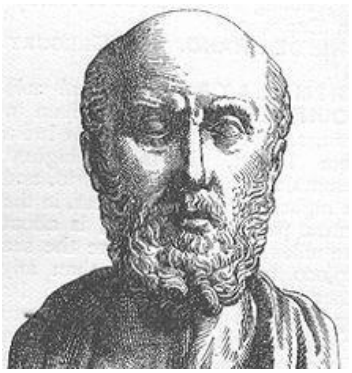
Cancer Association of South Africa (CANSA)

Research • Educate • Support

Fact Sheet
on
Cancer

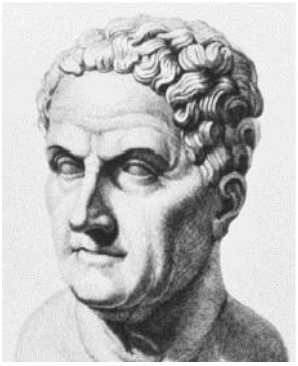
Introduction

The word cancer originated when 'the father of medicine', Hippocrates (460-370 BC) used the term *carcinos* and carcinoma to describe tumours, both ulcerous and non–ulcerous. Another Roman physician, Galen (130-200 AD) used the word *oncos* ('swelling' in Greek) which is now used to describe oncologists.



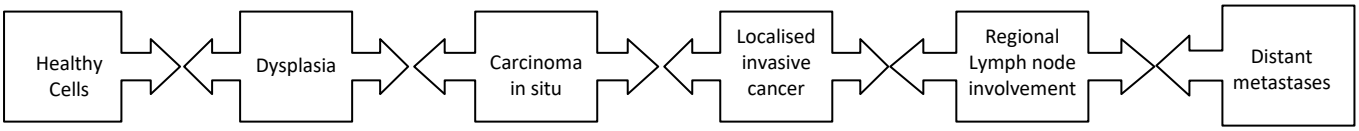
[Picture Credit: Hippocrates]

[Picture Credit: Galen]



Definition

Cancer is the term for a group of over 100 different diseases (solid tumours and haematological cancers), which includes malignant tumours of different sites. Most are named after the organ or type of cell in which they originate. Cancer is characterised by the uncontrolled growth of abnormal cells occurring in multiple phases (illustrated).



[Source: National Cancer Control Programmes – Policies and Managerial Guidelines. World Health Organization. 2nd Edition, 2002].

There are more than two hundred (200) different kinds of cancer. Cancer can develop in almost any organ or tissue, such as the lung, colon, breast, skin, bones, or nerve tissue (PubMed Health).

Causes Of Cancer
There are many causes of cancer, including:

Tobacco Use
After years of research the links between tobacco use and smoking and cancer are now clear. Smoking is by far the most important preventable cause of cancer in the world.

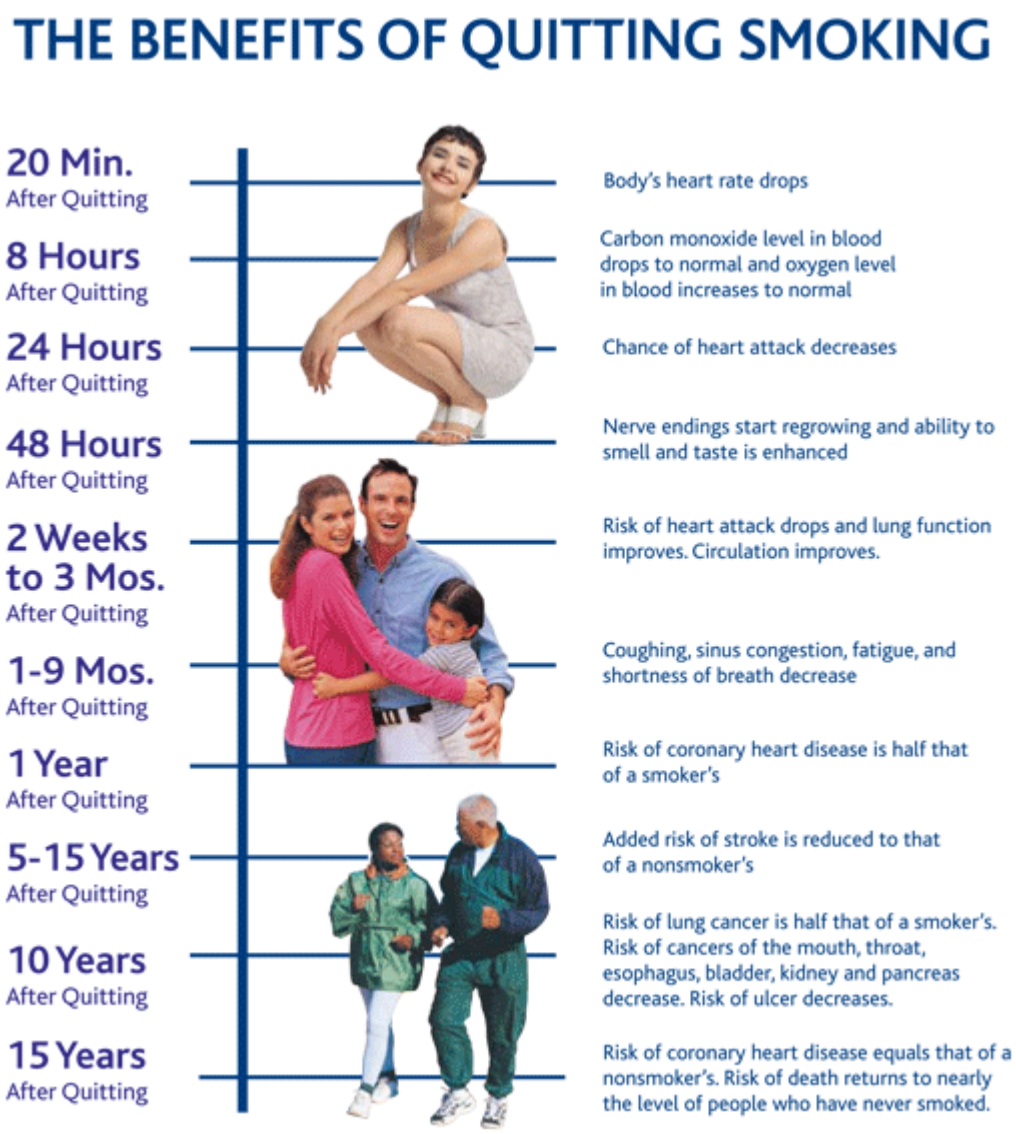
Tobacco use also increases the risk for over a dozen other cancers including cancers of the mouth, larynx (voice box), pharynx (upper throat), nose and sinuses, oesophagus (food pipe), liver, pancreas, stomach, kidney, bladder, cervix and bowel, as well as one type of ovarian cancer and some types of leukaemia. There is also some evidence that tobacco could increase the risk for breast cancer (Cancer Research UK).

[Picture Credit: What is in a Cigarette?]

Smoking just one cigarette a day is sufficient for someone to die of a smoking-related disease. Even smoking a single cigarette can cause the cilia (tiny hair-like structures that move mucus out of the lungs) to become paralysed for up to eight hours preventing the removal of impurities from the airways that could cause lung disease.

It is never too late to stop tobacco use. The timeline of quitting smoking shows the following health benefits:

- 20 minutes after quitting - heart rate and blood pressure drops
- 12 hours after quitting - the carbon monoxide level in your blood drops to normal
- 2 weeks to 3 months after quitting - circulation improves and your lung function increases
- 1 to 9 months after quitting - coughing and shortness of breath decrease; cilia (tiny hair-like structures that move mucus out of the lungs) start to regain normal function in the lungs, increasing the ability to remove mucus, clean the lungs, and reduce the risk of infection
- 1 year after quitting - the excess risk of coronary heart disease is half that of a continuing smoker's
- 5 years after quitting - risk of cancer of the mouth, throat, oesophagus, and bladder are cut in half; cervical cancer risk falls to that of a non-smoker
- 10 years after quitting - the risk of dying from lung cancer is about half that of a person who is still smoking; the risk of cancer of the larynx (voice box) and pancreas decreases
- 15 years after quitting - the risk of coronary heart disease is that of a non –smoker
- 25 years after quitting - stroke risk can fall to that of a non-smoker



[Picture Credit: Benefits of Quitting Smoking]

These are just a few of the benefits of quitting smoking for good. Quitting smoking also lowers the risk for diabetes, improves the functioning of blood vessels, the heart and lungs. Quitting while young further reduces the health risks. Quitting at any age can give back years of life that would otherwise be lost if one continues to smoke.

Quitting tobacco use is one of the most important health decisions anyone can make. It is also an important part of cancer prevention. Contact CANSA to find out about the e-KickButt Programme to quit smoking. Refer to CANSA's Fact Sheet and Position Statement on Tobacco Products.

Infections

Viral Infections - in Third World countries, cancer viruses are estimated to cause approximately 20 per cent of all cancers in humans. Most viral infections however, do not lead to tumour formation as several factors influence the progression from viral infection to cancer development. Some of these factors include the host's genetic makeup, mutation occurrence, exposure to cancer causing agents, and immune impairment. Viruses typically

initiate cancer development by suppressing the host's immune system, causing inflammation over a long period of time, or by altering host genes (About.Com Biology).

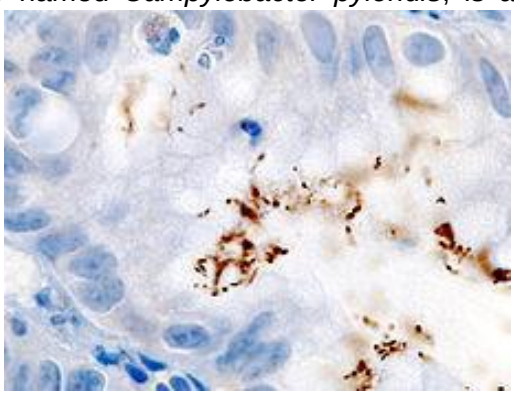
An estimated 20 percent of all human cancers worldwide may be attributed to viruses, representing a significant portion of the global cancer burden. Both DNA and RNA viruses have been shown to be capable of causing cancer in humans. Epstein-Barr virus (EBV), human papilloma virus (HPV), hepatitis B virus (HBV), and human herpes virus-8 are the four DNA viruses that are capable of causing the development of human cancers.

Human T Lymphotrophic Virus Type 1 and Hepatitis C (HCV) viruses are the two RNA viruses that contribute to human cancers.

Viruses and the Cancer(s) They Might Cause in Humans		
Agent:	**Sufficient Evidence:**	**Limited Evidence:**
Human Papillomavirus (HPV)	Cervix Vulva Vagina Penis Anus Oral cavity Oropharynx Tonsils	Larynx
Hepatitis B Virus (HBV)	Hepatocellular carcinoma	Cholangiocarcinoma Non-Hodgkin lymphoma
Hepatitis C Virus (HCV)	Hepatocellular carcinoma Non-Hodgkin lymphoma	Cholangiocarcinoma
Human T-cell Lymphotrophic Leukaemia Virus 1(HTLV-1)	Leukaemia	Lymphoma
Human Immunodeficiency Virus (HIV)	Kaposi's sarcoma Non-Hodgkin lymphoma Hodgkin lymphoma Cervical cancer Anal cancer	Vulva Vagina Penis Non-melanoma skin cancer Hepatocellular carcinoma Multicentric Castleman's Disease
Human Herpes Virus 8 (HHV-8)	Burkitt's lymphoma Immune-suppression-related non-Hodgkin lymphoma	
Extranodal NK/T-cell (nasal type)	Hodgkin lymphoma	
Aggressive NK-cell leukaemia	Leukaemia	
Epstein-Bar Virus (EBV)	Burkitt's lymphoma Hodgkin lymphoma Non-Hodgkin lymphoma Nasopharyngeal carcinoma Leiomyosarcoma arising in immune-compromised individuals	

(World Health Organization)

Bacterial Infections – *Helicobacter Pylori* previously named *Campylobacter pyloridis*, is a Gram-negative, micro-aerophilic bacterium found in the stomach. It was identified in 1982 by Barry Marshall and Robin Warren, who found that it was present in patients with chronic gastritis and gastric ulcers, conditions that were not previously believed to have a microbial cause. It is also linked to the development of duodenal ulcers and stomach cancer. However, over 80 per cent of individuals infected with the bacterium are asymptomatic and it has been postulated that it may play an important role in the natural stomach ecology.



[Picture Credit: Heliobacter Pylori]

In 1994, the International Agency for Research on Cancer (IARC) classified *H. pylori* as a carcinogen (cancer-causing agent) in humans. Colonisation of the stomach with *H. pylori* has been increasingly accepted as an important cause of stomach cancer and of gastric mucosa-associated lymphoid tissue (MALT) lymphoma. Infection with the bacteria is also associated with a risk for oesophageal adenocarcinoma (National Cancer Institute).

More than 50% of the world's population harbour *H. pylori* in their upper gastrointestinal tract. Infection is more prevalent in developing countries, and incidence is decreasing in Western countries. *H. pylori*'s helix shape (from which the generic name is derived) is thought to have evolved to penetrate the mucous lining of the stomach.

Parasitic Infections

Schistosoma Haematobium is a fluke–like worm that lives in water in endemic areas in Africa and the Middle East. Schistosomiasis, also known as bilharzia, is caused by this parasite. Studies have shown a relationship between *S. haematobium* infection and the development of squamous cell carcinoma of the bladder (Science20.com).

[Picture Credit: Schistosoma Haemotobium]

Chlonorchis sinensis, the Chinese liver fluke, is a human liver fluke in the class Trematoda, *Phylum Platyhelminthes*. This parasite lives in the liver of humans, and is found mainly in the common bile duct and gall bladder, feeding on bile. These parasites, which are believed to be the third most prevalent worm parasite in the world, are endemic to Japan, China, Taiwan, and Southeast Asia, currently infecting an estimated 30 million humans. It cannot pass from person to person.
(IARC).

[Picture Credit: Chlonorchis sinensis]

Transmission of the fluke relies on the presence of snails and fish in freshwater ponds. Eggs excreted from humans or other infected mammals, e.g. pigs, are ingested by snails and developed into the free-swimming form (i.e. cercariae). The cercariae in the pond get into contact with the fish skin and changes into an encysted form called metacercariae. When humans eat the infected fish, the metacercariae comes out from the cyst while in the duodenum (small bowel) and migrates to the biliary duct (gall bladder duct) in the liver. They mature in the biliary duct and start to form eggs that can pass with bile into faeces and continue the transmission cycle.

The fluke can cause obstruction of the bile duct and can cause liver cirrhosis. In severe cases the infection can result in chronic jaundice and eventually cholangiocarcinoma (cancer arising from bile duct cells).
(Centre for Food Safety).

Lifestyle Factors

Two major lifestyle factors that contribute towards development of cancer are obesity and a lack of exercise.

Obesity is a condition in which a person has an abnormally high and unhealthy proportion of body fat. To measure obesity, researchers commonly use a scale known as the body mass index (BMI). BMI is calculated by dividing a person's weight (in kilograms) by their height (in metres) squared. BMI provides a more accurate measure of obesity or being overweight than weight alone.

Obesity is associated with increased risks of the following cancer types, and possibly others as well:

- Oesophagus
- Breast (after menopause)
- Uterus
- Prostate
- Pancreas
- Colon and rectum
- Bowel
- Endometrium (lining of the uterus)
- Kidney
- Thyroid
- Gallbladder

(National Cancer Institute; IARC; Cancer Research UK).

There is limited evidence regarding whether physical activity is most protective if done in a single session or in increments throughout the day, but it is reasonable to assume that benefits can be accumulated in separate sessions of 20 to 30 minutes each. Data suggests that 60 minutes of moderate to vigorous activity on five or more days per week helps to prevent weight gain and obesity in adults.

Apart from effects on obesity, physical activity appears to have other effects on assisting in reducing the risk for cancers of the colon and breast, even when activity is not initiated until later in life (Life is Beautiful).

Environmental Factors

Environmental factors include exposure to carcinogenic (cancer causing) chemicals and radiation.

Exposure to carcinogens

- Human bio-monitoring studies show that many environmental contaminants, including known and potential carcinogens (cancer causing agents), are finding their way into people's bodies. The sources of these contaminants are wide-ranging and the following are some examples:

- Pesticides: conventional pesticides used in agriculture, industry, home, and garden, as well as chlorine and other disinfectants, and wood preservatives.

- Industrial chemicals, wastes, and waste byproducts from mining facilities, smelting operations, chemical manufacturing and processing plants, petrochemical plants, and

medical and municipal waste facilities. Such facilities release billions of kilograms of chemicals into the environment every year.

- Chemicals in consumer products, including building materials, furniture, and food packaging materials, and cosmetics

- Pollution from coal-fired power plants, automobile exhaust, and other sources

There are **481 known substances** linked to cancer in humans. The following represent these substances according to the IARC classification of carcinogens (substances that can cause cancer):

Group 1	*Carcinogenic to humans*	118 agents
Group 2A	*Probably carcinogenic to humans*	75
Group 2B	*Possibly carcinogenic to humans*	288

(IARC).

Environmental Toxins
Environmental toxins such as certain poisonous mushrooms and a type of fungus, called aflatoxins, may grow on grains under unfavourable storage conditions especially maize and peanuts and may cause cancer (MedlinePlus).

Radiation
Radiation is the emission (sending out) of energy from any source. X-rays are an example of radiation, but so is the light that comes from the sun and the heat, and is constantly coming off our bodies.

When talking about radiation and cancer, many people think of specific kinds of radiation such as x-rays or the radiation made by nuclear reactors, but there are different types of radiation that are not linked to cancer.

Radiation exists across a spectrum from very high-energy (high-frequency) radiation to very low-energy (low-frequency) radiation. This is sometimes referred to as the *electromagnetic spectrum*. From highest to lowest energy, the main forms of radiation are:

- Gamma rays
- X-rays
- Ultraviolet (UV) rays
- Visible light
- Infrared rays
- Microwaves
- Radiofrequency (radio) waves
- Extremely low-frequency (ELF) radiation

An important distinction that affects the health risks from radiation is whether the energy is ionising or non-ionising.

Ionising radiation is high-frequency radiation that has enough energy to remove (ionise) an electron from an atom or molecule. Ionising radiation has enough energy to damage the DNA in cells, which in turn may lead to cancer. Gamma rays, X-rays, some high-energy UV rays, and some sub-atomic particles such as alpha particles and protons are forms of ionising radiation.

Non-ionising radiation is low-frequency radiation that does not have enough energy to remove electrons or directly damage DNA. Low-energy UV rays, visible light, infrared rays, microwaves, and radio waves are all forms of non-ionising radiation. Aside from UV rays, these types of radiation are not known to increase cancer risk.

It is important to understand the difference between these types of radiation. For example, the non-ionising radiation given off by a cell phone or a television screen is not the same as the ionising radiation one might get from X-rays taken in the hospital.
(American Cancer Society).

Excessive exposure to sunlight

There is a definite causal relationship between ultraviolet (UV) exposure and the development of certain skin cancers. However, the relationship depends on the level and type of exposure, radiation intensities, kind of skin cancer, the person's skin type and possible genetic factors. Anyone can get skin cancer, although some people are at a greater risk than others. People with lighter skin colour, light hair and light eyes are more at risk, as they have less protective melanin in their skin to protect them. People who have long-term, unprotected sun exposure — chronic sun exposure — are at an increased risk (Skin Cancer Foundation). Refer to CANSA's Fact Sheet on Solar Radiation and Skin Cancer for additional information.

Hereditary Factors

Approximately ten per cent of cancers occur in persons who have inherited mutations in cancer predisposition genes. One of the biggest risks in colon, breast and prostate cancer is a familial history of cancer. Family history provides the cornerstone for identifying high risk individuals. Genetic testing can be done to determine whether a high risk person carries a gene mutation. What specifically causes mutations to occur in these genes is largely unknown. However, mutations can be caused by carcinogens (environmental factors known to increase the risk of cancer). The development of mutations is also a natural part of the aging process (Stanford Cancer Institute).

The four (4) most common hereditary cancers are:

- Breast cancer
- Ovarian cancer
- Prostate cancer
- Colorectal cancer

(American Cancer Society).

Alcohol Use

Alcohol was classified by the International Agency for Research on Cancer (IARC) as a Group 1 carcinogen.

It is known that alcohol use can cause varied health problems. However, many people may not be aware that alcohol use can increase one's risk for cancer. Even minimal use of alcohol will increase the risk for many cancers.

[Picture Credit: Alcohol]

Alcohol is a known cause of cancers of the:

- Mouth
- Throat (pharynx)
- Voice box (larynx)
- Oesophagus
- Liver
- Pancreas
- Colon and rectum
- Breast

With each of these cancers, the risk increases with the amount of alcohol consumed. Refer to CANSA's Lifestyle publication 'Life is Beautiful' for additional information.
(IARC; Cancer Research UK).

There is no doubt that alcohol can contribute to the cause of at least seven types of cancer. The more one cuts down on alcohol, the more reduction in the risk for cancer. A person does not need to be drunk to increase the risk for cancer. Drinking and smoking together are even worse. Not everyone who drinks will develop cancer. But on the whole, scientists have found that some cancers are more common in people who drink more alcohol than others.
(Cancer Research UK).

Chronic Inflammation

There is substantial evidence which supports the conclusion that chronic inflammation can predispose an individual to cancer. Chronic inflammation (inflammation which extends over a period of time) is caused by a variety of factors, including bacterial, viral, and parasitic infections, chemical irritants, and non-digestible particles.

The longer the inflammation persists, the higher the risk of carcinogenesis (cancer causing ability). Chronic inflammation contributes to neoplasia (new tumour development) by causing mutations, adaptive responses, resistance to apoptosis (cell death), and environmental changes such as stimulation of angiogenesis (new blood vessel formation).
(Shacter & Weitzman).

Epidemiological evidence points to a connection between inflammation and a predisposition for the development of cancer. Epidemiologic studies estimate that nearly 15 percent of the worldwide cancer incidence is associated with microbial infection.

Chronic infection such as human papilloma virus (HPV) or hepatitis B (HVB) and C (HVC) virus infection leads to cervical and liver cancers respectively.

In other cases germs may cause cancer due to opportunistic infection such as in Kaposi's sarcoma (a result of human herpes virus (HHV)-8 infection or human immunodeficiency virus (HIV) infection) or inappropriate immune responses to germs or viruses in certain individuals,

which may occur in gastric cancer following *Helicobacter pylori* infection or colon cancer because of long-standing inflammatory bowel disease.

In many other cases, conditions associated with chronic irritation and subsequent inflammation predispose to cancer, such as long-term exposure to cigarette smoke, asbestos, and silica (Rakoff-Nahoum, 2007).

Incidence of Cancer in South Africa

According to the National Cancer Registry (2012) the following number of cancer cases was histologically diagnosed in South Africa during 2012:

Group - Males 2012	Actual No of Cases	Estimated Lifetime Risk
All males	36 900	1:7
Asian males	843	1:7
Black males	11 666	1:10
Coloured males	4 336	1:4
White males	20 055	1:4

Group - Females 2012	Actual No of Cases	Estimated Lifetime Risk
All females	37 643	1:8
Asian females	1 085	1:7
Black females	16 514	1:10
Coloured females	4 172	1:6
White females	15 872	1:5

The frequency of histologically diagnosed cases of cancer in South Africa for 2012 was as follows (National Cancer Registry, 2012):

Group - Males 2012	0 – 19 Years	20 – 29 Years	30 – 39 Years	40 – 49 Years	50 – 59 Years	60 – 69 Years	70 – 79 Years	80+ Years
All males	539	543	1 705	3 450	7 021	10 112	8 548	2 629
Asian males	16	15	30	82	137	244	177	75
Black males	381	309	990	1 460	2 505	2 766	1 736	691
Coloured males	41	55	135	360	883	1 263	975	438
White males	74	1248	494	1 441	3 322	5 525	5 383	2 919

Group - Females 2012	0 – 19 Years	20 – 29 Years	30 – 39 Years	40 – 49 Years	50 – 59 Years	60 – 69 Years	70 – 79 Years	80+ Years
All females	411	826	3 240	5 711	7 607	8 184	6 613	4 207
Asian females	7	24	75	146	244	268	178	55
Black females	294	586	2 184	3 234	3 431	2 857	2 002	1 009
Coloured females	40	60	257	548	941	996	735	461
White females	58	139	660	1 644	2 808	3 861	3 538	2 588

N.B. In the event that the totals in any of the above tables do not tally, this may be the result of uncertainties as to the age, race or sex of the individual. The totals for 'all males' and 'all females', however, always reflect the correct totals.

Cancer as a Leading Cause of Death

The World Health Organization declared cancer the leading cause of death globally in 2010 with 7.6 million deaths. According to the *IARC Globocan Report*, an estimated 12.7 million new cancer cases occurred in 2008. Lung, female breast, colorectal and stomach cancers accounted for 40% of all diagnoses worldwide. In 2008 in South Africa, 207 males per 100 000 deaths and 124 female deaths per 100 000 were attributable to cancer. The lifetime risk for women to develop cancer is one in Nine (9) and for males is one in eight (8).

Researchers at the Medical Research Council (MRC) published an article in *The Lancet* in 2009 stating that South Africa has a quadruple burden of disease, namely HIV and Tuberculosis, Maternal and Child Mortality, Non-Communicable Diseases (NCD's) and Violence, Injuries and Trauma.

Most Prevalent Cancers Among Certain Groups in South Africa (Non-Melanoma Skin Cancers Excluded)				
Childhood**	**Adolescent Boys*****	**Adolescent Girls*****	**Adult Females******	**Adult Males******
Leukaemia	Bone	Leukaemia	Breast Cancer	Prostate Cancer
Lymphoma	Leukaemia	Bone	Cervical Cancer	Primary Site Unknown*
Central Nervous System Tumours	Non-Hodgkin Lymphoma	Connective Tissue	Primary Site Unknown*	Kaposi Sarcoma
Nephroblastoma	Hodgkin Lymphoma	Hodgkin Lymphoma	Kaposi Sarcoma	Lung Cancer
Sarcoma	Brain and Central Nervous System	Kaposi Sarcoma	Colorectal Cancer	Colorectal Cancer
Rhabdomyosarcoma	Testis	Brain and Central Nervous System	Cancer of Uterus	Cancer of Oesophagus
Neuroblastoma	Connective Tissue	Ovary	Non-Hodgkin's Lymphoma	Non-Hodgkin's Lymphoma
Bone	Melanoma	Thyroid	Cancer of Oesophagus	Bladder Cancer
Other malignancies	Kaposi sarcoma	Primary Site Unknown*	Cancer of the Lung	Stomach Cancer
Germ cells	Live and Bile Duct	Breast	Malignant Melanoma	Malignant Melanoma

(*) Primary Site Unknown means that the original site of the primary cancer could not be determines
(**) South African Paediatric Tumour Registry (2012)
(***) South African National Cancer Registry (2004)
(****) South African National Cancer Registry (2009)

How Cancer Kills

Not all cancers kill. Overall, more than 50% of people diagnosed with cancer live for more than 5 years. Some cancers have survival rates of more than 90%.

Early stage cancer also does not kill. It is for this reason that early diagnosis is so important – it is during early stage cancer that treatment is likely to work best.

Cancers can cause death in more than one way. There is, therefore, no single answer to the question of how cancer kills. It really depends on the type of cancer one has and which parts of the body are affected. There are some examples below.

Some types of cancer can spread to take over part of the body that does something essential for life. For example, if a cancer is growing in part of the digestive system, it can block it so that food cannot go through the intestines. If food cannot pass through, then the food cannot be absorbed.

If cancer affects the lungs, then eventually there is not enough healthy lung tissue to allow one to absorb enough oxygen and give off carbon dioxide. The cancer can also block off part

of the lung. This part then collapses and often becomes infected. If one has advanced cancer, one may not have the strength to fight off an infection, even with strong antibiotics. So the infection can eventually lead to death.

The human body has very finely balanced limits of certain body salts and chemicals. A cancer that has spread to the liver or bones can upset this chemical balance. The liver is the chemical factory of the body. It carries out many different tasks and is very important in maintaining the balance of body chemicals.

Cancer in the bones can affect the calcium balance of the body. If calcium levels go up or down in the blood, it upsets the whole chemical balance. Cancer in the bones can cause a lot of calcium to be released into the bloodstream. Normally the body has systems to correct this sort of imbalance. But when the imbalance becomes too great the systems do not work anymore. There is treatment to bring calcium levels back to normal, but these only work for a limited time. Then unfortunately the calcium levels will rise in the blood. If calcium continues to go up, it will cause the patient to become unconscious and eventually die.

If cancer cells take over the bone marrow, eventually the person will not have enough healthy bone marrow to make blood cells. In this event the person will not have enough red blood cells and will not have enough oxygen circulating around the body.

A drop in white blood cells means the patient has less resistance to infection. A drop in platelets means the patient is at greater risk of abnormal bleeding. If a blood vessel in a vital part of the body is damaged it can be life threatening. For example bleeding in the brain is a stroke, which can be fatal if the body cannot control it.

Some cancers make particular substances which upset the body balance. This can cause problems such as severe weight loss or dehydration, which will eventually overwhelm the natural balancing systems of the body.

Many treatments can control cancer for a long time, even if they cannot cure it. But if a cancer continues to grow, then unfortunately it can become too much for the body to cope with.
(Cancer Research UK).

Disease Prevention and Advancement of Health in Cancer Control

Primary prevention - primary prevention relates to activities aimed at reducing exposure to risk factors by promoting awareness and education. The primary prevention component is in line with, and supportive of, other efforts to increase public knowledge and the ability of individuals to make healthy lifestyle choices as well as creating environments that assist individuals in making healthy choices.

Interventions include using existing immunisation programmes with suitable vaccines and to immunise populations at risk against the biological agents at the origin of carcinogenesis (Hepatitis B viruses; HPV); reinforcing tobacco control; and involving traditional health practitioners in ensuring early referral of patients to health-care facilities are all examples.

Secondary prevention - secondary prevention involves the use of screening and tests to detect a cancer before the appearance of signs or symptoms at an early stage when cancers are curable. Before starting such a programme, the available evidence should be analysed

to estimate the effectiveness of the proposed activities. Essential requirements are an understanding of the natural history of the particular cancer, availability of a test that can detect it, effective treatment for it, good evidence that early detection reduces the incidence and/or mortality, and that the expected benefits of screening outweigh the risks and costs. A screening programme should be limited to significant cancers and applied selectively, and should be integrated into the total health care programme.

Programmes should take into account the risks, costs and expected benefits; provide quality assurance as well as facilities to follow, diagnose, and treat people with positive test results; maintain all records; and keep costs to a minimum. Ideally the effectiveness of screening should be demonstrated by randomised controlled trials showing a reduction in mortality, but this type of evidence exists for few cancers. Often an estimate of the effectiveness of screening must rest on other types of evidence, such as observations that the tests can detect the cancer before the appearance of signs or symptoms; that the tests can find a greater proportion of cancers in early stages; and that the patients with cancers detected through screening have higher survival rates after diagnosis and treatment (Eddy, 1986).

Tertiary prevention - according to the Centers for Disease Control and Prevention (CDC), tertiary prevention is focused on the individuals who have already been diagnosed or have symptoms.

The goals are:

- Pain control and symptom relief – according to the world Health Organization the relief of pain is a human right. Pain is a direct or indirect consequence of several diseases including cancer. The correct diagnosis and proper treatment of pain is an important public health concern. Millions of people in the world with severe acute and chronic pain suffer because of the ignorance of doctors and the lack of a standardised scientific approach. Refer to CANSA's Position Statement on Pain

- Prevention of complications of cancer and cancer treatment. Possible complications include
    - Lymphoedema - also known as lymphatic obstruction, is a condition of localised fluid retention and tissue swelling caused by a compromised lymphatic system. The lymphatic system returns the interstitial fluid to the thoracic duct and then to the bloodstream, where it is recirculated back to the tissues. Tissues with lymphoedema are at risk of infection. Refer to CANSA's Fact Sheet on Lymphoedema for additional information

    - Nausea and vomiting – nausea and vomiting are distressing symptoms in patients receiving cancer treatment as well as during palliative care for advanced cancer. Effective management can significantly improve the quality of life of patients. An understanding of the likely causes of these symptoms is required for accurate assessment and treatment, resulting in better symptom control. It can also be as a result of the cancer itself or as a result of cancer treatment
    - Anorexia - anorexia is the loss of appetite or inability to eat. Many cancer patients experience this prior to diagnosis and during treatment of the disease. Approximately 50% of patients with a new diagnosis of cancer have reported experiencing anorexia and unwanted weight loss

- Skin problems – some skin problems can result from the cancer itself while other problems could be caused as a result of cancer treatment and complications of bed rest. Common skin problems include:
    - Itching - some types of cancer produce substances that cause itching. Some types of treatment can also make you itchy. Itching can be very distressing.
    - Sweating - there are several reasons why someone may sweat a lot when they have cancer. Sweating can be very troublesome and embarrassing.
    - Pressure sores - pressure sores are wounds that develop when the skin is damaged by constant pressure or friction. When someone has cancer, they are at risk of developing pressure sores if they cannot move around very well.

- Mouth and throat problems - during cancer treatment, the mouth and/or throat may feel very dry, sore, or raw. This could be a side effect of some chemotherapy drugs and/or radiation therapy treatments

- Sleep disorders - Cancer patients are at great risk for developing insomnia (sleeplessness) and disorders of the sleep-wake cycle. Insomnia is often secondary to physical and/or psychological factors related to cancer and/or cancer treatment. Anxiety and depression, common psychological responses to the diagnosis of cancer, cancer treatment, and hospitalisation, are also correlated with insomnia

  Sleep disturbances may be exacerbated by paraneoplastic syndromes associated with steroid production and by symptoms associated with tumour invasion, such as draining lesions, gastrointestinal (GI) and genitourinary (GU) alterations, pain, fever, cough, dyspnoea (difficult of painful breathing), pruritus (itching), and fatigue. Medications including vitamins, corticosteroids, neuroleptics for nausea and vomiting, and sympathomimetics for the treatment of dyspnoea as well as other treatment factors can negatively impact on sleep patterns

- Hair loss - Some cancer treatments may cause one to lose some or all hair (alopecia). For instance, chemotherapy attacks rapidly-growing cancer cells, some chemotherapy drugs may also damage healthy cells such as hair follicles. The loss of hair may include scalp, facial, axillary, pubic and body hair. Radiation therapy may cause hair loss in the area that is treated

  Some people experience hair loss and others do not, or to varying degrees, even when undergoing the same treatment. If hair loss does occur, it usually begins within two weeks of starting treatment like chemotherapy and gets worse one to two months after the start of therapy. Hair will almost always grow back after treatment is complete. Regrowth usually occurs in six to eight weeks after completion of therapy. It is common for hair to grow back a slightly different colour and texture at first

- Pain – already discussed above

- Fatigue - Fatigue is the most common side effect of cancer treatment with chemotherapy, radiation therapy, or selected biologic response modifiers. Cancer treatment–related fatigue generally improves after therapy is completed, but some level of fatigue may persist for months or years following treatment. Research indicates that for at least a subset of patients, fatigue may be a significant issue long

into survivorship. Cancer treatment–related fatigue is reported in 14% to 96% of patients undergoing cancer treatment and in 19% to 82% of patients post treatment

- Care and support. For each person diagnosed, cancer is a unique experience. No two people will travel the same journey during and after cancer treatment. How people cope when diagnosed, during or after treatment (or even when in remission), is different for each individual. One common thread in all people with cancer is the need for a good support system.

At the CANSA Care Centres, CANSA provides holistic care and support to cancer survivors and their loved ones from the time of diagnosis, through all phases of need, including survivorship. The care and support provided by CANSA include:

- Provision of information
- Screening
- Cancer Control
- Specialist Care
- Provision of board and lodging while away from home (rural areas) and undergoing cancer treatment
- Individual Counselling
- Spiritual support
- Support Groups
- Support for Children & Youth and their families

The overall aim coupled with the goals is to ensure and implement diagnosis and provide treatment strategies through tertiary prevention that ensure that the majority of patients have access to efficient diagnostic and sufficient treatment facilities.

The following seven (7) strategies should be considered in assisting in reducing the risk for cancer.

Eat a healthy diet - Although making healthy selections at the grocery store and at mealtime cannot guarantee cancer prevention, it might help reduce the risk. Guidelines include:

- Eat plenty of vegetables and fresh fruit (in season). Diet should be based on fruits, vegetables and other foods from plant sources — such as whole grains and beans
- Limit fat intake. Eat lighter and leaner by choosing fewer high-fat foods, particularly those from animal sources. High-fat diets tend to be higher in calories and might increase the risk of overweight or obesity — which can, in turn, increase the risk for cancer
- Avoid or limit alcohol consumption. The risk for various types of cancer — including cancer of the breast, colon, lung, prostate, kidney and liver — increases with the amount of alcohol consumed and the length of time of drinking regularly

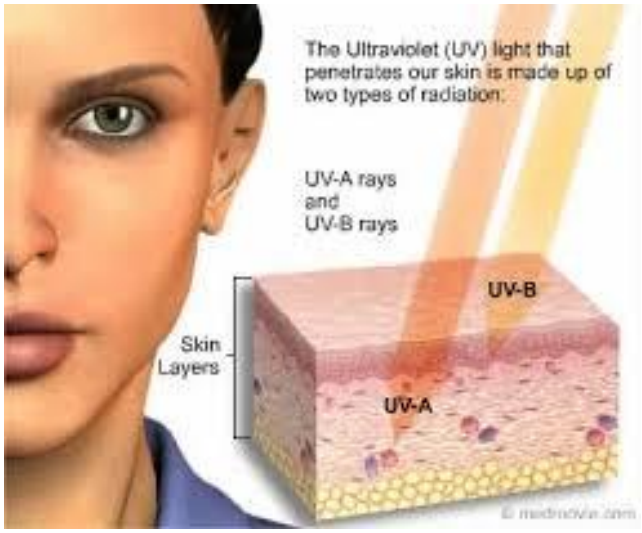
[Picture Credit: Healthy Weight]

Maintain a healthy weight and be physically active - Maintaining a healthy weight might assist in lowering the risk for various types of cancer, including cancer of

the breast, prostate, lung, colon and kidney. Physical activity counts, too. In addition to helping to control weight, physical activity on its own might assist in lowering the risk for breast cancer and colon cancer.

Protect against the harmful UV rays of the sun - Skin cancer is the most common kind of cancer — and also of the most preventable.

- Avoid midday sun **-** stay out of the sun between 10:00 and 15:00 when the sun's rays are strongest
- Stay in the shade when outdoors. Sunglasses with a protection of 400 and a broad-rimmed hat are essential



[Picture Credit: UV Radiation]

- Cover exposed areas - wear tightly woven, loose fitting clothing that covers as much of the skin as possible. Opt for bright or dark colours, which reflect more ultraviolet radiation than pastels or bleached cotton
- Do not skimp on sunscreen - use generous amounts of sunscreen, at least a teaspoon (5ml), on each limb, front and back of the body as well as the face, neck and ears, at least 20 minutes before going outdoors into the sun. Reapply the sunscreen every two hours
- Avoid tanning beds and sunlamps - these are just as damaging as natural sunlight.

Get immunised - Cancer prevention includes protection from certain viral infections. Talk to a doctor about immunisation against:

- Hepatitis B. Hepatitis B is responsible for 80% of primary liver cancer worldwide. The hepatitis B vaccine is recommended for certain high-risk adults — such as adults who are sexually active but not in a mutually monogamous relationship, people with sexually transmitted infections, intravenous drug users, men who have sex with men, and health care or public safety workers who might be exposed to infected blood or body fluids (Hepatitis B Foundation).
- Human papillomavirus (HPV). HPV is a sexually transmitted virus that can lead to cervical and other genital cancers as well as squamous cell cancers of the head and neck.

Avoid risky behaviours - Another effective strategy in assisting to lower the risk for cancer is to avoid risky behaviours that can lead to infections which, in turn, might increase the risk for cancer.

For example:

- Practice safe sex. Limit the number of sexual partners and use a condom when having sex. The more sexual partners, the more likely to contract a sexually transmitted infection — such as HIV or HPV. People who have HIV or AIDS have a higher risk for cancer of the anus, liver and lung. HPV is most often associated with cervical cancer, but it might also increase the risk for cancer of the anus, penis, throat, vulva and vagina
- Sharing needles with an infected drug user can lead to HIV, as well as hepatitis B and hepatitis C — which can increase the risk for liver cancer. If concerned about drug abuse or addiction, seek professional help

Get regular medical care, and do self-examinations - Regular self-examinations and screenings for various types of cancers — such as cancer of the skin, colon, prostate, cervix and breast — can increase one's chances of discovering cancer early, when treatment is most likely to be successful. Ask a doctor about the best cancer screening schedule. Please refer to CANSA's Fact Sheet on A Balanced Lifestyle for additional information (Mayo Clinic; Life is Beautiful).

Diagnosis of Cancer

There is no single test that can accurately diagnose cancer. The complete evaluation of a patient usually requires a thorough history and physical examination along with diagnostic testing. Many tests are needed to determine whether a person has cancer, or if another condition (such as an infection) is mimicking the symptoms of cancer.

Effective diagnostic testing is used to confirm or eliminate the presence of disease, monitor the disease process, and to plan for and evaluate the effectiveness of treatment. In some cases, it is necessary to repeat testing when a person's condition has changed, if a sample collected was not of good quality, or an abnormal test result needs to be confirmed.

Diagnostic procedures for cancer may include imaging, laboratory tests (including tests for tumour markers), tumour biopsy, endoscopic examination, surgery, or genetic testing.

What are the different types of laboratory tests?

Clinical chemistry uses chemical processes to measure levels of chemical components in body fluids and tissues. The most common specimens used in clinical chemistry are blood and urine.

Many different tests exist to detect and measure almost any type of chemical component in blood or urine. Components may include blood glucose, electrolytes, enzymes, hormones, lipids (fats), other metabolic substances, and proteins.

The following are some of the more common laboratory tests:

Blood tests - A variety of blood tests are used to check the levels of substances in the blood that indicate how healthy the body is and whether infection is present. For example, blood tests revealing elevated levels of waste products, such as creatinine or blood urea nitrogen (BUN), indicate that the kidneys are not working efficiently to filter those substances out. Other tests check the presence of electrolytes - chemical compounds such as sodium and potassium that are critical to the body's healthy functioning. Coagulation studies determine how quickly the blood clots.

A complete blood count (CBC) measures the size, number, and maturity of the different blood cells in a specific volume of blood. This is one of the most common tests performed. Red blood cells are important for carrying oxygen and fighting anaemia and fatigue; the haemoglobin portion of the CBC measures the oxygen carrying capacity of the red blood cells while the haematocrit measures the percentage of red blood cells in the blood. White blood cells fight infection. Increased numbers of white blood cells, therefore, may indicate the presence of an infection. Platelets prevent the body from bleeding and bruising easily.

Urine tests - Urinalysis breaks down the components of urine to check for the presence of drugs, blood, protein, and other substances. Blood in the urine (haematuria) may be the result of a benign (noncancerous) condition, but it can also indicate an infection or other problem. High levels of protein in the urine (proteinuria) may indicate a kidney or cardiovascular problem.

Tumour markers - Tumour markers are substances either released by cancer cells into the blood or urine or substances created by the body in response to cancer cells. Tumour markers are used to evaluate how well a patient has responded to treatment and to check for tumour recurrence. Research is currently being conducted on the role of tumour markers in detection, diagnosis, and treatment of cancers.

According to the National Cancer Institute (NCI), tumour markers are useful in identifying potential problems, but they must be used with other tests for the following reasons:

People with benign conditions may also have elevated levels of these substances in their blood.

Not every person with a tumour has tumour markers. Some tumour markers are not specific to any one type of tumour.

The following is a brief description of some of the more useful tumour markers:

Prostate-specific antigen (PSA)
Prostate-specific antigen is always present in low concentrations in the blood of adult males. An elevated PSA level in the blood may indicate prostate cancer, but other conditions such as benign prostatic hyperplasia (BPH) and prostatitis can also raise PSA levels. PSA levels are used to evaluate how a patient has responded to treatment and to check for tumour recurrence.

Prostatic acid phosphatase (PAP)
This is a different test to the PAP-test that is done for cervical cancer. PAP originates in the prostate and is normally present in small amounts in the blood. In addition to prostate cancer, elevated levels of PAP may indicate testicular cancer, leukaemia, and non-Hodgkin's lymphoma, as well as some non-cancerous conditions.
(Stanford Cancer Institute),

Classification of Cancers
Cancers may be classified by their primary site of origin or by their histological or tissue types.

Classification by site of origin - *b*y primary site of origin, cancers may be of specific types like breast cancer, lung cancer, prostate cancer, liver cancer, renal cell carcinoma (kidney cancer), oral cancer, brain cancer etc.

Classification by tissue types - *t*he international standard for the classification and nomenclature of histologies is the International Classification of Diseases for Oncology, (ICD-1O).

Based on tissue types cancers may be classified into six major categories:

- Carcinoma - this type of cancer originates from the epithelial layer of cells that form the lining of external parts of the body or the internal linings of organs within the body.
- Sarcoma - these cancers originate in connective and supportive tissues including muscles, bones, cartilage and fat. Bone cancer is one of the sarcomas termed osteosarcoma. It affects the young most commonly. Sarcomas appear like the tissue in which they grow.
- Myeloma - these originate in the plasma cells of bone marrow. Plasma cells are capable of producing various antibodies in response to infections. Myeloma is a type of blood cancer.
- Leukaemia – this is a group of cancers that are grouped within blood cancers. These cancers affect the bone marrow which is the site for blood cell production. When cancerous, the bone marrow begins to produce excessive immature white blood cells that fail to perform their usual actions and the patient is often prone to infection
- Lymphoma - these are cancers of the lymphatic system. Lymphomas are 'solid cancers'. Lymphomas may be of two types – Hodgkin's lymphoma and Non-Hodgkin's lymphomas. In Hodgkin lymphoma there is characteristic presence of Reed-Sternberg cells in the tissue samples which are not present in Non-Hodgkin lymphoma.
- Mixed types - these have two or more components of the cancer. Some of the examples include mixed mesodermal tumour, carcinosarcoma, adenosquamous carcinoma and teratocarcinoma. Blastomas are another type that involves embryonic tissues.

Classification by grade - cancers can also be classified according to grade. The abnormality of the cells with respect to surrounding normal tissues determines the grade of the cancer. Increasing abnormality increases the grade, from 1–4.

Cells that are well differentiated closely resemble normal specialized cells and belong to low grade tumours. Cells that are undifferentiated are highly abnormal with respect to surrounding tissues. These are high grade tumours.

- Grade 1 – well differentiated cells with slight abnormality
- Grade 2 – cells are moderately differentiated and slightly more abnormal
- Grade 3 – cells are poorly differentiated and very abnormal
- Grade 4 – cells are immature and primitive and undifferentiated

Classification by stage - cancers are also classified individually according to their stage. There are several types of staging methods. The most commonly used method uses classification in terms of tumour size (**T**), the degree of regional spread or node involvement (**N**), and distant metastasis (**M**). This is called the TNM staging.

For example, T0 signifies no evidence of tumour, T 1 to 4 signifies increasing tumour size and involvement and Tis signifies carcinoma in situ or limited to surface cells. Similarly N0 signifies no nodal involvement and N 1 to 4 signifies increasing degrees of lymph node involvement. Nx signifies that node involvement cannot be assessed. Metastasis is further classified into two – M0 signifies no evidence of distant spread while M1 signifies evidence of distant spread.

Stages may be divided according to the TNM staging classification. Stage 0 indicates cancer being in situ or limited to surface cells while stage I indicates cancer being limited to the tissue of origin. Stage II indicates limited local spread, Stage II indicates extensive local and regional spread while stage IV is advanced cancer with distant spread and metastasis. (Mandal)

The TNM staging was developed by Professor Pierre Denoix in 1932 at the Institute Gustav-Roissy. The UICC established a special committee together with the International Federation of Gynaecological and Obstetrics (FIGO). The UICC and AJCC classifications was unified in 1987. The American Joint Committee on Cancer (AJCC) was established in 1959 to devise and publish the classification of cancer in the AJCC Manual and Handbook.

Treatment of Cancer

Before treatment can commence after diagnosis, a full physical workup will be required (a workup can also accompany the diagnostic tests) and can include the following:

- Blood analysis for full blood count and differential cell count, kidney and liver function, tumour markers such as PSA (prostate specific antigen) in prostate cancer
- X- rays
- Ultrasound
- Mammography
- CAT Scan (computerised axial tomography)
- MRI scan (magnetic resonance imaging)
- PET scan (positron emission tomography)
- Bone scan
- Hearing tests – some treatment may affect hearing
- Electro- cardiogram – some treatment may affect heart function
- MUGA scan(radionuclide ventriculography or radionuclide Angiography) – for heart function
- ERCP (endoscopic retrograde cholangiopancreatography)
- Bone marrow aspirate or bone marrow trephine biopsy(in the case of haematological tumours)
- Broncoscope (lung), colonoscope (colon), gastroscope (stomach) or laparoscope (abdomen) etc.

The primary objectives of cancer treatment are to provide equitable, appropriate and effective treatment and care to cancer patients. This is dependant and pertinent to the type of cancer, the site, tumour size, if, and how much it has spread (stage) and how it is affecting normal body functions.

The most frequent treatments are:

- Surgery - Surgery can be used to diagnose, treat, or even help prevent cancer in some cases. Most people with cancer will have some type of surgery. It often offers the greatest chance for cure, especially if the cancer has not spread to other parts of the body. Advances in surgical techniques have allowed surgeons to operate on a growing number of patients and have good outcomes.

When a surgeon has to cut into the body to operate, it's called *invasive surgery*. Today, operations that involve less cutting and damage to nearby organs and tissues (less invasive surgery) often can be done to remove tumours while saving as much normal tissue and function as possible

[Picture Credit: Surgery]

Surgery offers the greatest chance for cure for many types of cancer, especially those that have not spread to other parts of the body (American Cancer Society).

- Cytotoxic chemotherapy - Chemotherapy uses anti-cancer (cytotoxic) drugs to destroy cancer cells. Cytotoxic means toxic to cells. Chemotherapy drugs disrupt the way cancer cells grow and divide but they also affect normal cells.

  Sometimes chemotherapy is used alone to treat some types of cancer. However, often it is used with other treatments such as surgery, radiotherapy, hormonal therapy, or other anti-cancer drugs such as targeted or biological therapies.

(MacMillan.org).

[Picture Credit: Radiotherapy]

- Radiotherapy which may be external radiotherapy - External radiotherapy destroys cancer cells using radiation aimed at a cancer from a machine outside the body. The types of radiation used include high energy X-ray beams, cobalt irradiation or particle beams, such as protons or electrons. The most common types of external radiotherapy use photon beams (either as X-rays or gamma rays). The radiotherapy beams destroy the cancer cells in the treatment area.

(Cancer Research UK).

- Radiotherapy which may be internal radiotherapy (also called Brachytherapy) - Brachytherapy is an advanced cancer treatment. Radioactive seeds or sources are placed in or near the tumour itself, giving a high radiation dose to the tumour while reducing the radiation exposure in the surrounding healthy tissues. The term 'brachy' is Greek for 'short distance'. Brachytherapy is radiation therapy given at a short distance: localised, precise, and high-tech.

(Cancer Treatment Centers of America).

- Hormonal manipulation – Hormones are chemicals that are naturally produced by the organs making up the body's endocrine system (including the pancreas, as well as pituitary, thyroid and adrenal glands). These chemicals travel throughout the body via the bloodstream, coordinating the functions of various organs from head to toe. Hormones are responsible for regulating the function of just about every cell in the body. Some examples of hormones include: oestrogen, testosterone, insulin, thyroid hormone, cortisol, and epinephrine.

  Researchers have determined that some cancers are 'fueled' by hormones, and may rely upon them to grow. In these cases, blocking the action of these hormones could possibly stop the cancer from growing. (Oncolink).

- Biological therapy (also called immunotherapy, biological response modifier therapy, or biotherapy) uses the body's immune system to fight cancer. The cells, antibodies, and organs of the immune system work to protect and defend the body against foreign invaders, such as bacteria or viruses. Physicians and researchers have found that the immune system might also be able to both determine the difference between healthy cells and cancer cells in the body, and to eliminate the cancer cells.

  Biological therapies are designed to boost the immune system, either directly or indirectly, by assisting in the following:
  - making cancer cells more recognizable by the immune system, and therefore more susceptible to destruction by the immune system
  - boosting the killing power of immune system cells
  - changing the way cancer cells grow, so that they act more like healthy cells
  - stopping the process that changes a normal cell into a cancerous cell
  - enhancing the body's ability to repair or replace normal cells damaged or destroyed by other forms of cancer treatment, such as chemotherapy or radiation
  - preventing cancer cells from spreading to other parts of the body

  The Cost of Biological Therapy

  New drugs called Biologics offer lifesaving hope to many individuals but threaten to drive up health spending to unsustainable levels – leaving medical aids with exorbitant costs and individuals unable to afford them.

  There are about 250 such drugs, according to pharmaceutical consultant Val Beaumont helping 350 million people worldwide. She said new funding mechanisms will need to be designed to pay for these as medical aids cannot keep up with the costs.

  The newest biologic on the market released on Thursday, 22 January 2015, in South Africa for stage 4 Melanoma gives dying patients about 25% of surviving. Last week, Discovery Health received its first request for the drug, Ipilimumab, at a cost of R2.1 million for the member. It's oncology advisory board is reviewing the request.
  Liberty Medical Scheme spends about 15% percent of its pharmaceutical budget on biologics drugs for only 275 members.

  In 2013, Discovery Health Medical Scheme spent R1-billion out of its R7-billion on drugs on these biologics for about one percent of members.

Discovery Health CEO Jonathan Broomberg said: "In 2013 there were 25 000 members claiming for high cost speciality medicines, up from 12 000 in 2008".
Biologic medicines include Herceptin for a particular breast cancer tumour, and chronic medicines for rheumatoid arthritis and inflammatory bowel disease.

Broomberg said: “The annual average cost per member for speciality medicines is approximately 10 times higher than the cost of a member taking non biologic chronic medicine”.

Currently Pretoria resident 22-month-old baby Brooklyn Rex has a rare a rare disease called Hemophagocytic Lymphohistiocytosis. Her parents import a biologic drug to keep her alive and prevent her from suffering from a permanent fever. As the biologic is not yet available in South African medical aids are not legally obliged to pay for it leaving the family raising more than R60 000 a month to keep their daughter alive.

Liberty Medical Scheme Principal Officer Andrew Edwards said besides high prices and increasing use, another problem with the medicines is they didn’t always work.

“One of the biggest challenges is managing the false perception that they represent a panacea. Much of the problem with these specialised medicines is that, while some patients experience clinically significant benefit, many patients do not.”

Many more such drugs coming to market.

Broomberg said: “According to IMS, a health research consultancy, biologics make up 36% of the late-stage pipeline medicines and 45% of the late stage oncology pipeline. IMS believes global spending on all cancer drugs, will reach about $100 billion in 2018, up from $65 billion in 2013”.

Beaumont explained that low number of patients, huge investment and the way the drugs are manufactured push up the prices.

Biologics, are often a copy of a particular protein or molecule from the body. The protein is grown in living cells in a lab in a process that could take months.

Fedhealth Principal Officer Peter Jordan said: “Medical aids are tasked with managing their funds in order to provide necessary coverage to all their members. They often have to rely on the principle of providing as much as possible to as many as possible of their members. Unfortunately, as the scheme funds are limited in order to keep member contributions affordable, some treatments and technologies have to be excluded from funding, or their funding may be limited. Fedhealth considers the overall scheme affordability, cost-effectiveness and medical evidence for new treatments when deciding on if and how these should be funded.”
(Biologics’ Sickening Costs).

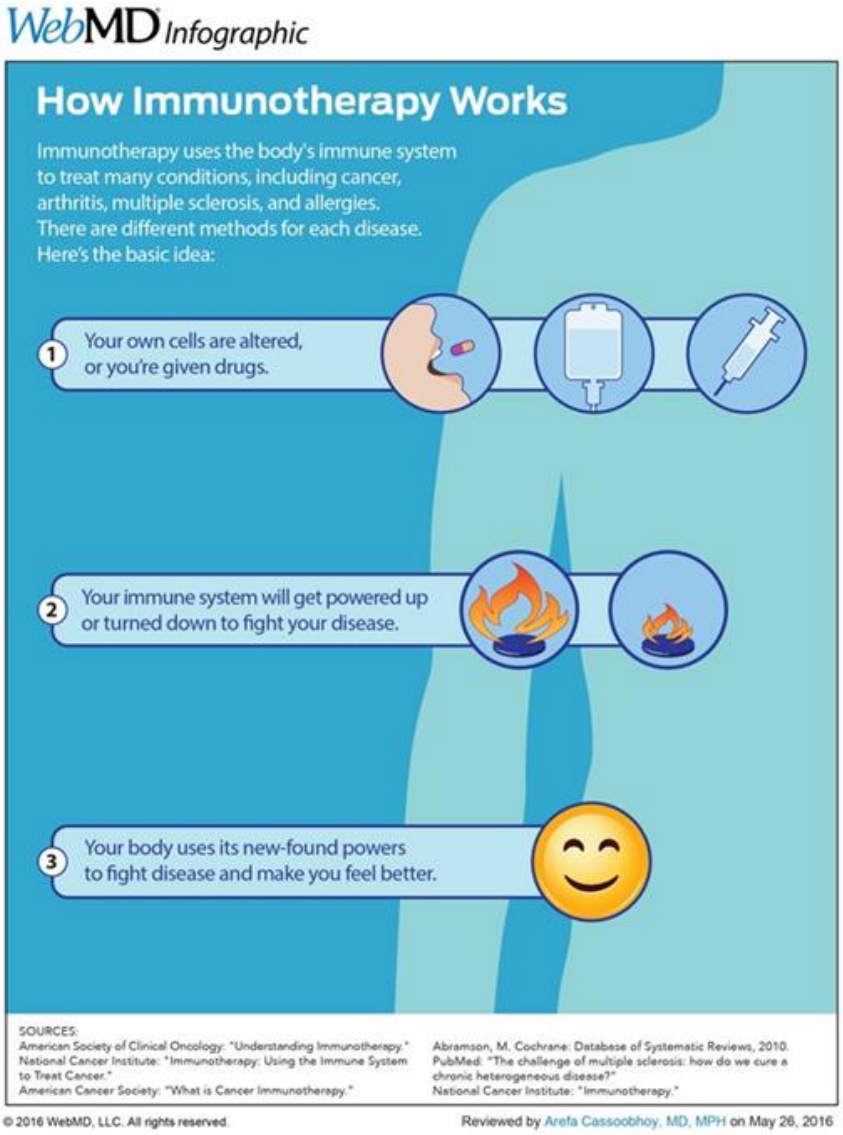
- Targeted therapy: Until the late 1990s nearly all drugs used in cancer treatment (with the exception of hormone treatments) worked by killing cells that were in the process of replicating their DNA and dividing to form 2 new cells. These chemotherapy drugs also killed some normal cells but had a greater effect on cancer cells.

Targeted therapies work by influencing the processes that control growth, division, and spread of cancer cells, as well as the signals that cause cancer cells to die naturally (the way normal cells do when they are damaged or old).

- Stereotactic radio-surgery: is therapy that uses special equipment to position the patient and precisely give a single large dose of radiation to a tumour. It is used to treat brain tumours and other brain disorders that cannot be treated by regular surgery

- Combined treatment of two or more of the above.

How Immunotherapy Works - Immunotherapy uses the body's immune system to treat many conditions, including cancer, arthritis, multiple sclerosis, and allergies. There are different methods for each disease.



Complications of Cancer
For cancer survivors to remain well includes maintaining a healthy lifestyle and following healthcare standards. In addition, it is important to keep in mind that special health needs may apply depending on the type of cancer they have had and the types of treatments they have received.

Cancer and its treatment can cause several complications, including:

- Pain can be caused by cancer or by cancer treatment. Medications and other approaches can effectively treat cancer-related pain.
- Fatigue in people with cancer has many causes, but it can often be managed. Fatigue associated with chemotherapy or radiation therapy treatments is common, but it's usually temporary.
- Difficulty breathing. Cancer or cancer treatment may cause a feeling of being short of breath. Treatments may bring relief.
- Nausea. Certain cancers and cancer treatments can cause nausea. Your doctor can sometimes predict if your treatment is likely to cause nausea. Medications and other treatments may help you prevent or cope with nausea.
- Diarrhoea or constipation. Cancer and cancer treatment can affect your bowels and cause diarrhoea or constipation.
- Weight loss**.** Cancer and cancer treatment may cause weight loss.
- Unusual immune system reactions to cancer. In some cases the body's immune system may react to the presence of cancer by attacking healthy cells. Called paraneoplastic syndromes, these unusual reactions can lead to a variety of signs and symptoms, such as difficulty walking and seizures.
- Cancer that spreads. As cancer advances, it may spread (metastasize) to other parts of the body. Where cancer spreads depends on the type of cancer.
- Cancer that recurs. Cancer survivors have a risk of cancer recurrence. Some cancers are more likely to recur than others. Ask your doctor about what you can do to reduce your risk of cancer recurrence. Your doctor may devise a follow-up care plan for you after treatment. This plan may include periodic scans and exams in the months and years after your treatment, to look for cancer recurrence.
- A new primary cancer. It can occur that a cancer survivor may experience the occurrence of a new primary cancer that has no relationship with the previous cancer

(Mayo Clinic).

Complementary Therapies
There is currently no scientific evidence that alternative cancer treatments are more efficacious and/or safer than current cancer treatment regimens. However, there are many natural substances, like essential fatty acids (e.g. Omega-3), phytochemicals and micronutrients, which are supported by considerable scientific evidence, indicating these substances can reduce the risk for cancers and even inhibit tumour growth - that could be recognised as complementary to existing conventional therapies to enhance and improve efficacy of cancer prevention and treatment.

Palliative Care
Palliative care comprises any form of treatment and care that focus on the patient's symptoms, quality of life and those affected by cancer. Palliative care is given throughout the

continuum of care even when curative therapy is given or end-of-life care which may be at the cancer treatment centre, in hospital, hospitium or at home.

The goals of palliative care include:

- Alleviation of distressing symptoms such as pain, nausea, breathlessness, insomnia, and other physical symptoms caused by cancer or its treatment
- Provision of emotional and psycho-social support, as well as symptoms such as anxiety or helping with difficult family relationships
- Addressing the patient's spiritual needs or concerns
- Addressing the patient's practical needs, such as transportation
- Supporting the patient's family, friends, and caregivers

Global, African and South African Cancer Control

The World Cancer Declaration 2008 builds on the Charter of Paris and the World Cancer Declaration approved by the World Cancer Congress in Washington in 2006 which calls for concerted strategic action to reduce the global cancer burden.

The World Health Assembly (WHA) Resolution 58.22

Cancer control has escalated to include the development of new strategies. The WHO 58th World Health Assembly reinforced cancer control to include comprehensive policies for member states to implement four components of cancer control: prevention, early detection, diagnosis and treatment and palliative care. This is outlined in the WHO Cancer Control Strategy that was adopted at the 58th World Health Assembly in May 2005 (WHA 58.22).

The World Health Organization (WHO)

The World Health organization is a specialised agency within the Charter of the United Nations which was established in 1948 by 61 governments for the purpose of cooperation among themselves and with others to promote the health of all people. The current number of member states is 191.

The World Health Organization is part of the United Nations and has various affiliate bodies involved specifically in cancer control.

The International Agency for Research in Cancer (IARC)

IARC is based in Lyon, France. It researches and monitors environmental and occupational carcinogens, and the HPV Centre in Barcelona, Spain, that does research in Human Papilloma Virus and the vaccines as well as cervical cancer monitoring and screening processes worldwide.

The United Nations Sustainable Development Goals

The new Sustainable Development Goals (SDGs), or Global Goals, will guide policy and funding for the next 15 years, beginning with a historic pledge to end poverty. Everywhere. Permanently.

The Global Goals replace the Millennium Development Goals (MDGs), which in September 2000 rallied the world around a common 15-year agenda to tackle the indignity of poverty.

Union for International Cancer Control (UICC)

The UICC was founded in 1933 by cancer researchers who recognised the need to share knowledge and expertise globally. The Union for International Cancer Control is the largest cancer control NGO in the world, based in Geneva, Switzerland, it is non-sectarian and non-political. The UICC was founded in 1933 and unites over 300 member organisations, specialised and engaged in cancer control, in more than 100 countries across the world. The UICC's mission is to connect, mobilise and support organisations, leading experts, key stakeholders and volunteers in a dynamic community working together to eliminate cancer as a life-threatening disease for future generations. UICC is governed by its member organisations, which meet in a general assembly, held in conjunction with the World Cancer Congress, every two years.

The Framework Convention on Tobacco Control (FCTC)

The WHO Framework Convention on Tobacco Control (FCTC) is the first and only treaty ever to be negotiated through the WHO. Its objective, as set out in Article 3, is 'to protect present and future generations from the devastating health, social, environmental and economic consequences of tobacco consumption and exposure to tobacco smoke by providing a framework for tobacco control measures to be implemented by the Parties at the national, regional and international levels in order to reduce continually and substantially the prevalence of tobacco use and exposure to tobacco smoke'.

South Africa signed the FCTC on 16 June 2003 and ratified acceptance on 19 April 2005 and is one of 161 Parties, covering more than 85% of the world's population. Since entering into force as international law in February 2005, the FCTC has become the framework through which its Parties make, implement and are held accountable for their tobacco control laws and policies.

The International Non–Communicable Disease Alliance (NCD Alliance)

The international NCD Alliance was formed in 2003 by four global NGO's representing the four main NCD's namely diabetes, cardiovascular disease, cancer and chronic respiratory disease. An international network of more than 2 000 civil society organisations in over 170 countries are affiliated to the NCD Alliance. The mission of the NCD Alliance is to fight the NCD epidemic by making health the primary objective by mobilising the 2,000 organisations and advocating that NCD's are a priority that requires urgent response from governments and policymakers.

The South African National Cancer Control Programme (NCCP)

South Africa currently still does not have a National Cancer Control Programme (NCCP)

The objectives of the 2009 NCCP, updated by CANSA for the National Department of Health, were to:

- Increase public knowledge of cancer, risk factors, prevention, early diagnosis, treatment and palliative care
- Identify vulnerable and at risk populations for cancer
- Develop a model that is consistent with the primary health care system that is already in place

- Develop a programme that will create a measurable positive impact on quality of life and ensure sustainability

- Promote population ownership and promote community participation

In April 2011, new regulations on the registration of cancers were promulgated. These regulations make it compulsory for every health care worker who has diagnosed a new case of cancer to notify the case on the prescribed form (3) (Act No. 61 of 2006 - Regulations related to Cancer Registration No. R.380). The regulations make provision for the establishment of a population-based cancer registry, which is defined as "the registration of the details of every cancer that occurs in a defined population, usually in those persons resident within the boundaries of a defined geographical region or country".

The responsibility for managing the pathology, specialised and population based registries was given to the National Health Laboratory Service (NHLS). The Chief Executive Officer of the NHLS was tasked with ensuring that the National Cancer Registry conformed to the norms and standards as set in the regulations. The regulations also include penalties for non-reporting.

The notification form, which has also been gazetted, includes patient demographic information, risk factors (occupation, smoking, alcohol use, HIV status), and clinical and laboratory details (PHASA).

The Minister of Health, Dr Aaron Pakishe Motsoaledi has established of a Ministerial Advisory Committee on the Prevention and Control of Cancer and the appointment of its inaugural members. The Committee will advise the Minister on all matters relating to the prevention and control of cancer in line with Section 91 (1) of the National Health Act.

The National Department of Health recognises that cancers, together with other non-communicable diseases such as diabetes, cardiovascular diseases and chronic respiratory diseases are leading causes of preventable mortality and morbidity in South Africa.

The inputs from a range of authorities are critical to combat cancer and the Minister looks forward to a productive evidence based engagement with experts including medical specialists, representatives of civil society and survivors. This committee will benefit the state to plan and implement comprehensive preventative, control and support services and more importantly it will benefit patients and their families by meeting their needs for quality care.
(Department of Health).

About Clinical Trials
Clinical trials are research studies that involve people. These studies test new ways to prevent, detect, diagnose, or treat diseases. People who take part in cancer clinical trials have an opportunity to contribute to scientists' knowledge about cancer and to help in the development of improved cancer treatments. They also receive state-of-the-art care from cancer experts.

Types of Clinical Trials

Cancer clinical trials differ according to their primary purpose. They include the following types:

Treatment - these trials test the effectiveness of new treatments or new ways of using current treatments in people who have cancer. The treatments tested may include new drugs or new combinations of currently used drugs, new surgery or radiation therapy techniques, and vaccines or other treatments that stimulate a person's immune system to fight cancer. Combinations of different treatment types may also be tested in these trials.

Prevention - these trials test new interventions that may lower the risk of developing certain types of cancer. Most cancer prevention trials involve healthy people who have not had cancer; however, they often only include people who have a higher than average risk of developing a specific type of cancer. Some cancer prevention trials involve people who have had cancer in the past; these trials test interventions that may help prevent the return (recurrence) of the original cancer or reduce the chance of developing a new type of cancer

Screening - these trials test new ways of finding cancer early. When cancer is found early, it may be easier to treat and there may be a better chance of long-term survival. Cancer screening trials usually involve people who do not have any signs or symptoms of cancer. However, participation in these trials is often limited to people who have a higher than average risk of developing a certain type of cancer because they have a family history of that type of cancer or they have a history of exposure to cancer-causing substances (e.g., cigarette smoke).

Diagnostic - these trials study new tests or procedures that may help identify, or diagnose, cancer more accurately. Diagnostic trials usually involve people who have some signs or symptoms of cancer.

Quality of life or supportive care - these trials focus on the comfort and quality of life of cancer patients and cancer survivors. New ways to decrease the number or severity of side effects of cancer or its treatment are often studied in these trials. How a specific type of cancer or its treatment affects a person's everyday life may also be studied.

Where Clinical Trials are Conducted

Cancer clinical trials take place in cities and towns in doctors' offices, cancer centres and other medical centres, community hospitals and clinics. A single trial may take place at one or two specialised medical centres only or at hundreds of offices, hospitals, and centres.
Each clinical trial is managed by a research team that can include doctors, nurses, research assistants, data analysts, and other specialists. The research team works closely with other health professionals, including other doctors and nurses, laboratory technicians, pharmacists, dieticians, and social workers, to provide medical and supportive care to people who take part in a clinical trial.

Research Team

The research team closely monitors the health of people taking part in the clinical trial and gives them specific instructions when necessary. To ensure the reliability of the trial's results, it is important for the participants to follow the research team's instructions. The instructions may include keeping logs or answering questionnaires. The research team may also seek to contact the participants regularly after the trial ends to get updates on their health.

Clinical Trial Protocol

Every clinical trial has a protocol, or action plan, that describes what will be done in the trial, how the trial will be conducted, and why each part of the trial is necessary. The protocol also includes guidelines for who can and cannot participate in the trial. These guidelines, called eligibility criteria, describe the characteristics that all interested people must have before they can take part in the trial. Eligibility criteria can include age, sex, medical history, and current health status. Eligibility criteria for cancer treatment trials often include the type and stage of cancer, as well as the type(s) of cancer treatment already received.

Enrolling people who have similar characteristics helps ensure that the outcome of a trial is due to the intervention being tested and not to other factors. In this way, eligibility criteria help researchers obtain the most accurate and meaningful results possible.

National and International Regulations

National and international regulations and policies have been developed to help ensure that research involving people is conducted according to strict scientific and ethical principles. In these regulations and policies, people who participate in research are usually referred to as "human subjects."

Informed Consent

Informed consent is a process through which people learn the important facts about a clinical trial to help them decide whether or not to take part in it, and continue to learn new information about the trial that helps them decide whether or not to continue participating in it.

During the first part of the informed consent process, people are given detailed information about a trial, including information about the purpose of the trial, the tests and other procedures that will be required, and the possible benefits and harms of taking part in the trial. Besides talking with a doctor or nurse, potential trial participants are given a form, called an informed consent form, that provides information about the trial in writing. People who agree to take part in the trial are asked to sign the form. However, signing this form does not mean that a person must remain in the trial. Anyone can choose to leave a trial at any time—either before it starts or at any time during the trial or during the follow-up period. It is important for people who decide to leave a trial to get information from the research team about how to leave the trial safely.

The informed consent process continues throughout a trial. If new benefits, risks, or side effects are discovered during the course of a trial, the researchers must inform the participants so they can decide whether or not they want to continue to take part in the trial. In some cases, participants who want to continue to take part in a trial may be asked to sign a new informed consent form.

New interventions are often studied in a stepwise fashion, with each step representing a different "phase" in the clinical research process. The following phases are used for cancer treatment trials:

Phases of a Clinical Trial

Phase 0. These trials represent the earliest step in testing new treatments in humans. In a phase 0 trial, a very small dose of a chemical or biologic agent is given to a small number of people (approximately 10-15) to gather preliminary information about how the agent is processed by the body (pharmacokinetics) and how the agent affects the body

(pharmacodynamics). Because the agents are given in such small amounts, no information is obtained about their safety or effectiveness in treating cancer. Phase 0 trials are also called micro-dosing studies, exploratory Investigational New Drug (IND) trials, or early phase I trials. The people who take part in these trials usually have advanced disease, and no known, effective treatment options are available to them.

Phase I (also called phase 1). These trials are conducted mainly to evaluate the safety of chemical or biologic agents or other types of interventions (e.g., a new radiation therapy technique). They help determine the maximum dose that can be given safely (also known as the maximum tolerated dose) and whether an intervention causes harmful side effects. Phase I trials enrol small numbers of people (20 or more) who have advanced cancer that cannot be treated effectively with standard (usual) treatments or for which no standard treatment exists. Although evaluating the effectiveness of interventions is not a primary goal of these trials, doctors do look for evidence that the interventions might be useful as treatments.

Phase II (also called phase 2). These trials test the effectiveness of interventions in people who have a specific type of cancer or related cancers. They also continue to look at the safety of interventions. Phase II trials usually enrol fewer than 100 people but may include as many as 300. The people who participate in phase II trials may or may not have been treated previously with standard therapy for their type of cancer. If a person has been treated previously, their eligibility to participate in a specific trial may depend on the type and amount of prior treatment they received. Although phase II trials can give some indication of whether or not an intervention works, they are almost never designed to show whether an intervention is better than standard therapy.

Phase III (also called phase 3). These trials compare the effectiveness of a new intervention, or new use of an existing intervention, with the current standard of care (usual treatment) for a particular type of cancer. Phase III trials also examine how the side effects of the new intervention compare with those of the usual treatment. If the new intervention is more effective than the usual treatment and/or is easier to tolerate, it may become the new standard of care.

Phase III trials usually involve large groups of people (100 to several thousand), who are randomly assigned to one of two treatment groups, or “trial arms”: (1) a control group, in which everyone in the group receives usual treatment for their type of cancer, or 2) an investigational or experimental group, in which everyone in the group receives the new intervention or new use of an existing intervention. The trial participants are assigned to their individual groups by random assignment, or randomisation. Randomisation helps ensure that the groups have similar characteristics. This balance is necessary so the researchers can have confidence that any differences they observe in how the two groups respond to the treatments they receive are due to the treatments and not to other differences between the groups.

Randomisation is usually done by a computer program to ensure that human choices do not influence the assignment to groups. The trial participants cannot request to be in a particular group, and the researchers cannot influence how people are assigned to the groups. Usually, neither the participants nor their doctors know what treatment the participants are receiving.

People who participate in phase III trials may or may not have been treated previously. If they have been treated previously, their eligibility to participate in a specific trial may depend on the type and the amount of prior treatment they received.

In most cases, an intervention will move into phase III testing only after it has shown promise in phase I and phase II trials.

Phase IV (also called phase 4). These trials further evaluate the effectiveness and long-term safety of drugs or other interventions. They usually take place after a drug or intervention has been approved by the medicine regulatory office for standard use. Several hundred to several thousand people may take part in a phase IV trial. These trials are also known as post-marketing surveillance trials. They are generally sponsored by drug companies.

Sometimes clinical trial phases may be combined (e.g., phase I/II or phase II/III trials) to minimize the risks to participants and/or to allow faster development of a new intervention.

Although treatment trials are always assigned a phase, other clinical trials (e.g., screening, prevention, diagnostic, and quality-of-life trials) may not be labelled this way.

Use of Placebos

The use of placebos as comparison or "control" interventions in cancer treatment trials is rare. If a placebo is used by itself, it is because no standard treatment exists. In this case, a trial would compare the effects of a new treatment with the effects of a placebo. More often, however, placebos are given along with a standard treatment. For example, a trial might compare the effects of a standard treatment plus a new treatment with the effects of the same standard treatment plus a placebo.

Possible benefits of taking part in a clinical trial

The benefits of participating in a clinical trial include the following:

- Trial participants have access to promising new interventions that are generally not available outside of a clinical trial.
- The intervention being studied may be more effective than standard therapy. If it is more effective, trial participants may be the first to benefit from it.
- Trial participants receive regular and careful medical attention from a research team that includes doctors, nurses, and other health professionals.
- The results of the trial may help other people who need cancer treatment in the future.
- Trial participants are helping scientists learn more about cancer (e.g., how it grows, how it acts, and what influences its growth and spread).

Potential harms associated with taking part in a clinical trial

The potential harms of participating in a clinical trial include the following:

- The new intervention being studied may not be better than standard therapy, or it may have harmful side effects that doctors do not expect or that are worse than those associated with standard therapy.

- Trial participants may be required to make more visits to the doctor than they would if they were not in a clinical trial and/or may need to travel farther for those visits.

Correlative research studies, and how they are related to clinical trials

In addition to answering questions about the effectiveness of new interventions, clinical trials provide the opportunity for additional research. These additional research studies, called correlative or ancillary studies, may use blood, tumour, or other tissue specimens (also known as 'biospecimens') obtained from trial participants before, during, or after treatment. For example, the molecular characteristics of tumour specimens collected during a trial might be analysed to see if there is a relationship between the presence of a certain gene mutation or the amount of a specific protein and how trial participants responded to the treatment they received. Information obtained from these types of studies could lead to more accurate predictions about how individual patients will respond to certain cancer treatments, improved ways of finding cancer earlier, new methods of identifying people who have an increased risk of cancer, and new approaches to try to prevent cancer.

Clinical trial participants must give their permission before biospecimens obtained from them can be used for research purposes.

When a clinical trial is over

After a clinical trial is completed, the researchers look carefully at the data collected during the trial to understand the meaning of the findings and to plan further research. After a phase I or phase II trial, the researchers decide whether or not to move on to the next phase or stop testing the intervention because it was not safe or effective. When a phase III trial is completed, the researchers analyse the data to determine whether the results have medical importance and, if so, whether the tested intervention could become the new standard of care.

The results of clinical trials are often published in peer-reviewed scientific journals. Peer review is a process by which cancer research experts not associated with a trial review the study report before it is published to make sure that the data are sound, the data analysis was performed correctly, and the conclusions are appropriate. If the results are particularly important, they may be reported by the media and discussed at a scientific meeting and by patient advocacy groups before they are published in a journal. Once a new intervention has proven safe and effective in a clinical trial, it may become a new standard of care.
(National Cancer Institute).

Medical Disclaimer

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

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