

Oncology 101: When Your Patient Also Has Cancer

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Glossary

- **Anaplastic** refers to cancer cells that have no or very little resemblance to normal cells.
- **Apoptosis** is programmed cell death and refers to the body's natural way of getting rid of abnormal and unneeded cells.
- **Carcinoma** is a cancer that arises from the skin or in the tissue that cover external or internal body surfaces.
- **Carcinogen** is any substance or agent that causes cancer.
- **Carcinogenesis** is the process by which normal cells are changed into cancer cells.
- **Differentiation** refers to how much a tumor cell looks like a normal cell. Tumors that are well differentiated appear more normal and tend to grow more slowly than poorly differentiated cells.
- **Doubling Time** is the amount of time it takes for a cell or group of cells to double in size.
- **DNA repair genes** are responsible for recognizing and repairing damaged genes.
- **Grading** is a system used to classify cancer cells according to how differentiated they are.
- **Lymphomas** are cancers that start in the lymph nodes or in the immune system.
- **Leukemias** arise from the blood forming tissues such as the bone marrow and cause the production of too many immature blood cells.
- **Metastasis** refers to the spread of cancer from one part of the body to another.
- **Mutation** is any change in the cell's DNA.
- **Oncogene** is the mutated form of a gene normally involved in cell growth. When mutated, it may cause the growth of cancer cells.
- **Proto-oncogene** is a normal cell involved in cell growth.
- **Sarcomas** arise from bone, cartilage, fat, muscle, and connective tissue.
- **Tumor suppressor genes** or **anti-oncogenes** help prevent the transformation of a normal cell to a cancer cell.

NCI, n.d.a

Purpose

The purpose of this nursing CE course is to provide an overview of important concepts related to the care of the oncology patient. This will facilitate a deeper understanding of the disease process, which will facilitate the monitoring of potential side effects and allow the healthcare professional to better educate their oncology patients.

Learning Objectives

After successful completion of this course, you will be able to:

1. Explain the transformation of a normal cell into a cancer cell.
2. Explain the concepts of cancer grading and staging.
3. Discuss the major modalities utilized in the treatment of cancer and possible side effects.
4. State American Cancer Society recommendations for cancer screening.

Case Study: Overview

Mary Smith, 54 years old, has been a patient at your primary care practice for 16 years. She is married and has two children, ages 14 and 17.

Today she comes in for her annual examination. She tells you she has been feeling very tired lately and has gained a lot of weight even though she does not feel like she is eating any more than usual, *"I can't button my pants."* She also complains of an enlarged lymph node in her axilla.

Case Study: Diagnostics

On exam, her vital signs are normal. Oxygen saturation is 98% on room air. Her weight is 168 pounds, up 12 pounds since her last visit. Her abdomen is somewhat distended with hypoactive bowel sounds. You palpate an enlarged lymph node in her right axilla.

The prescriber at your practice obtains a fine needle biopsy of the enlarged node and orders a complete blood count, chemistry panel, and mammogram.

The biopsy showed adenocarcinoma, but the origin was unclear. The mammogram was negative. You referred your patient to an oncologist. Further workup revealed ovarian cancer with metastasis to the axillary lymph nodes.

Case Study: Referral & Support

Mary is upset and doesn't know what to do. She calls you *"I have so many questions and I just don't know where to go from here."* You tell her to start writing down her questions and make an appointment for her and her husband to come in later that day. You also go to nccn.org and obtain for her the NCCN Guidelines for Patients™ for Ovarian Cancer.

This is a scenario that nurses are experiencing more and more in their daily practice.

The Issue

There will be an estimated 1,638,910 new cancer cases in the United States in 2012. Men have a 45% chance of being diagnosed with cancer sometime during their life while women have a 38% chance (Siegel et al, 2012b). The good news is that the death rate is declining between 1.6-1.8% a year.

Due to earlier diagnosis and improved treatment, the relative five year survival rates for most cancers, except lung and pancreas, have increased. Therefore, the number of survivors keeps increasing.

It is estimated that there were 13.7 million survivors in January 2012 and this number is expected to increase to close to 18 million by January 2022. (Siegel et al., 2012a).

Medical Concerns

A variety of medical conditions and concerns face cancer patients and survivors. These vary depending on the person's age, co-morbid conditions, socioeconomic status, and support systems. Persistent and delayed effects of treatment make regular medical care a necessity. It is important that healthcare professionals know what symptoms to look for and what behaviors patients need to follow to promote recovery.

The First Question: What is Cancer?

Cancer is not one disease but rather a group of diseases that occurs because there are changes in the genes of a cell which allow for an uncontrolled growth of abnormal cells in the body. Each gene consists of short pieces of deoxyribonucleic acid (DNA) composed of four different bases: adenine, thymine, cytosine, and guanine.

The DNA contains instructions for making a particular protein. If the bases that compose the DNA get rearranged in any way, they start signaling for the growth of abnormal cells. These abnormal cells are able to divide without control, invade other tissue, and live on after they have become old or damaged which causes disruptions of regulatory pathways in the cells.

Types of Cancer

Cancer can occur anywhere in the body. The most common type is a **carcinoma**. This is a cancer that arises from the skin or tissue that cover both external and internal organs.

Sarcomas arise from bone, cartilage, fat, muscle, and connective tissue.

Lymphomas are cancers that start in the lymph nodes or in the immune system.

Leukemias arise from the blood forming tissues such as the bone marrow and cause the production of too many immature blood cells.

NCI, n.d.c

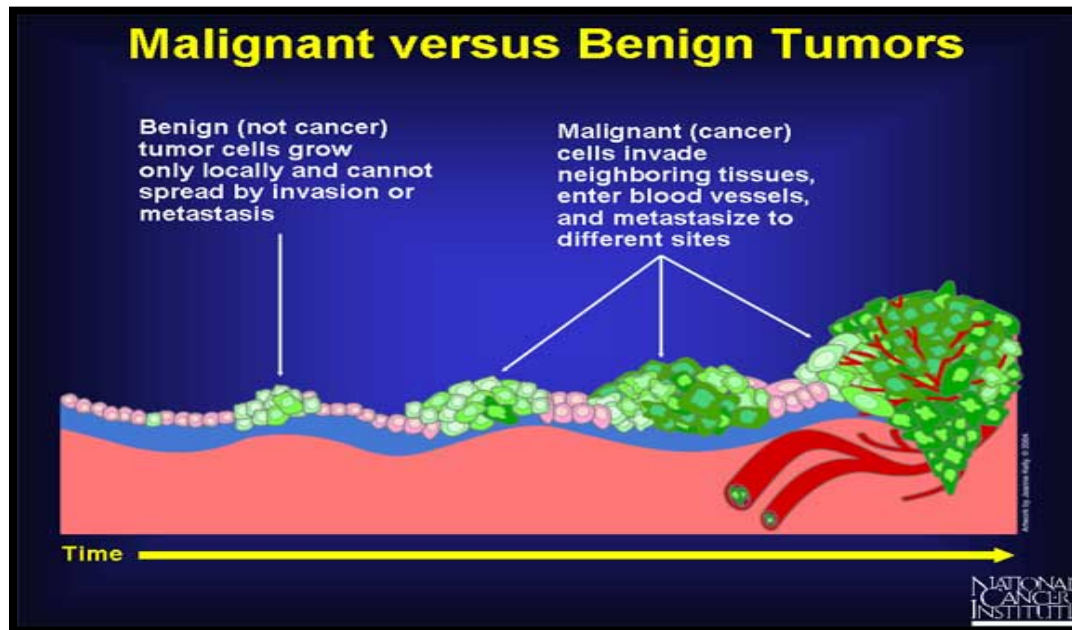
Are All Tumors Cancer?

No, there are tumors that are not cancer. They may be symptomatic because they take up space and/or put pressure on other organs or nerves. They have different characteristics than malignant tumors.

Benign vs. Malignant Tumors

Benign Tumors	Malignant Tumors
Grow slowly	Can proliferate rapidly and relentlessly
Remain localized	Infiltrate surrounding tissue
Contained within a fibrous capsule	Not contained within a capsule
Rarely reoccur	Recurrence common
Not harmful unless causes compression	Always harmful to some degree
Look like parent cells	Do not look like parent cell; may be poorly differentiated
Prognosis good	Prognosis varies

Differences Between Benign & Malignant Tumors



Malignant versus Benign Tumors. Retrieved August 2012 from The website of the National Cancer Institute at <http://www.cancer.gov>.

What Makes Cancer Cells Grow Differently?

Changes occur in the normal cell division cycle. There is a quiet period in the life of a cell when it is in what is called the resting phase or Gap (G_0). From here, cells that are old or damaged undergo **apoptosis** or planned cell death. Other cells enter the cell cycle in order to replicate to provide for growth of the organism.

The first phase of the cell cycle is G_1 . Here cells increase in size. Ribonucleic acid (RNA) and other proteins needed for new chromosomes are made. Cells then proceed to the S or synthesis phase where replication of DNA occurs. The cell continues to grow in the next stage which is referred to as G_2 . When the cell has grown enough, it will start actual cell division or mitosis, the M phase. The cell divides into two daughter cells.

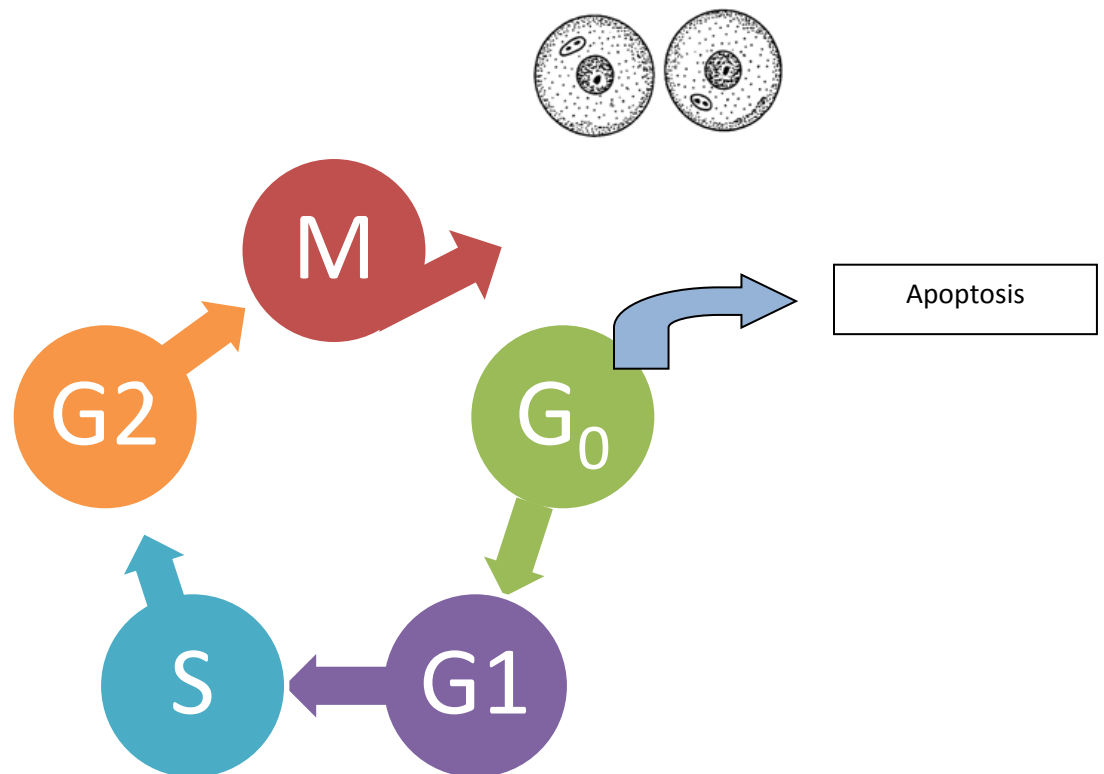
Chow, 2010, The Cell Cycle, 2012, Merkle, 2011

Cell Cycle Changes in Cancer

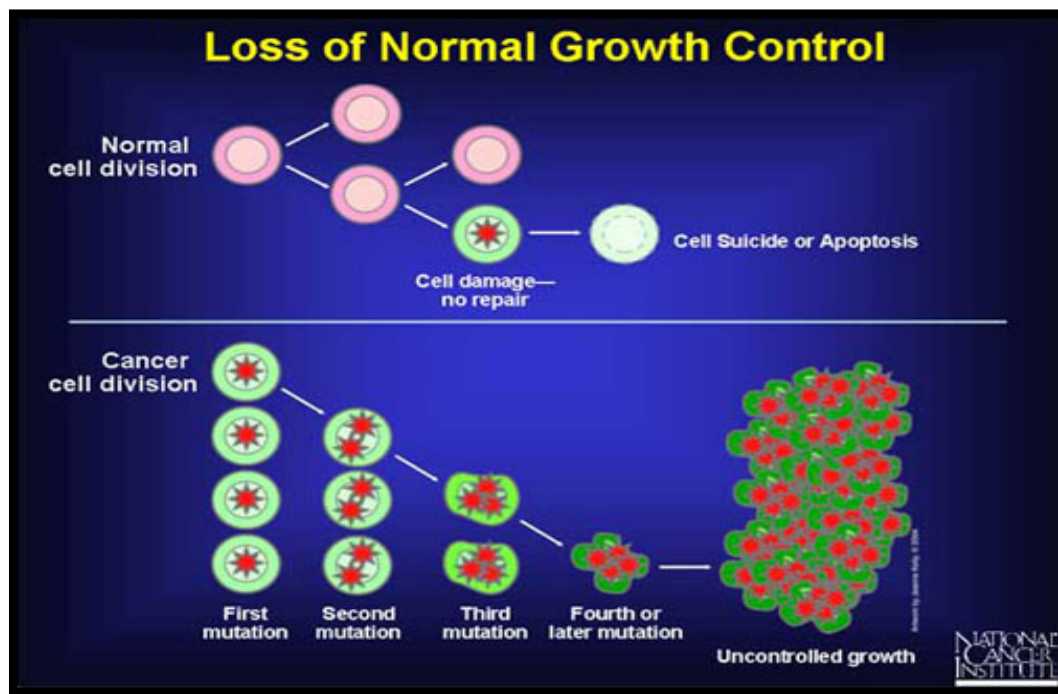
When cancer develops, changes occur in the normal cell cycle. For example, more cells that are in the resting phase (G_0) go into the cell cycle, and less undergo programmed cell death or apoptosis. The length of the cell cycle is also shortened so cells go through faster. Cells leave each phase before they have a chance to complete what is supposed to be accomplished in each phase. This leads to multiple “daughter” cells that may or may not resemble the parent cells.

Chow, 2010, NCI, n.d. b

The Cell Cycle



Dell, 2012; *Daughter cells*. Image retrieved August 2012 from mail.watertown.k12.ma.us
Loss of Normal Growth Control

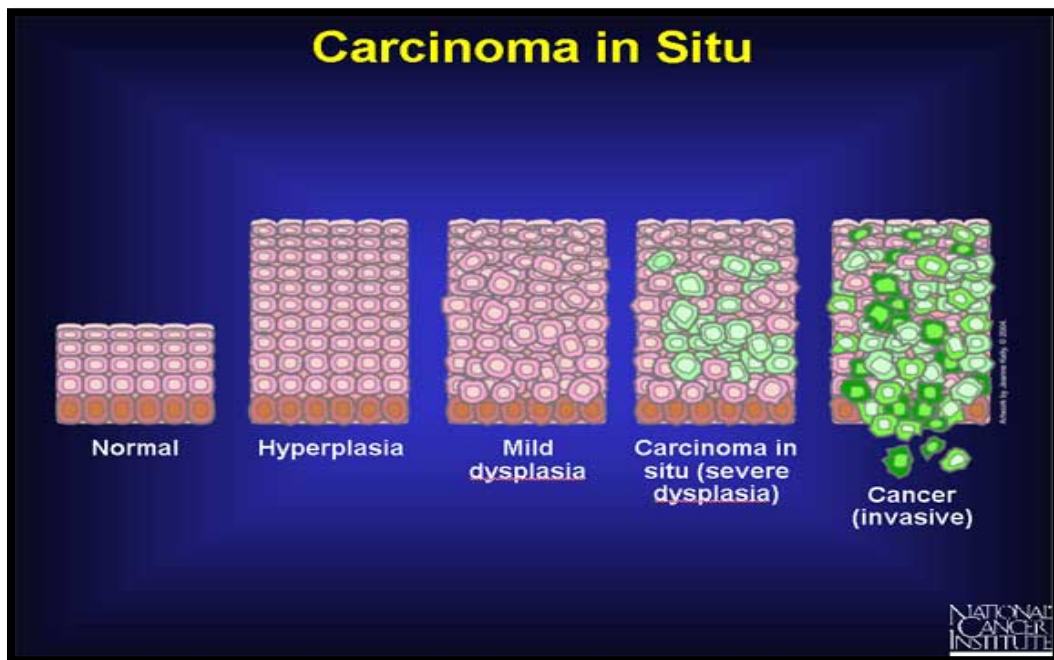


Loss of Normal Growth Control. Retrieved August 2012 from The website of the National Cancer Institute at <http://www.cancer.gov>.

How Quickly Do Cells Turn Into Cancer?

Carcinogens go through many alterations before they become cancer. This requires a prolonged period of time. There may be a delay of even decades before exposure to a carcinogen results in a cancer. For example, lung cancer may not develop until a person has a 20 or 30 year history of cigarette smoking.

NCI, n.d.c.



Carcinoma in Situ. Retrieved August 2012 from The website of the National Cancer Institute at <http://www.cancer.gov>.

When a cancer remains in the location where it first began, and has not spread to neighboring tissues, it is referred to as *cancer in situ*.

When cancer spreads to locations remote from the original site of the cancer, it is referred to as a *metastasis*, or *metastatic disease*. Cancer cells can break away from a primary tumor, penetrate into lymphatic and blood vessels, circulate through the bloodstream, and metastasize in normal tissues elsewhere in the body (Edinformatics, 2012).

Theories of Carcinogenesis

Carcinogenesis is the transformation of a normal cell into a cancer cell. Several theories have been proposed to explain this transformation. Very likely a series of multiple steps and a number of genetic mutations occur before a normal cell is transformed into a cancer cell. The multistep theory of carcinogenesis that includes the steps of initiation, promotion, and progression is a popular one.

Initiation is considered to be the first step in carcinogenesis. In this stage a carcinogen can damage DNA by changing a specific gene or its expression. If the gene is repaired by the cell, no cancer results. Alternatively, the genetic change may remain permanent but no cancer occurs unless there is exposure to another carcinogen at a later date. A third alternative is that the gene becomes permanently transformed or mutated and produces a cancer cell.

Merkle, 2011, CancerQuest, 2010

Contributing Genes

Oncogenes are often implicated in the development of cancer. They develop from genes called proto-oncogenes. **Proto-oncogenes** control cellular growth patterns. A mutated or overactive proto-oncogene becomes an oncogene which tells the cell's growth regulating pathways to become hyperactive.

Tumor suppressor genes (sometimes referred to as **anti-oncogenes**) are genes needed by the cell to decrease the risk of cancer developing. If a pair of these genes is either missing or mutated, they are unable to perform their job and the risk of cancer is increased. People can inherit a defective gene from a parent. They will be okay if the other gene in the pair is normal, but may develop cancer if the other gene becomes mutated.


DNA repair genes are responsible for sending messages that correct errors that arise in cells when they are duplicating their DNA to get ready for cell division. When they are mutated, the repairs do not occur.

Chow, 2010, NCI, n.d.c

Mutations & Cancer

Genes Implicated in Cancer	
<i>The prime suspects</i>	<i>But</i>
Mutations in:	Other mutations also occur in:
■ Oncogenes	■ Cell death genes
■ Tumor suppressor genes	■ Cell signaling genes
■ DNA repair genes	■ Cell cycle checkpoint genes
	■ Cellular senescence genes
	■ Cellular differentiation genes
	■ Metastasis/invasion genes
	■ Carcinogen
	–activating genes
	–deactivating genes

Source: National Cancer Institute, © 2012



Mutations and Cancer. Retrieved August 2012 from The website of the National Cancer Institute at <http://www.cancer.gov>.

Promotion & Progression

Promotion is the second step in the process of carcinogenesis. In this step a carcinogen(s) is reintroduced. This can result in reversible damage to the proliferation mechanism of the cell or irreversible damage to the proliferation mechanism which results in transformation of the cell into a cancer cell.

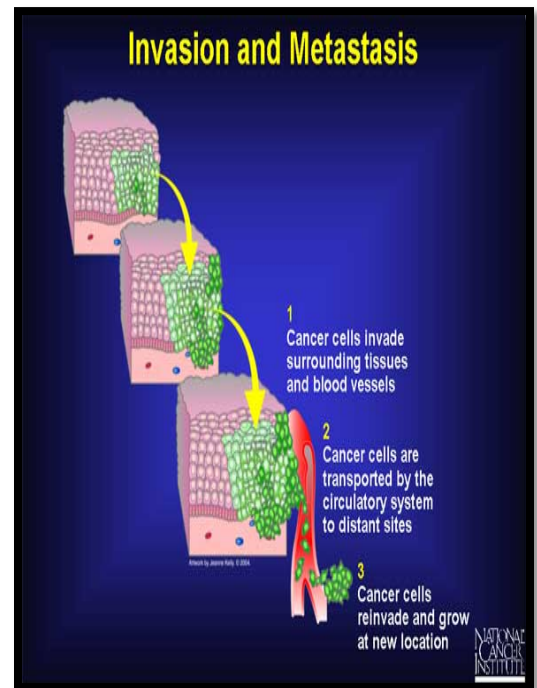
Progression is the third step. Once the cell(s) mutate to cancer they increase in bulk and spread into (invade) surrounding tissue. Until they are a few millimeters in size, cancer cells are able to get all the nutrition and oxygen they need to grow from diffusion. Once they are larger than this, they need to create their own blood supply in order to get nutrition and oxygen. Therefore, the cells start secreting tumor angiogenesis factor (TAF), also called vascular endothelial growth factor (VEGF) in order to stimulate the growth of new blood vessels. These new blood vessels also provide a potential route for the tumor cells to leave the primary cancer site and metastasize.

CancerQuest, 2010, Merkle, 2011

Metastases

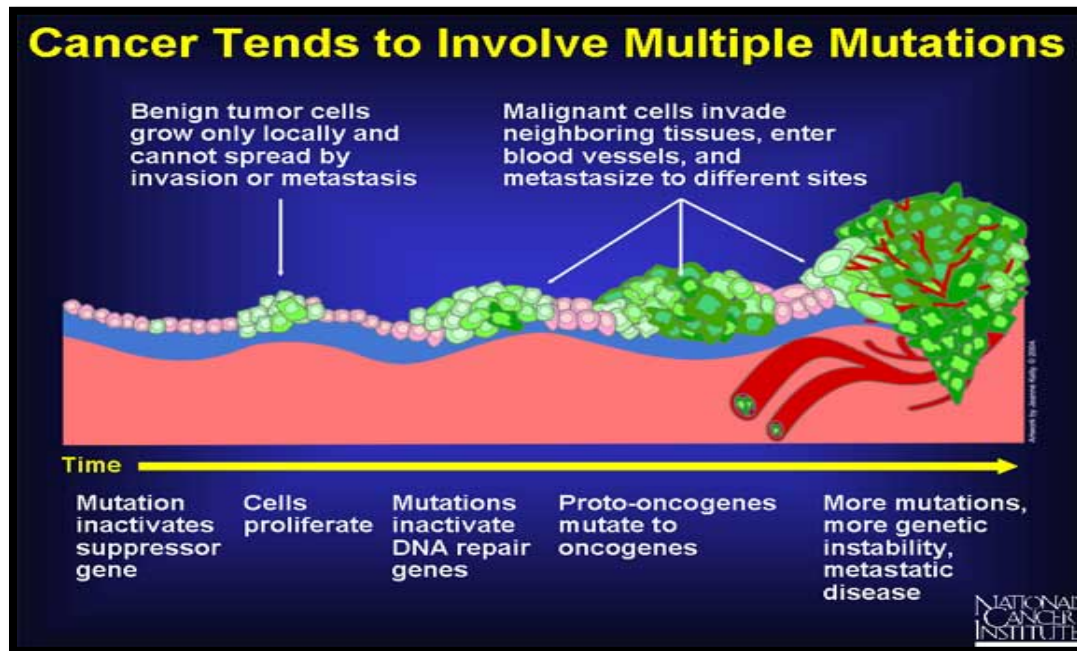
In order to metastasize (spread from one part of the body to another) the cancer cells must break away from the parent and invade surrounding tissue. They can do this by direct extension into surrounding tissue, by seeding (or spillage), or by gaining access to the lymphovascular system or blood vessels (circulating tumor cells). As the cells travel to another site, they have to survive the normal immune system and then establish themselves in the new area.

The most common sites of distant metastasis are the liver, lungs, bones, and brain.



Invasion and Metastasis. Retrieved August 2012 from The website of the National Cancer Institute at <http://www.cancer.gov>.

Multiple Mutations



Cancer Tends to Involve Multiple Mutations. Retrieved August 2012 from The website of the National Cancer Institute at <http://www.cancer.gov>.

Doubling Time (DT)

Even though you explain the concept of lag time, Ms. Smith cannot understand why she did not know she had cancer until it had already spread to other parts of her body (metastasized). You now explain the concept of **doubling time**. This is the time it takes to double the cancer cell population. At first there is only one cell, it then becomes two, then four, then eight, etc.

Each type of cancer has a different doubling time depending on the actual tumor type and vascularity. However, cells usually need to double around 30 times before the cancer is large enough to be detected clinically. One quarter of an inch is about the smallest size that a mass can be detected by clinical examination. A tumor that size has about a billion cancer cells. It would only need to double around ten more times to be large enough to be fatal. By the time the tumor is large enough to be clinically detected, most of its growth has already occurred.

Rare Cancer Alliance, 2010

Some Examples

A review of 128 studies from 1966-2006 measuring actual tumor doubling time reveals not only very different doubling times for different types of cancer but also a wide dispersion of DTs within individual types of cancer.

Cancer	Median DT (weeks)
Gastric	35
Breast	30
Colorectal	24
Lung	18
Hepatic	13
Head & neck	8
Pancreas	6

Queens University, n.d.

What Causes the Cells to Mutate?

As stated, a number of genetic mutations usually occur before a cell becomes a cancer. A **mutation** is a change in the DNA of a cell. A mutation may arise spontaneously when DNA replicates, but more often they are caused by a physical or chemical agent. A **carcinogen** is any substance that causes a mutation that transforms the normal cell into an abnormal, malignant cell. It can be a chemical, biologic, or physical agent.

Carcinogens

Examples of some agents and the cancers they are associated with are:

CHEMICALS

- Arsenic: Lung, skin, liver
- Ethyl Alcohol: Liver, esophagus, mouth, pharynx, larynx, breast
- Androgens: Liver
- Asbestos: Lung, mesothelioma
- Cyclosporin: Non-Hodgkin's lymphomas
- Tobacco: Lung, mouth, larynx, pharynx, esophagus, pancreas, bladder, kidney, cervix, breast

PHYSICAL AGENTS

- Ionizing Radiation: All organs
- Wood Dust: Nasal sinuses
- Vinyl Chloride: Liver
- UV Radiation: Skin
- Chronic Irritation: Skin

VIRUSES

- Hepatitis B: Liver
- Human T Cell Lymphocytic Virus: Leukemia, lymphoma
- Epstein-Barr Virus (EBV): Burkitt's lymphoma
- Herpes Papillomavirus (HPV): Cervical, head and neck, other genital

ENDOGENOUS AGENTS (factors within the body)

- Chronic inflammation
- Reactive oxygen species (ROS) and free radicals that result from normal cell metabolism

NCI, n.d.c, ACS (2012), Merkle, 2011

Are There Any Warning Signs?

The following mnemonic “**CAUTION**” will help patients recognize some early signs and symptoms that may indicate cancer.

Change in bowel or bladder habits

A sore that does not heal

Unusual bleeding or discharge

Thickening or lump

Indigestion or difficulty swallowing

Obvious change in wart or mole

Nagging cough or hoarseness

WebMD, 2012

Additional Signs & Symptoms

There are some other general signs and symptoms that may be of concern. Patients should always tell their healthcare professional if they have any symptoms that cannot be explained by another cause and/or that last for a long time. Examples are:

- Unexplained weight loss
- White patches inside mouth or on tongue
- Repeated fevers or infections
- Chronic headache or pain in bones or other areas
- Chronic fatigue

WebMD, 2012

Grading & Staging

Mary says her oncologist told her that she has a high grade tumor, Stage 4. She wants to know what this means. First you explain **grading**.

Grading looks at what is called cell **differentiation**, which means how closely the cell looks like the normal parent cell. Cells are referred to as **well** differentiated if they look like the parent cell. The more they differ from the parent cell, the more **undifferentiated** they are. Cells that have no or very little resemblance to the parent cell are described as **anaplastic**. The degree of differentiation, or how they are graded, indicates the aggressiveness of the malignancy. In general, the lower the grade the better the prognosis:

- Gx: Cannot be assessed
- G1: Well differentiated
- G2: Moderately well differentiated
- G3: Poorly differentiated
- G4: Undifferentiated

Edge et al, eds., 2010

Staging: Classification by Extent of Spread

You refer to the American Joint Committee on Cancer, Cancer Staging Handbook, 7th edition, in order to answer Mary's question about what having Stage 4 ovarian cancer means. The criteria differ for tumors at different anatomical locations and of different histologic types so it is almost always necessary to look up the information when needed.

Staging is a means of finding out how widespread the cancer is. It allows comparisons of treatments and helps decide therapy as cancers have different prognoses and are treated differently at different stages.

NCI, n.d.b, Edge et al., eds., 2010

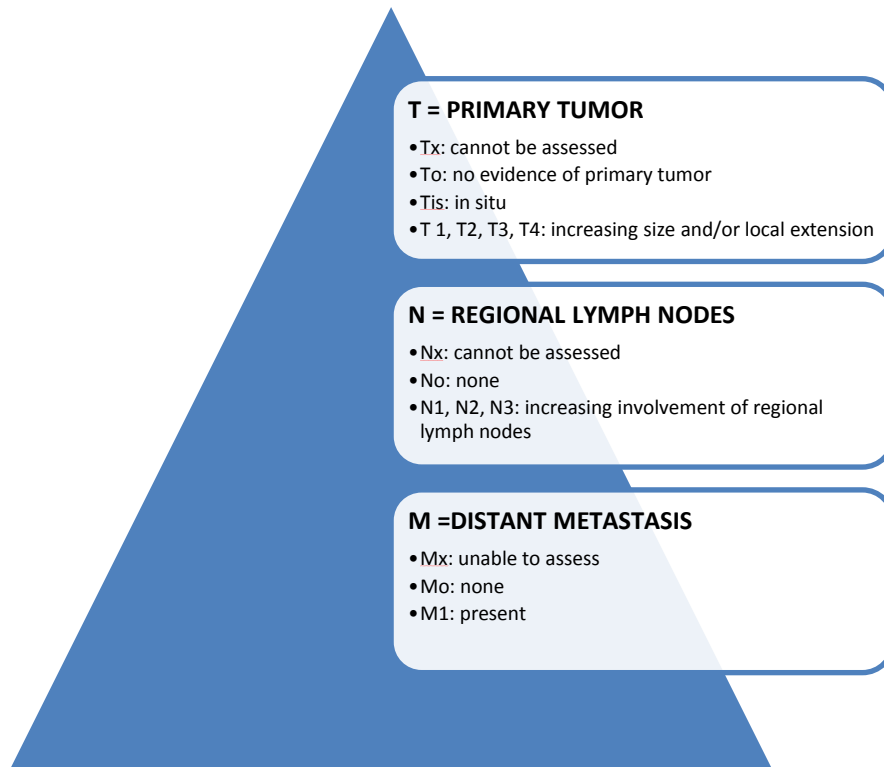
TNM System

The Tumor, Node, Metastasis (TNM) system is the most widely accepted system to determine staging.

- T = How large the primary tumor is
- N = If there is cancer in nearby lymph nodes
- M = The presence or absence of cancer in distant sites

A prefix placed before TNM indicates the timing of the staging.

- C = Clinical, made before treatment, used as a guide for primary treatment
- P = Pathologic, after surgical exploration, used as a guide for adjuvant treatment and estimation of prognosis
- R = Retreatment, used after a disease free interval before further treatment
- A = Autopsy



Stage Grouping

Stage groupings are usually made based on the TNM classifications. Remember; refer to AJCC Cancer Staging Manual for Specific Tumors. In general:

STAGE 1

- Mass is limited to the organ of origin (local involvement only)
- Lesion is resectable (by surgery)
- No nodal or vascular spread
- Best chance for survival

STAGE 2

- Local spread into surrounding tissue and/or first-station lymph nodes
- Resectable with uncertainty as to completeness of removal
- Specimen show evidence of microinvasion into capsule and lymphatics
- A good chance for survival

STAGE 3

- Extensive primary tumor with fixation to a deeper structure, bone invasion, and lymph nodes
- Operable but not resectable, gross disease is left behind
- Some chance of survival

STAGE 4

- Involves distant metastases beyond the site of origin as well as nodal involvement
- Usually inoperable
- Little to no chance of survival

NCI, n.d.b

Staging, Grading & Prognosis

Because Mary's cancer was found to be in lymph nodes not in the region, it is classified as Stage 4. Also, the pathologist, after examining the cells under the microscope, said her tumor was a grade 4. You know that, unfortunately, this portends a poor prognosis.

How is Cancer Treated?

What kills one cell may not kill another so various modes and combinations of treatments are needed to try to eliminate all the cancer. One or more modes of therapy will be recommended depending on the type of cancer, the stage, and the person's general overall health. Usually treatment includes a local treatment (surgery or radiation) and a systemic treatment (chemotherapy or targeted therapy.)

One reason for this is tumor heterogeneity. As the tumor continues to increase in size, the cells that compose it become heterogeneous. That means they develop differences. Differences can include such things as the genetic organization of the cell, degree of invasiveness, growth rate, and responsiveness to hormones. These changes affect the metastatic potential of the tumor and their susceptibility to treatment. Heterogeneity is one of the rationales for multimodality treatment.

Merkle, 2011

Surgery

Surgery, in the treatment of cancer, can be used in order to obtain tissue for a diagnosis, or for staging, a cure, or palliation. Surgery is also used to prevent cancer, and reconstructive surgery plays an important part in improving quality of life issues. Many surgeries today can be done with a laparoscope or robotics.

Diagnoses: Surgical interventions are commonly used to obtain tissue necessary to diagnose a cancer. The location of the suspected cancer will determine which option to use. The simplest procedure is a fine-needle aspiration. Other procedures include core-needle biopsy, incisional or excisional biopsy, needle localization biopsy, endoscopic or laparoscopic biopsy, and open biopsy.

Staging: The size of the tumor, involvement of lymph nodes and/or distant sites can be determined by pathology upon examining tissue that is removed.

Cure: If the cancer is localized, the whole tumor can be removed with curative intent. In oncologic surgery, a border or margin of normal appearing tissue is also taken in order to ensure that all tissue with cancer in it is removed. If all of the tumor cannot be removed, surgeons will “debulk” the tumor. This means they will remove all they can. Adjuvant systemic therapy and/or radiation therapy will follow to attempt to get rid of the rest of the cancer. This will probably be the type of surgery Mary is offered.

Palliation: If the cancer cannot be cured, surgery can be done to relieve distressing symptoms. Two common palliative surgeries are to remove bowel obstructions and airway obstructions.

Prevention: Surgery can be used to remove premalignant lesions. For example, colon polyps can be removed so they do not have a chance to become cancerous. Barrett’s esophagus is high grade dysplasia in the esophagus, and some patients with it will choose to have their esophagus removed. Women at high risk for breast cancer may choose prophylactic mastectomies or oophorectomies. Women at high risk for ovarian cancer may also choose this latter option.

Reconstruction: Plays a large role in the restoration of function and cosmetic appearance. Reconstruction of patients with head and neck surgeries often does both as it can enable people to regain speech and the ability to eat. Breast reconstruction is important to the psychological well-being of many women.

Side Effects of Surgery

The postoperative complications of cancer surgery are similar to that of general surgery. Patients need to be monitored for bleeding, infection, deep vein thromboses (DVT), pain, wound healing, skin integrity, and nutritional deficits. Other complications will depend on the specific surgery.

Specific side effects will depend on the type of surgery. For example, lymphedema can result if any axillary nodes are removed during breast surgery. Impotence and /or incontinence can result from prostate surgery. Difficulties speaking or eating can result from head and neck cancer surgeries, etc. Mary is at risk for infections, DVT, fistula formation, and, if she has not gone through menopause, she will quickly have menopause induced by the surgery as her ovaries will be removed.

Radiation Therapy

Radiation is another treatment modality used to treat cancer. Radiation therapy uses special machines to deliver high energy particles or waves such as x-rays, gamma rays, or other charged particles to damage the DNA inside of cells. The damaged DNA then causes cell death. Radiation damages all cells, but causes the most damage to cells that grow and divide quickly like cancer cells. Treatments are planned in an attempt to prevent radiation from reaching normal cells.

Curative vs. Palliative Radiation Therapy

Radiation may be given alone or in combination with chemotherapy, targeted therapy, and/or surgery. Radiation is often given for curative intent. It can be used to eliminate the tumor as in lymphomas and some head and neck cancers. Often it is used after surgery to get any cells that might have escaped the surgical field, or before surgery to shrink the tumor to make it easier to remove. Radiation is also used very frequently to provide palliation of symptoms such as bone pain or inflammation in the brain.

ACS, 2011b

Type of Radiation

The type of radiation prescribed depends on many things including the type of the cancer, the site, where it is in the body, how close it is to normal tissue, the patient's other comorbidities, and performance status.

Radiation can be delivered from an external source, an internal source, or systemically.

External radiation is delivered from a machine outside the body. Special techniques are used in order to aim it precisely at the tumor. It is usually given for a few minutes five days a week for several weeks. If too much radiation is given at once the normal cells will not have a chance to recover. Therefore, it is given in *fractions* which means it is divided into smaller doses.

Internal radiation therapy is also called brachytherapy. A radioactive source is implanted in the body. The implant can be a wire, seed balloon, or pellet. Since the implant is very close to the tumor, the radiation doesn't have to travel as far as that from an external source so there should be less effect on normal tissue.

Systemic radiation is delivered orally or intravenously. The radioactive agent may be combined with a monoclonal antibody in order to direct the substance to the right target inside the body.

ACS, 2011b

Radiation Side Effects

General side effects of radiation include fatigue and skin changes. Other effects depend on the part of the body radiated. For example, hair loss will occur if the head is radiated.

Radiation is not part of the treatment plan for Mary at this time. If it were, the radiation oncology nurses would teach her how to prevent or decrease side effects. You could give her some general guidance as to how to take care of herself. This includes instructions to:

1. Eat a balanced, nutritious diet.
2. Get plenty of rest.
3. Do not use any creams, lotions, powders etc. on the treatment area without asking your radiation healthcare provider. Some skin care products will interfere with the radiation treatments. Others will cause more irritation.
4. Do not use heat, cold, or adhesive tape on radiated area.
5. Use sun screen.
6. Do not wear clothing that is tight on the area treated.

ACS, 2011b

Systematic Therapy: Chemotherapy & Targeted Therapy

Chemotherapy drugs are those that kill cancer cells by interfering with cell division. They are usually given intravenously, but may be given by other routes including oral, intrathecal, or intraperitoneal. Unfortunately, these drugs cannot distinguish normal dividing cells from cancer cells so normal cells, particularly those that divide often, are damaged too. This causes the typical side effects of chemotherapy in the bone marrow (anemia, thrombocytopenia, neutropenia), gastrointestinal system (mucositis, diarrhea, constipation, nausea and vomiting), and hair follicles (hair loss). Most of these side effects are reversible as the normal cells are usually able to repair themselves. However, depending on the drug, there are some long term toxicities that may be irreversible. These long term effects can include possible lung, heart or kidney damage, neurotoxicity and second cancers.

Targeted therapies are drugs designed to specifically target a cancer protein, marker, or receptor. They act on the cancer cell preferentially to interfere with the growth and functioning of the cell. Side effects occur due to the drug's effects on normal cells that have the same target, but in lesser amounts, as the malignant cells. There are fewer side effects than with chemotherapy. There are three main categories of targeted therapies:

1. **Small Molecules:** These drugs can easily cross the cell membranes so that it can interfere with proteins on the inside and outside of the cell. They are often oral medications with short half-lives so need to be given daily.
2. **Monoclonal Antibodies:** These are antibodies that usually work outside the cell by binding to receptors on the cell surface so that they cannot be activated. They can be used inside the cell to deliver chemotherapy or radiation therapy. They are usually given intravenously and have longer half lives so only needed to be given every one to four weeks.
3. **Vaccines:** These drugs try to activate the immune system and make it recognize and attack cancer cells. They are usually given parenterally.

Side Effects of Targeted Therapies

Side effects depend on the class of the targeted therapy. For example, epidermal growth factor receptor inhibitors cause the development of dry, erythematous, papulopustular skin rashes, xerosis (dry skin), paronychia (skin infection around the nails), hair changes, and hand and foot reactions. Drugs that inhibit the HER2 receptor may cause cardiac dysfunction. Angiogenesis inhibitors often cause hypertension and proteinuria. Administration of monoclonal antibodies is often associated with infusion reactions.

For more information on targeted therapies, refer to *Oncology Update: Targeted Cancer Therapies & Patient Management*, RN.com, 2012.

Wilkes & Barton-Burke (2012), Dell (2012)

Mary's Systemic Therapy

Mary will receive neoadjuvant systemic treatment, in order to decrease the tumor burden, with the chemotherapy drugs carboplatin and taxotere and will receive the targeted agent bevacizumab. She will need to be closely monitored, and requires intensive teaching to care for herself.

- Carboplatin has many possible side effects including infection, bleeding, renal toxicity, nausea and vomiting, and infusion reactions.
- Taxotere's side effects include such things as hypersensitivity or anaphylactic reactions, infection, bleeding, anemia, fatigue, myalgias, fluid retention, and sensory neuropathies.
- Bevacizumab side effects include hypertension, proteinuria and nephrotic syndrome, gastrointestinal perforation, and delayed wound healing.

Wilkes & Barton-Burke (2012)

Screening

Mary wants to know what steps she and her family can take to detect cancers early and decrease their risk of dying from cancer. Each year the American Cancer Society publishes updated recommendations for screening. The full 2012 recommendations for the person at average risk can be found at <http://onlinelibrary.wiley.com/doi/10.3322/caac.20143/full>.

Summary of ACS Screening Recommendations

Breast	Breast Self Exam Monthly: Start at age 20, optional after discussion of pros and cons. Clinical Breast Exam every 3 years until 40, then every year. Mammography annually starting at 40.
Cervix	Pap test and HPV DNA test to begin 3 years after starting to have vaginal intercourse, no later than 21. After age 30 if 3 normal tests in a row, increase frequency to every 2-3 years.
Colorectal	Age 50: FOBT (fecal occult blood test) or FIT (fecal immunochemical test) annually, or stool DNA (Interval), or flexible sigmoidoscopy every 5 years, or double contrast barium enema every 5 years, or colonoscopy every 10 years, or CT colonography every 5 years.
Endometrial	At menopause women should be informed about risks and symptoms and encouraged to report unexpected vaginal bleeding or spotting.
Prostate	Men with at least 10 year life expectancy should make an informed decision about whether or not to have digital rectal exam and PSA test.
Cancer-Related Checkup	All 20 or older should have periodic health exam including examination for cancers of the ovaries, testicles, thyroid, lymph nodes, oral cavity, and skin. Counseling should be provided regarding smoking, sun exposure, diet, nutrition, risky practices, sexual

	practices, and environmental and occupational exposures.
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Survivorship

It has been a year since Mary has completed her systemic therapy and had her debulking surgery. Although she continues to be followed by her oncologist, she needs regular healthcare to monitor for other comorbidities and possible new cancers as well as for ongoing or delayed effects of treatment. The Institute of Medicine has recommended that patients and their primary care providers always be given a treatment summary as well as a comprehensive survivorship care plan. The National Cancer Survivorship Resource Center has developed tools to help cancer survivors, caregivers, and health care providers, as well as for advocates and policy makers. Information about these resources can be found at www.cancer.org/survivorshipcenter. Hopefully, with the support of her health care team, Mary will find be able to the support she needs to deal with the physical and emotional demands that she will face on the rest of her cancer and life journey.

Siegel et al., 2012b

Resources for Your Cancer Patients

National Comprehensive Cancer Network (NCCN):

NCCN Guidelines for Patients™: Is an educational tool for patients and oncology professionals that offers the most comprehensive and frequently updated clinical practice guidelines available. NCCN recognizes that patients benefit daily from the utilization of the NCCN Guidelines and have created patient-friendly versions to provide state of the art cancer treatment information in easy-to-understand language. The NCCN Guidelines for Patients™, translations of the NCCN Guidelines, are meant to help patients with cancer speak with their healthcare providers, about their best treatment options.

NCCN hopes that you will refer your patients and their families to the NCCN Guidelines for Patients™, as well as utilize them as a complementary tool in your practice to support consultations and meetings with your patients and their caregivers.

For more information on cancer for patients, including finding clinical trials, questions about dealing with and paying for cancer treatments and helpful tips for life after cancer, visit: NCCN.org.

National Cancer Institute:

The National Cancer Institute (NCI) is part of the National Institutes of Health (NIH), which is one of 11 agencies that compose the Department of Health and Human Services (HHS). The NCI, established under the National Cancer Institute Act of 1937, is the Federal Government's principal agency for cancer research and training.

The National Cancer Institute coordinates the National Cancer Program, which conducts and supports research, training, health information dissemination, and other programs with respect to the cause, diagnosis, prevention, and treatment of cancer, rehabilitation from cancer, and the continuing care of cancer patients and the families of cancer patients. As part of the National Institutes of Health, the National Cancer Center offers healthcare professionals, patients and their families' detailed information about different types of cancers, clinical trials, treatment options and support services.

Visit the NCI at <http://www.cancer.gov/> to access current oncology research news, NCI Fact sheets, treatment options, community support groups and more.

Resources for Your Cancer Patients

American Cancer Society:

Visit the NCI at <http://www.cancer.org/index> to learn more about cancer, find support and treatment, explore research and get involved in community organizations to make a difference in the fight against cancer.

The American Cancer Society also offers a comprehensive website dedicated to cancer survivors, offering resources and support services. Visit the [National Cancer Survivorship Resource Center](#) to learn more about how you can support your cancer survivor patient.

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