Cancer 101

Cancer Services of New Mexico
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Disclosures

Nothing to reveal
"I think you should be more explicit here in step two."
Outline

• What is Cancer
• Cancer Treatment Timeline
• Cancer Screening
• Cancer Diagnosis
• Cancer Staging
• Cancer Treatment Basics
• Cancer Clinical Trials
• Questions
What is Cancer?

A Bad Cell

- Cells are the building blocks of our bodies.
- Each cell has a function and a place.
- Cancer occurs when a cell goes **bad**.
  - Divides (grows) without control
  - Grows into places it does not belong

Courtesy of the National Cancer Institute
What is Cancer?

Webster’s Definition:
A malignant tumor of potentially unlimited growth that expands locally by invasion and systemically by metastasis

• Over 200 Different types of cancer

• Some are very aggressive, some require no treatment.
What is Cancer?

**Normal Cell**
- Cells divide to replace cells that die
- Grow only where they belong
- Do not grow in other organs

**Cancer Cell**
- Cells divide without control
- Grow into tissues where they do not belong
- Grow in distant organs where they don’t belong

**BALANCED**
(homeostasis)

**UNBALANCED**
(disease)
What is Cancer?

Cancer Spread

- **Direct Extension:** grows directly into tissues next to the original site
- **Lymphatic Spread:** travels through the lymphatic system and grows in lymph nodes
- **Hematogenous Spread:** travels through the blood stream and grows in other organs (lung, liver, bone, brain, ...)

What is Cancer?

Lymphatic System
The lymphatic system is a network of small thin vessels that is associated with the circulatory system. The veins in the body return about 98% of the fluid delivered by the arteries. The remaining 2% of fluid is returned by the lymphatic system. In the lymph nodes, the immune system filters this fluid looking for disease. Many types of cancer spread along this system.
Who gets cancer?
In the U.S.
1 of every 2 men and
1 of every 3 women
will receive a cancer diagnosis
in their lifetime
<table>
<thead>
<tr>
<th>Rank</th>
<th>Cause</th>
<th>Death Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>All causes</td>
<td>2,596,993</td>
</tr>
<tr>
<td>1</td>
<td>Diseases of heart (I00-I09,I10-I11,I13,I20-I51)</td>
<td>611,105</td>
</tr>
<tr>
<td>2</td>
<td>Malignant neoplasms (C00-C97)</td>
<td>584,881</td>
</tr>
<tr>
<td>3</td>
<td>Chronic lower respiratory diseases (J40-J47)</td>
<td>149,205</td>
</tr>
<tr>
<td>4</td>
<td>Accidents (unintentional injuries) (V01-X59,Y85-Y86)</td>
<td>130,557</td>
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<tr>
<td>5</td>
<td>Cerebrovascular diseases (I60-I69)</td>
<td>128,978</td>
</tr>
<tr>
<td>6</td>
<td>Alzheimer’s disease (G30)</td>
<td>84,767</td>
</tr>
<tr>
<td>7</td>
<td>Diabetes mellitus (E10-E14)</td>
<td>75,578</td>
</tr>
<tr>
<td>8</td>
<td>Influenza and pneumonia (J09-J18)</td>
<td>56,979</td>
</tr>
<tr>
<td>9</td>
<td>Nephritis, nephrotic syndrome and nephrosis (N00-N07,N17-N19,N25-N27)</td>
<td>47,112</td>
</tr>
<tr>
<td>10</td>
<td>Intentional self-harm (suicide) (*U03,X60-X94,Y87.0)</td>
<td>41,149</td>
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<tr>
<td>11</td>
<td>Septicemia (A40-A41)</td>
<td>38,155</td>
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<tr>
<td>12</td>
<td>Chronic liver disease and cirrhosis (K70,K73-K74)</td>
<td>36,427</td>
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<tr>
<td>13</td>
<td>Essential hypertension and hypertensive renal disease (I10,I12,I15)</td>
<td>30,770</td>
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<td>14</td>
<td>Parkinson’s disease (G20-G21)</td>
<td>25,196</td>
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<tr>
<td>15</td>
<td>Pneumonitis due to solids and liquids (J69)</td>
<td>18,579</td>
</tr>
<tr>
<td>...</td>
<td>All other causes (Residual)</td>
<td>537,554</td>
</tr>
</tbody>
</table>
Cancer Treatment Timeline

Symptoms/Screening
- You go to the doctor because of symptoms (mass, pain, cough, ...) or you have a screening test performed (mammogram, colonoscopy, pelvic exam, ...)

Diagnosis (Biopsy)
- Typically diagnosis is made with a biopsy (needle biopsy to surgery); rarely the diagnosis is made without a biopsy

Staging
- Examinations are performed to see the extent of the cancer growth. These include blood tests, imaging tests (CT, ultrasound, ...), and even surgery

Treatment
- Surgery, chemotherapy, radiation, and other treatments are performed to cure or control the cancer

Surveillance
- Examinations to check that the cancer has not come back or is responding to the therapy
Cancer Screening

A test on a healthy patient to check for cancer

Standard Tests
- Mammogram (woman 50-74)
- Colonoscopy (adults 50-75)
- Pap Smear (woman up to 65)

Controversial Tests
- PSA for prostate cancer
- Ultrasound for Ovarian
- CT for Lung Cancer (smokers)
- Mammogram (age <50)
- MRI for Breast Cancer
- Others
Diagnosis almost always requires a biopsy. A biopsy is a surgical procedure that removes a piece of the cancer. The piece is then examined under the microscope by a pathologist. The pathologist determines if the specimen is cancer. They also sometimes grade the cancer.
Cancer Diagnosis

Cancer Diagnosis - grade

The grade of a cancer is an assessment of how abnormal the cancer cells appear under the microscope. Higher grade means more abnormal. In some cancers, this is very important. In others, it is not important.
Cancer Staging

Examinations performed to see how far the cancer has spread. Sometimes, these are not necessary. Other times, several tests are required. These examinations include: CT scans, ultrasound, PET scans, blood tests, and even surgery.
A common staging system is the TNM staging system used by the American Joint Committee on Cancer (AJCC)

T Stage
- Primary tumor assessment
  (size of tumor, depth of invasion, …)

N Stage
- Lymph node assessment
  (number nodes involved, location of nodes, …)

M Stage
- Distant organ assessment
  (spread to the liver, lung, bone, …)
Cancer Treatment

Treatment Modalities

Surgery
A localized treatment (treats a specific area of the body). Removes the primary cancer or rarely metastatic lesions.

Chemotherapy
A systemic treatment (treats the entire body). Kills cancer wherever the blood carries it. There are many types.

Radiation Therapy
A localized treatment (treats a specific area of the body). Modern treatments can target cancer with great accuracy.

Others
Many other treatments are available, including supportive therapies (to help side effects of the standard treatments).
Many types of surgery can be done to treat cancer. These include small delicate surgery for skin cancer (Moh’s surgery) to the longest and most involved surgeries performed (Whipple procedure – pancreatic cancer).
Systemic Therapy

Chemotherapy/biotherapy/immunotherapy/targeted therapy consists of many different systemic treatments for cancer. These vary from the older regimens that target fast growing cells (side effects including nausea, vomiting, fatigue and hair loss) to modern agents that target specific genetic errors in the cancer.
Radiation Therapy

Radiation therapy is a targeted form of radiation used to treat cancer at a specific location within the body. There are many ways to treat with radiation; from using external beams to implanting radioactive sources. Treatments can be as short as a single session or more commonly consist of daily treatments for many weeks.
Other Therapies (Complementary)

There are many other therapies that are designed to both treat the cancer directly as well as support the body when receiving therapies that have significant side effects. These are important to consider as they may make standard treatments much easier to tolerate.
What was the next rabbit to be pulled from the hat?
What are Cancer Clinical Trials?

- Research studies involving people and cancer
- Intended to answer scientific questions to find better ways to diagnose, prevent and treat cancer
- There are different types and phases of trials
- They follow strict scientific guidelines called a protocol
Types of Clinical Studies

Treatment trials determine what is the most effective and new treatment that can help people with cancer.

Prevention trials find new approaches that can prevent a specific cancer from developing in people who do not have cancer.

Early-detection trials develop new ways of finding cancer in people before they have symptoms.

Diagnosis trials find new tests or procedures that identify cancer more accurately and at an earlier stage.

Quality-of-life trials find new approaches to improve the quality of life for cancer patients.
Barriers for the General Populations

- Lack of awareness of clinical trials
- Lack of access to trials
- Fear, distrust, or suspicions of research
- Practical or personal obstacles
- Insurance or cost problems
- Unwillingness to go against personal physician’s wishes
- Cultural and ethnic backgrounds
- Language or literacy
Less than 5% of cancer patients participate in clinical trials
The FDA approved 15 cancer drugs in 2015 compared to 6 in 2010
800 clinical trials for new cancer immunotherapy drugs
Pharmaceutical Research and Development Dept.

“We’ve run out of things to name our drugs. It’s time to invent some new alphabet letters.”
Finding Clinical Trials

Clinical Trials open in New Mexico

• New Mexico Cancer Care Alliance: www.nmcca.org

Clinical Trials Open Nationally

• NCI: www.cancer.gov
• NIH: www.clinicaltrials.gov
• Coalition of Cancer Cooperative Groups: www.cancertrialshelp.org
What are targeted cancer therapies?
Targeted cancer therapies:

Drugs or other substances that block the growth and spread of cancer by interfering with specific molecules ("molecular targets") that are involved in the growth, progression, and spread of cancer

Also known as "molecularly targeted drugs," "molecularly targeted therapies," "precision medicines," or similar names
How do targeted therapies differ from standard chemotherapy?
Targeted therapies differ from standard chemotherapy in several ways:

Targeted therapies act on specific molecular targets that are associated with cancer
  Most standard chemotherapies act on all rapidly dividing normal and cancerous cells

Targeted therapies are deliberately chosen or designed to interact with their target
  Many standard chemotherapies were identified because they kill cells

Targeted therapies are often cytostatic (block tumor cell proliferation)
  Standard chemotherapy agents are often cytotoxic (kill tumor cells)
Harry Potter’s Invisibility Cloak
Klingon Empire
Bird-of-Prey
Cloaking Device
Storm trooper: Let me see your identification.
Obi-Wan: [with a small wave of his hand] You don't need to see his identification.
Storm trooper: We don't need to see his identification.
Obi-Wan: These aren't the droids you're looking for.
Storm trooper: You can go about your business.
Obi-Wan: Move along.
Storm trooper: Move along... move along...
Unusual relationships
How many cancer survivors are there in U.S?
• There are now >14 million cancer survivors in the U.S.

• Five-year survival for all cancers is >68% (2004-2010) up from 49% in the late 1970s
Things People Believe About Cancer…
Things People Believe About Cancer…

• **Cancer is a death sentence**

• **NO** (but the cure rate and long term survival are still not good enough)
Things People Believe About Cancer…

• Cancer is a death sentence  
  • No

• In the U.S., the likelihood of dying from cancer has dropped steadily since the 1990s

• Five-year survival rates for some cancers, such as breast, prostate, and thyroid cancers, now exceed 90 percent

• The 5-year survival rate for all cancers combined is currently about 66 percent.

• For more information, see the Annual Report to the Nation on the Status of Cancer
It is important to note:

- Rates are based on data from large numbers of people.
- How long an individual cancer patient will live and whether he or she will die from the disease depend on many factors, e.g.
  - Slow or fast growing,
  - How much the cancer has spread in the body
  - Effectiveness of available treatments
  - Person’s overall health
Things People Believe About Cancer…

• Sugar causes or worsens cancer
Things People Believe About Cancer…

- **Sugar causes or worsens cancer**
  - **NO**
  - Research has shown that cancer cells consume more sugar (glucose) than normal cells.
  - No studies have shown that eating sugar will make your cancer worse or that, if you stop eating sugar, your cancer will shrink or disappear.
  - A high-sugar diet may contribute to excess weight gain, and obesity is associated with an increased risk of developing several types of cancer.
  - **For more information, see the NCI fact sheet on [Obesity and Cancer Risk](#)**.
Things People Believe About Cancer…

- Cancer is contagious  
- **NO** (in general)
Things People Believe About Cancer…

- Cancer is contagious
  - NO (in general)
  - In some people, cancers may be caused by certain viruses (some types of human papillomavirus, or HPV, for example) and bacteria (such as *Helicobacter pylori*).
  - While a virus or bacterium can spread from person to person, the cancers they sometimes cause cannot spread from person to person.

For more information about cancer-causing viruses and bacteria, see the NCI fact sheets on *Helicobacter pylori* and Cancer, HPV and Cancer, & Cancer Vaccines.
Things People Believe About Cancer…

- Attitude—positive or negative—determines risk of, or likely recovery from, cancer
Things People Believe About Cancer…

• **Myth**
  
  - Attitude—positive or negative—determines risk of, or likely recovery from, cancer

• **Fact**
  
  - **NO**
  - Scientific evidence that links a person’s “attitude” to his or her risk of developing or dying from cancer is absent to date
  
  - It’s normal to feel sad, angry, or discouraged sometimes and positive or upbeat at other times
  
  - People with a positive attitude may be more likely to maintain social connections and stay active, and physical activity and emotional support may help cope with cancer

• **For more information, see the NCI fact sheet on Psychological Stress and Cancer**
Things People Believe About Cancer…

- Cancer surgery or a tumor biopsy causes cancer to spread in the body

Fact? Heal with steel
Things People Believe About Cancer…

Myth

- Cancer surgery or a tumor biopsy causes cancer to spread in the body

Fact

- NO (when done correctly)
- The chance that surgery will cause cancer to spread to other parts of the body is extremely low
- Following standard procedures, surgeons use special methods and take many steps to prevent cancer cells from spreading during biopsies or surgery to remove tumors
- For example, if they must remove tissue from more than one area of the body, they use different surgical tools for each area

For information about how cancer spreads in the body, see the NCI fact sheet on Metastatic Cancer
Things People Believe About Cancer…

- **Myth**: Cancer gets worse if exposed to air
  - **Fact**: NO
Things People Believe About Cancer…

- **Myth**
  - Cancer gets worse if exposed to air

- **Fact**
  - NO
  - Exposure to air will not make tumors grow faster or cause cancer to spread to other parts of the body.

- For information about how cancer spreads in the body, see the NCI fact sheet on [Metastatic Cancer](#)
Things People Believe About Cancer…

- Cell phones cause cancer
Things People Believe About Cancer…

- **Cell phones cause cancer**
  - **NO**
  - According to the best studies completed so far
  - Power lines emit both electric and magnetic energy
  - Electric energy emitted by power lines is easily shielded or weakened by walls and other objects
  - Magnetic energy emitted by power lines is a low-frequency form of radiation that does not damage genes.
  - **For more information, see the NCI fact sheet on [Magnetic Field Exposure and Cancer](https://www.cancer.gov/cancer-information/cancer-topics/prevention/magnetic-fields)**

**Fiction** | **Fact**
Things People Believe About Cancer…

- Botanicals/Herbal products can cure cancer
  - NO
Things People Believe About Cancer…

- **Botanicals/Herbals/Vitamins can cure cancer**
  - **NO**
  - Some studies suggest that alternative or complementary therapies, including some herbs, may help patients cope with the side effects of cancer treatment, no herbal products have been shown to be effective for treating cancer.
  - In fact, some herbal products may be harmful when taken during chemotherapy or radiation therapy because they may interfere with how these treatments work.
  - Cancer patients should talk with their doctor about any complementary and alternative medicine products—including vitamins and herbal supplements—they may be using.

- For more information, see the Botanicals/Herbal Products section in Topics in Complementary and Alternative Therapies
Things People Believe About Cancer…

• If someone in my family has cancer, I am likely to get cancer, too…

Fact? T’ain’t necessarily so
Things People Believe About Cancer…

- **Fiction**
  - If someone in my family has cancer, I am likely to get cancer, too…

- **Fact**
  - NO
  - Cancer is caused by harmful changes (mutations) in genes. Only about 5-10% of cancers are caused by harmful mutations that are inherited from a person’s parents. In families with an inherited cancer-causing mutation, multiple family members will often develop the same type of cancer. These are “familial” or “hereditary” cancers.
  - 90-95% of cancers are caused by mutations that happen during a person’s lifetime as a natural result of aging and exposure to environmental factors, such as tobacco smoke and radiation. These are “non-hereditary” or “spontaneous” cancers.
  - For more information about the risk of getting cancer, see the NCI fact sheet on [Genetic Testing for Hereditary Cancer Syndromes](https://www.cancer.gov/cancertopics/pdq/tests/genetics) and [Cancer Causes and Risk Factors](https://www.cancer.gov/cancertopics/factsheet/causes-risk-factors).
Things People Believe About Cancer…

• If no one in my family has had cancer, that means I’m risk-free…

Fact? Oh, t’were it so…
Things People Believe About Cancer…

- If no one in my family has had cancer, that means I’m risk-free…  
  - **Fiction**
  - **Fact**

- NO
- Based on current data, about 40% of men and women will be diagnosed with cancer during their lives
- Most cancers are caused by genetic changes that occur throughout a person’s lifetime as a natural result of aging and exposure to environmental factors, such as tobacco smoke and radiation
- Other factors, such as kind of food eaten, how much you eat, and whether you exercise, may also influence risk of developing cancer
- **For more information, see** [Cancer Causes and Risk Factors](#)
Things People Believe About Cancer…

• Antiperspirants or deodorants cause breast cancer…

Fact? No sweat? or No cancer?
Things People Believe About Cancer…

- **Myth**: Antiperspirants or deodorants cause breast cancer…

- **Fact**: NO

- Best studies so far have found no evidence linking the chemicals typically found in antiperspirants and deodorants with changes in breast tissue.

- **For more information, see the NCI fact sheet on Antiperspirants/Deodorants and Breast Cancer**
Things People Believe About Cancer…

• Hair dye use increases the risk of cancer…
Things People Believe About Cancer…

- Hair dye use increases the risk of cancer…
  - NO

  - No convincing scientific evidence that personal hair dye use increases the risk of cancer

  - Some studies suggest, however, that hairdressers and barbers who are regularly exposed to large quantities of hair dye and other chemical products may have an increased risk of bladder cancer

  - For more information, see the NCI fact sheet on Hair Dyes and Cancer Risk
Things People Believe About Cancer…

- Popular ideas about how cancer starts and spreads seem to make sense, especially when those ideas are rooted in old theories or half truths.
- But…

- Scientifically wrong and
- Wrong ideas about cancer can lead to needless worry and even hinder good prevention and treatment decisions

So what?  Potentially harmful
Questions?