What You Need To Know About™

Thyroid Cancer

NATIONAL INSTITUTES OF HEALTH
National Cancer Institute

This booklet is about thyroid cancer. The Cancer Information Service can help you learn more about this disease. The staff can talk with you in English or Spanish.

The number is 1–800–4–CANCER (1–800–422–6237). The number for deaf and hard of hearing callers with TTY equipment is 1–800–332–8615. The call is free.

Este folleto es acerca del cáncer de tiroides. Llame al Servicio de Información sobre el Cáncer para saber más sobre esta enfermedad. Este servicio tiene personal que habla español.

El número a llamar es el 1–800–4–CANCER (1–800–422–6237). Personas con problemas de audición y que cuentan con equipo TTY pueden llamar al 1–800–332–8615. La llamada es gratis.

Contents

U.S. DEPARTMENT OF HEALTH AND
HUMAN SERVICES
Public Health Service
National Institutes of Health

What You Need To Know About™ Thyroid Cancer

This National Cancer Institute (NCI) booklet has important information about *cancer** of the thyroid. Each year in the United States, thyroid cancer is diagnosed in 14,900 women and 4,600 men.

This booklet discusses possible causes, symptoms, diagnosis, treatment, and followup care. It also has information to help patients cope with thyroid cancer.

Research is increasing what we know about thyroid cancer. Scientists are studying its causes. They are also looking for better ways to detect, diagnose, and treat this disease. Because of research, people with thyroid cancer can look forward to a better *quality of life* and less chance of dying from the disease.

Information specialists at the NCI's Cancer Information Service at 1–800–4–CANCER can help people with questions about cancer and can send NCI publications. Also, many NCI publications are on the Internet at **http://cancer.gov/publications**. People in the United States and its territories may use this Web site to order publications. This Web site also explains how people outside the United States can mail or fax their requests for NCI publications.

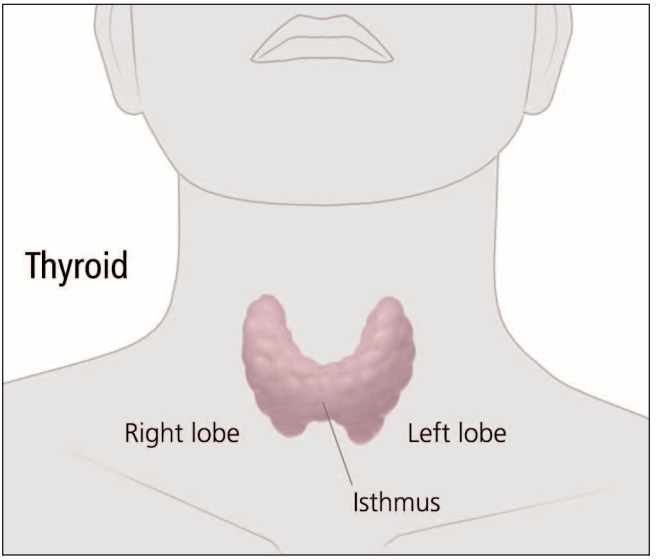
*Words that may be new to readers appear in *italics*. The "Dictionary" section gives definitions of these terms. Some words in the "Dictionary" have a "sounds-like" spelling to show how to pronounce them.

The Thyroid

The *thyroid* is a *gland* in the neck. It has two kinds of cells that make *hormones*. *Follicular cells* make *thyroid hormone*, which affects heart rate, body temperature, and energy level. *C cells* make *calcitonin*, a hormone that helps control the level of calcium in the blood.

The thyroid is shaped like a butterfly and lies at the front of the neck, beneath the voice box (*larynx*). It has two parts, or *lobes*. The two lobes are separated by a thin section called the *isthmus*.

A healthy thyroid is a little larger than a quarter. It usually cannot be felt through the skin. A swollen lobe might look or feel like a lump in the front of the neck. A swollen thyroid is called a *goiter*. Most goiters are caused by not enough *iodine* in the diet. Iodine is a substance found in shellfish and iodized salt.



This picture shows the thyroid.

Understanding Cancer

Cancer is a group of many related diseases. All cancers begin in *cells*, the body's basic unit of life. Cells make up *tissues*, and tissues make up the organs of the body.

Normally, cells grow and divide to form new cells as the body needs them. When cells grow old and die, new cells take their place.

Sometimes this orderly process goes wrong. New cells form when the body does not need them, and old cells do not die when they should. These extra cells can form a mass of tissue called a growth or *tumor*. Growths on the thyroid are usually called *nodules*.

Thyroid nodules can be *benign* or *malignant:*

- **Benign** nodules are not cancer. Cells from benign nodules do not spread to other parts of the body. They are usually not a threat to life. Most thyroid nodules (more than 90 percent) are benign.
- **Malignant** nodules are cancer. They are generally more serious and may sometimes be life threatening. Cancer cells can invade and damage nearby tissues and organs. Also, cancer cells can break away from a malignant nodule and enter the bloodstream or the *lymphatic system*. That is how cancer spreads from the original cancer (*primary tumor*) to form new tumors in other organs. The spread of cancer is called *metastasis*.

The following are the major types of thyroid cancer:

- ***Papillary*** and ***follicular thyroid cancers*** account for 80 to 90 percent of all thyroid cancers. Both types begin in the follicular cells of the thyroid. Most papillary and follicular thyroid cancers tend to grow slowly. If they are detected early, most can be treated successfully.

- ***Medullary thyroid cancer*** accounts for 5 to 10 percent of thyroid cancer cases. It arises in C cells, not follicular cells. Medullary thyroid cancer is easier to control if it is found and treated before it spreads to other parts of the body.
- ***Anaplastic thyroid cancer*** is the least common type of thyroid cancer (only 1 to 2 percent of cases). It arises in the follicular cells. The cancer cells are highly abnormal and difficult to recognize. This type of cancer is usually very hard to control because the cancer cells tend to grow and spread very quickly.

If thyroid cancer spreads (*metastasizes*) outside the thyroid, cancer cells are often found in nearby *lymph nodes*, nerves, or blood vessels. If the cancer has reached these lymph nodes, cancer cells may have also spread to other lymph nodes or to other organs, such as the lungs or bones.

When cancer spreads from its original place to another part of the body, the new tumor has the same kind of abnormal cells and the same name as the primary tumor. For example, if thyroid cancer spreads to the lungs, the cancer cells in the lungs are thyroid cancer cells. The disease is metastatic thyroid cancer, not lung cancer. It is treated as thyroid cancer, not as lung cancer. Doctors sometimes call the new tumor "distant" or metastatic disease.

Thyroid Cancer: Who's at Risk?

No one knows the exact causes of thyroid cancer. Doctors can seldom explain why one person gets this disease and another does not. However, it is clear that thyroid cancer is not contagious. No one can "catch" cancer from another person.

Research has shown that people with certain *risk factors* are more likely than others to develop thyroid cancer. A risk factor is anything that increases a person's chance of developing a disease.

The following risk factors are associated with an increased chance of developing thyroid cancer:

- ***Radiation.*** People exposed to high levels of radiation are much more likely than others to develop papillary or follicular thyroid cancer.

  One important source of radiation exposure is treatment with *x-rays*. Between the 1920s and the 1950s, doctors used high-dose x-rays to treat children who had enlarged tonsils, acne, and other problems affecting the head and neck. Later, scientists found that some people who had received this kind of treatment developed thyroid cancer. (Routine diagnostic x-rays—such as dental x-rays or chest x-rays—use very small doses of radiation. Their benefits nearly always outweigh their risks. However, repeated exposure could be harmful, so it is a good idea for people to talk with their dentist and doctor about the need for each x-ray and to ask about the use of shields to protect other parts of the body.)

  Another source of radiation is *radioactive fallout*. This includes fallout from atomic weapons testing (such as the testing in the United States and elsewhere in the world, mainly in the 1950s and 1960s), nuclear power plant accidents (such as the Chornobyl [also called Chernobyl] accident in 1986), and releases from atomic weapons production plants (such as the Hanford facility in Washington state in the late 1940s). Such radioactive fallout contains *radioactive iodine* (I-131). People who were exposed to one or more sources of I-131, especially if they were children at the time of their exposure, may have an increased risk for thyroid diseases.

People who are concerned about their exposure to radiation from medical treatments or radioactive fallout may wish to ask the Cancer Information Service at 1–800–4–CANCER about additional sources of information.

- **Family history.** Medullary thyroid cancer can be caused by a change, or alteration, in a *gene* called RET. The altered RET gene can be passed from parent to child. Nearly everyone with the altered RET gene will develop medullary thyroid cancer. A blood test can detect an altered RET gene. If the abnormal gene is found in a person with medullary thyroid cancer, the doctor may suggest that family members be tested. For those found to carry the altered RET gene, the doctor may recommend frequent lab tests or *surgery* to remove the thyroid before cancer develops. When medullary thyroid cancer runs in a family, the doctor may call this "familial medullary thyroid cancer" or "*multiple endocrine neoplasia* (MEN) *syndrome*." People with the MEN syndrome tend to develop certain other types of cancer.

  A small number of people with a family history of goiter or certain *precancerous polyps* in the *colon* are at risk for developing papillary thyroid cancer.

- **Being female.** In the United States, women are two to three times more likely than men to develop thyroid cancer.
- **Age.** Most patients with thyroid cancer are more than 40 years old. People with anaplastic thyroid cancer are usually more than 65 years old.
- **Race.** In the United States, white people are more likely than African Americans to be diagnosed with thyroid cancer.

- **Not enough iodine in the diet.** The thyroid needs iodine to make thyroid hormone. In the United States, iodine is added to salt to protect people from thyroid problems. Thyroid cancer seems to be less common in the United States than in countries where iodine is not part of the diet.

Most people who have known risk factors do not get thyroid cancer. On the other hand, many who do get the disease have none of these risk factors. People who think they may be at risk for thyroid cancer should discuss this concern with their doctor. The doctor may suggest ways to reduce the risk and can plan an appropriate schedule for checkups.

Symptoms

Early thyroid cancer often does not cause *symptoms*. But as the cancer grows, symptoms may include:

- A lump, or nodule, in the front of the neck near the Adam's apple;
- Hoarseness or difficulty speaking in a normal voice;
- Swollen lymph nodes, especially in the neck;
- Difficulty swallowing or breathing; or
- Pain in the throat or neck.

These symptoms are not sure signs of thyroid cancer. An infection, a benign goiter, or another problem also could cause these symptoms. Anyone with these symptoms should see a doctor as soon as possible. Only a doctor can diagnose and treat the problem.

Diagnosis

If a person has symptoms that suggest thyroid cancer, the doctor may perform a physical exam and ask about the patient's personal and family medical history. The doctor also may order laboratory tests and *imaging* tests to produce pictures of the thyroid and other areas.

The exams and tests may include the following:

- **Physical exam**—The doctor will feel the neck, thyroid, voice box, and lymph nodes in the neck for unusual growths (nodules) or swelling.

- **Blood tests**—The doctor may test for abnormal levels (too low or too high) of *thyroid-stimulating hormone* (TSH) in the blood. TSH is made by the *pituitary gland* in the brain. It stimulates the release of thyroid hormone. TSH also controls how fast thyroid follicular cells grow.

  If medullary thyroid cancer is suspected, the doctor may check for abnormally high levels of calcium in the blood. The doctor also may order blood tests to detect an altered RET gene or to look for a high level of calcitonin.

- ***Ultrasonography***—The ultrasound device uses sound waves that people cannot hear. The waves bounce off the thyroid, and a computer uses the echoes to create a picture called a *sonogram*. From the picture, the doctor can see how many nodules are present, how big they are, and whether they are solid or filled with fluid.

- ***Radionuclide scanning***—The doctor may order a *nuclear medicine scan* that uses a very small amount of radioactive material to make thyroid nodules show up on a picture. Nodules that absorb less radioactive material than the surrounding thyroid tissue are called *cold nodules*. Cold nodules may be benign or malignant. *Hot nodules* take up more radioactive material than surrounding thyroid tissue and are usually benign.

- ***Biopsy***—The removal of tissue to look for cancer cells is called a biopsy. A biopsy can show cancer, tissue changes that may lead to cancer, and other conditions. A biopsy is the only sure way to know whether a nodule is cancerous.

The doctor may remove tissue through a needle or during surgery:

—***Fine-needle aspiration***: For most patients, the doctor removes a sample of tissue from a thyroid nodule with a thin needle. A *pathologist* looks at the cells under a microscope to check for cancer. Sometimes, the doctor uses an ultrasound device to guide the needle through the nodule.

—**Surgical biopsy**: If a diagnosis cannot be made from the fine-needle aspiration, the doctor may operate to remove the nodule. A pathologist then checks the tissue for cancer cells.

A person who needs a biopsy may want to ask the doctor the following questions:

- What kind of biopsy will I have?
- How long will the procedure take? Will I be awake? Will it hurt?
- Will I have a scar on my neck after the biopsy?
- How soon will you have the results? Who will explain them to me?
- If I do have cancer, who will talk to me about treatment? When?

Staging

If the diagnosis is thyroid cancer, the doctor needs to know the *stage*, or extent, of the disease to plan the best treatment. *Staging* is a careful attempt to learn whether the cancer has spread and, if so, to what parts of the body.

The doctor may use *ultrasonography*, *magnetic resonance imaging* (MRI), or *computed tomography* (CT) to find out whether the cancer has spread to the lymph nodes or other areas within the neck. The doctor may use a nuclear medicine scan of the entire body, such as a radionuclide scan known as the "diagnostic I-131 whole body scan," or other imaging tests to learn whether thyroid cancer has spread to distant sites.

Treatment

People with thyroid cancer often want to take an active part in making decisions about their medical care. They want to learn all they can about their disease and their treatment choices. However, the shock and stress that people may feel after a diagnosis of cancer can make it hard for them to think of everything they want to ask the doctor. It often helps to make a list of questions before an appointment. To help remember what the doctor says, patients may take notes or ask whether they may use a tape recorder. Some also want to have a family member or friend with them when they talk to the doctor—to take part in the discussion, to take notes, or just to listen.

The doctor may refer patients to doctors (*oncologists*) who specialize in treating cancer, or patients may ask for a referral. Specialists who treat thyroid cancer include *surgeons*, *endocrinologists* (some of whom are called thyroidologists because they specialize in thyroid diseases), *medical oncologists*, and *radiation oncologists*. Treatment generally begins within a few weeks after the diagnosis. There will be time for patients to talk with the doctor about treatment choices, get a second opinion, and learn more about thyroid cancer.

Getting a Second Opinion

Before starting treatment, the patient might want a second opinion about the diagnosis and the treatment plan. Some insurance companies require a second opinion; others may cover a second opinion if the patient or doctor requests it. Gathering medical records and arranging to see another doctor may take a little time. In most cases, a brief delay does not make treatment less effective.

There are a number of ways to find a doctor for a second opinion:

- The patient's doctor may refer the patient to one or more specialists. At cancer centers, several specialists often work together as a team.
- The Cancer Information Service, at 1–800–4–CANCER, can tell callers about treatment facilities, including cancer centers and other programs supported by the National Cancer Institute.
- A local medical society, a nearby hospital, or a medical school can usually provide the name of specialists.
- The *Official ABMS Directory of Board Certified Medical Specialists* lists doctors'names along with their specialty and their educational background. This resource is available in most public libraries. The American Board of Medical Specialties (ABMS) also offers information by telephone and on the Internet. The public may use these services to check whether a doctor is board certified. The telephone number is 1–866–ASK–ABMS (1–866–275–2267). The Internet address is **http://www.abms.org/newsearch.asp**.

Preparing for Treatment

The doctor can describe treatment choices and discuss the results expected with each treatment option. The doctor and patient can work together to develop a treatment plan that fits the patient's needs.

Treatment depends on a number of factors, including the type of thyroid cancer, the size of the nodule, the patient's age, and whether the cancer has spread.

These are some questions a person may want to ask the doctor before treatment begins:

- What type of thyroid cancer do I have?
- Has the cancer spread? What is the stage of the disease?
- Do I need any more tests to check for the spread of the disease?
- What are my treatment choices? Which do you recommend for me? Why?
- What are the benefits of each type of treatment?
- What are the risks and possible *side effects* of each treatment?
- What is the treatment likely to cost?
- How will the treatment affect my normal activities?
- Would a *clinical trial* (research study) be appropriate for me? Can you help me find one?

People do not need to ask all of their questions or understand all of the answers at one time. They will have other chances to ask the doctor to explain things that are not clear and to ask for more information.

Methods of Treatment

People with thyroid cancer have many treatment options. Depending on the type and stage, thyroid cancer may be treated with *surgery*, *radioactive iodine*, *hormone treatment*, *external radiation*, or *chemotherapy*. Some patients receive a combination of treatments.

The doctor is the best person to describe the treatment choices and discuss the expected results.

A patient may want to talk to the doctor about taking part in a clinical trial, a research study of new treatment methods. The section on "The Promise of Cancer Research" has more information about clinical trials.

Surgery is the most common treatment for thyroid cancer. The surgeon may remove all or part of the thyroid. The type of surgery depends on the type and stage of thyroid cancer, the size of the nodule, and the patient's age.

- **Total *thyroidectomy*** — Surgery to remove the entire thyroid is called a total thyroidectomy. The surgeon removes the thyroid through an *incision* in the neck. Nearby lymph nodes are sometimes removed, too. If the pathologist finds cancer cells in the lymph nodes, it means that the disease could spread to other parts of the body. In a small number of cases, the surgeon removes other tissues in the neck that have been affected by the cancer. Some patients who have a total thyroidectomy also receive radioactive iodine or external radiation therapy.
- ***Lobectomy*** — Some patients with papillary or follicular thyroid cancer may be treated with lobectomy. The lobe with the cancerous nodule is removed. The surgeon also may remove part of the remaining thyroid tissue or nearby lymph nodes. Some patients who have a lobectomy receive radioactive iodine therapy or additional surgery to remove remaining thyroid tissue.

Nearly all patients who have part or all of the thyroid removed will take thyroid hormone pills to replace the natural hormone.

After the initial surgery, the doctor may need to operate on the neck again for thyroid cancer that has spread. Patients who have this surgery also may receive I-131 therapy or external radiation therapy to treat thyroid cancer that has spread.

These are some questions a person may want to ask the doctor before having surgery:

- What kind of operation will I have?
- How will I feel after the operation?
- What will you do for me if I have pain?
- How long will I be in the hospital?
- Will I have any long-term effects?
- When can I get back to my normal activities?
- What will my scar look like?
- What is my chance of a full recovery?
- Will I need to take thyroid hormone pills?
- How often will I need checkups?

Radioactive iodine therapy (also called radioiodine therapy) uses radioactive iodine (I-131) to destroy thyroid cancer cells anywhere in the body. The therapy usually is given by mouth (liquid or capsules) in a small dose that causes no problems for people who are allergic to iodine. The intestine absorbs the I-131, which flows through the bloodstream and collects in thyroid cells. Thyroid cancer cells remaining in the neck and those that have spread to other parts of the body are killed when they absorb I-131.

If the dose of I-131 is low enough, the patient usually receives I-131 as an outpatient. If the dose is high, the doctor may protect others from radiation exposure by isolating the patient in the hospital during the treatment. Most radiation is gone in a few days. Within 3 weeks, only traces of radioactive iodine remain in the body.

Patients with medullary thyroid cancer or anaplastic thyroid cancer generally do not receive I-131 treatment. These types of thyroid cancer rarely respond to I-131 therapy.

Hormone treatment after surgery is usually part of the treatment plan for papillary and follicular cancer. When a patient takes thyroid hormone pills, the growth of any remaining thyroid cancer cells slows down, which lowers the chance that the disease will return.

After surgery or I-131 therapy (which removes or destroys thyroid tissue), people with thyroid cancer may need to take thyroid hormone pills to replace the natural thyroid hormone.

People may want to ask these questions about radioactive iodine (I-131) therapy or hormone therapy:

- Why do I need this treatment?
- What will it do?
- Will I need to stay in the hospital for this treatment?
- Will it cause side effects? What can I do about them?
- How long will I be on this treatment?
- How often will I need checkups?

External radiation therapy (also called radiotherapy) uses high-energy rays to kill cancer cells. A large machine directs radiation at the neck or at parts of the body where the cancer has spread.

External radiation therapy is *local therapy*. It affects cancer cells only in the treated area. External radiation therapy is used mainly to treat people with advanced thyroid cancer that does not respond to radioactive iodine therapy. For external radiation therapy, patients go to the hospital or clinic, usually 5 days a week for several weeks. External radiation may also be used to relieve pain or other problems.

These are some questions a person may want to ask the doctor before having external radiation therapy:

- Why do I need this treatment?
- When will the treatments begin? When will they end?
- How will I feel during therapy? Are there side effects?
- What can I do to take care of myself during therapy?
- How will we know if the radiation is working?
- Will I be able to continue my normal activities during treatment?
- How often will I need checkups?

Chemotherapy, the use of drugs to kill cancer cells, is sometimes used to treat thyroid cancer. Chemotherapy is known as *systemic therapy* because the drugs enter the bloodstream and travel throughout the body. For some patients, chemotherapy may be combined with external radiation therapy.

Patients may want to ask these questions about chemotherapy:

- Why do I need this treatment?
- What will it do?
- Will I have side effects? What can I do about them?
- How long will I be on this treatment?
- How often will I need checkups?

Side Effects of Cancer Treatment

Because cancer treatment may damage healthy cells and tissues, unwanted side effects sometimes occur. These side effects depend on many factors, including the type and extent of the treatment. Side effects may not be the same for each person, and they may even change from one treatment session to the next. Before treatment starts, the health care team will explain possible side effects and suggest ways to help the patient manage them.

The NCI provides helpful booklets about cancer treatments and coping with side effects, such as *Radiation Therapy and You*, *Chemotherapy and You*, and *Eating Hints for Cancer Patients*. See the sections "National Cancer Institute Information Resources" and "National Cancer Institute Booklets" for other sources of information about side effects.

Surgery

Patients are often uncomfortable for the first few days after surgery. However, medicine can usually control their pain. Patients should feel free to discuss pain relief with the doctor or nurse. It is also common for patients to feel tired or weak. The length of time it takes to recover from an operation varies for each patient.

After surgery to remove the thyroid and nearby tissues or organs, such as the *parathyroid glands*, patients may need to take medicine (thyroid hormone) or vitamin and mineral supplements (vitamin D and calcium) to replace the lost functions of these organs. In a few cases, certain nerves or muscles may be damaged or removed during surgery. If this happens, the patient may have voice problems or one shoulder may be lower than the other.

Radioactive Iodine (I-131) Therapy

Some patients have nausea and vomiting on the first day of I-131 therapy. Thyroid tissue remaining in the neck after surgery may become swollen and painful. If the thyroid cancer has spread to other parts of the body, the I-131 that collects there may cause pain and swelling.

Patients also may have a dry mouth or lose their sense of taste or smell for a short time after I-131 therapy. Chewing sugar-free gum or sucking on sugar-free hard candy may help.

During treatment, patients are encouraged to drink lots of water and other fluids. Because fluids help I-131 pass out of the body more quickly, the bladder's exposure to I-131 is reduced.

Because radioactive iodine therapy destroys the cells that make thyroid hormone, patients may need to take thyroid hormone pills to replace the natural hormone.

A rare side effect in men who received large doses of I-131 is loss of *fertility*. In women, I-131 may not cause loss of fertility, but some doctors suggest that women avoid pregnancy for one year after I-131 therapy.

Researchers have reported that a very small number of patients may develop *leukemia* years after treatment with high doses of I-131.

Hormone Treatment

Thyroid hormone pills seldom cause side effects. However, a few patients may get a rash or lose some of their hair during the first months of treatment.

The doctor will closely monitor the level of thyroid hormone in the blood during followup visits. Too much thyroid hormone may cause patients to lose weight and to feel hot and sweaty. It also may cause chest pain, cramps, and diarrhea. (The doctor may call this condition "*hyperthyroidism*.") If the thyroid hormone level is too low, the patient may gain weight, feel cold, and have dry skin and hair. (The doctor may call this condition "*hypothyroidism*.") If necessary, the doctor will adjust the dose so that the patient takes the right amount.

External Radiation Therapy

External radiation therapy may cause patients to become very tired as treatment continues. Resting is important, but doctors usually advise patients to try to stay as active as they can. In addition, when patients receive external radiation therapy, it is common for their skin to become red, dry, and tender in the treated area. When the neck is treated with external radiation

therapy, patients may feel hoarse or have trouble swallowing. Other side effects depend on the area of the body that is treated. If chemotherapy is given at the same time, the side effects may worsen. The doctor can suggest ways to ease these problems.

Chemotherapy

The side effects of chemotherapy depend mainly on the specific drugs that are used. The most common side effects include nausea and vomiting, mouth sores, loss of appetite, and hair loss. Some side effects may be relieved with medicine.

Followup Care

Followup care after treatment for thyroid cancer is an important part of the overall treatment plan. Regular checkups ensure that any changes in health are noted. Problems can be found and treated as soon as possible. Checkups may include a careful physical exam, x-rays and other imaging tests (such as a nuclear medicine scan), and laboratory tests (such as a blood test for calcitonin). The doctor can explain the followup plan—how often the patient must visit the doctor and which types of tests are needed.

An important test after thyroid cancer treatment measures the level of *thyroglobulin* in the blood. Thyroid hormone is stored in the thyroid as thyroglobulin. If the thyroid has been removed, there should be very little or no thyroglobulin in the blood. A high level of thyroglobulin may mean that thyroid cancer cells have returned.

For six weeks before the thyroglobulin test, patients must stop taking their usual thyroid hormone pill. For part of this time, some patients may take a different,

shorter-lasting thyroid hormone pill. But all patients must stop taking any type of thyroid hormone pill for the last two weeks right before the test. Without adequate levels of thyroid hormone, patients are likely to feel uncomfortable. They may gain weight and feel very tired. It may be helpful to talk with the doctor or nurse about ways to cope with such problems. After the test, patients go back to their usual treatment with thyroid hormone pills.

The doctor may request an I-131 scan of the entire body. This may be called a "diagnostic I-131 whole body scan." For a short time (usually six weeks) before this scan, the patient stops taking thyroid hormone pills. Thyroid cancer cells anywhere in the body will show up on the scan. After the test, the doctor will tell the patient when to start taking thyroid hormone pills again.

Support for People with Thyroid Cancer

Living with a serious disease such as cancer is not easy. Some people find they need help coping with the emotional and practical aspects of their disease. Support groups can help. In these groups, patients or their family members get together to share what they have learned about coping with the disease and the effects of treatment. Patients may want to talk with a member of their health care team about finding a support group. Groups may offer support in person, over the telephone, or on the Internet.

People living with cancer may worry about caring for their families, keeping their jobs, or continuing daily activities. Concerns about treatments and managing side effects, hospital stays, and medical bills are also common. Doctors, nurses, and other members of the health care team can answer questions about

treatment, working, or other activities. Meeting with a social worker, counselor, or member of the clergy can be helpful to those who want to talk about their feelings or discuss their concerns. Often, a social worker can suggest resources for financial aid, transportation, home care, or emotional support.

The Cancer Information Service can provide information to help patients and their families locate programs, services, and publications.

The Promise of Cancer Research

Doctors all over the country are conducting many types of clinical trials. These are research studies in which people take part voluntarily. Studies include new ways to treat thyroid cancer. Research already has led to advances, and researchers continue to search for more effective approaches.

Patients who join these studies have the first chance to benefit from treatments that have shown promise in earlier research. They also make an important contribution to medical science by helping doctors learn more about the disease. Although clinical trials may pose some risks, researchers take very careful steps to protect their patients.

Patients who are interested in being part of a clinical trial should talk with their doctor. They may want to read *Taking Part in Clinical Trials: What Cancer Patients Need To Know.* This NCI booklet describes how research studies are carried out and explains their possible benefits and risks. NCI's cancerTrials™ Web site at **http://cancertrials.nci.nih.gov** provides general information about clinical trials. It also offers detailed information about specific ongoing studies of thyroid cancer by linking to PDQ®, NCI's cancer information database. The Cancer Information Service at

1–800–4–CANCER can answer questions and provide information from the PDQ database.

Another agency of the Federal Government, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), conducts a Thyroid Research Program. NIDDK performs laboratory studies and conducts clinical trials on thyroid cancer. NIDDK clinical trials are listed in the PDQ database. The Web site address of the NIDDK is **http://www.niddk.nih.gov**.

Dictionary

Anaplastic thyroid cancer (an-a-PLAS-tik): The least common but most aggressive type of thyroid cancer. Anaplastic is another word for undifferentiated; that is, the highly malignant cells do not look like normal thyroid cells.

Benign (beh-NINE): Not cancerous; does not invade nearby tissue or spread to other parts of the body.

Biopsy (BY-ahp-see): The removal of cells or tissues for examination under a microscope. When only a sample of tissue is removed, the procedure is called an incisional biopsy or core biopsy. When an entire tumor or lesion 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 or fine-needle aspiration.

C cell: A type of cell in the thyroid. C cells make calcitonin, a hormone that helps control the calcium level in the blood.

Calcitonin (cal-si-TOE-nin): A hormone formed by the C cells of the thyroid gland. It helps maintain a healthy level of calcium in the blood. When the calcium level is too high, calcitonin lowers it.

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.

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

Chemotherapy (kee-mo-THER-a-pee): Treatment with anticancer drugs.

Clinical trial: A research study that tests how well new medical treatments or other interventions work in people. Each study is designed to test new methods of screening, prevention, diagnosis, or treatment of a disease.

Cold nodule: When radioactive material is used to examine the thyroid with a scanner, nodules that collect less radioactive material than the surrounding thyroid tissue are considered "cold." A nodule that is cold does not make thyroid hormone. Cold nodules may be benign or cancerous. Cold nodules are sometimes called hypofunctioning nodules.

Colon (KO-lun): The long, coiled, tubelike organ that removes water from digested food. The remaining material, solid waste called stool, moves through the colon to the rectum and leaves the body through the anus.

Computed tomography (tuh-MAH-gra-fee): CT 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.

Endocrinologist (en-do-krih-NAH-lo-jist): A doctor who specializes in diagnosing and treating hormone disorders.

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.

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

Fine-needle aspiration: The removal of tissue or fluid with a needle for examination under a microscope. Also called needle biopsy.

Follicular cell: A type of cell in the thyroid. Follicular cells make thyroid hormone.

Follicular thyroid cancer (fo-LIK-yu-ler): Develops from thyroid follicular cells. One of the slow-growing, highly treatable types of thyroid cancer.

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.

Gland: An organ that produces and releases one or more substances for use in the body. Some glands produce fluids that affect tissues or organs. Others produce hormones.

Goiter: An enlarged thyroid. It may be caused by too little iodine in the diet or by other conditions. Most goiters are not cancer.

Hormone treatment: Treatment that removes, blocks, or adds hormones. Also called endocrine therapy.

Hormones: Chemicals produced by glands in the body and circulated in the bloodstream. Hormones control the actions of certain cells or organs.

Hot nodule: When radioactive material is used to examine the thyroid with a scanner, nodules that collect more radioactive material than the surrounding thyroid tissue are considered “hot.” Hot nodules are rarely malignant. Hot nodules are sometimes called hyperfunctioning nodules.

Hyperthyroidism: Too much thyroid hormone. Also called overactive thyroid. Symptoms include weight loss, chest pain, cramps, diarrhea, and nervousness.

Hypothyroidism: Too little thyroid hormone. Also called underactive thyroid. Symptoms include weight gain, constipation, dry skin, and sensitivity to the cold.

Imaging: Tests that produce pictures of areas inside the body.

Incision (in-SIH-zhun): A cut made in the body during surgery.

Iodine: Substance found in shellfish and iodized salt.

Isthmus (iz-muhs): A narrow part inside the body that connects two larger structures.

Larynx (LAIR-inks): The area of the throat containing the vocal cords and used for breathing, swallowing, and talking. Also called the voice box.

Leukemia (loo-KEE-mee-a): Cancer of blood-forming tissue.

Lobe: A portion of an organ, such as the liver, lung, breast, thyroid, or brain.

Lobectomy (lo-BEK-toe-mee): The removal of a lobe.

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

Lymph node: A rounded mass of lymphatic tissue that is surrounded by a capsule of connective tissue. Also known as a lymph gland. Lymph nodes are spread out along lymphatic vessels and contain many lymphocytes, which filter the lymphatic fluid (lymph).

Lymphatic system (lim-FAT-ik): The tissues and organs that produce, store, and carry white blood cells that fight infection and other diseases. This system involves the bone marrow, the spleen, the thymus, lymph nodes, and a network of thin tubes that carry lymph and white blood cells. These tubes branch, like blood vessels, into all tissues of the body.

Magnetic resonance imaging (mag-NET-ik REZ-o-nans IM-a-jing): MRI. A procedure in which a magnet linked to a computer is used to create detailed pictures of areas inside the body.

Malignant (ma-LIG-nant): Cancerous; a growth with a tendency to invade and destroy nearby tissue and spread to other parts of the body.

Medical oncologist (on-KOL-o-jist): A doctor who specializes in diagnosing and treating cancer using chemotherapy, hormonal therapy, and biological therapy. A medical oncologist often serves as the main caretaker of someone who has cancer and coordinates treatment provided by other specialists.

Medullary thyroid cancer (MED-yoo-LAIR-ee): Arises in C cells of the thyroid. The C cells make a hormone (calcitonin) that lowers the calcium level in blood.

Metastasis (meh-TAS-ta-sis): The spread of cancer from one part of the body to another. Tumors formed from cells that have spread are called "secondary tumors" and contain cells that are like those in the original (primary) tumor. The plural is metastases.

Metastasize (meh-TAS-ta-size): To spread from one part of the body to another. When cancer cells metastasize and form secondary tumors, the cells in the metastatic tumor are like those in the original (primary) tumor.

Multiple endocrine neoplasia syndrome: MEN. An inherited tendency to develop thyroid cancer and other cancers of the endocrine system. The altered gene can be detected with a blood test.

Nodule (NOD-yool): A growth or lump that may be cancerous or noncancerous.

Nuclear medicine scan: A method of diagnostic imaging that uses very small amounts of radioactive material. The patient is injected with a liquid that contains the radioactive substance. The substance

collects in the part of the body to be imaged. Sophisticated instruments detect the radioactive substance in the body and process that information into an image.

Oncologist (on-KOL-o-jist): A doctor who specializes in treating cancer. Some oncologists specialize in a particular type of cancer treatment. For example, a radiation oncologist specializes in treating cancer with radiation.

Papillary thyroid cancer (PAP-i-lair-ee): Develops from thyroid follicular cells. The most common type of thyroid cancer.

Parathyroid glands (pair-a-THIGH-roid): Four pea-sized glands found on the thyroid. The parathyroid hormone produced by these glands increases the calcium level in the blood.

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

Pituitary gland (pih-TOO-ih-tair-ee): The main endocrine gland; it produces hormones that control other glands and many body functions, especially growth.

Precancerous polyps: Growths that protrude from a mucous membrane. Precancerous polyps may (or are likely to) become cancer.

Primary tumor: The original tumor.

Quality of life: The overall enjoyment of life. Many clinical trials measure aspects of an individual's sense of well-being and ability to perform various tasks to assess the effects of cancer and its treatment on the quality of life.

Radiation: Radiant energy given off by x-ray machines, radioactive substances, rays that enter the Earth's atmosphere, and other sources.

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

Radiation therapy (ray-dee-AY-shun): 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 in the area 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) ***fallout***: Airborne radioactive particles that fall to the ground during and after an atomic bombing, nuclear weapons test, or nuclear plant accident.

Radioactive (RAY-dee-o-AK-tiv) ***iodine***: A radioactive form of iodine, often used for imaging tests or as a treatment for cancer. For imaging tests, the patient takes a small amount of radioactive iodine by mouth, and it collects in the thyroid. A probe is used to scan the thyroid. For treatment, the patient takes a large dose of radioactive iodine, which kills thyroid cells.

Radionuclide scanning: 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.

Risk factor: A substance, agent, genetic alteration, trait, habit, or condition that increases a person's chance of developing a disease.

Side effects: Problems that occur when treatment affects healthy cells. Common side effects of cancer treatment are fatigue, nausea, vomiting, decreased blood cell counts, hair loss, and mouth sores.

Sonogram (SON-o-gram): A computer picture of areas inside the body created by bouncing sound waves off organs and other tissues. Also called ultrasonogram or ultrasound.

Stage: The extent of a cancer, especially whether the disease has spread from the original site to other parts of the body.

Staging: Performing exams and tests to learn the extent of the cancer within the body, especially whether the disease has spread from the original site to other parts of the body.

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

Surgery: A procedure to remove or repair a part of the body or to find out whether disease is present.

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): Treatment that uses substances that travel through the bloodstream, reaching and affecting cells all over the body.

Thyroglobulin (THIGH-roe-GLOB-yu-lin): The form that thyroid hormone takes when stored in the cells of the thyroid. If the thyroid has been removed, thyroglobulin should not show up on a blood test. Doctors measure thyroglobulin level in blood to detect thyroid cancer cells that remain in the body after treatment.

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

Thyroidectomy (thigh-roid-EK-toe-mee): Surgery to remove part or all of the thyroid.

Thyroid hormone: The thyroid gland makes T3 (triiodothyronine) and T4 (thyroxine), which together are considered thyroid hormone. T3 and T4 have identical effects on cells. Thyroid hormone affects heart rate, blood pressure, body temperature, and weight. T3 and T4 are stored as thyroglobulin, which can be converted back into T3 and T4.

Thyroid-stimulating hormone: TSH. A hormone produced by the pituitary gland. TSH stimulates the release of thyroid hormone from thyroglobulin. It also stimulates the growth of thyroid follicular cells. An abnormal TSH level may mean that the thyroid hormonal regulation system is out of control, usually as a result of a benign condition (hyperthyroidism or hypothyroidism).

Tissue (TISH-oo): A group or layer of cells that are alike in type and work together to perform a specific function.

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

Ultrasonography (UL-tra-son-OG-ra-fee): A procedure in which sound waves (called ultrasound) are bounced off tissues and the echoes produce a picture (sonogram).

X-ray: High-energy radiation used in low doses to diagnose diseases and in high doses to treat cancer.

National Cancer Institute Information Resources

You may want more information for yourself, your family, and your doctor. The following National Cancer Institute (NCI) services are available to help you.

Telephone

Cancer Information Service (CIS)

Provides accurate, up-to-date information on cancer to patients and their families, health professionals, and the general public. Information specialists translate the latest scientific information into understandable language and respond in English, Spanish, or on TTY equipment.

Toll-free: 1–800–4–CANCER (1–800–422–6237)

TTY: 1–800–332–8615

Internet

http://cancer.gov

NCI's Web site contains comprehensive information about cancer causes and prevention, screening and diagnosis, treatment and survivorship; clinical trials; statistics; funding, training, and employment opportunities; and the Institute and its programs.

Fax

CancerFax®

Includes NCI information about cancer treatment, screening, prevention, and supportive care. To obtain a contents list, dial 1–800–624–2511 or 301–402–5874 from your touch-tone phone or fax machine hand set and follow the recorded instructions.

National Cancer Institute Booklets

National Cancer Institute (NCI) publications can be ordered by writing to the address below, and some can be viewed and downloaded from **http://cancer.gov/publications** on the Internet.

Publications Ordering Service
National Cancer Institute
Building 31, Room 10A31
31 Center Drive, MSC 2580
Bethesda, MD 20892–2580

In addition, people in the United States and its territories may order these and other NCI booklets by calling the Cancer Information Service at 1–800–4–CANCER. They may also order many NCI publications on-line at **http://cancer.gov/publications**.

Booklets About Cancer Treatment

- *Radiation Therapy and You: A Guide to Self-Help During Treatment*
- *Chemotherapy and You: A Guide to Self-Help During Treatment*
- *Help Yourself During Chemotherapy: 4 Steps for Patients*
- *Eating Hints for Cancer Patients*
- *Understanding Cancer Pain*
- *Pain Control: A Guide for People with Cancer and Their Families*
- *Get Relief From Cancer Pain*
- *Taking Part in Clinical Trials: What Cancer Patients Need To Know*
- *La quimioterapia y usted: Una guía de autoayuda durante el tratamiento del cáncer (Chemotherapy*

and You: A Guide to Self-Help During Treatment for Cancer)

- *El dolor relacionado con el cáncer* (*Understanding Cancer Pain*)
- *El tratamiento de radioterapia: Guía para el paciente durante el tratamiento (Radiation Therapy and You: A Guide to Self-Help During Treatment)*
- *¿En qué consisten los estudios clínicos? Un folleto para los pacientes de cáncer (What Are Clinical Trials All About? A Guide for Cancer Patients)*

Booklets About Living With Cancer

- *Advanced Cancer: Living Each Day*
- *Taking Time: Support for People With Cancer and the People Who Care About Them*
- *When Cancer Recurs: Meeting the Challenge*

This booklet was written and published by the National Cancer Institute (NCI), 31 Center Drive, MSC 2580, Bethesda, MD 20892–2580. The NCI, the largest component of the National Institutes of Health, coordinates a national research program on cancer causes and prevention, detection and diagnosis, and treatment. In addition, NCI's mission includes dissemination of information about cancer to patients, the public, and health professionals.

The National Cancer Act, passed by Congress in 1971, made cancer research a National priority. Since that time, the NCI, the lead Federal agency for cancer research, has collaborated with top researchers and facilities across the country to conduct innovative research leading to progress in cancer prevention, detection, diagnosis, and treatment. These efforts have resulted in a decrease in the overall cancer death rate, and have helped improve and extend the lives of millions of Americans.

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P620