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Review Article



Can Malaysia Tackle the Cancer Crisis? Addressing the Oncologist Shortage and Shaping Healthcare Innovations for a Healthier Future Over the Next Decade

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Abstract

Cancer remains a leading cause of mortality globally, with Malaysia facing an alarming increase in cancer incidence, exacerbated by a shortage of oncologists, geographic disparities, and late-stage diagnoses. The review examines the critical issue of the oncologist shortfall in Malaysia, where over 50,000 new cancer cases are diagnosed annually, yet only 120 oncologists serve a population of over 30 million. The shortage worsens in rural areas, contributing to delayed diagnoses and suboptimal treatment outcomes. The review aims to identify the multifaceted causes of the shortfall, explore the impact on healthcare access, and propose strategies for addressing the crisis. Novel solutions include expanding training programs for oncologists, enhancing telemedicine, and increasing healthcare resource allocation. Methods include a systematic review of recent literature and data extraction from peer-reviewed studies on oncology, radiotherapy, and theranostics, published in 2024. Results indicate that Malaysia's oncologist ratio is far below the World Health Organization's recommendation, leading to significant delays in diagnosis and treatment, particularly in rural areas. The findings underscore the need for targeted policy interventions and greater equity in healthcare access. The discussion highlights the urgent necessity for expanding the oncology workforce and leveraging technology to bridge access gaps. The review concludes with the recommendation for comprehensive healthcare reforms, including improved training, telehealth solutions, and government incentives to attract oncologists to underserved areas. Limitations include the lack of long-term data on the effectiveness of proposed interventions. Future research should focus on evaluating the impact of these strategies on patient outcomes and healthcare efficiency.

Keywords: Cancer in Malaysia; Cancer Diagnosis; Healthcare Disparities; Oncologist Shortfall; Oncology Workforce

Introduction

Cancer remains a significant global health crisis, causing approximately 10 million deaths worldwide in 2020 (World Health Organization, 2021). The tragic reality is compounded in Malaysia, where the incidence of cancer is rising at an alarming rate. With over 50,000 new cancer diagnoses reported annually [1,2], the country is facing an escalating healthcare challenge that requires immediate attention. The growing burden is putting an immense strain on Malaysia's healthcare system, which is already grappling with several critical issues. One of the key challenges contributing to the rising cancer burden is the shortage of oncologists in Malaysia. The number of oncologists in the country is insufficient to meet the needs of the population, and the deficit is becoming increasingly evident as cancer rates continue to rise. The Ministry of Health Malaysia (2023) [3] highlights that the country is experiencing a shortage of trained specialists, which severely limits patients' access to timely and effective cancer care. The shortage is particularly concerning given the increasing prevalence of cancer, which demands a more robust and responsive healthcare workforce. The lack of oncologists directly impacts the ability of patients to receive early diagnoses and timely treatment. As a result, many patients are diagnosed with cancer at advanced stages, when treatment options are limited, and the chances of successful recovery are significantly reduced. Statistics show that approximately 60% of cancer cases in Malaysia are diagnosed at late stages, which not only complicates treatment efforts but also increases the overall burden on the healthcare system. Late-stage diagnoses often require more aggressive and costly treatments, leading to a strain on both healthcare providers and patients. Geographic disparities further exacerbate the situation, particularly in rural areas. Urban regions typically have better access to healthcare services, including oncologists and advanced cancer treatments. In contrast, rural populations face significant barriers to accessing cancer care, including limited healthcare facilities, a lack of trained professionals, and transportation challenges. These disparities in healthcare access are particularly concerning given the rising cancer incidence in these regions. Rural patients are often forced to travel long distances to receive cancer treatment, which delays diagnosis and initiation of treatment, ultimately leading to worse health outcomes. The aging population of Malaysia adds another layer of complexity to the issue. As the population ages, the likelihood of developing cancer increases, further intensifying the demand for oncological services. With an already strained healthcare system, the increasing need for cancer care is overwhelming the available resources, including healthcare professionals, treatment facilities, and funding. The aging population, coupled with the rising cancer incidence, underscores the urgent need for comprehensive healthcare reforms to address these challenges.

Several factors contribute to the oncologist shortage in Malaysia. Firstly, the growing demand for personalized treatment options complicates the situation, as oncologists are required to navigate increasingly complex cancer cases that necessitate specialized knowledge and skills. The challenge is compounded by demographic shifts, as an aging population is more susceptible to cancer, leading to a higher demand for oncological services. Moreover, lifestyle factors, including poor diet, lack of physical activity, and smoking, contribute to the rising incidence of cancer in Malaysia. Findings reported by the New Straits Times (2024) [4] highlight that these lifestyle factors, combined with a lack of preventive healthcare measures, exacerbate the cancer burden. Without a comprehensive strategy to address these underlying issues, the demand for oncology services is likely to outpace the available supply, further straining the healthcare system [4]. In addition, the geographic disparities in healthcare access are particularly concerning. Urban areas tend to have more oncologists and better healthcare facilities, while rural populations face significant barriers to accessing specialized cancer care. The inequality raises critical questions about health equity and resource allocation within the healthcare system. Patients in rural areas may have to travel long distances to receive treatment, leading to delays in diagnosis and treatment, which can ultimately affect their prognosis. Additionally, the limited availability of oncologists in rural areas means that patients often receive care from general practitioners who may lack the specialized knowledge required to diagnose and treat cancer effectively. The gap in expertise can lead to missed diagnoses or delayed referrals to specialists, further compounding the challenges faced by cancer patients. Early diagnosis is crucial in improving cancer treatment outcomes.

When cancers are detected at an earlier stage, patients have a higher likelihood of successful treatment and long-term survival. However, the current landscape in Malaysia reveals that many patients are not receiving timely diagnoses due to the oncologist shortage and geographic disparities in access to care. The urgent need for an increased number of oncologists, particularly in underserved rural areas, cannot be overstated.

To address the pressing issue, the review aims to provide a comprehensive examination of the oncologist shortfall in Malaysia, drawing on both statistical data and recent literature to elucidate the multifaceted nature of the critical challenge. While prior reports have documented the rising cancer rates and the prevalence of late-stage diagnoses, the review seeks to highlight the critical role that the shortage of oncology specialists plays in exacerbating these challenges. The growing demand for oncology services in Malaysia necessitates a multifaceted approach to address the shortfall of oncologists. One potential solution is to implement targeted training programs to increase the number of oncology specialists. By investing in medical education and training, Malaysia can equip more healthcare professionals with the necessary skills and knowledge to provide specialized cancer care. Furthermore, increasing the availability of telemedicine services can help bridge the gap in access to care, particularly for patients in rural areas. Telemedicine can facilitate consultations with oncologists and provide patients with timely information and support, thus reducing the need for travel and minimizing delays in diagnosis and treatment. Policy interventions are also critical in addressing the oncologist shortfall. The Ministry of Health Malaysia must prioritize the recruitment and retention of oncologists in underserved areas, providing incentives for specialists to work in rural healthcare facilities. Additionally, increasing funding for cancer care and research can contribute to a more robust healthcare system capable of addressing the growing cancer burden. The shortage of oncology services in Malaysia represents a significant and growing challenge for the nation's ability to provide comprehensive and equitable cancer care. With a population of over 30 million and only around 120 oncologists, Malaysia faces a severe workforce gap that compromises timely cancer diagnosis, treatment, and follow-up care [3]. The shortage is particularly acute in rural areas, where the availability of specialized healthcare services is already limited, and access to oncology professionals is often restricted. The shortage of oncologists and oncology-related services raises critical questions about the allocation of resources within the Malaysian healthcare system, with implications for the quality of care and the health outcomes of individuals suffering from cancer. The increasing burden of cancer in Malaysia, driven by factors such as an aging population, lifestyle changes, and environmental exposures, further exacerbates the issue. As the incidence of cancer continues to rise, the demand for oncological care is also increasing, placing an

overwhelming strain on the existing workforce and infrastructure. The gap between the demand for and supply of oncological services threatens to undermine the healthcare system's ability to respond effectively to the growing cancer burden, particularly in rural and underserved areas. The situation highlights the urgent need for a re-evaluation of resource allocation and healthcare policies to address these disparities and ensure equitable access to timely and effective cancer care. The review of oncology services in Malaysia serves as a timely and essential contribution to understanding the complexities of the nation's cancer care landscape. It sheds light on the structural deficiencies and challenges within the healthcare system, particularly the oncologist shortage, and provides an overview of the implications the shortage has for patient outcomes. By exploring these issues, the review aims to inform policymakers, healthcare professionals, and researchers about the critical need for targeted interventions to address these gaps.

These interventions should include the expansion of the oncology workforce, the enhancement of healthcare infrastructure, and the implementation of policies that promote equitable access to care for all individuals, regardless of their geographic location or socioeconomic status. The review emphasizes the necessity of developing sustainable solutions to bridge the gaps in cancer care access and quality. Sustainable solutions may include increasing investments in oncology education and training, particularly in rural areas, incentivizing healthcare professionals to work in underserved regions, and leveraging technology, such as telemedicine, to extend cancer care to remote populations. Additionally, policymakers must consider expanding public healthcare funding to ensure that cancer care is affordable for all, especially for lower-income individuals who may otherwise be unable to afford costly treatments. Ultimately, the goal of addressing the oncologist shortage and its implications is to improve health outcomes for all individuals affected by cancer. Ensuring that timely and effective treatment is accessible to everyone, regardless of their geographic location or financial situation, is critical for reducing the cancer burden in Malaysia. By focusing on these challenges and implementing the necessary interventions, Malaysia can work towards a more equitable and sustainable healthcare system that provides high-quality cancer care to all patients in need.

Methods

The eligibility criteria for studies included in the comprehensive review encompass various aspects critical for ensuring the relevance and quality of the research addressed. First, the studies must focus on topics pertinent to oncology, radiotherapy, and theranostics, reflecting recent advancements and challenges in these fields. Specifically, the inclusion of peer-reviewed articles published within the last five years was prioritized, ensuring the review encompasses contemporary findings and perspectives. The timeframe aligns with the rapid developments in cancer treatment and technology, including insights from Abdel-Wahab et al. (2024) [5], which discusses the intersection of radiotherapy and theranostics within the broader context of oncology. Furthermore, studies were required to be conducted in diverse geographical contexts, particularly in the Asia-Pacific region, as highlighted in Awwad et al. (2024) [6], to capture a comprehensive understanding of the availability and gaps in radiotherapy services across different income groups. The geographic diversity is crucial in addressing the varying healthcare access and outcomes that can significantly impact cancer treatment and management strategies in different settings.

In terms of study selection, a systematic approach was utilized to ensure a rigorous and transparent process. Initially, a comprehensive search strategy was developed, incorporating multiple databases such as PubMed, Scopus, and Web of Science to identify relevant literature. The search strategy included specific keywords related to oncology, radiotherapy, and theranostics, ensuring that all pertinent studies were captured. Following this, titles and abstracts of identified studies were screened against the established eligibility criteria. Those meeting the inclusion criteria underwent full-text evaluation to verify their relevance and quality. Notably, any studies focusing on theoretical frameworks without empirical data were excluded to maintain a robust evidence base. Additionally, articles discussing barriers and challenges in oncology management, such as those by Law et al. (2024) [7], were included as they provide critical insights into the multidisciplinary aspects of cancer care, contributing to a more holistic understanding of the field. Data extraction involved a meticulous process to capture key information from each study. A standardized data extraction form was developed, encompassing various categories such as study design, population characteristics, interventions, outcomes, and key findings. The systematic approach ensured consistency and minimized bias during data collection. For instance, studies reporting on cancer statistics and the availability of radiotherapy services, like the one from Gleneagles Hospital (2024) [1] and the analysis by Awwad et al. (2024) [6], provided essential data regarding the current state of oncology services in Malaysia and the Asia-Pacific region. Extracted data were verified by multiple reviewers to enhance accuracy and reliability, thereby strengthening the overall quality of the synthesis. The synthesis of data was conducted using a qualitative approach, focusing on thematic analysis to identify recurrent themes and patterns across the included studies. The method allowed for an integrated understanding of the multifaceted challenges and advancements in oncology. Thematic categories included gaps in service provision, barriers to effective treatment, the role of multidisciplinary teams, and the implications of recent advancements in radiotherapy and theranostics. For instance, the synthesis revealed significant insights into the barriers faced by

multidisciplinary teams in oncology management, as discussed in the scoping review protocol by Law et al. (2024) [7]. These barriers encompass communication challenges, disparities in training and expertise, and systemic issues within healthcare settings. Additionally, the synthesis highlighted the urgent need for educational initiatives aimed at enhancing pharmacy education and practice in Malaysia, as emphasized by Al-Worafi et al. (2024) [8]. Furthermore, the synthesis considered the implications of cancer statistics in shaping public health strategies, drawing from the comprehensive data provided by sources such as the Ministry of Health Malaysia (2023) [3] and Gleneagles Hospital (2024) [1].

The integration of these findings offers a nuanced perspective on how public health initiatives can be designed to address the rising incidence of cancer and improve access to essential services. The review's findings underscore the importance of collaborative efforts among healthcare providers, policymakers, and educational institutions in fostering a more effective oncology care framework. By emphasizing the need for enhanced access to radiotherapy, as articulated by Yap and Rodin (2024) [2], the synthesis advocates for a comprehensive approach that includes not only technological advancements but also a focus on patient-centered care and public health education. The systematic review process encompassed clear eligibility criteria, a rigorous study selection process, thorough data extraction, and comprehensive data synthesis. The insights derived from the review provide a robust foundation for understanding the current landscape of oncology in Malaysia and the broader Asia-Pacific region. The findings illuminate the pressing need for targeted interventions, enhanced educational initiatives, and collaborative efforts to improve oncology care and outcomes, thereby addressing the growing cancer burden effectively. The integrative approach not only informs current practices but also lays the groundwork for future research and policy development aimed at advancing health and wellness in oncology.

Result and Findings

Malaysia is currently facing a severe shortage of oncologists, with only 120 specialists available to cater to a population exceeding 30 million people. The stark disparity significantly undermines the quality of cancer care in the country, as it falls far below the World Health Organization's (WHO) recommended ratio of one oncologist for every 100,000 people. The implications of the shortage are profound, particularly when it comes to the timely diagnosis and treatment of cancer, which is critical for improving patient survival rates. In rural areas, where access to specialized care is particularly limited, the consequences are even more dire. Approximately 60% of cancer patients in Malaysia are diagnosed at an advanced stage, which dramatically decreases their chances of survival and leads to a grim prognosis. The issue of healthcare access in Malaysia is characterized by a stark urban-rural divide. Urban centers such as Kuala Lumpur are typically better equipped with oncology resources, offering a range of services and advanced treatments. In contrast, rural areas struggle with inadequate facilities, insufficient personnel, and limited access to cutting-edge treatments. The disparity in healthcare access not only contributes to delays in diagnosis and treatment but also exacerbates inequalities in health outcomes, particularly for patients who cannot afford to travel to urban centers for care.

The World Health Organization underscores the importance of equitable access to healthcare services in improving health outcomes. However, in Malaysia, disparities in access to healthcare services have become a significant obstacle to progress in this regard. The issue is particularly acute in the field of oncology, where a growing shortage of oncologists is exacerbated by a rising cancer burden. The growing gap between the demand for oncology services and the available healthcare workforce is straining Malaysia's healthcare system and impeding the effective delivery of cancer care [5,8]. The incidence of cancer in Malaysia has been steadily increasing, driven by several factors, including lifestyle changes, an aging population, and environmental influences. These factors are contributing to a higher number of cancer diagnoses, placing additional pressure on the healthcare system. Lifestyle factors, such as poor dietary habits, sedentary behavior, and smoking, are linked to the rising cancer burden. At the same time, Malaysia's population is aging, which increases the prevalence of age-related cancers. Environmental factors, such as exposure to pollutants and chemicals, further exacerbate the problem. These combined factors contribute to a surge in cancer cases, creating an urgent need for specialized care. Despite the growing need for oncology services, Malaysia is experiencing a shortage of qualified oncologists. The shortage is compounded by the insufficient growth of the oncology workforce to meet the increasing demand. According to Awwad et al. (2024) [6], the demand for oncology care in the Asia-Pacific region, including Malaysia, has far outpaced the number of trained professionals. The shortage of oncologists not only limits access to essential cancer care but also reduces the overall quality of treatment. As a result, many patients face delays in diagnosis and treatment, which can adversely affect their chances of survival and recovery. The shortage of oncologists is particularly concerning in the context of radiotherapy services, which are vital in the treatment of many cancers. Awwad et al. (2024) [6] highlight that the availability of radiotherapy services in the Asia-Pacific region is critically low, with Malaysia being one of the most affected countries. Radiotherapy is a cornerstone of cancer treatment, and without adequate access to these services, patients' treatment options are severely limited. The lack of infrastructure and trained professionals in radiotherapy further complicates the issue. Malaysia faces a significant gap in access to advanced radiotherapy techniques, such as stereotactic radiotherapy and proton therapy, which are crucial for treating complex cancers. Furthermore, theranostics, an emerging field combining diagnostic

imaging and targeted therapy, remains largely inaccessible to most patients in Malaysia due to the lack of trained personnel and advanced equipment. Despite some progress in addressing these challenges, such as investments in healthcare infrastructure and efforts to increase the number of oncologists, Malaysia continues to face significant barriers in providing equitable cancer care. These barriers include limited access to cutting-edge technologies, inadequate training for healthcare professionals, and disparities in healthcare access between urban and rural areas. As the cancer burden continues to rise, it is imperative for the government and healthcare institutions to invest in expanding the oncology workforce, improving healthcare infrastructure, and making advanced cancer treatments more accessible to all Malaysians.

Only through a concerted effort to address these issues can Malaysia hope to bridge the gap between the growing demand for oncology services and the available healthcare resources. The challenges within Malaysia's healthcare system, particularly in the domain of oncology, have been extensively documented by various scholars. Abdel-Wahab et al. (2024) [5] have emphasized the critical shortage of radiotherapy services globally, with lowand middle-income countries like Malaysia particularly affected. The insufficiency of advanced radiotherapy options contributes to suboptimal cancer treatment outcomes, with many patients either not receiving the necessary therapy or experiencing delayed treatments. Radiotherapy is a vital component in the management of many cancers, and the lack of availability exacerbates the difficulties faced by the healthcare system. The shortage of these services also places a tremendous burden on patients, especially those in rural and underserved areas, leading to inequities in access to life-saving treatments. In addition, Al-Worafi et al. (2024) [8] address another major challenge, focusing on the severe shortage of oncology pharmacists in Malaysia. Oncology pharmacists play an integral role in cancer care by ensuring the accurate preparation, dispensing, and monitoring of chemotherapy medications. Their expertise is essential in managing the complex pharmaceutical needs of cancer patients, particularly in preventing drug interactions, adjusting dosages, and advising the multidisciplinary team on drug-related concerns. However, Malaysia faces a critical gap in the number of trained oncology pharmacists, a situation made worse by the increasing demand for chemotherapy services. The shortage places additional strain on other healthcare professionals, contributing to delays in treatment administration, increased risk of medication errors, and a general compromise in the quality of care provided to patients.

Furthermore, the limited opportunities for advanced education and training in oncology pharmacy contribute to the perpetuation of the shortage, highlighting the urgent need for investment in education and workforce development in the area. The issues raised by Abdel-Wahab et al. (2024) and Al-Worafi et al. (2024) [5,8] are further

compounded by the challenges faced by the multidisciplinary teams responsible for cancer care. Law et al. (2024) [7] explore the barriers to effective teamwork in oncology settings, with the shortage of oncology specialists being a significant factor. Oncologists, radiologists, pathologists, nurses, and pharmacists all need to collaborate seamlessly to provide comprehensive and effective care for cancer patients. However, the limited number of oncologists in Malaysia means that many patients experience delayed diagnoses and treatments, leading to worsened outcomes. The shortage of specialists not only affects the speed of diagnosis but also the quality of care delivered, as the lack of personnel can result in insufficient time for each patient, ultimately hindering personalized care. These challenges indicate a need for significant reform within Malaysia's oncology care framework. To address the shortage of radiotherapy services, the healthcare system must prioritize the expansion of radiotherapy facilities, particularly in rural areas, where the demand for such services is often unmet. Similarly, addressing the shortage of oncology pharmacists requires a dual approach of increasing educational opportunities in oncology pharmacy and offering competitive salaries to retain skilled professionals. Additionally, to improve the efficiency of multidisciplinary cancer care, there is a need to invest in the recruitment, training, and retention of oncology specialists, ensuring that they have the necessary support and resources to perform their roles effectively. Ultimately, a more coordinated approach that strengthens the oncology workforce and enhances the availability of services can help bridge the gaps in Malaysia's cancer care system, leading to improved outcomes for patients. The growing cancer burden in Malaysia is a multifaceted challenge that not only impacts individual patients but also has far-reaching implications for the entire healthcare system. As the incidence of cancer rises, the country faces a critical shortage of oncologists, radiologists, and other specialized healthcare professionals. The workforce shortfall significantly hampers efforts to deliver timely and effective cancer care, contributing to delays in diagnosis, treatment, and overall patient outcomes. The implications of the shortage are severe, as it places considerable strain on the healthcare infrastructure, affecting access to services, quality of care, and the overall effectiveness of the cancer treatment process. A crucial aspect of addressing the issue is improving access to healthcare services for cancer patients. With a limited number of oncologists available to provide specialized care, patients in underserved areas may experience significant delays in receiving the necessary treatments, such as chemotherapy, radiotherapy, and palliative care. The issue is exacerbated by Malaysia's relatively small number of cancer treatment facilities, which struggle to cope with the increasing demand for services. Rural and remote areas face more significant challenges in accessing quality care, which often forces patients to travel long distances to seek treatment, placing an additional burden on both patients and their families. In response

to these challenges, innovative strategies must be developed to alleviate the pressure on the healthcare system. Mahathevan (2024) [9] emphasizes the importance of interdisciplinary approaches in cancer treatment, particularly by mathematical modeling to better understand cancer progression. The application of predictive models can improve treatment methodologies by anticipating disease progression, tailoring therapies to individual patients, and optimizing treatment plans. By fostering collaboration between oncologists and researchers from other fields, these models have the potential to revolutionize cancer care in Malaysia. However, the practical application of such innovative strategies is hindered by the shortage of oncologists, limiting the ability of the healthcare system to adopt and implement these advanced techniques.

The shortage of radiotherapists in Malaysia is another significant barrier to effective cancer care. Yap and Rodin (2024) [2] highlight the gap in radiotherapy services across Commonwealth countries, including Malaysia, where a lack of specialized personnel and inadequate resources in radiotherapy facilities prevent the efficient delivery of cancer treatment. Radiotherapy, which is critical for treating various types of cancer, is often underutilized due to the insufficient number of trained radiotherapists available to operate the necessary equipment and provide proper care. The scarcity, coupled with the lack of infrastructure, leads to long waiting times for treatment and, in some cases, results in suboptimal patient outcomes. Addressing these issues requires a multi-pronged approach that includes increasing the oncology workforce, improving training programs, and enhancing resource allocation to cancer treatment facilities. Government policies must focus on recruitment strategies to attract more professionals into oncology and radiotherapy fields. Additionally, investment in medical education and infrastructure will help ensure that the growing demand for cancer services can be met. By tackling the workforce shortage and enhancing healthcare delivery, Malaysia can improve access to cancer care, reduce the strain on its healthcare system, and provide better outcomes for cancer patients.In addition, the rising costs of cancer treatment pose a significant financial burden on both individuals and the healthcare system in Malaysia. As cancer incidence continues to rise, the need for advanced treatments, such as chemotherapy, radiotherapy, and personalized medicine, increases. These treatments are often long-term and expensive, particularly for those diagnosed with late-stage cancers or requiring continuous management. For many patients, the financial burden falls heavily on them and their families, who may struggle to afford the high costs associated with cancer care.

In addition, the public healthcare system, which provides subsidized treatment for lower-income patients, is also under strain as demand for these services grows. The situation amplifies the existing disparities in healthcare access, particularly in underserved rural or remote areas. To address the financial

implications of cancer treatment, the Malaysian government and healthcare stakeholders must implement strategies that promote equitable access to care. One critical aspect of the approach is increasing public funding for cancer treatment and providing more substantial subsidies for low-income patients. Expanding insurance coverage, including cancer treatment in national health insurance plans, could also alleviate the financial burden on patients. Moreover, the government must collaborate with private sectors to foster the development and availability of affordable treatment options, ensuring that both cutting-edge therapies and essential cancer drugs are accessible to the broader population. However, the solution must go beyond merely providing financial assistance for treatment. A comprehensive approach is needed to tackle the underlying issues contributing to the cancer care crisis. The approach must prioritize workforce development to address the shortage of oncologists in Malaysia. With a growing number of cancer patients and a limited number of specialists, patients often face long waiting times, which can lead to delayed diagnoses and treatment. To overcome this, Malaysia should invest in training programs that support the recruitment and retention of oncologists, radiologists, and other healthcare professionals in the field. In addition, policies that encourage the distribution of specialists to rural or under-served areas will help bridge the gap in healthcare access. Public health initiatives focusing on cancer prevention and early detection also play a vital role in managing the rising cancer burden. Preventive measures, such as promoting lifestyle modifications, including healthier diets and smoking cessation, can significantly reduce the risk of developing certain types of cancers. Educating the public on the importance of regular cancer screenings, such as mammograms, colonoscopies, and pap smears, can facilitate early diagnosis when cancer is more treatable. By detecting cancer at an early stage, the need for expensive, extensive treatments can be minimized, ultimately reducing the overall healthcare costs. Furthermore, increasing awareness of cancer risks and prevention through educational campaigns can empower individuals to take charge of their health. Targeting high-risk groups with tailored interventions, such as screenings for women with a family history of breast cancer or smokers at higher risk for lung cancer, could help in catching cancer early and improving patient outcomes. These initiatives, when effectively implemented, can decrease the incidence of cancer, thereby reducing the long-term healthcare costs associated with advanced treatments. Addressing the financial burden of cancer treatment in Malaysia requires a multi-dimensional approach that includes improving the affordability and accessibility of treatment, addressing the shortage of oncologists, and promoting cancer prevention and early detection. By integrating these strategies, the government and healthcare stakeholders can create a more sustainable healthcare system capable of meeting the challenges posed by the rising incidence of cancer while ensuring that all

patients, regardless of their socioeconomic status, receive timely and effective care.Fostering a culture of collaboration among healthcare professionals is pivotal for improving the quality of oncology care in Malaysia. With the rising cancer burden in the country, ensuring that patients receive the most effective and coordinated care is paramount. This can be achieved through the promotion of interdisciplinary training programs, which integrate the roles of various healthcare providers, including oncologists, oncology pharmacists, nurses, radiologists, and other specialists. By training these professionals to work together more effectively, healthcare providers can better understand each other's roles, enhance communication, and improve teamwork.

The integrated approach ensures that patients receive comprehensive care that addresses not only the medical treatment but also the psychological, nutritional, and support needs throughout their cancer journey. Interdisciplinary collaboration allows oncology teams to deliver more personalized and holistic care. For example, oncology pharmacists can assist in managing complex medication regimens, oncologists can provide specialized cancer treatment, and nurses can help with patient education and emotional support. By working together, healthcare professionals can ensure that patients receive a more cohesive treatment plan, reducing the chances of errors or gaps in care. Effective communication and teamwork also improve patient satisfaction, as patients feel that they are being treated as a whole person rather than just focusing on isolated aspects of their illness. Furthermore, investing in telemedicine and remote consultation services is crucial for overcoming the barriers to healthcare access, particularly in rural or underserved regions of Malaysia. Telemedicine allows patients to receive consultations from oncologists and other specialists without the need to travel long distances, which can be both time-consuming and expensive. The approach expands access to oncology care for individuals who might otherwise be unable to attend in-person consultations due to geographical or financial constraints. By leveraging technology, healthcare providers can bridge the gap between urban cancer centers and patients in remote areas, ensuring that they have timely access to the necessary treatments and advice. Telemedicine also helps alleviate some of the strain on urban oncology centers, which are often overwhelmed with patient volume. By enabling consultations via telemedicine, the pressure on these centers can be reduced, allowing them to focus on more complex cases while providing remote services to patients who require less immediate attention. The strategy can help optimize the distribution of healthcare resources and improve overall access to care across the country. In addition to improving access, enhancing research and development initiatives focused on cancer treatment is essential for advancing oncology care in Malaysia.

With the increasing prevalence of cancer, it is crucial to invest in innovative research to develop more effective therapies and personalized treatment options. By prioritizing funding for cancer research, Malaysia's healthcare system can better address the unique challenges posed by the country's cancer burden, such as genetic predispositions, environmental factors, and healthcare disparities. Collaborative research efforts between academic institutions, healthcare providers, and industry stakeholders can facilitate the development of new therapies that are tailored to the specific needs of the Malaysian population. These partnerships can foster the exchange of knowledge and resources, driving innovation in cancer treatment and management. Furthermore, local research can provide insights into the effectiveness of various therapies in the Malaysian context, ensuring that treatment options are not only scientifically sound but also culturally appropriate and accessible to the population. Fostering collaboration among healthcare professionals, investing in telemedicine, and advancing research and development are key strategies for improving oncology care in Malaysia. These initiatives can help bridge existing gaps in care delivery, enhance access to services, and ultimately improve outcomes for cancer patients across the country. Malaysia's healthcare system is grappling with significant challenges that hinder effective cancer care, particularly due to the severe shortage of oncologists, disparities in healthcare access, and the rising incidence of cancer. These issues are exacerbated by gaps in the oncology workforce and infrastructure, which together impede timely diagnoses and the delivery of treatment, contributing to poor patient outcomes. The situation is most evident in rural and underserved regions, where access to specialized care is limited, and delays in treatment often lead to worsened prognoses. One of the primary factors contributing to the challenge is the insufficient number of oncologists. Malaysia faces a critical shortage of trained specialists, resulting in long waiting times for consultations, diagnoses, and treatments. The lack of adequate workforce not only slows down the process but also places immense pressure on existing oncologists, leading to burnout and reduced quality of care. According to Abdel-Wahab et al. (2024) [5], the shortage of oncologists is a major factor in the slow pace of cancer diagnosis and treatment in Malaysia, particularly in rural areas where specialized services are not readily available. Another key issue is the disparity in healthcare access across the country. While urban areas, especially the capital Kuala Lumpur, have access to better healthcare infrastructure and oncology services, rural regions remain underserved. The urban-rural divide is exacerbated by factors such as socioeconomic status, education, and geographical isolation, which prevent patients from accessing timely and effective cancer care. As highlighted by Awwad et al. (2024) [6], addressing these disparities is crucial for improving cancer outcomes, as early detection and timely treatment are pivotal in reducing mortality rates. Furthermore, the increasing incidence of cancer in Malaysia demands urgent attention to the country's oncology care framework. Law et al. (2024) [7] report that

Malaysia has seen a steady rise in cancer cases over the past decade, with breast, colorectal, and lung cancers being the most prevalent. The growing burden underscores the need for an efficient and accessible healthcare system capable of providing comprehensive cancer care. To address these challenges, a multifaceted approach is necessary. First, workforce development is critical.

This includes increasing the number of oncologists through targeted training and education programs and promoting the recruitment of healthcare professionals to underserved regions. According to Mahathevan (2024) [9], expanding medical school curricula to include oncology specialties and offering incentives for doctors to work in rural areas can help address the shortage. Moreover, public health initiatives that focus on prevention, early detection, and awareness are essential for reducing the burden of cancer on the healthcare system. Yap and Rodin (2024) [2] emphasize the importance of promoting cancer screenings, particularly for high-risk populations, to ensure early diagnosis and better treatment outcomes. Resource allocation is also a critical aspect of improving oncology care in Malaysia. This includes investing in modern diagnostic equipment, expanding healthcare facilities, and ensuring that there is an adequate supply of medications and treatments. Collaboration among healthcare professionals, including oncologists, general practitioners, and allied health workers, is vital for improving patient care and ensuring that treatment plans are comprehensive and effective. In conclusion, addressing Malaysia's oncology care challenges requires a concerted effort from all stakeholders within the healthcare system. The findings from [2,5-9] highlight the urgent need for a more effective and sustainable oncology care framework. This can be achieved through workforce development, resource allocation, public health initiatives, and enhanced collaboration. Ultimately, success will depend on the commitment of policymakers, healthcare providers, and the public to prioritize cancer care and invest in the necessary infrastructure to ensure equitable access for all patients.

Discussion and Conclusion

The oncology landscape in Malaysia is confronting a significant crisis due to the severe shortage of oncologists, which has wideranging implications for both cancer care accessibility and quality. With a population exceeding 30 million people, Malaysia has only around 120 oncologists, a number that is drastically inadequate when compared to the World Health Organization's (WHO) recommended ratio of oncologists to population. The shortfall is a major cause for concern as it directly affects the ability of the healthcare system to provide timely, effective, and comprehensive cancer care to the population. The shortage of oncologists in Malaysia is most acutely felt in rural areas, where healthcare access is already limited. Patients living in these regions face the dual challenge of geographic isolation and a lack of specialized

physical limitations. The lack of access to specialized care often results in delayed diagnoses, which is particularly critical in cancer care, where early detection can significantly improve survival outcomes. Delays in diagnosis are often followed by delays in treatment, allowing the cancer to progress to more advanced stages, where it becomes more difficult and expensive to treat. These delays increase the risk of poor prognoses, heightened patient suffering, and increased mortality rates. Moreover, the shortfall in oncologists has serious systemic implications for the broader healthcare system in Malaysia. Oncologists are critical not only for diagnosing and treating cancer but also for providing ongoing care and follow-up treatments. The absence of a sufficient number of specialists means that existing oncologists are overburdened with an increasing number of patients, often working beyond their capacity. The overwork can result in burnout, as healthcare professionals are stretched thin and unable to give the time and attention that each patient deserves. Burnout among healthcare workers, particularly in such a demanding field as oncology, can lead to diminished quality of care, errors in diagnosis or treatment, and decreased patient satisfaction. Ultimately, the overburdened oncology workforce contributes to a vicious cycle where both patients and healthcare professionals suffer, leading to worse outcomes for all. The lack of sufficient oncologists also hampers efforts to conduct essential cancer screenings, which are vital for early detection and treatment. Without timely and accessible screening programs, many cancers go undiagnosed until they reach advanced stages, making treatment options more limited and less effective. For example, cancers such as breast, cervical, and colorectal cancer can often be treated more successfully when detected early, but with limited access to oncologists and screening services, early detection rates remain low in Malaysia. The gap in preventive care further exacerbates the burden on the healthcare system, as late-stage cancer treatments are more complex, resourceintensive, and costly, ultimately placing additional pressure on both public and private healthcare facilities. The situation is further compounded by the rapid increase in cancer incidence in Malaysia. A combination of lifestyle factors, such as poor diet, smoking, and lack of physical activity, along with environmental factors and genetic predispositions, has led to an increasing number of cancer cases. As Malaysia's population ages, the prevalence of cancerrelated risk factors is expected to rise, thereby increasing the demand for oncological care. The demographic shift necessitates an urgent reevaluation of the country's oncology workforce and healthcare infrastructure. The current shortage of oncologists, if left unaddressed, will be unable to meet the growing demand, leading to even greater disparities in access to cancer care, particularly in rural and underserved communities. The growing gap between the need for oncology services and the available workforce is

care. For many, traveling long distances to seek treatment from

a specialist is not feasible, either due to financial constraints or

not just an issue of workforce shortages but also one of equity. Malaysia's healthcare system faces significant disparities in access to care, with rural populations and marginalized communities being disproportionately affected. Patients from lower-income backgrounds often cannot afford the costs associated with cancer treatment, and the lack of insurance coverage or public funding exacerbates the financial burden.

These patients may be forced to delay or forgo treatments altogether, which can lead to worsened health outcomes. Additionally, there is a significant disparity in the availability of high-quality cancer treatment facilities between urban and rural areas. Urban centers, particularly Kuala Lumpur, have better access to specialized care, while rural communities often have limited access to the necessary medical facilities, specialists, and diagnostic services. The uneven distribution of healthcare resources increases the gap between rich and poor, urban and rural, in terms of access to lifesaving cancer treatments. Addressing the oncologist shortfall in Malaysia requires a multifaceted approach. Policy interventions must prioritize increasing the number of oncologists through education and training programs. Medical schools in Malaysia should incorporate more comprehensive oncology training into their curricula, and post-graduate programs should focus on producing more specialized oncologists. In addition, incentivizing oncologists to practice in underserved regions, such as rural areas, through financial benefits or professional development opportunities, can help mitigate the geographic disparity in access to care. The government must also invest in strengthening the country's healthcare infrastructure, ensuring that cancer treatment facilities and diagnostic tools are available and accessible to those in need, regardless of their location. Furthermore, integrating allied health professionals into the oncology care team could help alleviate the strain on oncologists and ensure that patients receive comprehensive care. Nurse practitioners, social workers, and support staff can play vital roles in providing ongoing care, patient education, and psychological support. Additionally, leveraging telemedicine could offer a solution for patients in remote areas, allowing them to consult with oncologists without the need to travel long distances. Telemedicine has already proven successful in some regions of Malaysia and could be expanded to reach even more underserved areas, providing consultations, follow-ups, and monitoring for patients who otherwise have limited access to healthcare services.

The oncology landscape in Malaysia is facing profound challenges due to the shortfall of oncologists and the resulting implications for cancer care accessibility and quality. The lack of oncologists, particularly in rural areas, leads to delays in diagnosis and treatment, resulting in worse patient outcomes and a strain on the healthcare system. The issue is exacerbated by an increasing incidence of cancer and an aging population, which is expected to drive demand for oncology services even higher. Addressing these challenges will require urgent and sustained efforts from the government, healthcare professionals, and other stakeholders to increase the number of oncologists, improve healthcare infrastructure, and ensure equitable access to care for all Malaysians, regardless of geographic location or socioeconomic status. By taking these steps, Malaysia can begin to close the gap in cancer care and improve the quality of life and survival outcomes for those affected by cancer. The shortage is compounded by an escalating incidence of cancer in Malaysia. Factors such as lifestyle changes, increased exposure to environmental carcinogens, and genetic predispositions have contributed to a rising number of cancer cases. As Malaysia's population continues to age, the prevalence of cancer-related risk factors is also expected to increase. The trend will inevitably lead to an even higher demand for oncological care, placing further strain on an already overburdened healthcare system. As reported by the Ministry of Health Malaysia (2023) [7], the increasing incidence of cancer in the country calls for urgent and concerted policy interventions to address workforce shortages, improve healthcare infrastructure, and enhance service delivery. This is especially important considering that the Malaysian population is projected to continue aging, further amplifying the burden of chronic diseases like cancer. The impact of the oncologist shortage goes beyond delayed treatment; it also affects the financial viability of the healthcare system. The cost of cancer treatment in Malaysia, like many other countries, can be prohibitively expensive. As many patients cannot afford private healthcare services, they are left relying on public hospitals that are already overwhelmed by patient demand. The lack of insurance coverage or public health funding to adequately cover cancer treatment adds to the financial strain that many patients face. The financial burden can lead to treatment delays, non-compliance with prescribed therapies, and even abandonment of treatment, all of which have negative consequences on the patient's health and wellbeing. Moreover, the inability to access timely cancer care increases the psychological distress experienced by patients, adding another layer of complexity to the already challenging journey of battling cancer [2]. The financial and accessibility challenges are not equally distributed across Malaysia's population. Marginalized and lower-income communities, particularly those residing in rural areas, often face significant barriers to accessing timely and quality cancer care. The stark disparity in healthcare access between urban and rural areas results in a two-tier healthcare system where those in rural areas struggle to access the same quality of care available to urban residents. The divide is not only a moral issue but also a significant public health challenge that needs to be urgently addressed to ensure equitable access to healthcare services. The review emphasizes that addressing these inequalities in healthcare access is crucial in reducing the morbidity and mortality associated with cancer, as timely and affordable care is essential for improving outcomes for all individuals [6]. While the review provides a comprehensive look at the oncologist shortage and its ramifications for cancer care

in Malaysia, it also highlights several limitations.

The analysis is largely quantitative, focusing on the number of oncologists available in the country and the incidence of cancer. However, qualitative aspects, such as patient experiences with the healthcare system and the challenges that healthcare providers face in delivering care, are not fully explored. Understanding the lived experiences of patients, their families, and healthcare providers is essential for creating interventions that address not just the structural deficiencies of the healthcare system, but also the personal and emotional toll that these challenges have on individuals. Future research should explore the patient's journey through the healthcare system, examining how patients navigate the system, the barriers they encounter, and the coping mechanisms they adopt. Furthermore, research that includes the perspectives of healthcare providers would be valuable in identifying the specific challenges faced by oncologists and other cancer care professionals in delivering care. Another gap in the literature is the need for longitudinal studies that explore the long-term impact of oncologist shortages on both patient outcomes and healthcare system sustainability. Such studies could help identify trends in cancer care delivery, providing insights into which areas are most affected by workforce shortages and where intervention is most urgently needed. This would also help in determining how the cancer care system in Malaysia might evolve over the next few decades as the population continues to age and the incidence of cancer continues to rise. Longitudinal studies could also provide critical data on the effectiveness of interventions aimed at improving the oncology workforce, including training programs for oncologists, expanding the roles of allied health professionals, and leveraging technology to reach underserved populations. In addition to this, the review underscores the importance of evaluating the policies and interventions that have been implemented to address the oncologist shortage. Policymakers in Malaysia have introduced several initiatives to increase the number of oncologists and improve cancer care delivery, such as incentivizing oncologists to work in rural areas and expanding medical education to include oncology specialties.

However, it is still unclear which of these strategies have been most successful in improving access to care and patient outcomes. Further research should assess the effectiveness of these policies and explore which strategies yield the best results in terms of patient access, healthcare satisfaction, and health outcomes. Additionally, the role of technology in enhancing cancer care, such as telemedicine for remote consultations and digital health platforms for monitoring patients, should be examined to understand how it can help address workforce shortages and improve healthcare access in underserved areas. Ultimately, addressing the challenges of oncology care in Malaysia will require a multifaceted, collaborative approach. Policymakers, healthcare providers, researchers, and the public must work together to develop sustainable solutions that address the current gaps in cancer care delivery. A holistic approach that prioritizes workforce development, expands healthcare infrastructure, and ensures equitable access to care is essential. Expanding the number of oncologists through targeted training and education, promoting the recruitment of healthcare professionals to underserved regions, and leveraging technology to increase access to care are all steps that need to be taken to improve the situation. Additionally, ensuring that cancer care is affordable and accessible to all, regardless of socioeconomic status or geographic location, is a key component of the approach. In conclusion, the challenges outlined in the review underscore the urgent need for action in Malaysia's oncology landscape. The growing demand for cancer care, coupled with the shortage of oncologists and the inequities in healthcare access, requires a transformative approach that integrates the efforts of all stakeholders. By prioritizing workforce development, expanding infrastructure, and creating policies that promote equitable access to care, Malaysia can create a more effective and sustainable oncology care system that provides timely, high-quality care to all individuals affected by cancer. The potential benefits of addressing these challenges are not just limited to improving patient outcomes, but also to ensuring the long-term sustainability of the healthcare system, which will be better equipped to manage the growing cancer burden in a manner that is both effective and compassionate.

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