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# Interdisciplinary approach to cancer diagnosis and treatment: nursing, epidemiology, laboratory and radiology perspectives

*Khawater Ali Hassan Alzelaei (1), MOHAMMED Dhaim ALGHALIBI (2), Dahim Yhayia Althurwi (3), Jameela seed Alzahrani (4), Rahma Suleiman Al-Quzi(5) and Halaym hussain alamri(6)*

**1- Al -qunfudah general hospital: Nursing technician**

**2- Prince Mohamed bin Nasser hospital: Epidemiology inspector**

**3- West sector ( Arrmaid and Alheiaj ) : Lab technician**

**4- Al -qunfudah general hospital: asttfNursing**

**5- Al -qunfudah general hospital: Nursing technician**

**6- Al-qunfudah south general hospital: Radiology specialist**

**Abstract**

Cancer is a serious global health concern, with rising incidence and fatality rates globally. Despite substantial advances in research and therapy options, the complexities of cancer demand a multidisciplinary approach to optimal diagnosis and care. This review paper investigates the multidisciplinary viewpoints of nursing, epidemiology, laboratory medicine, and radiology in delivering complete treatment to cancer patients. Nurses have a critical role in patient evaluation, education, symptom management, advocacy, and teamwork, which all have a substantial influence on patient outcomes. Epidemiological research informs preventative and therapeutic activities by detecting trends, risk factors, and personalised screening programs. Laboratory medicine offers essential tools for cancer detection, therapy optimization, and the discovery of novel medicines. Radiology is critical in providing vital morphological and functional data required for early illness identification and therapy response assessment. The joint efforts across these fields represent a breakthrough period in cancer management, boosting diagnostic accuracy, therapeutic efficacy, and, ultimately, patient outcomes. This integrated approach emphasizes the need of interdisciplinary teamwork in resolving the complex problems faced by cancer, providing promise for a brighter future in oncology treatment.

**Keywords: Interdisciplinary approach, Radiology applications, Nursing perspectives, Epidemiology insights, Laboratory medicine.**

**Introduction:**

Cancer is one of the most important global health concerns, with incidence and death rates rapidly increasing across all demographics. Cancer is one of the most deadly diseases affecting people [1, 2], ]. It is the world's second largest cause of death, and its incidence is rising [3]. Cancer contributes significantly to global mortality rates and is the top cause of death worldwide. Cancer killed more than 8 million people globally in 2013, rising from the third leading cause of death in 1990 to the second leading cause in 2013, trailing only heart disease. In 2013, heart disease killed 611,105 people in the United States, followed by cancer with

584,881 deaths[4]. In 2020, about 19 million people were diagnosed with cancer, and over 10 million died as a result of it globally. Cancer incidence in low- and middle-income countries (LMICs) is expected to increase by 60% by 2030.[5]

Despite major advances in cancer research and therapy options, the disease's complexity needs a multidisciplinary approach for accurate diagnosis and management. The integration of many disciplines is critical in the comprehensive assessment and treatment of cancer. This review article will look at the multidisciplinary views of nursing, epidemiology, laboratory medicine, and radiology in the holistic care of cancer patients. Numerous medical specializations, such as nursing, epidemiology, laboratory medicine, and radiology, play important roles in the fight against cancer and its reduction in prevalence.

First, nurses carry out a variety of essential diagnostic tasks. Nurses identify eligible patients and remove screening obstacles through community education and outreach prior to the diagnostic phase. They are in charge of providing a number of screening techniques for malignancies of the breast, skin, cervix, and mouth throughout the diagnosis stage. After the diagnostic stage, nurses are in charge of informing patients, sharing results, and scheduling follow-up treatment, which could involve referrals and more diagnostic testing. Additionally, they actively take part in follow-up and patient tracking programs to guarantee the effectiveness and continuity of service. Additionally, nurses actively participate in research to enhance cancer prevention and early detection techniques as well as teaching healthcare professionals. Nurses' contributions to the comprehensive approach used in the fight against cancer through screening and early intervention are crucial, even in the event that responsibilities are shifted across different locations [6]. Additionally, patients are actively involved in the many cancer treatment options because to the changing healthcare landscape, which promotes collaborative decision-making. The vital role that nurses and nurse practitioners play in patient education and information exchange is acknowledged [8 ,7].

Moreover Because epidemiology detects patterns and risk factors associated with the disease, it is crucial to the diagnosis and treatment of cancer [9, 10]. Epidemiological research may be used to identify relationships between certain conditions and the emergence of particular cancer types, such as Burkitt's lymphoma and cervical cancer [11]. Additionally, epidemiology may be used to identify probable cofactors involved in the development of malignancy and assess the degree of risk supplied by different variables. Healthcare professionals may create individualized screening programs, prevention measures, and treatment plans by having a thorough understanding of the epidemiological profile of cancer. Additionally, epidemiological data support ongoing investigations into the mechanisms behind the development of cancer and the identification of possible therapeutic targets [9].

Also, laboratory medicine is vital in cancer detection and therapy [12]. It provides crucial tools for detecting biomarkers associated with cancer, so aiding with risk assessment, early detection, prognosis prediction, and therapy selection. By analyzing tumor indicators and host response biomarkers, laboratories contribute to the advancement of personalized medicine by improving therapy strategies for specific patients. Additionally, advancements in laboratory techniques, such as the detection of microRNAs and circulating tumor cells, present significant opportunities for non-invasive diagnosis and tailored treatment options across a broad spectrum of cancer types. Effective communication between basic scientists, laboratory personnel, and oncologists is essential for integrating test results into clinical settings and enhancing patient

outcomes. But more work has to be done to close the knowledge gap between laboratory research and ordinary oncology care, particularly when it comes to solid tumor diagnosis and treatment [13].

Lastly, radiography helps in cancer treatment and diagnosis [14-16] providing important details about the tumor and its surroundings. Radiologists can carefully analyze the temporal and geographic characteristics of malignancies by using medical imaging techniques including computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), and ultrasonography (US) [14]. The area of radiomics has also transformed as a result of advancements in computing technology, particularly the use of artificial intelligence for medical image processing and analysis. Radiomics is the process of obtaining quantitative data from multimodal medical pictures and relating it to clinical results in the treatment of cancer. Through data mining, radiomics facilitates the creation and verification of models that improve cancer diagnosis and therapy response assessments. Moreover, radiomics combines clinical information, treatment outcomes, and genomic/proteomic studies to present a whole picture of cancer. The development of precision diagnostics and customized cancer therapies is ultimately facilitated by this methodical, objective approach to decision-making in cancer diagnosis and treatment [14].

**1- Role of nursing**

When it comes to cancer diagnosis and treatment, nurses are essential since they significantly enhance patient outcomes and care. [17, 18]. Nurses have critical roles in the interdisciplinary landscape of oncology, offering comprehensive care, support, and coordination throughout the patient's journey from suspicion to diagnosis and beyond. Their engagement is multifaceted, including patient evaluation, education, symptom management, advocacy, and cooperation with the healthcare team. Patient evaluation is a cornerstone of nursing practice in cancer, where nurses methodically analyze patients' physical, emotional, and psychological requirements [19]. This thorough assessment helps identify potential cancer-related symptoms and evaluates the patient's readiness for diagnostic procedures and treatment options. Because of their competent clinical judgment and keen observation, nurses play a significant role in early diagnosis and timely intervention, which affects patient outcomes. Nurses are excellent at evaluating patients as well as educating them about their health, available diagnostic options, and treatments. Nurses facilitate informed decision-making and active patient participation in treatment by simplifying complex medical information in a way that is easy to understand. This ultimately helps patients feel more in charge of their care and independent [8].

Additionally, their continuous support and guidance lessens uncertainty and anxiety, enhancing the patient experience overall during the diagnostic stage. Another crucial component of cancer nursing practice is symptom management [20]. Nurses can employ evidence-based treatments and compassionate care to assess and treat cancer-related symptoms such as pain, nausea, fatigue, and psychological distress. Their proactive approach to symptom management maximizes treatment outcomes by optimizing drug adherence and tolerance while also improving patients' quality of life [21]. In addition, nurses represent patients' interests by making sure the healthcare system takes into account their needs and opinions. Effective communication and collaboration with interdisciplinary team members, including doctors, social workers, and allied health professionals, enable nurses to successfully advocate for patients' rights, interests, and well-being throughout the diagnostic and treatment process.

Nurses foster teamwork, cut down on delays, and enhance patient outcomes, all of which help to ensure smooth care coordination and continuity. In essence, nurses are essential to the diagnosis and treatment of cancer in a variety of ways. Their all-encompassing approach to care, which incorporates advocacy, education, symptom management, assessment, and teamwork, has a significant impact on the outcomes and experiences of patients. As essential members of the healthcare team, nurses embody the ethos of patient-centered care, exhibiting expertise, dedication, and compassion in the face of the challenges posed by cancer [22].

Working in a multidisciplinary environment across a range of healthcare settings, oncology nurses are essential to the overall care of cancer patients. They are responsible for providing direct patient care, managing symptoms, educating patients, coordinating therapy, and providing supporting care. The core of their duties is patient assessment, when nurses expertly examine patients' physical and mental conditions, past medical histories, and treatment plans to ensure that patients are aware of the prospective outcomes and expectations. Another crucial element that builds rapport and gives patients the capacity to actively engage in decision-making is patient education. Additionally, nurses manage patient care, facilitating seamless changes between phases of therapy and continued assistance for patients and their families. Giving medication and keeping an eye on symptoms are all part of direct patient care. Myths and fears are debunked, and comfort and adherence are prioritized. In conclusion, oncology nurses' comprehensive approach and ongoing professional development significantly improve patient outcomes and quality of life throughout cancer treatment [23].

**2- Role of epidemiology**

Because epidemiology provides crucial information on the occurrence, distribution, and causation of the illness in communities, it is crucial for the diagnosis and treatment of cancer. When epidemiologists closely examine data on cancer incidence, mortality rates, and risk factors across a range of demographic groups, they can identify patterns and trends that impact preventive and treatment efforts [24]. Additionally, epidemiological research aids in understanding the complex interactions among genetic, environmental, and lifestyle factors that influence the development of cancer [25, 26]. By customizing screening programs and treatment options to each patient's unique risk profile, this multimodal approach helps medical professionals maximize positive outcomes while reducing unfavorable ones. Moreover, epidemiological research aids in our understanding of the intricate interplay of genetic, environmental, and lifestyle factors that influence the development of cancer. By customizing screening programs and treatment options to each patient's unique risk profile, this multimodal approach helps medical professionals maximize positive outcomes while reducing unfavorable ones. The three most widely utilized indicators for calculating the burden of cancer are mortality, prevalence, and incidence. By tracking changes in these variables over time and comparing them across states, regions, and countries, significant contributors to cancer may be found [27]. Numerous causes of cancer have been identified via epidemiology, opening the door to early identification and prevention [30-28].

3- **Role of laboratory medicine**

It is impossible to overestimate the importance of laboratory medicine in the treatment of cancer, particularly for diagnosis [31], Clinical monitoring and treatment stratification [32].

Laboratory medicine has evolved over the past 50 years from a supporting field to an essential part of cancer treatment. Finding and characterizing biomarkers, molecular signs, and genetic changes connected to different forms of cancer is one of its main responsibilities [33, 34]. These biomarkers are essential diagnostic instruments that let medical professionals identify cancers accurately, forecast how they will behave, and customize treatment plans for each patient [34]. Additionally, laboratory testing is essential for tracking the effectiveness of treatment and identifying the formation of drug resistance, enabling prompt modifications to treatment strategies [35].

Additionally, laboratory medicine makes it possible to study the interactions between tumors and hosts, providing insights into the complex relationship between the immune system and the tumor microenvironment [36]. The creation of innovative immunotherapeutic treatments that maximize the body's innate defenses against cancer is influenced by laboratory research. By investigating the mechanisms behind immune surveillance evasion and tumor development [37]. Additionally, precise detection of circulating tumor cells, cell-free DNA, and other circulating biomarkers may be achieved in the lab, which helps in the selection of targeted therapies and provides significant prognostic information. To sum up, the incorporation of laboratory medicine into clinical oncology not only enhances the precision of diagnosis and effectiveness of treatment, but it also promotes a better comprehension of the molecular causes of cancer and the creation of customized treatment plans based on the individual biology of each patient [38].

**4- Role of radiology**

The advancement of oncology has ushered in an age of personalized medicine, adapting medicines to unique tumor subtypes and improving patient care within multidisciplinary frameworks, thereby increasing clinical results [39, 40]. Radiology plays a critical part in this paradigm change, utilizing medical imaging methods to provide essential morphological and functional data for better cancer care. [41]. By facilitating early illness detection [42], Imaging emerges as a crucial ally in the oncologist's armory, allowing for better patient categorization for therapeutic interventions and the rapid detection of therapy response [43]. Furthermore, the introduction of radiomics, machine learning, and deep learning has transformed cancer characterisation, automating segmentation procedures and prognosticating therapeutic responses with new precision. Concurrently, radiology contributes to the development of targeted imaging technologies and treatment molecules, which is a joint effort between academics and industry. This Special Issue aims to investigate the growing role of radiology in cancer imaging, emphasizing the potential applications of radiomics and artificial intelligence across various malignancies.[43]

Multiple biomedical imaging methods are used throughout the cancer treatment process, and they constitute an important part of clinical regimens. Such imaging techniques provide a wide range of morphological, structural, metabolic, and functional information, which may be combined with other diagnostic methods such as in vitro tissue and fluid investigations to help clinicians make decisions. Hybrid imaging approaches help with staging and therapy planning, while image-guided minimally invasive therapies show promise for improving treatment results and reducing collateral effects. Notably, the critical function of imaging in early cancer identification, particularly through screening programs, highlights its importance in lowering death rates for specific cancers. Ongoing research initiatives, such as targeted receptor imaging,

gene therapy expression, and cancer stem cells, point to an impending translation into clinical practice within the next decade. Technological developments aiming at increasing imaging speed to mimic physiological processes are expected to accelerate progress. The joint discovery of tailored imaging and therapeutic agents, supported by seamless academia-industry alliances embracing the pharmaceutical, information technology, and biotechnology sectors, heralds a transformational era in cancer management.[44]

**Conclusion**

In conclusion, the multidimensional character of cancer necessitates a collaborative and multidisciplinary approach to diagnosis and therapy. Nurses, epidemiologists, laboratory specialists, and radiologists all play important roles in delivering comprehensive cancer treatment to patients. Nurses excel at patient evaluation, education, symptom treatment, and advocacy, promoting favorable patient outcomes through a comprehensive approach. Epidemiological studies discover cancer-related trends and risk factors, which influence preventative actions and individualized treatment techniques. Through biomarker identification and characterization, laboratory medicine allows for more accurate diagnosis, treatment stratification, and monitoring. Radiology provides critical morphological and functional data for early illness identification and treatment response evaluation, leveraging advances in imaging technology and artificial intelligence. The joint efforts across these disciplines represent a breakthrough period in cancer management, promising better patient outcomes and a brighter future for oncology care. This integrated approach emphasizes the need of interdisciplinary teamwork in dealing with the complex problems faced by cancer, opening the way for advances in precision medicine and tailored treatment techniques.

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