

Review Article

Multidisciplinary and Interdisciplinary Tumor Boards in Optimizing Patient Outcomes: An Integrated Approach

Rabia Tahseen¹, Asifa Maheen², Mariam Fahim^{2*}, Maria Tariq³, Yumna Ahmed¹, Fatima Shaukat¹, Agha Muhammad Hammad Khan⁴

¹Department of Radiation Oncology, Cyberknife and Tomotherapy Centre, Jinnah Postgraduate Medical Center (JPMC), Karachi, Pakistan.

²Jinnah Sindh Medical University, Karachi, Pakistan.

³Department of Radiation Oncology, The Aga Khan University Hospital, Karachi, Pakistan.

⁴Department of Radiation Oncology, McGill University, Montreal QC, Canada.

Abstract: Multidisciplinary and interdisciplinary tumor boards (MTBs and ITBs) are critical components in optimizing oncological diagnosis, management, and treatment protocols. Over the past few decades, the implementation of multidisciplinary tumor boards has become a standard practice in developed regions and is experiencing steady growth globally. There is a wealth of research exploring the advantages of integrating MTBs and ITBs into cancer care, revealing improvements across various domains including patient satisfaction and clinical outcomes. This article presents a comprehensive review of the existing literature on the impact of tumor boards on patient outcomes, including the relevant statistical data. Additionally, we discuss emerging paradigms and future recommendations, including the use of novel technologies and strategies for more effective tumor boards, thereby providing a holistic perspective on the evolution of cancer care practices.

Keywords: Multidisciplinary tumor boards, Cancer mortality, Patient-Centered Care (PCC), Personalized medicine, Healthcare systems.

INTRODUCTION

If numbers could speak, they would tell a story of survival, fight, and stark inconsistency in cancer care. A person's chances of surviving cancer more often than not depend on one's country of residence and which resources are accessible as certain people face an inordinate burden of cancer due to environmental, social, and economic disadvantages. For example, a person with a long travelling distance to screening or treatment sites is less likely to have proper screening and treatment according to the guidelines in comparison to those who don't have to face such obstacles [1]. Though cancer mortality has improved over the years in most High-Income Countries (HICs), disparities are still observed in various areas of the world, especially in Lower-Middle Income Countries (LMICs) where the equipment of personalized treatment plans imposes a significant burden [2, 3]. A study reported that in the US, despite the decline in cancer mortality, incidence rates of the top 6 out of 10 major cancers will increase by 2024 [4]. This paints a complex picture; while some cancers show promising outcomes due to the advancing treatments and tools acquired for treatment, others remain stubbornly lethal, implicating the need for efficient ways for the betterment of patient outcomes.

However, this does not mean that work is not being put in towards improving patient outcomes. According to current trends in diag-

nosis, treatment, and long-term patient care, various methods of improvement are being employed just as Patient-Centered Care (PCC), personalized medicine, genomic profiling, the use of AI, and most importantly the engagement of Multidisciplinary Tumor Board (MTB) and Interdisciplinary Tumor Boards (ITB) [5]. MTBs and ITBs have essentially become a part of standard cancer care on a global scale where they significantly contribute in the increased efficacy of treatment plans and cancer care strategies [6, 7].

As declared by Freytag *et al.* the increase in the number of MTBs manifested the improvement of clinical outcomes and survival [8]. At the same time, ITBs constitute the focal structure of discussion of complicated cancer cases. Different studies around various countries and about various types of cancer have demonstrated that ITBs can effectively result in a boost of diagnostic accuracy, adherence to evidence-based guidelines, treatment recommendations, functional outcomes, and survival [7]. Such statements prove that MTBs and ITBs ultimately work toward the same goal and can be integrated properly for the best of the patient outcomes.

This review aims to explore the contribution of both MTBs and ITBs in enhancing patient outcomes through a comprehensive, integrated approach. By giving an insight into MTBs and ITBs, this review seeks to consolidate the benefits, challenges, and potential improvements in utilizing these collaborative frameworks (MTBs and ITBs) for effective cancer care. Furthermore,

* Address correspondence to this author at the Jinnah Sindh Medical University, Karachi, Pakistan. Email: mariam.fahim1947@gmail.com

it will highlight the emerging paradigms and prospects regarding the implementation of MTBs and ITBs.

LITERATURE REVIEW

Prevalent Outcomes in Oncology Patients

The global burden of cancer continues to escalate, with predictions that cancer incidence will rise to 28.4 million cases annually by 2040, up from approximately 19.3 million in 2020 [9]. In the United States alone there were expected to be approximately 2,001,140 new cancer cases in 2024 [4].

This surge in cancer cases poses significant challenges to healthcare systems worldwide, and contributes to increased morbidity and mortality rates. The economic impact of the increasing cancer burden is felt disproportionately by LMICs and exacerbates existing health disparities, primarily access to care [10]. The rising prevalence of various cancer types—particularly lung, breast, prostate, and colorectal cancers—underscores the urgent need for effective management strategies. In 2022, lung cancer had the highest incidence with 2.5 million new cases globally [11].

Providing optimal care to cancer patients is a complex process in which the healthcare provider needs to navigate the intricacies of diagnosis, treatment selection, and follow-up care. For this, it is necessary to establish smooth communication and coordination between various specialists as well as with the patients and their families [12]. The employment of set pathways and guidelines can also go a long way in facilitating the patient by reducing wait times, improving the transfer of information, reducing complications, and delivering more effective care overall.

Failure of proper planning of diagnostic procedures, treatment plans, and the lack of proper interventions can have devastating effects on patient outcomes. This is particularly a problem in LMICs where resource limitations and lack of awareness lead to delayed and fragmented care. Limited understanding of the disease, prolonged wait times, lost medical records, and improper infrastructure all contribute to reduced compliance and delays in treatment as well [13]. There is no question that enhancing coordination and communication among healthcare providers is essential for developing optimal treatment plans and improving quality of care.

Personalized Approaches and Synergies in MDTs and IDTs

In modern oncology, no two patients are identical, and neither should their treatment plans be. That is when multidisciplinary teams (MDTs) and interdisciplinary teams (IDTs) make their entry in the show. In oncology, MDTs are regarded as the cooperation between professionals from various specialties involved in cancer care with the aim of the betterment of treatment efficacy and patient care [14]. While IDTs are a modified version of MDTs in which a deeper integration of specialties is applied.

As declared by Jonathan Hart, while both MDTs and IDTs are two similar concepts, two main differences arise between them, which is the focus and perspective [15].

MDTs allow for each discipline to autonomously contribute its specialized expertise for the patient's care. In case of IDTs, the approach is much more holistic and the professionals involved retain their dedicated roles while fostering continuous communication with each other to achieve a singular goal. For example, in an MDT the primary goal of one physician would be to improve the blood pressure of the patient and that of the other would be the glycemic control. On the other hand, in an IDT there is a singular goal like preserving the state of well-being of the patient [16].

Abundant studies conducted in different countries and fixating on different types of cancers have implied that IDTs can ameliorate diagnostic accuracy, equipment of evidence-based guidelines, case outcomes, and survival. German Cancer Society (GCS) equips the application of IDTs as a core pillar of their certified organ-specific tumor centers. A study conducted in Germany showed that pancreatic cancer patients treated in GCS-certified cancer centers showed better median survival than those patients treated in non-certified centers [7]. Another study concluded that improved survival outcomes for patients with metastatic Esophago-Gastric Cancer were noticed due to early integration of interdisciplinary care which turned out to be a successful intervention [17]. In the case of non-metastatic castration-resistant prostate cancer (nmCRPC), it was suggested that a multidisciplinary approach would be effective for the application of precision medicine to patient care [18].

As opposed to IDTs, MDTs have a more solid foundation as they were established way before IDTs. MDTs in the field of oncology have been long used for gathering professionals from different fields to discuss complex cases and therefore, have contributed a lot towards the improvement of cancer and patient care [19]. More often than not, it is noticed that cases discussed in MDTs had changes done in diagnosis, treatment and survival for improving the course of the cancer journey. Barbara *et al.* stated that a greater percentage of patients in their MDT program for lung cancer remained free of disease at the one-year mark compared to those who received conventional care, suggesting that a comprehensive MDT program can bring out a positive effect in yielding better patient outcomes [20].

Transformative Impact of MDTs and IDTs on Patient Journey

Over the past few decades, numerous reviews have demonstrated the effectiveness of multidisciplinary and interdisciplinary teams in enhancing outcomes for cancer patients, resulting in improved survival rates and overall care quality [21]. A systematic review provided compelling evidence of the overarching benefits of multidisciplinary tumor boards, indicating marked improvements in clinical outcomes for patients diagnosed with colorectal, head and neck, breast, esophageal, and lung cancers

[22]. These findings highlight that tumor board discussions often lead to better prognosis due to the comprehensive, collaborative nature of care given.

There is little doubt that integrating multidisciplinary teams into cancer care protocols is crucial for enhancing patient outcomes. However, these outcomes can vary significantly depending on the specific type of cancer and its anatomical location [23]. To offer a more comprehensive understanding of the effectiveness of collaborative decision-making in shaping treatment plans, it is important to consider these differences and categorize outcomes accordingly. This approach will help inform future protocols and optimize patient care [24]. A brief discussion of patient outcomes in cases where MDTs were used are mentioned below according to the type of cancer.

A retrospective cohort study conducted in the UK on 13,722 women showed a significant improvement in survival statistics of breast cancer after multidisciplinary care was integrated into the treatment plan with an 18% difference in the intervention vs nonintervention group [25]. However, a systematic review found limited evidence on the impact of multidisciplinary care on breast cancer survival, highlighting the need for more intensive and structured research [26]. An evaluation of the format of different breast cancer MDTs worldwide highlighted significant variability regarding structure and guidelines, with a need for standardization [27].

For colorectal cancer, advanced-stage patients (stages III and IV) had better outcomes when included in an MDT care pathway [28]. MDTs were also found to enhance patient satisfaction and reduce waiting times, leading to improvements in overall outcomes [21]. The involvement of a multidisciplinary team for assessing, managing, and referring patients with metastatic colorectal cancer was also associated with improved overall survival rates [29]. Similarly, a multidisciplinary approach is essential for adapting to rapid advancements in head and neck cancer treatment and ensuring quality care for patients [30]. Another study also showed improvement with results indicating that groups treated with multidisciplinary team management had a higher survival rate (HR = 0.84, 95% CI) for head and neck cancers in particular [31]. In a retrospective study conducted in Pakistan on head and neck cancer management, data showed that in 43.06% of cases the management had been guided by tumor board discussions [32].

Numerous studies emphasize the significance of multidisciplinary tumor boards, particularly for rare cancers, as they notably enhance adherence to guidelines through their discussions [33]. However, there is a marked lack of standardization and consistency in practices worldwide, and additional data is required to assess the statistical improvements in survival outcomes thoroughly.

Revolutionizing Care: Emerging Paradigms in MTBs and ITBs

Albeit the undeniable advancements in oncological care and the great improvement in patient outcomes, MTBs and ITBs often grapple with prevalent issues such as poor communication between specialties, delays in decision-making, and fragmented care pathways and much more [34, 35]. Although much evolution was seen in this field after COVID-19 pandemic, extra workload due to the scarcity of pre-developed digital documentation systems remains another significant challenge faced by the healthcare workers and staff involved in MDTs, especially the pathologists and radiologists [7].

In response, healthcare systems are witnessing a shift towards more integrated, patient-centered models [5, 33]. Leveraging tools like telemedicine, data-driven analytics, and personalized treatment plans, these emerging paradigms aim to streamline collaboration and enhance the precision of care, improving outcomes for cancer patients. In an analysis of a national survey by S. Elkefi and O. Asan, emphasis was put on how Patient-Centered Care (PCC) positively impacted these three areas of patient outcomes: The analyses showed that PCC significantly improved the 3 outcomes: self-efficacy, trust in doctors, and Quality of Care (QOC) [5].

Telemedicine and its application in the field of oncology is also much appreciated. Telemedicine involves the exchange of medical information via technology and digital means, this aspect substantially helps delivering high-quality cancer care in areas where there is a lack of trained specialists and resources [36, 37].

Even though technology is emerging and its integration into MTBs and ITBs is a means of future betterment of patient outcomes, we cannot dismiss the tangible efforts being made by medical student forces and enthusiastic clinicians. Tumor Board Establishment Facilitation Forum [TEFF] provides an exemplary example regarding such a situation. In LMICs, where organizational sources are scarce and MTBs are not well established, a force of students and clinicians started TEFF in Pakistan to encourage the establishment of tumor boards. With limited students and doctors on board, lack of venue arrangements, weak virtual infrastructure, no tumor board coordinators and technicians, and no proper record systems in tertiary-care settings, TEFF was established with the hope to develop and revolutionize cancer care in Pakistan [38].

As treatment options for Cancer patients become increasingly diverse, this requires the healthcare teams to spend relentless hours in order to update their knowledge [39]. This brings us to put emphasis on the emerging paradigm of Artificial Intelligence (AI) in MTB, amongst which, a promising tool is AI-Driven Clinical Decision Support Systems (AI-CDSS). CDSS has become an essential tool in modern-day medicine and AI takes it a step further in improving clinicians' decisions and patient outcomes. One exemplary example in this application would

be the CDSS, Watson for Oncology (WFO), which managed to cause positive change in patients' perception of hospitals, patient satisfaction, and patients' understanding of their treatments [37, 40].

FUTURE PROSPECTS AND STRATEGIC RECOMMENDATIONS

While there is no doubt that tumor boards play a critical role in enhancing patient care in oncology, there is a pressing need to standardize practices and implement innovative strategies to increase their efficacy. One of the primary challenges faced in multidisciplinary and interdisciplinary meetings is the coordination and communication among various specialists, as well as within the same team.

To mitigate these challenges, physicians can utilize technological advancements, including AI, Electronic Health Records (EHRs), and multi-modal communication tools, to facilitate smoother coordination [41]. Virtual tumor board conferences have proven particularly effective in improving collaboration between specialists at different locations, especially in the post-COVID era, where virtual meetings have become more accepted and the necessary resources are readily available [42].

Furthermore, tumor board practices should undergo regular audits within healthcare institutions to ensure alignment with the most current clinical evidence. The integration of patient information into a central database, which is readily accessible to all involved physicians, alongside effective logistical management and timely communication, are cornerstones for optimizing the effectiveness of tumor board meetings.

CONCLUSION

There is no denying that MTBs and ITBs have revolutionized cancer care; a journey starting from fragmented approaches to cohesive, patient-centered strategies. By bringing together diverse expertise and nurturing interdisciplinary communications, they have uplifted survival rates, improved experiences of patients, and set new standards in oncology treatment protocols.

Even though hurdles in coordination and standardization are still prevalent, innovations like telemedicine and AI are continuously emerging and creating opportunities to make cancer care and outcomes finer. As we proceed further into time, the role of MTBs and ITBs will be crucial in meeting the needs of growing cancer incidence and providing better care. With continued research and refinement of clinical-based literature to quantify the impact of these platforms, these hold the potential of providing the best of cancer care and giving the best of patient outcomes.

ABBREVIATIONS

AI: Artificial Intelligence.

AI-CDSS: AI-Driven Clinical Decision Support Systems.

EHRs: Electronic Health Records.

GCS: German Cancer Society.

HICs: High-Income Countries.

ITDs: Interdisciplinary teams.

ITB: Interdisciplinary Tumor Boards.

LMICs: Lower-Middle Income Countries.

MDTs: Multidisciplinary teams.

MTB: Multidisciplinary Tumor Board.

nmCRPC: Non-metastatic Castration-Resistant Prostate Cancer.

PCC: Patient-Centered Care.

QOC: Quality of Care.

TEFF: Tumor Board Establishment Facilitation Forum.

WFO: Watson for Oncology.

AUTHORS' CONTRIBUTION

Rabia Tahseen: Conceptualization, Study Design.

Asifa Maheen: Study Design, Methodology, Writing Draft, Critical review and revision the manuscript.

Mariam Fahim: Study Design, Methodology, Data analysis and interpretation, Writing Draft, Critical review and revision the manuscript.

Maria Tariq, Yumna Ahmed, Fatima Shaukat and Agha Muhammad Hammad Khan: Critical review and revision the manuscript, Final approval, Final proof to be published.

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Use of AI-Assisted Technologies

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were utilized in the writing of this manuscript, in the creation of images/graphics/tables/captions, or in any other aspect of its preparation.

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