The plural form of metastasis is metastases (meh-TAS-taseez).

**Mole:** A benign growth on the skin (usually tan, brown, or flesh-colored) that contains a cluster of melanocytes and surrounding supportive tissue.

**MRI:** Magnetic resonance imaging (mag-NET-ik REZ-o-nans IM-a-jing). A procedure in which radio waves and a powerful magnet

linked to a computer are used to create detailed pictures of areas inside the body. These pictures can show the difference between normal and diseased tissue. MRI makes better images of organs and soft tissue than other scanning techniques, such as CT or x-ray. MRI is especially useful for imaging the brain, spine, the soft tissue of joints, and the inside of bones. Also called nuclear magnetic resonance imaging.

**Mutation:** Any change in the DNA of a cell. Mutations may be caused by mistakes during cell division, or they may be caused by exposure to DNA-damaging agents in the environment. Mutations can be harmful, beneficial, or have no effect. If they occur in cells that make eggs or sperm, they can be inherited; if mutations occur in other types of cells, they are not inherited. Certain mutations may lead to cancer or other diseases.

**Organ:** A part of the body that performs a specific function. For example, the heart is an organ.

**Pap test:** The collection of cells from the cervix for examination under a microscope. It is used to detect cancer and changes that may lead to cancer. Also called a Pap smear.

**Pathologist** (pa-THOL-o-jist): A doctor who identifies diseases by studying cells and tissues under a microscope.

**PET scan:** Positron emission tomography scan. A procedure in which a small amount of radioactive glucose (sugar) is injected into a vein, and a scanner is used to make detailed, computerized pictures of areas inside the body where the glucose is used. Because cancer cells often use more glucose than normal cells, the pictures can be used to find cancer cells in the body.

**Polyp** (POL-ip): A growth that protrudes from a mucous membrane.

**Primary tumor:** The original tumor.

**Progestin** (pro-JES-tin): Any natural or laboratorymade substance that has some or all of the biologic effects

If progesterone, a female hormone.

**Quality of life:** The overall enjoyment of life. Many clinical trials assess the effects of cancer and its treatment on the quality of life.

These studies measure aspects of an individual's sense of well-being and ability to carry out various activities.

**Radiation oncologist** (ray-dee-AY-shun on-KOLO-jist): A doctor who specializes in using radiation to treat cancer.

**Radiation therapy** (ray-dee-AY-shun THER-ah-peel): The use of high-energy radiation from x-rays, gamma rays, neutrons, and other sources to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy), or it may come from radioactive material placed in the body near cancer cells (internal radiation therapy, implant radiation, or brachytherapy). Systemic radiation therapy uses a radioactive substance, such as a radiolabeled monoclonal antibody, that circulates throughout the body. Also called radiotherapy.

**Radioactive**: (RAY-dee-o-AK-tiv): Giving off radiation.

**Radioactive fallout** (RAY-dee-o-AK-tiv): Airborne radioactive particles that fall to the ground during and after an atomic bombing, nuclear weapons test, or nuclear plant accident.

**Radionuclide scan** (RAY-dee-o-NEW-klide): A test that produces pictures (scans) of internal parts of the body. The person is given an injection or swallows a small amount of radioactive material; a machine called a scanner then measures the radioactivity in certain organs.

**Radon** (RAY-don): A radioactive gas that is released by uranium, a substance found in soil and rock.

Breathing in too much radon can damage lung cells and lead to lung cancer.

**Recurrence**: The return of cancer, at the same place as the original (primary) tumor or in another location, after the tumor had disappeared.

**Risk factor**: Something that may increase the chance of developing a disease. Some examples of risk factors for cancer include age, a family history of certain cancers, use of tobacco products, certain eating habits, obesity, exposure to radiation or other cancer-causing

agents, and certain genetic changes.

**Screening:** Checking for disease when there are no symptoms.

**Side effect:** A problem that occurs when treatment affects healthy tissues or organs. Some common side effects of cancer treatment are fatigue, pain, nausea, vomiting, decreased blood cell counts, hair loss, and mouth sores.

**Sigmoidoscopy** (sig-moid-OSS-ko-pee): Inspection of the lower colon using a thin, lighted tube called a sigmoidoscope. Samples of tissue or cells may be collected for examination under a microscope. Also called proctosigmoidoscopy.

**Sonogram** (SAHN-o-gram): A computer picture of areas inside the body created by bouncing high-energy sound waves (ultrasound) off internal tissues or organs. Also called an ultrasonogram.

**Spiral CT scan:** A detailed picture of areas inside the body. The pictures are created by a computer linked to an x-ray machine that scans the body in a spiral path. Also called helical computed tomography.

**Stage:** The extent of a cancer within the body. Staging it based on the size of the tumor, whether lymph nodes contain cancer, and whether the disease has spread from the original site to other parts of the body.

**Stem cell:** A cell from which other types of cells develop. Blood cells develop from blood-forming stem cells.

**Stem cell transplantation:** A method of replacing immature blood-forming cells that were destroyed by cancer treatment. The stem cells are given to the person after treatment to help the bone marrow recover and continue producing healthy blood cells.

**Supportive care:** Care given to improve the quality of life of patients who have a serious or life-threatening disease. The goal of supportive care is to prevent or treat as early as possible the symptoms of the disease, side effects caused by treatment of the disease, and psychological, social, and spiritual problems related to the disease or its treatment. Also called palliative care, comfort care, and symptom management.

**Surgeon:** A doctor who removes or repairs a part of the body by operating on the patient.

**Surgery** (SER-juh-ree): A procedure to remove or repair a part of the body or to find out whether disease is present. An operation.

**Symptom:** An indication that a person has a condition or disease. Some examples of symptoms are headache, fever, fatigue, nausea, vomiting, and pain.

**Systemic therapy** (sis-TEM-ik THER-a-pee): Treatment using substances that travel through the bloodstream, reaching and affecting cells all over the body.

**Thyroid** (THIGH-royd): A gland located beneath the voice box (larynx) that produces thyroid hormone. The thyroid helps regulate growth and metabolism.

**Tissue** (TIH-shoo): A group or layer of cells that are alike and that work together to perform a specific function.

**Tumor** (TOO-mer): A mass of excess tissue that results from abnormal cell division. Tumors perform no useful body function. They may be benign (not cancerous) or malignant (cancerous).

**Tumor marker:** A substance sometimes found in the blood, other body fluids, or tissues. A high level of tumor marker may mean that a certain type of cancer is in the body. Examples of tumor markers include CA 125 (ovarian cancer), CA 15-3 (breast cancer), CEA (ovarian, lung, breast, pancreas, and gastrointestinal tract cancers), and PSA (prostate cancer). Also called biomarker.

**Ultrasound:** A procedure in which high-energy sound waves (ultrasound) are bounced off internal tissues or organs and make echoes. The echo patterns are shown on the screen of an ultrasound machine, forming a picture of body tissues called a sonogram. Also called ultrasonography.

**Ultraviolet radiation** (ul-tra-VYE-o-let ray-dee- AY-shun): UV radiation. Invisible rays that are part of the energy that comes from the sun. UV radiation also comes from sun lamps and tanning beds. UV radiation can damage the skin and cause melanoma and other types of skin cancer. UV radiation that reaches the Earth's

surface is made up of two types of rays, called UVA and UVB rays. UVB rays are more likely than UVA rays to cause sunburn, but UVA rays pass deeper into the skin. Scientists have long thought that UVB radiation can cause melanoma and other types of skin cancer. They now think that UVA radiation also may add to skin damage that can lead to skin cancer and cause premature aging. For this reason, skin specialists recommend that people use sunscreens that reflect, absorb, or scatter both kinds of UV radiation.

**Virtual colonoscopy** (ko-lun-AHS-ko-peel): A method under study to examine the colon by taking a series of x-rays (called a CT scan) and using a high-powered computer to reconstruct 2-D and 3-D pictures of the interior surfaces of the colon from these x-rays. The pictures can be saved, manipulated to better viewing angles, and reviewed after the procedure, even years later. Also called computed tomography colography.

**Virus** (VYE-rus): A microorganism that can infect cells and cause disease.

**X-ray**: A type of high-energy radiation. In low doses, x-rays are used to diagnose diseases by making pictures of the inside of the body. In high doses, x-rays are used to treat cancer.



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## Notes

## Notes

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