

Cancer is a generic term that is used to describe over 100 different diseases. When the DNA of a cell becomes changed or damaged, mutations occur that affect normal cell growth resulting in uncontrollable cell division. Abnormal cell division oftentimes results in a mass of tissue called a tumor. When the tissue cells of the tumor remain in the same place where the cells originated and cell division simply enlarges the tumor, the condition is considered to be benign (not cancerous). Cancer occurs when the abnormally dividing cells migrate and invade other body cells. The condition is considered malignant because the migrating cells “take over” and the invaded cells die. Although tumors can be a classic symptom of cancer, not all tumors are cancerous and not all cancers form tumors (National Cancer Institute (NCI), 2015c). Cancers are generally categorized according to type:

- **Carcinoma** - cancer that begins in the skin or in tissues that line or cover internal organs
- **Sarcoma** - cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue
- **Leukemia** - cancer that starts in blood-forming tissue such as the bone marrow and causes large numbers of abnormal blood cells to be produced and enter the blood
- **Lymphoma and myeloma** - cancers that begin in the cells of the immune system

- **Central nervous system cancers** - cancers that begin in the tissues of the brain and spinal cord
(NCI, 2015c)

Leading Cancers in the U.S. and Texas

Among the various cancers, research has concluded that lung and bronchus, colon and rectum, breast (female) and prostate account for more than half of cancer diagnoses and deaths (American Cancer Society [ACS], 2015a).

The most recent statistical information reported to the Texas Department of State Health Services (DSHS) regarding statewide mortality rates related to cancer covers the years from 2007-2011. Based on this data DSHS projects a total of 42,255 fatalities due to cancer in Texas in 2015. DSHS believes that lung and bronchus cancer will continue to be the leading cause of mortality with an estimated 13,619 new cases and 10,985 deaths. Prostate and breast cancer are anticipated to have the highest incidence of new cases with approximately 13,363 and 15,420 new diagnoses respectively. DSHS predicts 2,948 women to pass away from breast cancer and 1,918 males from prostate cancer in 2015. However, the second highest number of expected deaths for the year will likely be caused by colon cancer; though only 7,002 people are estimated to be newly diagnosed with this form of cancer, 3,217 mortalities are predicted. Cancer of the pancreas appears to have the closest connection between new diagnoses and fatalities with 2,967 new cases predicted and 2,676 deaths expected for 2015 (DSHS, 2015).

The following table lists the most recent five-year survival statistics for the state of Texas and the nation for reporting year 2011. In almost all instances, U.S. survival rates are higher than those in Texas.

Five-Year Relative Survival		
	Texas %	U.S. %
All Sites	62.4	67.1
Oral Cavity & Pharynx	58.4	64.3
Esophagus	17.0	18.3
Stomach	25.6	30.3
Colon & Rectum	62.2	65.2
Liver and IH Bile Duct	14.3	18.3
Pancreas	8.5	7.9
Larynx	59.8	60.2
Lung & Bronchus	15.7	18.0
Melanoma of the Skin	84.3	91.5
Breast (Female only)	86.4	89.6
Cervix uteri	68.7	67.4
Corpus & Uterus, NOS	80.6	81.6
Ovary	46.1	45.8
Prostate	95.9	98.9
Testis	94.0	95.2
Urinary Bladder	75.0	77.4
Kidney & Renal Pelvis	67.9	73.6
Brain & Nervous System	39.8	33.8
Thyroid	96.4	98.2
Hodgkin Lymphoma	81.3	85.8
Non-Hodgkin Lymphoma	64.3	70.6
Myeloma	41.4	48.5
Leukemia	55.2	59.4
Mesothelioma	10.0	9.1
(DSHS, 2014; Howlander, et al., 2015)		

Risk Factors

There is oftentimes no identifiable cause for cancer. Factors such as age (78% of all cancers are diagnosed in people aged 55 and older) (ACS, 2015a), tobacco use, sunlight (UV rays), certain chemicals and other substances, ionizing radiation, some viruses and bacteria, hormones, family history and poor diet can all play a role. However, the existence of one or more of these factors does not guarantee a cancer diagnosis, but does heighten the risk of eventually developing cancer in the future (NCI, 2015b). While some cancers are strongly hereditary (colorectal, breast, and prostate) it is now thought that it is the interplay between common gene variations and environmental risk factors/lifestyle that lead to the genetic damage that results in cancer. "In 2015, almost

171,000 of the estimated 589,430 cancer deaths will be caused by tobacco use. In addition, the World Cancer Research Fund has estimated that up to one-third of the cancer cases that occur in economically developed countries like the US are related to overweight or obesity, physical inactivity, and/or poor nutrition, and thus could also be prevented" (ACS, 2015a, p.1).

Some of the major risk factors that are strongly linked to an increased risk for specific cancers include:

- *Tobacco use* is linked to many cancers such as lung, kidney, bladder, oral cavity, esophageal, pancreatic, and stomach; it is thought that cigarette smoking causes about 30% of all cancer deaths in the U.S.
- *Infections* from certain viruses and bacteria are thought to cause about 1 in 4 cases of cancer
 - Human papillomavirus (HPV) is linked to cancers of the cervix, penis, vagina, anus, and oropharynx
 - Hepatitis B and C viruses are linked to liver cancer
 - Epstein-Barr virus is linked to Burkitt lymphoma
 - *Helicobacter pylori* is linked to gastric (stomach/esophageal) cancer
- *Ionizing radiation* causes leukemia and cancers of the thyroid, breast, lung, stomach, colon, esophagus, bladder, and ovaries and myeloma
- *Alcohol consumption* has been linked to increased risk of oral, esophageal, breast and colorectal cancers
- *Obesity* is linked to higher risk of postmenopausal breast cancer as well as colorectal, endometrial, esophageal, kidney and pancreatic cancers; It is not known if losing weight lowers the risk of cancers that have been linked to obesity.
- *Environmental* chemical exposure has been linked to lung cancer (air pollution, second hand smoke, and asbestos) and skin and bladder cancers (arsenic in drinking water) (NCI, 2015b)

Prevention

Researchers estimate that up to two-thirds of all cancers can be prevented. The Mayo Clinic advocates some simple steps that everyone can take to prevent cancer:

- Eliminate tobacco use
- Eat healthy
- Stay active and maintain a healthy weight
- Protect yourself from the sun
- Get immunized (Hepatitis B and HPV)
- Avoid risky behaviors (HIV prevention)
- Get cancer screenings

(Mayo Clinic, 2012)

The first six goals of the Texas Cancer Plan are related to primary prevention and risk reduction of cancer through “promoting change in behavior, policy, environment, or other systems to prevent or reduce the risk of developing cancer” (Cancer Prevention & Research Institute of Texas [CPRIT], 2012, p.4). Those goals relate to the same lifestyle changes as listed above.

Treatment

There are a variety of treatment options available, depending on the type of cancer diagnosed. The basic treatments include:

- *Chemotherapy* – drug used to kill cancer cells, stop the cancer cell growth or to slow the growth of cancer cells, or kill cancer cells that have spread to other parts of the body
- *Radiation therapy* – injures or destroys cells in the area being treated by damaging their genetic material, making it difficult for these cells to continue to grow and divide
- *Surgery* – in most cases, the surgeon removes the tumor and some tissue around it which may help prevent the tumor from growing back – nearby lymph nodes may also be removed

(ACS, 2015b)

Treatment generally depends upon the spread of the cancer at the time of diagnosis. Localized cancers respond well to surgery and radiation, which are focused treatments aimed at removing and destroying cancer cells, respectively. Treatments are often used in

conjunction with each other; for example, surgery performed prior to radiation in an effort to improve the effectiveness of radiation treatment or radiation used before surgery to shrink the size of a tumor and thereby reduce physical disfigurement (ACS, 2015b).

Chemotherapy is given as a combination of drugs that work together to destroy cancer cells. The primary advantage of chemotherapy is that it treats the entire body, not a localized area. Since cancer cells can spread from the primary site through blood or lymph vessels to secondary sites, localized treatments may not be thorough enough to cure the cancer that is diagnosed (ACS, 2015c).

Although chemo, radiation and surgery have been the traditional courses of treatment, newer treatment options such as targeted therapy (where drugs attack specific cancer cells), and immunotherapy (also called biological therapy, helps the immune system attack cancer cells), can be used to work with the chemo and radiation, or used as a primary source of treatment. Numerous other therapy options exist including: hormone therapy, hyperthermia (use of heat), stem cell transplant, and photodynamic therapy (uses photosensitizing drugs and light). Many more cancer treatments, such as gene therapy, are still in clinical trials and not yet available to everyone (Mayo Clinic, 2013; NCI, 2015a).

Cost for Cancer Treatment

One of the biggest expenses associated with cancer is the treatment itself. “The Agency for Healthcare Research and Quality (AHRQ) estimates that the direct medical costs (total of all health care expenditures) for cancer in the US in 2011 were \$88.7 billion. Half of this cost is for hospital outpatient or office-based provider visits, 35% is inpatient hospital stays, and 11% is prescription medications” (ACS, 2015a, p3). In Texas, the 2014 direct medical costs and costs for morbidity and mortality losses were \$32.4 billion. Additionally, estimates for cancer cost to the Texas economy were \$161.7 billion in reduced annual spending; \$79.8 billion in output losses, and 785,865 jobs lost due to

morbidity and mortality. The Texas government spent nearly \$1.02 billion in health-related expenditure related to cancer treatments through the CHIP, Medicaid, Teacher Retirement and Employee Retirement systems (CPRIT, 2014).

The individual cost of cancer can be devastating to the patient and his/her family. A study conducted in 2011 found that the average monthly out-of-pocket expense for cancer care was \$1,266 for patients with insurance coverage; with 41% of that cost being for prescription drugs, 14% for medical equipment, 10% for travel, 6% for special diet, and 5% for non-prescription drugs. These costs had a negative impact on the quality of cancer care since patients had to make significant lifestyle changes (spent less on food and clothing), took fewer than prescribed of the medications, or failed to fill prescriptions due to the cost (Zafar, et al., 2011).

Another factor making health care expensive is the cost of new cancer treatments. "Of the 12 cancer medications approved by the Food and Drug Administration last year, 11 cost more than \$100,000 annually" (Edney, 2013). The new treatments typically drive up the cost of prescription drugs and health care becomes less accessible. It is believed that with the disparity in the health care system, those who cannot afford to pay for their care end up with higher medical costs, poorer outcomes, and could possibly face premature death.

Social and Emotional Impacts of Cancer

It is estimated that 70% of cancer survivors experience depression at some point in their treatment. Depression in a cancer patient can be difficult to diagnose because it mirrors many symptoms of cancer treatment, including weight loss, fatigue, insomnia and inability to concentrate. It has also been found that symptoms of depression were associated with a shorter survival time (University of Texas MD Anderson Cancer Center, 2015).

In many cases the social aspect can be as daunting as the emotional. It is not uncommon for cancer survivors to experience amputations,

disfigurement and loss of organs like the colon or bladder. How other people react to someone's illness is perhaps the biggest challenge faced by cancer survivors. Re-entering social and professional life can often be difficult. Many times worries of infection, not having enough energy to get through a workday; and anxiety about not being able to think clearly because of "chemobrain" or memory loss can make the transition from patient to ordinary person stressful (University of Texas MD Anderson Cancer Center, 2015).

Survivorship

"Due to advances in early detection and treatment, today there are more cancer survivors, living longer after diagnosis, than ever before" (CPRIT, 2012, p.10). A recent study reported that cancer survivors had significantly lower health-related quality of life than the general population (1 in 4 versus 1 in 10 respectively) and that a large portion of survivors were not referred for needed services. The need to identify and rehabilitate impairments and disabilities that result from cancer treatment is often unrecognized or ignored by medical providers (Silver, Baima, and Mayer, 2013). Providing "survivorship programs and services such as patient navigation, treatment and care plans, culturally and linguistically appropriate outreach and education, and effective symptom management" (CPRIT, 2012, p.10) is a critical component of the Texas Care Plan.

The Future

The future for research and prevention continues to broaden both on a national and state level. The Cancer Genome Atlas (TCGA), a project of the National Institutes of Health (NIH), "is a comprehensive and coordinated effort to create a detailed catalog, or "atlas," of genomic changes associated with specific types of tumors to improve the prevention, diagnosis and treatment of cancer...One day, patients may be cared for based on their genomic profile instead of where their cancer originated" (NIH, 2014, pp.1&4).

In 2007, the Texas legislature approved the establishment of the Cancer Prevention and Research Institute of Texas (CPRIT, 2012). Through August 2014, CPRIT has “awarded 61 individual Investigator Research Awards, 15 High Impact-High Reward research grants, seven continuation grants for Research Training Awards, and four continuation grants for Multi-Investigator Research Awards, for a total of \$77,175,515 and supported the recruitment of 21 outstanding cancer researchers to Texas with recruitment awards totaling \$52,339,259” (CPRIT, 2014, p.11).

Despite the decline of cancer incidence and mortality in recent years, it still remains a prevalent threat today. Researchers feel that with enough funding there is the possibility of a cure in the coming years. Until then, prevention awareness, early detection and effective treatment will be the only means of preventing or treating someone with cancer. Additionally, “developing the philosophical, ethical, and political framework necessary to balance the benefits of future advances with our ability to pay for them is one of the next great challenges for health policy” (Kaiser Family Foundation, 2012, p32).

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