

CANCER

BACKGROUND

1. What is cancer?
2. What causes cancer?
- . What causes cancer?
3. Can cancer be prevented?

The Facts

- One out of every two men and one out of every three women will have some type of cancer at some point during their lifetime.³
- Cancer is one of the leading causes of death in the world and represents a tremendous burden on patients, families and societies.⁴
- In 2008, there were 12.7 million new cases of cancer diagnosed and 7.6 million deaths from the disease.² The most common cancers in terms of incidence were lung (1.61 million),⁵ breast (1.29 million) and colorectal (1.15 million).⁵
- Based on projections, cancer deaths will continue to rise. By the year 2030, the burden is set to more than double: there will be 21.4 million cancer cases, 13.2 million deaths and 75 million people living with the disease.²

4. How is cancer treated?

1. WHAT IS CANCER?

Cancer is a general term that is used to describe a group of more than 200 diseases, which can affect any part of the body. It is a major public health problem, with significant associated death and disability. It is the second leading cause of death in developed countries and is one of the three leading causes of death for adults in developing countries. Globally, cancer accounts for one in eight deaths overall – more than AIDS, tuberculosis and malaria combined.¹ A substantial number of sufferers experience a significant reduction in their quality of life due to physical pain, mental anguish and economic hardship.

Although there has been a decline in cancer incidence and mortality rates in many parts of the developed world, rapid growth in the global cancer burden is being fuelled by a continued rise in economically developing countries.¹

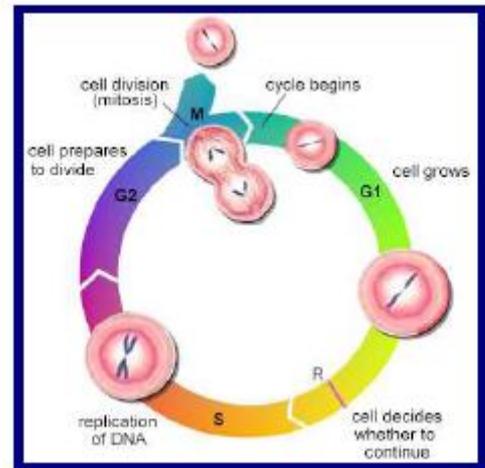
Worldwide, the number of new cancer cases per year is expected to top 21.4 million and the number of deaths could grow to as many as 13.2 million by 2030.² At least 63% of these deaths will be in economically developing countries, where survival rates (20–30%) are often less than half those in the USA and other developed nations (more than 60%).^{1,2}

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2. WHAT CAUSES CANCER?

Cancer begins in cells, the basic building blocks of the body. In a healthy body, cells will grow and divide to form new cells as the body needs them. Over time, as cells get old they die and new cells take their place. This process is called the cell cycle. A key feature of cancer is that this process goes wrong: new cells form when the body does not need them and old cells do not die when they should. These extra cells form a mass or tumour, although some cancers, like leukaemia, involve the blood and blood-forming organs, and circulate through other tissues.



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Tumours can be benign or malignant. Benign tumours are not cancerous. They can often be removed by surgery and in most cases do not spread to other parts of the body. Most benign tumours are not life threatening. Malignant tumours are cancerous, are generally more serious than benign tumours and may be life-threatening. In some cases, the original cancer, also called the primary tumour, can spread to other parts of the body via the bloodstream or lymphatic system to form new, or secondary, tumours. This process is called metastasis.

To care effectively for cancer patients, it is essential to consider the following factors:

Site of origin of the cancer (e.g. breast, prostate, colon)

Histological type (or tissue type) of the tumour (e.g. adenocarcinoma, lymphoma)

Degree to which the cancer has grown or spread (i.e. extent or stage of the disease)

For most tumour types there is an established TNM classification. These factors provide clinicians with knowledge of the extent or stage of the cancer, which assists in management of the disease. These factors also form the basis of the global standard for cancer staging known as the TNM classification:

T = describes the size or direct extent of the primary tumour - histological type of the tumour (e.g. adenocarcinoma, lymphoma)

N = describes the spread to regional lymph nodes

M = describes if there are distant metastasis

The TNM system developed from the observation that the prognosis of patients with small tumours was better than for those with tumours of greater size at the primary site. In general, patients with tumours confined to the primary site have better prognosis than those with involvement of the lymph nodes, and in turn those patients have better prognosis than those with tumours that have metastasised (or spread).

Cancer occurs because of changes in the genes responsible for cell growth and repair. Certain lifestyle and environmental factors can change normal genes into faulty genes that allow cancer growth. Many of these changes are the result of tobacco use, poor diet, exposure to ultraviolet (UV) rays, and radiation from the sun or exposure to cancer-causing substances (carcinogens) in the environment.

Some gene alterations are inherited; however, having an inherited gene – for example, the BRCA1 or BRCA2 (breast cancer) gene – does not necessarily mean the person will develop cancer, only that their chance of getting cancer is increased.

Although cancer itself is not contagious, being infected with certain viruses, such as hepatitis B or C, Human Papilloma Virus (HPV) and others, increases the risk of developing some types of cancer.

3. CAN CANCER BE PREVENTED?

Although there is no guaranteed way to prevent cancer, a combination of public health

Main risk factors for cancer

- Tobacco use
- Sun exposure
- Excessive alcohol abuse
- Getting older
- Family history
- Poor diet
- Lack of exercise
- Infection from certain viruses
- Occupational exposure to chemicals

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measures and individual risk-factor management could significantly reduce the global burden of cancer.

One-third of cancers could be cured if detected early and treated adequately. Treatment is often more effective when cancer is detected earlier. For some cancers, such as prostate, breast and cervical, screening such as blood tests, mammography and cytology can help to identify cancer or pre-cancerous changes before physical changes can be detected. In addition, education about the recognition of key symptoms, such as unusual lumps, persistent coughing, abnormal bleeding or change in bowel habits, can all help improve outcome through early diagnosis and treatment.

There are a number of cancer prevention strategies aimed at reducing an individual's exposure to risk, including:

- Reducing tobacco and alcohol usage
- Improving diet and physical exercise
- Immunisation against HPV infection
- Education about risk behaviours relating to hepatitis B and C infection
- Immunisation against hepatitis B infection
- Controlling exposure to occupational hazards, such as certain chemicals
- Reducing exposure to sunlight

4. HOW IS CANCER TREATED?

Cancer can be treated in a number of ways, including surgery, radiation therapy and systemic therapy. The doctor may use only one or a combination of treatment methods depending on the type and location of the cancer, the patient's age and health, and whether the cancer is localised in one area or has spread. Some cancer treatments can also affect healthy as well as cancerous cells and result in side effects; however, treatments are available that can reduce these unwanted effects during and after treatment.

Surgery is the oldest treatment for cancer and is still a very important and often successful option for many cancer types, particularly breast, colon and prostate. It is often used in combination with radiotherapy and/or chemotherapy and so is heavily focused towards the multidisciplinary approach to cancer management.

The aim of treatment is complete eradication of the disease, and if no metastatic disease is present then removing the tumour can achieve cure. However, in some cases there are residual undetected cancer cells and patients will go on to develop recurrent disease. But in many cases, patients will remain disease-free and eventually outlive their cancer and die from unrelated causes.

Radiation therapy is the practice of treating disease with ionising radiation. First used in 1896, just after the discovery of X-rays, it is now an important treatment option in the modern management of cancer, with approximately 50% of patients potentially benefiting from radiotherapy at some stage in their illness.⁶



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In two-thirds of patients given radiotherapy, the treatment objective is curative, either alone or in combination with surgery or systemic therapy. The aim is to maximise damage to cancer cells while minimising damage to healthy tissue. In addition, palliative radiotherapy may offer many patients relief from symptoms associated with advanced cancer.

Radiation can be given externally by a machine that aims radiation at the tumour area. It can also be given internally by needles, seeds, wires or catheters containing a radioactive substance, which are placed directly in or near the tumour.

Side effects from radiotherapy are usually temporary and most can be treated or controlled. Radiation may cause patients to feel tired and cause a decrease in white blood cells, which help to protect the body against infection. With external radiation, it is also common to have temporary hair loss in the treated area and for the skin to become red, dry, tender and itchy.

Systemic therapy Although surgery and radiotherapy remain the primary treatment options for many cancers, some patients will also need systemic therapy. Systemic therapy encompasses chemotherapy, hormonal therapy and targeted therapy and plays an important role in the multidisciplinary management of cancer.

The main aims of treatment are curative, prolongation of survival, symptom relief and improved quality of life. The improved understanding of the molecular biology of cancer has led to novel therapeutic targets and the development of many new anti-cancer agents.

Chemotherapy is the general term for any treatment involving the use of chemical agents to kill cancer cells or stop them from growing. Importantly, different types of cancer respond to different types of chemotherapy and different chemotherapeutic agents act in different ways on the cell. Consequently, treatment may involve a combination of different agents to achieve the best effect. Unfortunately, chemotherapeutic or cytotoxic agents cannot differentiate between a cancer cell and some healthy cells, so as well as destroying cancer cells chemotherapy also affects other fast-growing cells in the body, including hair and blood cells. This broad-spectrum effect is responsible for many of the side effects that are typically associated with chemotherapy, such as hair loss, blood disorders and nausea.

Hormonal therapy is used to treat certain cancers that depend on hormones to grow. The main hormone responsive cancers are breast, prostate and endometrial cancer, and the main hormones involved are oestrogens, androgens and progesterones, respectively. Thyroid cancer is also a hormone-responsive cancer and suppression of thyroid-stimulating hormone is important in the management of this disease. Hormone therapy may include the use of medication to stop the production of hormones. Alternatively, surgery may be used to remove organs that are responsible for making the hormones – for example, removal of the testicles in prostate cancer. Side effects caused by hormonal therapy are related to the natural effects of hormones in the body. These may include fluid retention, weight gain, hot flushes and erectile dysfunction, depending on which hormone is being inhibited by treatment.

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Targeted therapy is medication that blocks the growth and spread of cancer by interfering with specific molecules that are involved in carcinogenesis (the process by which normal cells become cancer cells) and tumour growth. By focusing on molecular and cellular changes that are specific to cancer, these 'targeted' cancer therapies may be more effective than current treatments and less harmful to normal cells. Examples of targeted cancer therapies include: monoclonal antibodies, angiogenesis inhibitors, signal-transduction inhibitors (also known as small molecule drugs), cell-cycle kinase inhibitors and gene therapy.

Personalised medicine is the concept that drug therapy can be tailored to a person's genetic make-up. It has long been recognised that patients respond very differently to the same medication. If these differences can be linked to an individual's genetic variations, then it opens up opportunities to screen patients before therapy. This could avoid a trial-and-error approach to prescribing. By selecting the right medication first time and tailoring the dose, it is hoped that personalised medicine will reduce the number of adverse reactions that occur. This could also mean that patients who are not likely to respond to treatment will not receive unnecessary medicines with their related side effects. For example, lung cancer once thought of as homogenous disease is many different types of disease. As more lung cancer biomarkers are discovered so the amount of individual lung cancer types grows. In addition, this expands opportunities to develop drugs to target these new types of cancers. Some believe that personalised medicine is entering a new phase, marked by the emergence of treatments now in clinical trials for patients who develop resistance to personalised drugs.⁷ Currently, it seems that the most progress in personalised medicine is being made in the field of oncology.⁸ Personalised medicine could also have cost-saving benefits for governments and payers.

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