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Review Article

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# Oncology and Cancer Treatment

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**Abstract**

*Today, we are witnessing an increasing incidence of malignant diseases, statistics show that every third person suffers from malignant disease, and every fourth person dies. 25 million people in the world live with cancer. The increase in morbidity and mortality rates indicates an epidemic of cancer in modern society, and advances in diagnosis, therapy and treatment provide patients with better health care. The use of cytostatics in therapy in the last few decades is the most common way of treating patients with malignant tumors.*

**Keywords:** Oncology, Cancer, Malignancy, Carcinogenesis

## Introduction

Oncology is an exciting but continuously evolving study with constant progress in understanding, prevention, investigation and management [1]. This includes a constant search for better treatment agents and treatment methods. There is now an increasing plethora of names of chemotherapeutic, hormonal, immunological, and anti-enzyme anti-cancer agents and gene therapy. Some are of historic interest, some are presently in clinical use, some are under study in clinical trials and some are still confined to laboratory investigation. Students are advised that agents and protocols for use of agents are constantly changing. Newer agents and newer techniques inevitably replace older ones. With constant progress in cancer research and treatment schedules some names, doses and treatment programs of today will become outdated.

## Malignancy

A malignant growth is characterised by a continuing, purposeless, unwanted, uncontrolled and damaging growth of cells that differ structurally and functionally from the normal cells from which they developed [1].All living plants and animals are composed of living cells that often need to divide to produce more cells for growth and development, and also to replace cells that have been damaged or have died. The process of cell proliferation (cell division and cell growth) is controlled by genes in the DNA of the cell nucleus. The genes are inherited from parents and bestow particular features in the offspring, including height, colour, weight and countless other distinctive features and functions of the tissues. The process is normally under remarkably wellbalanced control. A cancer forms when this genetic control is damaged or lost in one or more cells, which then continue to divide and divide again producing more abnormal cells that continue to divide and increase in number when and where they should not. The masses of unwanted dividing cells cause damage to other cells and tissues in the body. They are no longer controlled by normal genes that stop division after normal body needs have been met. They just go on dividing in spite of causing damage to other tissues and body functions. This is a cancer. All the causes of cancer are now known to directly, or indirectly, damage these normal genes that regulate cell division.

## Cells

One obvious factor is that the longer we live the more chance there is for the genes that regulate cell proliferation to become damaged by exposure to agents that damage the genetic blueprint, DNA [1]. So most cancers become more common the longer we live; most cancers are more common in old age. Another factor is the rate of division for growth and replacement of tissues. Tissues like skin, bowel lining or lining of air passages (especially in the lungs), and blood cells are constantly being shed and replenished. Breast cells are constantly changing due to hormone activity over a woman's years of fertile life. With all this constant cell proliferation there is more likelihood of mistakes being made in the process of copying the genetic blueprint to daughter cells, especially as the process becomes less accurate as we get older. A mistake or error in copying the genetic blueprint is called a genetic mutation. These then are the tissues most likely to undergo malignant change. Bone growth is greatest in growing young people and testicular activity is greatest in young adult males and these are the periods of life most prone to cancers of these tissues. As men grow old the slow but constant changes in the prostate gland make it more likely that factors causing a change in cells might go wrong after years of

exposure to the driving force of male hormones. So prostate cancer becomes increasingly common in old age.

The remarkable thing is not that something goes wrong from time to time in the delicate process of cell division but that things don't go wrong more often. In all life there is a continuous delicate living process involving countless generations of cell division. The better we care for our bodies with good living practices the greater the likelihood of preventing something, possibly uncontrollable, from seriously going wrong.

These good living practices include having good nutrition, healthy exercise, safe sex and avoiding exposure to potentially damaging agents in our environment. All of these practices serve to reduce the exposure of the genetic material in cells to agents that could cause changes in the genetic blueprint.

## Carcinogenesis

All tissues have a rate at which cells naturally die, while other cells divide to take their place [2]. The skin, for example, consists of large numbers of cells that are dying or dead and are constantly sloughed off, while new layers of skin regenerate by cell division beneath the cell surface. Maintaining the homeostatic balance of cell loss and cell gain is crucial to the health and survival of the tissue and organism, and so the balance is tightly regulated in all tissues throughout the body. Disturbing this balance of cell loss and cell proliferation can lead to disease. Tumor formation occurs when cell division exceeds cell death. This happens in one of two ways: either cell proliferation is increased so that it occurs faster than cell death or cell death is prevented or slowed so that it no longer keeps up with cell division. The progression of cellular changes leading to this excess growth and formation of a malignant tumor is the process known as multistage carcinogenesis. Most, if not all, of the morphological and biochemical characteristics of malignant cells have as their source either genetical or epigenetical alterations in gene expression. Therefore, the controls that usually tightly regulate the cell growth and death processes on a molecular level must be examined and manipulated in order to fully understand multistage carcinogenesis. Many factors can contribute to carcinogenesis, including viruses, chemicals, radiation, diet, hormones, and genetical predisposition.

The incidence of common cancers increases with age [3]. This association is universal and is observed with the aging of any population around the world. A clear explanation of this phenomenon is the time-length of carcinogenesis, a stepwise process involving the activation of cellular oncogenes, and the suppression of anti-proliferative genes (antioncogenes). It is reasonable to assume that the duration of carcinogenesis reflects the number of stages involved in the pathogenesis of different tumors, and that this number be highest for tumors whose incidence peaks late in life, such as adenocarcinoma of the prostate and of the large bowel, or non-melanomatous skin cancer. In the era of chemoprevention and recognition and elimination of environmental carcinogens, an alternative possibility should be considered. These interventions may cause the prolongation of one or more carcinogenic steps and, in so doing; they may delay the development of cancer. For example, the incidence of lung cancer has decreased for individuals less than 60, while it has increased for older individuals. As a result, the peak incidence of lung cancer has become more and more delayed. Interestingly, these changes have paralleled the incidence of smoking cessation in the Western population. In this case it is reasonable to assume that the length of carcinogenesis has increased as a result of a prolongation of the late carcinogenic stages, from reduced intensity of exposure to tobacco smoke. If this hypothesis is correct, one may expect to see a progressive delay in the appearance of common cancer and an increased incidence of neoplasia in advanced ages.

## Cancer

Cancer is a major public health issue which can affect every individual [4]. Worldwide, cancer is one of the leading causes of mortality, morbidity, and decreased quality of life. Additionally, incidence of cancers is growing, and it would be the main source of burden on both patients and societies, particularly in low- to medium-resource countries. A total of one-ffth of overall cancers can be prevented by immunization against oncogenic infections. Thus, national vaccination programs against viruses such as HPV help prevent cancers and are regarded as the primary level of prevention using immunotherapy. On the other hand, current standards of care have failed to do much for many cancer patients; hence, a new therapeutic avenue like immunotherapy is needed to improve the care of cancer patients. With regard to current status of cancers worldwide including considerable incidence, morbidity, mortality rate, and insuffciency of current mainstays of cancer management including surgical approaches, chemotherapy, and radiotherapy, immunotherapy holds great promise in combating cancers.

## Statistics

Cancer has become a global health issue with respect to its worldwide increase in incidence and burden [4]. New cancer cases were estimated to be 18.1 million in 2018, whereas it is expected to rise to 22.2 million in 2030. This is alarming since increase in incidence of cancers outnumbers the proportional increase in population worldwide. Another unpleasant fact is the high mortality of this growing issue. Of 18.1 million new cancer cases in 2018, 48.4% were diagnosed in Asia, 23.4% in Europe, 21% in Americas, 5.8% in Africa, and 1.4% in Oceania. On the other hand, of 9.6 million deaths, 57.3% occurred in Asia, 20.3% in Europe, 14.4% in Americas, 7.3% in Africa, and 0.7% in Oceania. Considering these absolute numbers of new cases and deaths owing to cancers, low- to middle-income countries are at emergent need for appropriate heath policies to fght cancers. In the following years, it is also estimated that new cases will mostly occur in low- to mediumresource countries due to two major reasons: (1) increase in the incidence of cancers associated with westernized lifestyle including colorectal, breast, and prostate cancers and (2) increase in the incidence of infection-related cancers (stomach, liver, and cervical cancers and less importantly lymphomas and Kaposi's sarcoma) owing to the dramatic increase in the prevalence of human immunodefciency virus (HIV), hepatitis B virus (HBV), and human papillomavirus (HPV) infections, particularly in sub-Saharan Africa and East Asia. These data shed light on "global cancer transition" that should be considered when establishing priorities to control cancers. One of the best strategies to control cancer pandemic, particularly in a low-resource setting, is to provide vaccination against oncogenic viruses considered to have prophylactic use in immunotherapy to fght cancers.

## Pain

Nociceptive pain describes pain that is perceived to be commensurate with tissue damage associated with an identifiable somatic or visceral lesion [5]. The persistence of pain is thought to be related to ongoing activation of nociceptors. Nociceptive pain that originates from somatic structures (somatic pain) is usually well localized and described as sharp, aching, burning, or throbbing. As previously described, pain that arises from visceral structures (visceral pain) is generally diffuse; pain characteristics may differ depending on the involved structures. From the clinical perspective, nociceptive pains (particularly somatic pains) usually respond to opioid analgesics or to interventions that ameliorate or denervate the peripheral lesion.

Although neuropathic pains can be described in terms of the pain characteristics (continuous or lancinating) or site of injury (for example, neuronopathy or plexopathy), it is useful to distinguish these syndromes according to the presumed site of the aberrant neural activity ("generator") that sustains the pain. Peripheral neuropathic pain is caused by injury to a peripheral nerve or nerve root and is presumably sustained by aberrant processes originating in the nerve root, plexus, or nerve. Neuropathic pains believed to be sustained by a central "generator" include sympathetically maintained pain [also known as reflex sympathetic dystrophy (RSD) or causalgia] and a group of syndromes traditionally known as the deafferentation pains (e.g., phantom pain). Sympathetically maintained pain may occur following injury to soft tissue, peripheral nerve, viscera, or central nervous system, and is characterized by focal autonomic dysregulation in a painful region (e.g., vasomotor or pilomotor changes, swelling, or sweating abnormalities) or trophic changes. Understanding of "RSD" and "causalgia" and sympathetically maintained pain have undergone considerable review.

The diagnosis of neuropathic pain has important clinical implications. The response of neuropathic pains to opioid analgesics is less predictable and generally less dramatic than the response of nociceptive pains. Optimal treatment may depend on the use of so-called adjuvant analgesics or other specific approaches such as somatic or sympathetic nerve block.

Pain that is perceived to be excessive for the extent of identifiable organic pathology can be termed idiopathic unless the patient presents with affective and behavioral disturbances that are severe enough to infer a predominating psychological pathogenesis, in which case a specific psychiatric diagnosis (e.g., somatoform disorder) can be applied. When the inference of a somatoform disorder cannot be made, however, the label idiopathic should be retained and assessments should be repeated at appropriate intervals. Idiopathic pain in general, and pain related to a psychiatric disorder specifically, are uncommon in the cancer population, notwithstanding the importance of psychological factors in quality of life.

## Supportive Care

The goal of supportive care in oncology—as is the goal of palliative care in any medical specialty—is to make patients function and feel better than they would have without that supportive care [6]. This goal is explicitly different from that of curative or life-extending therapy, in which there is regularly a moderate to high tolerance for side effects and temporary functional impairments. Even with curative or life-extending therapies, supportive care measures are necessary, and the success of the palliative aspects of care may determine whether the patient is willing to tolerate repeated courses of the treatment, as is usually necessary with chemotherapy. Whether the care is given in conjunction with other cancer treatments or is used exclusively to palliate the effects of the cancer, the criteria for success are that the patient feels and functions better. When patients are less pleased with how they are feeling or functioning—that is, when they believe their quality of life is not better—then the supportive care has not been successful. The patients' personal, subjective perception of how they are feeling and how they are functioning thus becomes a critical outcome measure of this aspect of cancer care.

Physicians and nurses are usually attuned to the physical, symptomatic distress expressed by patients. How likely it is that the range of HQL (health-related quality of life) effects of this distress will be addressed depends on a willingness to take time with the patient and to ask appropriate questions that are relevant to the patient's disease. Even with the emphasis of the importance of HQL in cancer care over the past 10 years, patients express more concern and spend more time trying to discuss palliative care questions than physicians, who tend to focus on medical and technical issues. Asking the appropriate questions requires a knowledge of how specific factors about the disease and its treatment are likely to affect the patient's HQL. It also takes a recognition that these issues are paramount to many patients, and willingness to spend the extra time is needed to listen and offer thoughtful supportive responses.

Any discussion of HQL measurement must also recognize that HQL is influenced by considerations other than the disease in question and its therapy. Because the measured quality of life is dependent on expectations as well as the patient's current situation, anything that can affect expectations can have an influence on the measured quality. Younger people have different expectations regarding life expectancy than do older persons; they may also have different expectations about functional ability, pain, or other symptoms that could affect their perceived HQL. Age has been found to affect decision making by patients with cancer when they are presented with scenarios in which survival can be traded for quality of life: Younger patients are more likely to accept a treatment with more severe side effects to gain an increment in survival than are older patients, who have a greater interest in maintaining their current quality of life. In addition, patients with higher scores on the social well-being subscale of the Functional Assessment of Cancer Therapy (FACT) assessment, as well as those with children living at home, were more willing to have aggressive cancer treatment. Debilities from the disease or comorbid conditions may be greater in older patients and result in a worse baseline quality of life.

## Palliative Care

When cure is beyond all probability and remaining life is, or is likely to become, increasingly miserable, doctors, nurses and other associated experts who develop special expertise in relieving distressing symptoms and making remaining life more comfortable and tolerable make up the palliative care team [1]. Rather than leave the family doctor, or specialist surgeon, physician, radiation

oncologist or other specialist oncologist either individually or collectively to do their best to relieve distress, the experts in palliative care form a team dedicated to studying and administering methods to best make life more comfortable for suffering patients. These teams specialise in relieving acute or chronic pain, bladder or bowel incontinence, feeding, respiratory, speech and mobility problems and sleeping difficulties. They are aware of and help avoid problems of prolonged ill health or confinement to bed such as pressure sores, pulmonary congestion or deep-vein thrombosis.

These caring specialists have now become most valuable associates for cancer treatment teams attending to special needs of the patient not only medical and physical but also needs of a social, emotional and spiritual nature. They help families and friends adjust to different circumstances and different needs – specially when there is no prospect of curing the cancer.

## Prevention

Much progress has been made over the past three decades in understanding, preventing, detecting, diagnosing, and treating cancer [7]. Cancer prevention, as a public health strategy based on research evidence, is the first line of defense in reducing the number of deaths resulting from cancer. It includes medical approaches (i.e., use of recommended cancer screenings) as well as environmental and behavioral interventions to modify risk factors. While many factors contribute to cancer risk, the chief behavioral (modifiable) risk factors are tobacco use, obesity, physical inactivity, and diet. These behavioral risk factors also have a large impact on the incidence of other major chronic illnesses, such as cardiovascular disease and diabetes. Moreover, comprehensive reviews have documented disparities in these risk factors among racial, ethnic, and socioeconomically vulnerable populations, and by geographic region. Though not fully understood, the causes of disparities in behavioral risk factors for cancer appear to be multifaceted and complex; experts suggest that cancer disparities are partly due to lack of access to medical care, including preventive care and state-of-the-art cancer services, environmental factors that deter adoption of healthful behaviors, or that facilitate unhealthful ones (e.g., the higher prevalence of fast-food outlets in segregated Black neighborhoods), and the interplay of low socioeconomic class, culture, and social injustice. On the other hand, inherent biological characteristics are not considered key factors in influencing cancer disparities.

## Life

Cancer is one of the most common, disabling, and costly diagnoses that affects people living in the USA and worldwide [8]. Today, nearly 40% of people will develop cancer in their lifetime. Due to many advances in oncology therapies, the overall 5-year survival rate has steadily increased and is currently hovering around 67%. As a result, there are more than 15.5 million cancer survivors living in the USA, and by 2020, the US Centers for Disease Control and Prevention (CDC) projects there will be more than 18 million Americans living with cancer.

However, even though there is an increase in the overall 5-year survival rate, survival is not necessarily disease free, and often people live with cancer as a chronic condition. Although many people with advanced cancer will ultimately succumb to complications related to progression of their malignancy, increasingly, an oncological diagnosis may not be the cause of mortality. Nearly everyone who lives with cancer as a chronic condition will experience significant and progressive morbidity and functional disability over time. This is in large part because they are subjected to a combination of oncology-directed therapies (e.g., surgery, chemotherapy, and/ or radiation therapy) that are often delivered sequentially or even simultaneously over months or years. The cumulative effect of cancer and/or its treatment increases the functional morbidity burden. Newer therapies, such as targeted treatments, may further increase survival rates while at the same time contribute to more morbidity and disability for survivors. Therefore, there is a growing need for cancer rehabilitation.

## Conclusion

Side effects in the treatment of cancer patients are numerous, and can be divided into local and systemic, may occur suddenly or occur over time. Systemic side effects include gastrointestinal side effects, pneumotoxicity, hepatotoxicity, hematological toxicity, nephrotoxicity, neurotoxicity, cardiotoxicity, gonadal dysfunction, and induction of secondary tumors. Local side effects include skin reactions, extravasation, and alopecia. Side effects are all harmful, and they appear as side effects to a drug, caused despite adherence to the prescribed dose and method of administration. Nausea, vomiting and diarrhea are the most common side effects associated with the action of cytostatics. Inadequate control of side effects significantly impairs the quality of life of the cancer patient and leads to serious concomitant problems such as dehydration, electrolyte imbalance, anorexia, malnutrition, and worsening of the general condition.

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