

NARRATIVE REVIEW

MULTIDISCIPLINARY APPROACH IN ONCOLOGY: ENHANCING PATIENT OUTCOMES THROUGH COLLABORATIVE CARE

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ABSTRACT: Italian and international studies clearly indicate that Multidisciplinary teams (MDTs) play a crucial role in enhancing cancer patient outcomes through a collaborative approach that integrates diverse expertise and perspectives. By involving specialists from various medical and supportive disciplines, MDTs ensure comprehensive care, tailored to the individual needs of patients. This integrative strategy fosters accurate diagnoses, personalized treatment plans, and continuous monitoring, thereby improving clinical outcomes. Research indicates that MDTs contribute to higher survival rates, better management of complex cases, and increased patient satisfaction. The coordinated efforts of oncologists, radiologists, surgeons, pathologists, nurses, and allied health professionals result in improved communication, reduced treatment delays, and optimized resource utilization. Moreover, MDTs facilitate shared decision-making, empowering patients and their families to engage actively in the treatment process. The collaborative nature of MDTs also enhances the management of psychosocial aspects, providing holistic support that addresses the emotional, social, and psychological needs of cancer patients. Despite challenges such as logistical coordination and the need for effective communication, the benefits of MDTs in cancer care are well-documented. Overall, the multidisciplinary approach fosters a patient-centered model of care that not only aims at extending survival but also at improving the quality of life for cancer patients.

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Impact statement: Availability of literature data on MDTs at an international level and Italian experiences can guide professionals in making increasingly complex therapeutic decisions for cancer patients.

Population-based data are essential for identifying outcome indicators for patients managed by MDTs. Early results are encouraging and should pave the way for impact assessments in the real world.

Key words: *multidisciplinary team; endometrium; ovarian cancer; colon cancer.*

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INTRODUCTION

Recent advancements in oncology have led to a paradigm shift in the management of cancer patients, moving from a site-specific to a more holistic view of oncological diseases (1).

This transition is driven by the increasing recognition of cancer as a complex pathology necessitating a multidisciplinary approach. In recent years, the management of oncological patients has increasingly necessitated a multidisciplinary approach encom-

passing diverse professional specializations. This shift is driven by the recognition of cancer as a complex, multifaceted pathology rather than merely a site-specific disease. Furthermore, the enhanced life expectancy of cancer patients has redirected the focus of healthcare professionals towards not only extending survival life, but also improving the quality of life (2-4).

The deployment of sophisticated pharmacological therapies, integration of cutting-edge technology, and the potential for severe adverse events, such as cardiovascular diseases, necessitate the involvement of multiple specialists alongside the oncologist, with the specific team composition varying based on tumor site (5). For example, in breast cancer management, the multidisciplinary team typically includes a surgeon, radiologist, pathologist, nuclear medicine physician, and psychologist, among others. This collaborative approach ensures comprehensive patient care, addressing both the medical and psychosocial aspects of cancer treatment. This inherent complexity has catalyzed the development comprehensive patient care strategies that account the holistic needs of the individual's personal and social context, as well as the specific tumor pathology. Consequently, the Multi-Disciplinary Team (MDT) has emerged engaging professionals across different disciplines with the shared objective of optimizing patient outcomes. Despite numerous international implementations of MDTs demonstrating substantial changes in the patient management and therapeutic strategies, there remains a paucity of empirical evidence testifying their definitive impact on patient outcomes. This study aims to give an overview of the use of the MDT approach in the management of cancer patients, with a focus on both international and Italian experiences, and to illustrate how a population-based approach we can be instrumental in assessing the outcomes associated with MDT interventions, ultimately refining collaborative care strategies in oncology.

THE DEFINITION OF MDT: THE INTERNATIONAL EXPERIENCES

The MDT serves as an essential mechanism for standardizing clinical approaches to specific patient categories, with the main objective of enhancing healthcare quality, optimizing therapeutic outcomes, and ensuring patient safety through the

judicious use of resources (6, 7). From the patient's perspective, the MDT framework represents a comprehensive document that delineates the individualized, diagnostic and treatment pathway, mapping out the optimal sequence of interventions required to achieve health objectives and bridging traditional sectoral divides.

The MDT is particularly crucial in oncology, where it ensures that a diverse group of physicians and healthcare professionals with diverse skills and backgrounds collaborate synergistically to provide the most appropriate treatment at the right time. The acronym MDT (Multi-Disciplinary Team), highlighting the importance of teamwork in determining the optimal treatment strategy, starting from established guidelines, and taking into account the specific disease characteristics (such site, stage, and grading), the patient's socio-cultural context, and their personal expectations.

Internationally, numerous studies have documented the efficacy of MDT approach in improving cancer patient outcomes by modifying treatment types, reducing recurrences rates, and lowering mortality rates (8). For instance, MDT approaches have been shown to reduce recurrences in breast cancer (9-11), colorectal cancer (12, 13) and lung cancer mortality (14). Significant improvements have also been observed in head and neck tumors (15-17), esophagus cancer (18), and cholangiocarcinoma (19). In ovarian cancer, a multidisciplinary approach has been associated with a 40% increase in survival rates (20), alongside a reduction in recurrences rates (21), particularly when treated in specialized centers (22-24).

ITALIAN EXPERIENCES

In Italy, experiences vary based on the tumor site and the diverse approaches employed at different medical centers.

In prostate cancer, the involvement of a multidisciplinary team could better guarantee an unbiased approach between surgical treatment and radiation therapy (25). A study conducted in Turin on 201 prostate cancer patients showed that those with localized, advanced, and metastatic disease experienced significant diagnostic-therapeutic changes due to MDT involvement, affecting 23.2%, 46.9% and 33.4% respectively ($P < 0.001$). The uro-oncology MDT meetings altered management plans in at least a quarter of patients, reaching nearly 50% in cases of locally advanced disease (26).

The complexity of multimodality treatment in head and neck cancer has led to an emerging need for multidisciplinary approach to tailor optimal treatment strategies, occasionally refining staging or modifying therapeutic strategy (27). This need was evidenced in a study conducted in Istituto Nazionale dei Tumori of Milan where changes occurred in 69% of cases, new staging tests were requested in 49% of patients and the treatment plan was modified in 10% (28). Multidisciplinary assessment has become a crucial element even in managing oligometastatic head and neck cancer patients (29). Moreover, the MDT can effectively identify patients who are candidates for intervention and subsequent treatments for head and neck tumors (30). Additionally, an MDT can better supervise the surveillance strategy based on positron emission tomography (PET) imaging on a case-by-case basis. Among 59 tongue tumor patients who presented FDG-PET uptake during follow-up, the current results demonstrated a change in the diagnostic strategy in approximately one fifth of the patients, as decided by the MDT (31).

In the case of vulvar cancer, a multidisciplinary team of specialists developed recommendations during the COVID-19 pandemic that addressed both safety standards of care pathways for patients and healthcare workers, as well as personalized treatment strategies (32). A study on 35 vulvar cancer patients treated with radiotherapy \pm adjuvant chemotherapy from April 2013 to September 2017 at the Policlinico Gemelli in Rome highlighted the benefits of a personalized multidisciplinary approach in managing vulvar cancer. With a median follow-up of 32 months (range 6-72), the 24-month local control, disease-free survival, and actuarial overall survival rates were 88.6%, 82.0% and 91.0%, respectively, coupled by a low rate of severe acute (12%) and late (3%) toxicity (33).

At the IRCCS-CROB in Rionero in Vulture, a pathway analysis of 266 patients with early-stage breast cancer managed by the MDT during 2019-2020 showed that the MDT approach improved patient management by optimizing staging, promoting neo-adjuvant treatments, and facilitating earlier surgery, and fostering professional working environment (34). In a recent investigation conducted in Udne, the disparity between clinical team recommendations and patient-selected therapeutic modalities in the context of breast cancer was scrutinized. The discordance rates were delineated as follows: 15% when deliberating the neces-

sity of chemotherapy escalating to 39% for endocrine therapy and reaching 35% for the combined approach of chemotherapy alongside endocrine therapy (35).

Research conducted at Policlinico Gemelli in Rome reaffirms the efficacy of a multidisciplinary paradigm in delivering the intricate care requisite for cancer patients. This imperative underscores the necessity for organizational and cultural adaptations, and cultural spearheaded by adept healthcare administrators. Nonetheless, the inquiry underscores the exigency to delve tangible ramifications on survival metrics, quality of life indices, and patient satisfaction (5).

Another aim of interest is to assess the impact of MDT implementation on patient satisfaction and treatment adherence. A study conducted in Rome at Sant'Andrea Hospital in Rome by Lucarini, involving 355 colorectal cancer patients, investigated survival outcomes (cumulative overall survival 79%), alongside the average interval for computed tomography or colonoscopy appointments (14.9 days for patients in the MDT group compared to 24.5 in the no-MDT group). Notably, from the patient perspective, 89.5% perceived a sense of comprehensive care of during treatment and 93.5% expressed a high level of satisfaction with the MDT initiative (36). In select instances, the management entails addressing rare pathologies, such as an international study involving two Italian centers. This study delved into the intricate facets of managing recurrent hepato-cellular carcinoma (RHCC), encompassing recurrence prediction, prevention, diagnostic modalities, therapeutic interventions, and surveillance protocols (37). Also, a study conducted at the Policlinico Gemelli in Rome, focusing on 132 consecutive schwannoma patients referred to MDT and subsequently managed through observation, microsurgery or fractional stereotactic radiotherapy revealed notable findings. Statistically significant differences between the cohorts were observed concerning quality of life metrics, particularly within the physical domain. This underscores the MDT's capability to deliver tailored therapeutic approaches for vestibular schwannoma patients, surpassing the efficacy compared to a single gold standard strategy (38).

Research focusing on kidney cancer has elucidated that patients who would benefit the most from an MDT assessment are those categorized as: a) having cT3-4 disease (irrespective of age or comorbidity); b) possessing cT2 tumors, provided they

are healthy and under 70 years of age, or under 60 years old with at least one comorbidity; or c) exhibiting cT1b disease, if aged under 60 and without comorbidity. The study underscores the feasibility of identifying optimal candidates for MDT evaluations and advocates for considering patients with RCC for inclusion in clinical trials, deferred treatment protocols, and the refinement of treatment guidelines (39).

A Dutch study, in collaboration with the Department of Gastroenterology of Trento, involving 292 patients with neuroendocrine tumors (NRNs), demonstrated that the MDT discussions significantly impacted management. Notable changes occurred in 61% of NENs, with 7% experiencing changes in diagnosis, 8% in tumor grade, and 16% in stage and treatments plans, including surgical interventions (9%) and the administration of somatostatin analogues (20%). Significant change more frequently observed in patients with stage IV disease compared to stage I (hazards ratio (HR) 3.6; 95% confidence interval (CI) 1.9-6.9), and in NEN G2 compared to G1 (HR 2.1; 95% CI 1.2-3.8) (40). Additionally, gastrointestinal stromal tumor (GIST) patients with liver metastases benefit from MDT discussions, which can improve the quality of life and prolong survival (41).

A large-scale study conducted at Humanitas involved 847 patients with liver metastases from colorectal cancer, whose cases were reviewed during weekly MDT meetings. These patients were subdivided in two groups: those receiving systemic therapy (ST) and those undergoing locoregional treatment (LRT). The rigorous patient selection by the MDT effectively mitigated the selection bias, resulting in a median overall survival (OS) of 51 months for the LRT group compared to 15 months for ST group (42).

A comprehensive and critical evaluation of MDT effectiveness in lung cancer management was undertaken at the National Cancer Institute of Naples, adhering to the international standard ISO 31000/2018, with the aim of improving MDT practices. The study focused on identifying key factors that could delay the panel's final decision or impact the timing of diagnosis, staging, and treatment planning processes. For instance, ensuring the final MDT decision was accessible to all members within 24 hours of the meeting significantly reduced delays in implementing MDT recommendation for patients. Additionally, measures such as establishing an integrated outpatient department

with both oncologists and radiation oncologists (risk ID 03.03) effectively shortened the time to start integrated treatments by improving coordination between these specialists. A follow-up risk analysis conducted three months post-implementing of the risk treatment plan confirmed its effectiveness in optimizing MDT operations (43).

A multicenter study involving 196 physicians across 20 Italian centers highlighted key factors for optimal lung cancer management. The three pivotal elements identified were invasive diagnosis of nodal disease for staging, a priori determination of "surgical resectability", and consistent MDT meetings with all essential participants present. The primary barriers to the effective clinical of these diagnostic and therapeutic strategies varied regionally. In Southern and Central Italy, the absence of regular and comprehensive MDT meetings was a significant impediment. In contrast, in Northern Italy, the main challenges included limited time for clinical case discussions during MDT meetings and prolonged waiting lists for staging and therapeutic procedures (44).

An organizational study conducted at Sapienza University in Rome on the management of cholangiocarcinoma examines in detail the roles of specialists who should be integrated into a treatment pathway. The study identifies mandatory specialists (oncologist, primary care physician, surgeon, diagnostic and interventional radiologist, hepatologist, pathologist, endoscopist and gastroenterologist) and those whose presence is recommended (palliative care, nurse, dietitian, basic researcher, psychologist and social worker). According to 76.92% of participants the optimal frequency of MDT meetings was weekly. Additionally, 73.06% believed that all newly diagnosed patients should ideally be discussed with a new treatment, although this occurred in less than half of MDTs (46.15%) in current practice. The majority of participants indicated that guidelines were used either always (46.15%) or often (50%), with a preference for international guidelines (61%), such as European and American, followed by national/local ones (39%) (45).

A study conducted by Basso at Gemelli Policlinic assessed the impact of MDT evaluation on patients with colorectal liver metastases. Although the MDT approach did not demonstrate a significant survival benefit, it facilitated surgical interventions in patients with more advanced disease stages and was associated with reduced median chemother-

apy duration and lower postoperative morbidity rates. Liver resection remains the gold standard treatment for patients with colorectal metastases confined to the liver. This study aimed to compare the survival outcomes of patients managed through an MDT (MDT cohort) versus those referred for surgery by other hospitals without MDT discussion (non-MDT cohort). Out of the 523 patients, 229 were managed by the MDT, while 294 were referred from external institutions. The analysis revealed no significant difference in median overall survival between the two groups (52.5 vs. 53.6 months; HR, 1.13; 95% CI, 0.88-1.45). The MDT cohort presented with a higher median number of metastases occurred in the MDT cohort (4.5 vs. 2.7; $P < 0.0001$). Moreover, the MDT cohort experienced a shorter median duration of chemotherapy (8 vs. 10 cycles; $P < 0.001$), and a lower rate of postoperative morbidity (6.2 vs. 21.5%; $P < 0.001$) (46).

A study evaluated the impact of a dedicated radiologist in the multidisciplinary management of patients with head and neck tumors at a single center, involving a total of 540 cases. Image review at the time of tumor diagnosis was performed in 310 cases (57.4%). Most patients (69%) had advanced stage tumors (III and IV). In 262 (48%) cases, there was no change in the initial radiological report. In 144 cases (27%), the available imaging was deemed insufficient for a definitive treatment decision, necessitating further imaging. For the remaining 134 cases (25%), radiological review resulted in changes to tumor staging in 55% of cases and modifications to the treatment strategy in 45% of cases (47).

To validate an MDT approach, a methodologist assembled a multidisciplinary group of experts from various institutions. This panel developed a comprehensive flowchart that detailed critical elements, intervention points, connecting lines, and outcome measures. An accredited certification body has validated the entire process, forming a foundation for empowerment and implementation among patients and oncology professionals in various hospitals (48).

MDT meetings significantly impact on the management of lung cancer patients in thoracic oncology surgery, modifying the initial outpatient clinical hypothesis in 10.6% of cases. The clinical contexts with the highest rates of decision modification include "solitary pulmonary nodule" and "confirmed or suspected recurrence" with modification rates of 14.6% and 13.3%, respectively (49). Over 100

cases of laryngeal cancers (LCs) were evaluated by an MDT specializing in the management of head and neck cancers. Optimizing oncological outcomes in T3 LCs can only be achieved through a comprehensive MDT approach, considering that different therapeutic options have heterogeneous toxicity profiles and indications (50).

A case report showed that a multidisciplinary team devised a sequential "reverse strategy" approach for a patient, which included induction chemotherapy, hematopoietic stem cell mobilization and harvesting, followed by autologous stem cell transplant (51).

A multidisciplinary team approach appears to be beneficial in decision making regarding the diagnosis and management of pancreatic serous cystic neoplasms. A study involving 43 patients demonstrated that MDT assessment significantly influenced the type of management. A uni-multivariate analysis indicated that an MDT approach independently reduced the likelihood of surgery (odds ratio (OR) 0.1; 95% confidence interval (CI) 0.02-0.8) (52).

THE IMPACT OF THE MDT ON THE REAL-WORLD: THE REGGIO EMILIA'S EXPERIENCE

The AUSL-IRCCS of Reggio Emilia has embarked on a comprehensive initiative to quantify the real impact of MDTs on specific outcome indicators such as recurrence incidence and mortality rates in cancer patients. This analysis utilizes data from the Cancer Registry and includes three studies focusing on ovarian, endometrial, and colorectal cancers.

Ovarian cancer study

Ovarian cancer remains one of the most challenging cancers to manage due to its clinical, biological, and molecular complexity, despite therapeutic advances. In Italy, approximately 5,000 new cases are diagnosed annually, with a 5-year survival rate of 43% (53).

This study evaluated the benefits of MDT involvement in ovarian cancer management *versus* non-MDT management in terms of disease-free survival (DFS) and mortality (54).

From 2012 to 2020, 448 cases of ovarian cancer were identified with 24% (108 cases) managed by MDTs. The study included a significant proportion of older patients (over 65 years) and advanced-stage diag-

Table 1. Ovarian cancer, years 2012-2020. Distribution of outcomes by stage among MDT and no-MDT patients at 1 year and 2 years after diagnosis.

	1 YEAR		P- VALUE	2 YEARS		P- VALUE
	YES MDT	NO MDT		YES MDT	NO MDT	
Stage I			0.64			0.53
Disease-free survival	88.9	86.0		9.2	89.6	
Recurrence	7.4	4.0		3.9	6.3	
Death	0.0	4.0		0.0	4.2	
Stage II			0.62			0.72
Disease-free survival	75.0	81.8		100	81.8	
Recurrence	25.0	9.1		0.0	9.1	
Death	0.0	9.1		0.0	9.1	
Stage III			<0.01			<0.01
Disease-free survival	54.1	25.3		92.3	45.6	
Recurrence	24.3	23.2		7.7	27.9	
Death	10.8	11.1		0.0	8.8	
Stage IV			0.08			0.20
Disease-free survival	60.0	38.8		84.2	62.5	
Recurrence	0.0	4.1		0.0	5.0	
Death	26.7	55.1		15.8	32.5	

nosed (75% stage III-IV). After a median follow-up of three years, the recurrence rate was comparable between MDT (25%) and non-MDT (27%) groups. However, stage-specific analysis revealed some significant differences (**Table 1**). Stage III MDT patients had higher DFS rates (54.1% vs. 25.3%) and lower recurrence (10.8% vs. 40.4%) and mortality rates compared to non-MDT patients. These results were also confirmed 2 years after diagnosis. Stage IV MDT patients also exhibited higher DFS (60% vs. 38.8%) and lower mortality rates (26.7% vs. 55.1%) at one year, which were maintained at two years post-diagnosis.

Endometrial cancer study

Endometrial cancer, with about 8,300 new cases annually in Italy and a 5-year survival rate of 77%, was the focus of the second study. This study assessed all endometrial cancer cases registered from 2013 to 2020, involving 643 patients (55). The MDT group constituted about half of the cases, with a notable representation of elderly and early-stage patients (73% diagnosed at stage I).

Recurrence rates were similar between MDT and non-MDT groups (10%). However, MDT patients had a higher recurrence rate within the first year. Although DFS did not show significant differences (HR 1.1; 95% CI 0.7-1.6), OS was better in the MDT

group (HR 1.5; 95% CI 1.0-2.4). Five-year survival rates were significantly higher for MDT patients (87% vs. 79%). **Figure 1** shows that OS rates were statistically significantly higher for stage I, young-adult women, and slightly improved for the most recent period analyzed. Notably, women managed by MDT had superior 5-year survival than the no-MDT group (87% vs. 79%).

Over time, the MDT pathway evolved to include a broader range of patients, increasing in number (from about 20 to 50 cases per year), and diversity, including more elderly (average age increased from 63 to 67 years), advanced-stage (from 8% to 49%) or locally advanced (from 8% to 96%), and rural residents (from 25% to 70%).

Colorectal cancer study

The third investigation, focusing on colorectal cancer, a disease with approximately 44,000 new diagnoses per year in Italy with a 5-year survival of 65% (25), assessed the impact of MDTs on survival outcomes. The study analyzed 605 colorectal cancers diagnosed between 2017-2018. Significant advantages in relative survival rates were observed for MDT patients at 1 and 3 years after diagnosis, especially in advanced disease stages. Specifically, there were no differences in survival by site between colon and rectum, while significant differ-

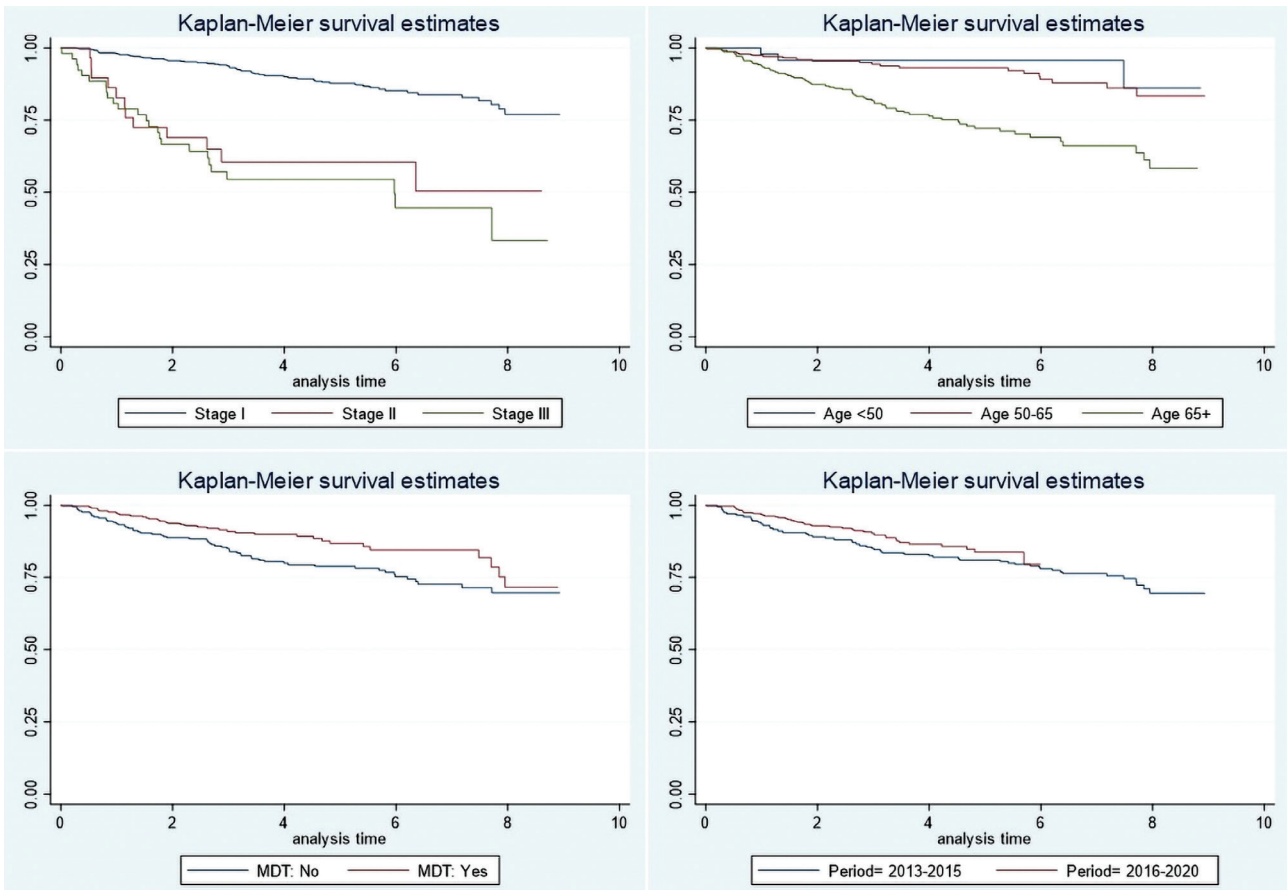


Figure 1. Endometrial cancer, years 2013-2020. Kaplan-Maier Overall Survival by stage, age, MDT and period of diagnosis.

ences were recorded after 1 year in the MDT (90%) vs. no-MDT (62%) group (**Figure 2**). Stratification by stage showed that there was no survival advantage for stage I and II patients among MDT vs. no-MDT patients. However, stage III MDT patients had a higher survival rate at one year (86.4% vs. 56.9%) and three years (69.9% vs.

35.1%). Similarly, stage IV MDT patients showed a survival advantage at one year (63.7% vs. 27.4%) and three years (29.2% vs. 5.1%). Although other confounding factors cannot be excluded, these findings suggest a substantial benefit of the multidisciplinary approach in managing advanced colorectal cancer.

In conclusion, despite some fragmentary data, the literature supports the notion that multidisciplinary teams enhance patient care pathways. To optimize their effectiveness, MDTs must be well-organized, efficient, and coordinated, ensuring robust communication within the team and with patients (4). This approach is critical for continuing to improve the management and outcomes of cancer patients.

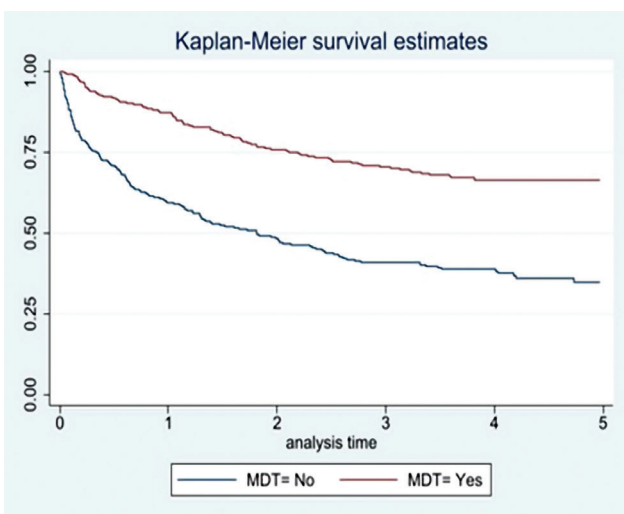


Figure 2. Colorectal cancer, years 2017-2018. Kaplan-Maier Overall Survival by MDT.

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The data underlying this article are available in the article.

Authors' contributions

IB: conceptualization, investigation, writing-original draft, visualization, supervision; FMO: formal analysis, writing-review and editing, and visualization, supervision; AN: investigation and supervision; LM: conceptualization, investigation, visualization, supervision.

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