Saudi Journal of Medicine and Public Health

https://saudijmph.com/index.php/pub

https://doi.org/10.64483/202412338

From Cellular Aberration to Existential Integration: A Narrative Review of the Multidisciplinary Continuum in Oncology Care

Ahmed Abdullah Yahya Maashi [(1)] , Nasser Fheed Nasser Aldowsari [(2)] , Sara Alhawsawi [(3)] , Saif Allah Atiah Bkr [(4)] , Seetah Modhe Salman [(5)] , Mohmmed Mahdi Abdullah Al Jaran [(6)] , Aisha Abdulrahman Almaiman [(7)] , Areej Mohammed Saeed Melibari [(8)] , Ali Hassan Ali Bastta [(9)] , Hind Mohammed Jafari [(10)] , Dalal Hathloul Alshammari [(11)] , Hassan Mohammed Ali Ghazwani [(12)] , Eman Katam Ibrahim Alhalal [(13)]

(1) Aledabi Vector Disease Control,Ministry of Health, Saudi Arabia,
(2) Wadi Al-Dawasir General Hospital,Ministry of Health, Saudi Arabia,
(3) King Abdulaziz Hospital Jeddah,Ministry of Health, Saudi Arabia,
(4) Central Blood Bank Jizan Cluster, Ministry of Health, Saudi Arabia,
(5) Al, Azizia Ii Health Center, Riyadh,Ministry of Health, Saudi Arabia,
(6) Al-Nairiyah General Hospital, Al-Nairiyah Governorate,Ministry of Health, Saudi Arabia,
(7) King Saud Hospital, Qassim, Unaizah,Ministry of Health, Saudi Arabia,
(8) Jarana Health Center,Ministry of Health, Saudi Arabia,
(9) Jazan General Hospital, Ministry of Health, Saudi Arabia,
(10) Hospital Sabya,Ministry of Health, Saudi Arabia,
(11) Radifa Health Center,Ministry of Health, Saudi Arabia,
(12) Erada Mental Health Hospital,Ministry of Health, Saudi Arabia,
(13) Erada Complex For Mental Health In Dammam,Ministry of Health, Saudi Arabia

Abstract

Background: Contemporary oncology has evolved from a disease-centered model to a patient-centered continuum, demanding intricate collaboration across diverse specialties. This paradigm shift recognizes cancer not merely as a pathological entity but as a complex biopsychosocial experience, impacting individuals from molecular diagnosis through to survivorship or palliative integration.

Aim: This narrative review aims to synthesize current evidence (2010-2024) on the roles and collaborative imperatives of key specialties—including pathology, radiology, pharmacy, nursing, blood bank, clinical psychology, and epidemiology—across the oncology journey.

Methods: A comprehensive literature search was conducted across PubMed, Scopus, PsycINFO, and CINAHL databases for English-language articles published between 2010 and 2024. Search terms combined "multidisciplinary team," "oncology," "cancer care continuum," with each specialty (e.g., "oncology pharmacy," "psycho-oncology," "cancer epidemiology").

Results: The review delineates the critical, interwoven functions of each discipline across the care trajectory: from diagnostic precision (pathology/radiology) and therapeutic orchestration (pharmacy/nursing/blood bank) to psychosocial-spiritual support (clinical psychology) and population health insights (epidemiology).

Conclusion: Optimal cancer outcomes are fundamentally dependent on seamless, intentional multidisciplinary integration. The future of oncology lies in formalizing collaborative frameworks, leveraging shared decision-making tools, and embedding supportive care as a standard from diagnosis forward. A proactive, team-based approach is essential for navigating the complex journey from cellular aberration to existential integration.

Keywords: multidisciplinary cancer care, oncology continuum, integrated care model, psycho-oncology, supportive oncology.

Introduction

The landscape of oncology has undergone a profound transformation in the 21st century, shifting from a historically siloed, disease-focused approach to a dynamic, patient-centered continuum (Fennell et al., 2010). This journey, initiated at the moment of diagnostic suspicion and extending through treatment, survivorship, or palliative care, is no longer the exclusive domain of the oncologist. Instead, it represents a complex orchestration of expertise, where the integration of diverse specialties is not merely beneficial but essential for achieving optimal biomedical and humanistic outcomes (Taplin et al., 2015). Cancer is now understood as a

*Corresponding author e-mail: Aamaashi@Moh.Gov.Sa (Ahmed Abdullah Yahya Maashi).
Receive Date: 12 December 2024, Revise Date: 30 December 2024, Accept Date: 31 December 2024

multilevel challenge: a cellular aberration requiring molecular interrogation, a physical illness demanding sophisticated interventions, and a life-altering experience fraught with psychological, social, and existential distress (Holland & Alici, 2010). This review posits that navigating this journey effectively requires a meticulously coordinated multidisciplinary team (MDT) whose collective efforts support the patient across the entire spectrum of need.

The modern oncology MDT is a constellation of specialists. The laboratory pathologist and radiologist form the diagnostic vanguard, translating tissue and images into actionable knowledge (Byrd et al., 2021). The pharmacist and nurse are the architects and engineers of therapeutic delivery, managing complex regimens and mitigating toxicities (Neuss et al., 2016). The blood bank technician ensures the vital support of safe transfusion. The clinical psychologist addresses the profound emotional and cognitive turmoil (Watson & Kissane, 2011). Meanwhile, the epidemiological inspector, through cancer registry data and survivorship studies, provides the essential population-level context, informing both individual prognosis and public health strategy (Garpenhag et al., 2023). This narrative review synthesizes contemporary literature (2010-2024) to delineate the integral roles of these specialties across the cancer care continuum—from diagnosis through palliation—and argues for the intentional design of systems that foster deep, proactive collaboration as the cornerstone of 21st-century cancer care.

The Diagnostic Foundation

The oncology journey is irrevocably shaped by its beginning: the precise and timely establishment of a diagnosis. This phase sets the therapeutic trajectory and prognostic expectations, relying on a symbiotic partnership between laboratory medicine and radiology.

Pathology and Laboratory Medicine

The pathologist's role has evolved from morphological description to comprehensive molecular profiling. Histopathological analysis remains the gold standard for diagnosis, but it is now augmented by immunohistochemistry, cytogenetics, and genomic sequencing (Cree et al., 2014). This shift towards precision oncology means the laboratory is no longer a passive service but an active guide. For instance, the identification of specific mutations (e.g., EGFR in lung cancer, BRCA in breast cancer) directly dictates eligibility for targeted therapies (Mosele et al., 2020). Tumor markers, while limited in screening, are crucial for monitoring treatment response and detecting recurrence (Lahoud et al., 2021). The laboratory's timely and accurate communication of these complex results is critical for MDT discussion and treatment planning. Delays or errors at this stage cascade through the entire care process, underscoring the need for integrated pathology informatics and direct pathologist participation in tumor boards (Ortelli et al., 2018).

Radiology

Radiology provides the structural and functional map of disease. Diagnostic imaging (CT, MRI, PET-CT) is indispensable for staging, determining resectability, and establishing baseline measurements (Aerts et al., 2014). The radiologist's interpretation, especially when utilizing structured reporting frameworks, provides the MDT with a clear understanding of disease extent (Brook et al., 2015). Beyond diagnosis, interventional radiology has become a therapeutic pillar. Techniques such as image-guided biopsy, tumor ablation (RFA, cryoablation), transarterial chemoembolization (TACE), and radioembolization offer minimally invasive treatment options, often for patients unsuitable for surgery (Sgalambro et al., 2022). This blurring of diagnostic and therapeutic lines highlights the need for radiologists to be embedded in the care continuum, contributing to decisions on the most appropriate local control strategies (Table 1). Figure 1 illustrates the integrated continuum of oncology care from initial diagnosis through treatment, survivorship, and palliative care.

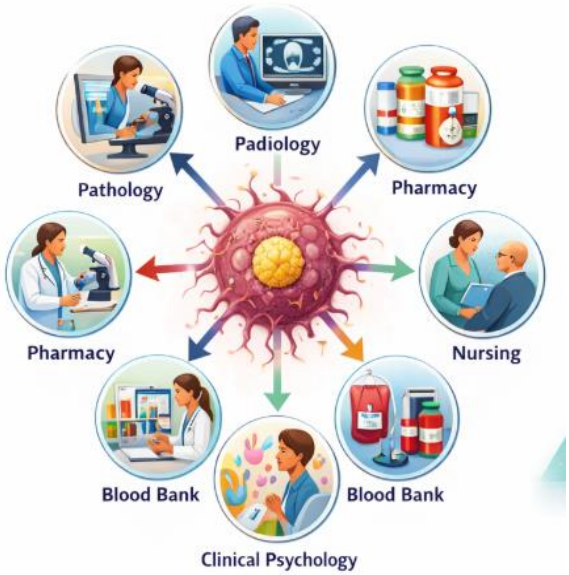

Figure 1: The Multidisciplinary Oncology Care Continuum Across the Cancer Trajectory

Table 1: The Diagnostic & Therapeutic Vanguard: Key Roles in Early Phase Care

Specialty	Primary Role in Diagnosis/Staging	Key Collaborative Output	Impact on Care Trajectory
Pathology/Lab	Tissue diagnosis, molecular profiling, tumor marker analysis.	Comprehensive pathology report with prognostic & predictive biomarkers.	Determines tumor type, grade, and eligibility for targeted therapy; guides all

			subsequent decisions.
Diagnostic Radiology	Anatomical & functional imaging for staging and baseline assessment.	Structured radiology report integrated with clinical data.	Defines disease extent, influences curability intent (localized vs. metastatic), monitors response.
Interventional Radiology	Image-guided biopsy (diagnostic) and tumor-directed ablative procedures (therapeutic).	Minimally invasive tissue sampling; alternative local therapy for selected tumors.	Enables precise diagnosis without major surgery; provides treatment option for inoperable patients.

The Therapeutic Execution

Once a treatment plan is established, its safe and effective execution requires a second layer of specialized collaboration, primarily involving pharmacy, nursing, and blood bank services.

Oncology Pharmacy

Oncology pharmacists are central to medication safety and efficacy. Their role extends far beyond dispensing to encompass chemotherapy regimen verification, dose calculation (including adjustments for renal/hepatic function), and proactive management of drug interactions (Holle et al., 2017). They are critical in preventing errors in the high-risk process of chemotherapy ordering, preparation, and labeling (Boşnak et al., 2018). Furthermore, pharmacists lead in managing side effects, authorizing antiemetic protocols, and optimizing complex pain management regimens, often involving opioids and adjuvants (Portenoy et al., 2021). Their expertise in pharmacogenomics is increasingly relevant for personalizing therapy and avoiding adverse drug reactions (Relling & Evans, 2015). Direct patient counseling on oral chemotherapy adherence and toxicity recognition is another vital function.

Oncology Nursing

Oncology nurses are the constants in the patient's journey, providing clinical care, education, and emotional support. They are responsible for the safe administration of chemotherapy, monitoring for acute reactions (e.g., hypersensitivity, extravasation), and managing a wide array of symptoms, including nausea, fatigue, mucositis, and cytopenias (Given et al., 2012). Nurses perform comprehensive symptom assessments, often using validated tools, and act as the primary communicators between the patient and the broader MDT (Brant, 2022). Their role in patient and family education—demystifying treatment, explaining side effect management, and advising on when to seek help—is fundamental to patient empowerment and safety outside the clinical setting (Pandey et al., 2021).

Blood Bank/Transfusion Medicine

The blood bank is a silent but essential partner, particularly for patients experiencing treatment-induced myelosuppression. Chemotherapy and radiation frequently cause anemia and thrombocytopenia, requiring transfusions of packed red blood cells and platelets to prevent life-threatening complications and maintain quality of life (Carson et al., 2023). The blood bank technician ensures the safe provision of compatible blood products, manages inventory for patients on chronic transfusion schedules, and oversees procedures for irradiated or leukoreduced products for immunocompromised patients (Dunbar, 2020). Their work directly supports treatment intensity, allowing patients to receive planned chemotherapy cycles without dangerous delays.

The Psychosocial-Spiritual Dimension

A cancer diagnosis is a profound psychological trauma. Integrating clinical psychology into the standard care fabric is not a luxury but an evidence-based necessity for comprehensive care.

Clinical Psychology and Psycho-Oncology

Psycho-oncology addresses the significant mental health comorbidities of cancer, including diagnostic distress, adjustment disorders, anxiety, depression, and delirium (Grassi et al., 2014). Early psychological assessment and intervention can improve coping skills, enhance treatment adherence, and reduce overall distress (Jacobsen & Jim, 2008). Cognitive-behavioral therapy (CBT) and mindfulness-based interventions are effective for managing anxiety, pain, and insomnia (Oberoi et al., 2020). As the disease progresses, psychologists and trained counselors provide essential support in navigating existential concerns, legacy building, and end-of-life decision-making, aligning medical care with patients' values (Peppercorn et al., 2011). Furthermore, they offer crucial support for caregivers, who themselves are at high risk for burnout and depression (Applebaum & Breitbart, 2013).

The Population Health Lens

Epidemiology and cancer registry data provide the macro-context for micro-decisions, linking individual patient care to broader public health goals.

Epidemiology and Cancer Registries

Cancer registries are indispensable for understanding disease patterns, disparities, and outcomes at a population level (Garpenhag et al., 2023). Epidemiological data informs screening guidelines, helps evaluate the real-world effectiveness of new therapies, and identifies gaps in care access (Charlton et al., 2022). For the individual MDT, registry-derived survival statistics provide context for prognostic discussions. Survivorship research, a key epidemiological domain, has

illuminated the long-term physical and psychological sequelae of cancer treatment, driving the development of survivorship care plans and late-effects clinics (Shapiro et al., 2019). The epidemiological inspector ensures data quality and facilitates research that continuously refines clinical practice.

The Palliative and End-of-Life Transition

Palliative care is a philosophy and specialized medical care that should be integrated early, concurrent with curative treatment, not reserved for the terminal phase (Temel et al., 2017). The transition to a primary palliative focus represents a critical phase in the continuum.

Integrated Palliative Care

Early integration of palliative care specialists alongside oncologists improves quality of life, reduces depressive symptoms, and may even prolong survival in some advanced cancers (Hui et al., 2018). This model requires full MDT engagement. The nurse coordinates comfort care; the pharmacist manages complex symptom cocktails; the psychologist addresses existential distress and grief; and the social worker navigates family dynamics and practical needs (Bakitas et al., 2015). Effective communication during this transition, emphasizing patient values and goals of care, is a shared responsibility of the entire team (Bernacki & Block, 2014). Table 2 and Figure 2 depict a holistic, patient-centered framework for oncology care. The model progresses from biological and molecular foundations through clinical, emotional, and psychosocial domains, culminating in existential and spiritual integration.

Table 2: The Supportive & Integrative Backbone: Key Roles in Sustaining Care

Specialty	Primary Role in Therapeutic & Supportive Care	Key Collaborative Action	Impact on Patient Outcomes
Oncology Pharmacy	Chemotherapy safety, dose optimization, side-effect pharmacology.	Active participation in MDT to review regimen feasibility and drug interactions.	Reduces medication errors, optimizes efficacy, manages toxicity, improves adherence.
Oncology Nursing	Direct care, symptom management, patient education, continuous assessment.	Acts as hub for patient communication; relays patient-reported outcomes to MDT.	Improves safety, enhances quality of life, empowers self-management, reduces unplanned admissions.
Blood Bank	Provision of safe, timely transfusion support for cytopenias.	Proactive communication with clinical team on product needs and special requirements.	Prevents hemorrhage and severe anemia, supports treatment continuity, maintains functional status.
Clinical Psychology	Assessment and treatment of psychological distress, coping facilitation.	Integrated screening for distress; provides therapy and collaborates on goals-of-care discussions.	Reduces anxiety/depression, improves coping and adherence, enhances quality of life, supports dignified EOL.
Epidemiology/Registry	Population-level data collection, outcomes analysis, survivorship research.	Provides data for MDT on community standards and outcomes; identifies care disparities.	Informs evidence-based practice, improves quality metrics, guides survivorship care planning.

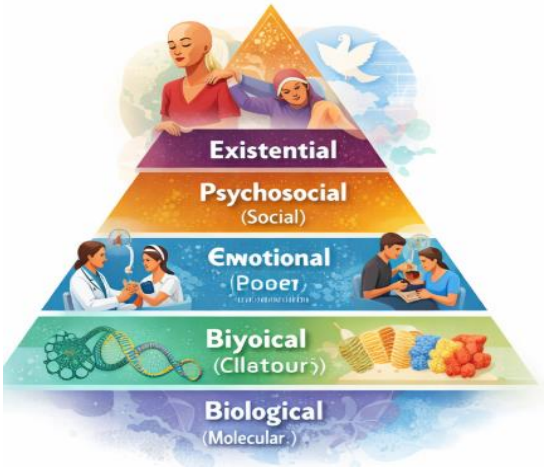

Figure 2: Biopsychosocial–Existential Model of Patient-Centered Oncology Care

Challenges and Barriers to Effective Multidisciplinary Integration

Despite the clear rationale for MDT care, implementation faces significant hurdles. Communication silos persist, often due to incompatible electronic health records, lack of protected time for team meetings, or hierarchical structures (Lamb et al., 2011). Fragmented workflows can lead to duplicated tests, delayed referrals, and patient confusion (Taplin et al., 2015). Furthermore, access to supportive care services like psychology and palliative care remains uneven, often dependent on institution or geography (Zimmermann et al., 2014). Financial and reimbursement models frequently fail to incentivize the collaborative time

required for optimal MDT function (Fennell et al., 2010).

Future Directions and Conclusion

The future of oncology lies in formalizing and optimizing multidisciplinary integration. This includes implementing shared decision-making tools that visually incorporate inputs from all specialties, developing co-located clinics, and leveraging technology for virtual tumor boards to include all relevant providers, including psychosocial and palliative care (Taylor et al., 2010). Standardized distress screening and automatic referral pathways can embed psychological care into the routine workflow (Li et al., 2016). Investment in team science and communication training is crucial.

In conclusion, the journey from a cancer cell's first aberrant division to a patient's final integration of their experience—whether into a long survivorship or a peaceful end of life—is a path that cannot be navigated by a single guide. It is a multidisciplinary odyssey. The seamless collaboration of laboratory, radiology, pharmacy, nursing, blood bank, psychology, and epidemiology is not an ideal but a practical necessity for achieving the dual aims of oncology: to prolong life and to make that life worth living. By intentionally designing systems that foster this deep collaboration, we can ensure that the continuum of care is not a series of handoffs between silos, but a unified, supportive, and patient-centered journey.

References

1. Aerts, H. J., Velazquez, E. R., Leijenaar, R. T., Parmar, C., Grossmann, P., Carvalho, S., ... & Lambin, P. (2014). Decoding tumour phenotype by noninvasive imaging using a quantitative radiomics approach. *Nature communications*, *5*(1), 4006. https://doi.org/10.1038/ncomms5006
2. Applebaum, A. J., & Breitbart, W. (2013). Care for the cancer caregiver: a systematic review. *Palliative & supportive care*, *11*(3), 231-252. doi:10.1017/S1478951512000594
3. Bakitas, M. A., Tosteson, T. D., Li, Z., Lyons, K. D., Hull, J. G., Li, Z., ... & Ahles, T. A. (2015). Early versus delayed initiation of concurrent palliative oncology care: patient outcomes in the ENABLE III randomized controlled trial. *Journal of clinical oncology*, *33*(13), 1438-1445. https://doi.org/10.1200/JCO.2014.58.6362
4. Bernacki, R. E., & Block, S. D. (2014). Communication about serious illness care goals: a review and synthesis of best practices. *JAMA internal medicine*, *174*(12), 1994-2003. doi:10.1001/jamainternmed.2014.5271
5. Boşnak, A. S., Birand, N., Diker, Ö., Abdi, A., & Başgut, B. (2019). The role of the pharmacist in the multidisciplinary approach to the prevention and resolution of drug-related problems in cancer chemotherapy. *Journal of Oncology Pharmacy Practice*, *25*(6), 1312-1320. https://doi.org/10.1177/1078155218786048
6. Brant, J. M. (2022, February). The assessment and management of acute and chronic cancer pain syndromes. In *Seminars in oncology nursing* (Vol. 38, No. 1, p. 151248). WB Saunders. https://doi.org/10.1016/j.soncn.2022.151248
7. Brook, O. R., Brook, A., Vollmer, C. M., Kent, T. S., Sanchez, N., & Pedrosa, I. (2015). Structured reporting of multiphasic CT for pancreatic cancer: potential effect on staging and surgical planning. *Radiology*, *274*(2), 464-472. https://doi.org/10.1148/radiol.14140206
8. Byrd, K., Alqahtani, S., Yopp, A. C., & Singal, A. G. (2021, January). Role of multidisciplinary care in the management of hepatocellular carcinoma. In *Seminars in liver disease* (Vol. 41, No. 01, pp. 001-008). Thieme Medical Publishers, Inc.. DOI: 10.1055/s-0040-1719178
9. Carson, J. L., Stanworth, S. J., Guyatt, G., Valentine, S., Dennis, J., Bakhtary, S., ... & Pagano, M. B. (2023). Red blood cell transfusion: 2023 AABB international guidelines. *Jama*, *330*(19), 1892-1902. doi:10.1001/jama.2023.12914
10. Charlton, M. E., Kahl, A. R., McDowell, B. D., Miller, R. S., Komatsoulis, G., Koskimaki, J. E., ... & Cronin, K. A. (2022). Cancer Registry Data linkage of electronic health record data from ASCO's CancerLinQ: evaluation of advantages, limitations, and lessons learned. *JCO clinical cancer informatics*, *6*, e2100149. https://doi.org/10.1200/CCI.21.00149
11. Cree, I. A., Deans, Z., Ligtenberg, M. J., Normanno, N., Edsjö, A., Rouleau, E., ... & Van Krieken, J. H. (2014). Guidance for laboratories performing molecular pathology for cancer patients. *Journal of clinical pathology*, *67*(11), 923-931. https://doi.org/10.1136/jclinpath-2014-202404
12. Dunbar, N. M. (2020). Does ABO and RhD matching matter for platelet transfusion?. *Hematology 2014, the American Society of Hematology Education Program Book*, *2020*(1), 512-517. https://doi.org/10.1182/hematology.2020000135
13. Fennell, M. L., Prabhu Das, I., Clauser, S., Petrelli, N., & Salner, A. (2010). The organization of multidisciplinary care teams:

modeling internal and external influences on cancer care quality. *Journal of the National Cancer Institute Monographs*, *2010*(40), 72-80. https://doi.org/10.1093/jncimonographs/lgq010

14. Garpenhag, L., Halling, A., Larsson, A. M., & Calling, S. (2023). The role of primary care in the cancer care continuum: a qualitative study of cancer survivors' experiences. *Scandinavian Journal of Primary Health Care*, *41*(1), 13-22. https://doi.org/10.1080/02813432.2022.2145848
15. Given, B. A., Given, C. W., & Sherwood, P. R. (2012). Family and caregiver needs over the course of the cancer trajectory. *The journal of supportive oncology*, *10*(2), 57-64.
16. Grassi, L., Caruso, R., Hammelef, K., Nanni, M. G., & Riba, M. (2014). Efficacy and safety of pharmacotherapy in cancer-related psychiatric disorders across the trajectory of cancer care: a review. *International Review of Psychiatry*, *26*(1), 44-62. https://doi.org/10.3109/09540261.2013.842542
17. Holle, L. M., Harris, C. S., Chan, A., Fahrenbruch, R. J., Labdi, B. A., Mohs, J. E., ... & Vela, C. M. (2017). Pharmacists' roles in oncology pharmacy services: Results of a global survey. *Journal of Oncology Pharmacy Practice*, *23*(3), 185-194. https://doi.org/10.1177/1078155216629827
18. Holland, J. C., & Alici, Y. (2010). Management of distress in cancer patients. *The journal of supportive oncology*, *8*(1), 4-12.
19. Hui, D., Hannon, B. L., Zimmermann, C., & Bruera, E. (2018). Improving patient and caregiver outcomes in oncology: Team-based, timely, and targeted palliative care. *CA: a cancer journal for clinicians*, *68*(5), 356-376. https://doi.org/10.3322/caac.21490
20. Jacobsen, P. B., & Jim, H. S. (2008). Psychosocial interventions for anxiety and depression in adult cancer patients: achievements and challenges. *CA: a cancer journal for clinicians*, *58*(4), 214-230. https://doi.org/10.3322/CA.2008.0003
21. Lahoud, R. M., O'Shea, A., El-Mouhayyar, C., Atre, I. D., Eurboonyanun, K., & Harisinghani, M. (2021). Tumour markers and their utility in imaging of abdominal and pelvic malignancies. *Clinical Radiology*, *76*(2), 99-107. https://doi.org/10.1016/j.crad.2020.07.033
22. Lamb, B. W., Brown, K. F., Nagpal, K., Vincent, C., Green, J. S., & Sevdalis, N. (2011). Quality of care management decisions by multidisciplinary cancer teams: a systematic review. *Annals of surgical oncology*, *18*(8), 2116-2125. https://doi.org/10.1245/s10434-011-1675-6
23. Li, M., Kennedy, E. B., Byrne, N., Gérin-Lajoie, C., Katz, M. R., Keshavarz, H., ... & Green, E. (2016). Management of depression in patients with cancer: a clinical practice guideline. *Journal of oncology practice*, *12*(8), 747-756. https://doi.org/10.1200/JOP.2016.011072
24. Mosele, F., Remon, J., Mateo, J., Westphalen, C. B., Barlesi, F., Lolkema, M. P., ... & André, F. (2020). Recommendations for the use of next-generation sequencing (NGS) for patients with metastatic cancers: a report from the ESMO Precision Medicine Working Group. *Annals of Oncology*, *31*(11), 1491-1505. https://doi.org/10.1016/j.annonc.2020.07.014
25. Neuss, M. N., Gilmore, T. R., Belderson, K. M., Billett, A. L., Conti-Kalchik, T., Harvey, B. E., ... & Polovich, M. (2016). 2016 updated American Society of Clinical Oncology/Oncology Nursing Society chemotherapy administration safety standards, including standards for pediatric oncology. *Journal of Oncology Practice*, *12*(12), 1262-1271. https://doi.org/10.1200/JOP.2016.017905
26. Oberoi, S., Yang, J., Woodgate, R. L., Niraula, S., Banerji, S., Israels, S. J., ... & Zarychanski, R. (2020). Association of mindfulness-based interventions with anxiety severity in adults with cancer: a systematic review and meta-analysis. *JAMA network open*, *3*(8), e2012598-e2012598. doi:10.1001/jamanetworkopen.2020.12598
27. Ortelli, L., Spitale, A., Mazzucchelli, L., & Bordoni, A. (2018). Quality indicators of clinical cancer care for prostate cancer: a population-based study in southern Switzerland. *BMC cancer*, *18*(1), 733. https://doi.org/10.1186/s12885-018-4604-2
28. Pandey, J. R., Saha, S. K., & Jha, A. (2020, March). An Empirical Investigation into Gender-Based Differences of Direct to Consumer Promotion on Medication Adherence. In *International Conference on Emerging Trends and Advances in Electrical Engineering and Renewable Energy* (pp. 663-669). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-15-7504-4_68

29. Peppercorn, J. M., Smith, T. J., Helft, P. R., DeBono, D. J., Berry, S. R., Wollins, D. S., ... & Schnipper, L. E. (2011). American society of clinical oncology statement: toward individualized care for patients with advanced cancer. *Journal of Clinical Oncology*, *29*(6), 755-760. https://doi.org/10.1200/JCO.2010.33.1744
30. Portenoy, R. K., Ahmed, E., & Krom, C. (2021). Assessment and Management of Pain. *Palliative and Serious Illness Patient Management for Physician Assistants*, 214.
31. Relling, M. V., & Evans, W. E. (2015). Pharmacogenomics in the clinic. *Nature*, *526*(7573), 343-350. https://doi.org/10.1038/nature15817
32. Sgalambro, F., Zugaro, L., Bruno, F., Palumbo, P., Salducca, N., Zoccali, C., ... & Arrigoni, F. (2022). Interventional radiology in the management of metastases and bone tumors. *Journal of Clinical Medicine*, *11*(12), 3265. https://doi.org/10.3390/jcm11123265
33. Shapiro, C. L., Van Poznak, C., Lacchetti, C., Kirshner, J., Eastell, R., Gagel, R., ... & Neuner, J. (2019). Management of osteoporosis in survivors of adult cancers with nonmetastatic disease: ASCO clinical practice guideline. *Journal of Clinical Oncology*, *37*(31), 2916-2946. https://doi.org/10.1200/JCO.19.01696
34. Taplin, S. H., Weaver, S., Chollette, V., Marks, L. B., Jacobs, A., Schiff, G., ... & Salas, E. (2015). Teams and teamwork during a cancer diagnosis: interdependency within and between teams. *Journal of oncology practice*, *11*(3), 231-238. https://doi.org/10.1200/JOP.2014.003376
35. Taylor, C., Munro, A. J., Glynne-Jones, R., Griffith, C., Trevatt, P., Richards, M., & Ramirez, A. J. (2010). Multidisciplinary team working in cancer: what is the evidence?. *Bmj*, *340*. https://doi.org/10.1136/bmj.c951
36. Temel, J. S., Greer, J. A., El-Jawahri, A., Pirl, W. F., Park, E. R., Jackson, V. A., ... & Ryan, D. P. (2017). Effects of early integrated palliative care in patients with lung and GI cancer: a randomized clinical trial. *Journal of clinical oncology*, *35*(8), 834-841. https://doi.org/10.1200/JCO.2016.70.5046
37. Watson, M., & Kissane, D. W. (Eds.). (2011). *Handbook of psychotherapy in cancer care*. John Wiley & Sons.
38. Zimmermann, C., Swami, N., Krzyzanowska, M., Hannon, B., Leighl, N., Oza, A., ... & Lo, C. (2014). Early palliative care for patients with advanced cancer: a cluster-randomised controlled trial. *The Lancet*, *383*(9930), 1721-1730. https://doi.org/10.1016/S0140-6736(13)62416-2.