

Improving coordination of lung cancer care at a tertiary healthcare center in Saudi Arabia

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ABSTRACT

Objectives: To evaluate the impact of coordination of care of lung cancer in a tertiary care center.

Methods: A retrospective study was carried out on all patients diagnosed with lung cancer between 2016-2017 at King Abdulaziz Medical City, Riyadh, Saudi Arabia. Data were collected from medical records, which included demographic data, the interval between cancer suspicion and definitive therapy, multidisciplinary tumor board (MTB) data, and palliative care.

Results: A total of 60 (41 males and 19 females) cases of lung cancer were analyzed. The majority of patients had adenocarcinoma (63.3%) and stage IV (70%) lung cancer. A total of 32 (76.2%) of stage IV patients were referred to palliative care. Only 40 (66.7%) of the patients were presented in the MTB, of whom new findings were found in 15 (37.5%) patients including pathology findings in 3 (7.5%), radiology findings in 7 (17.5%), and staging data in 5 (12.5%). Multidisciplinary tumor board discussion had impacted the management in 14 (35%) of patients presented.

Conclusion: Discussion of lung cancer cases in MTB had a positive influence on the coordination of patients' care.

Keywords: multidisciplinary tumor board, multidisciplinary care, lung cancer, quality of life

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Management of cancer patients is a complicated process because of the disease nature and available treatment options. Cancer treatment options, including chemotherapy, surgery, and radiotherapy, require multidisciplinary care from a cooperative team of medical, nursing, and associated health practitioners in hospital and community care settings.^{1,2} Taking these

factors into consideration, patients with cancer are at risk of receiving poorly organized and fragmented care.

Improving healthcare outcomes is the primary goal of any healthcare institution and require efficient cooperation among different disciplines and healthcare providers.³ Coordination of care is essential for ensuring safe and high-quality patients' outcomes.³ In addition, care coordination is positively correlated to lower hospital admissions, better quality of care for chronically ill patients, efficient specialist services, and higher patients' satisfaction level.⁴ This coordination of care considers the 6 domains mentioned by the Institute of Medicine, namely, safe, timely, efficient, effective, patient-centered, and equal care.⁵

In the last few years, many initiatives were applied to improve the coordination of cancer care at our institution, which include multiple diseases-specific tumor boards and interdisciplinary teams, who provide patients' care or inpatients' services. This study aimed to evaluate the current status of coordination of care of patients with lung cancer to recommend further improvement interventions.

Methods. This was a retrospective qualitative study that assessed the level of cancer care coordination offered to patients diagnosed with lung cancer and managed at the Oncology Department at King Abdulaziz Medical City, Riyadh, Saudi Arabia. The study was approved by the Institutional Review Board (RC15/016/R). All inpatients and outpatients diagnosed with cancer between January 2017 and December 2018 were included in this study with no exclusion criteria. Data was reviewed from the Electronic Health Record (EHR, BestCare). Extracted data was entered into a Microsoft Access database and checked for accuracy and consistency. Data included the interval between suspected cancer and confirmed cancer diagnosis, the interval between cancer diagnosis and period receiving definitive care, and multidisciplinary tumor board (MTB) data (presentation at MTB, adherence to MTB recommendations, MTB attendance data, MTB compliance data, and more). Other data included palliative and end-of-life care (timing of consultation, transfer to palliative care, last chemotherapy, and death), health care application, the care documentation, adherence to adopted clinical guidelines, and quality indicator identified during the process. Descriptive analysis was used to describe the patients' data. Categorical variables were reported as numbers and frequencies. Continuous variables were reported as medians, which included the number of days from the first appointment with the oncologist until referral to palliative care.

Statistical analysis. All the statistical analysis was carried out using Statistical Package for the Social Sciences for Windows, version 22.0 (IMB Corp, Armonk, NY, USA).

Results. A total of 60 cases (41 males and 19 females) of lung cancer were evaluated. Most of these cases (63.3%) had adenocarcinoma; the others had squamous cell carcinoma, adenosquamous, neuroendocrine, non-small cell lung cancer, and poorly differentiated carcinoma (Table 1).

Molecular testing. The majority of tumors were stage IV (70%). Epidermal growth factor receptor (EGFR) status for stage IV and non-squamous non-small cell lung carcinoma (NSCLC) was tested on 30 patients; 23 (76.7%) had wild-type, and the other 7 (23.3%) had the mutant type. Anaplastic lymphoma kinase (ALK) testing of stage IV, non-squamous NSCLC, and wild EGFR was carried out on 19 patients; 17 (89.5%) had the wild-type, and 2 (10.5%) patients had the mutant type. The c-ros oncogene 1 (ROS1) testing for stage IV, non-squamous NSCLC, wild EGFR, and ALK was carried out on 15 patients; 14 (93.3%) had the wild-type and one (6.7%) patient had the mutant type (Table 1). Inadequate tissue limited the molecular testing actionable targets beyond EGFR, for which next-generation sequencing was implemented. Adherence to molecular testing recommendations was 100% for EGFR, 82% for ALK, 71.4% for ROS1, and 59.5% for programmed death-ligand 1. (Table 2).

Therapy. Systemic therapy was provided to 27 (45%) patients, radiation to 12 (20%) patients, surgery to 8 (13.3%), and chemoradiation to one (1.7%). Therapy was not carried out in 12 (20%) patients. The number of patients referred to palliative care was 39 (65%), majority were in stage IV (76.2%). The median number of days for the first visit to an oncologist and the median for palliative care referral is 35 days [0-643].

Multidisciplinary tumor board presentation. Of all patients, 40 (66.7%) were presented in the MTB. Some of the cases were presented multiple times, and the total number of presentations in the MTB was 65 times. A total of 31 (51.7%) of these presentations were before treatment, and 9 (15%) were after treatment. Of the 40 cases presented, the active treatment per type were as follows: chemotherapy (27.7%), radiation (18.5%), and surgery (13.8%). None of the presented

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Table 1 - Patient characteristics (N=60).

Characteristics	n (%)
Gender	
Male	41 (68.3)
Female	19 (31.7)
Histology	
Adenocarcinoma	38 (63.3)
Squamous cell carcinoma	14 (23.3)
Non-small cell lung cancer and poorly differentiated carcinoma	5 (8.4)
Adenosquamous and neuroendocrine	3 (5.0)
Stage	
I	2 (3.3)
II	7 (11.7)
III	6 (10.0)
IV	42 (70.0)
Missing	3 (5.0)
EGFR status for stage IV and non-squamous NSCLC (n=30)	
Mutant	7 (23.3)
Wild-type	23 (76.7)
ALK for the cases who are stage IV and non-squamous NSCLC and wild EGFR (n=19)	
Mutant	2 (10.5)
Wild-type	17 (89.5)
ROS1 for the cases who are stage IV and non-squamous NSCLC and wild EGFR and ALK (n=15)	
Mutant	1 (6.7)
Wild-type	14 (93.3)
Survival status	
Dead	30 (50.0)
Alive	24 (40.0)
Lost to follow up	6 (10.0)
NSCLC: non-small cell lung carcinoma, ALK: anaplastic lymphoma kinase, EGFR: epidermal growth factor receptor, ROS1: c-ros oncogene 1	

Table 2 - Adherence to molecular testing recommendations.

Molecular testing	n (%)
EGFR	
The candidates for this test are stage IV and non-squamous NSCLC (n=30)	30 (100)
ALK	
For the cases who are stage IV and non-squamous NSCLC and wild EGFR (n=23)	19 (82.6)
ROS1	
For the cases who are stage IV and non-squamous NSCLC and wild EGFR and ALK (n=21)	15 (71.4)
PD-L1	
For stage IV (n=42)	25 (59.5)
ALK: anaplastic lymphoma kinase, EGFR: epidermal growth factor receptor, ROS1: c-ros oncogene 1, PD-L1: programmed death ligand 1	

cases had palliative care as active treatment. The overall active treatment was 31 out of 65 (47.7%). The MTB recommendations were carried out in 22 out of 31 (71%) cases. Further investigations were recommended for 20 (30.8%) cases and were carried out in 14 (70%) cases. Imaging was requested for 20 cases and carried out for all (100%) cases. Other recommendations are shown in [Table 3](#).

New findings were discovered from the presentation of these cases: pathology 3 (7.5%), radiology 7 (17.5%), and 5 (12.5%). In total, 11 (27.5%) unique cases had new findings. Moreover, board discussion had impacted the management of 14 out of 40 (37.5%) patients presented ([Table 3](#)).

Survival status. Of the 60 patients initially treated, 30 (50%) patients died; 24 (40%) patients survived; 6 (10%) patients could not be followed up ([Table 1](#)).

Discussion. Advanced coordination is essential to the provision of safe, timely, efficient, and effective

Table 3 - Tumor board recommendations for the 40 cases which presented for 65 times (N=65).

Tumor board recommendations	n (%)
<i>Active treatment per type</i>	
Surgery	9 (13.8)
Chemotherapy	18 (27.7)
Radiation	12 (18.5)
Palliative care	0 (0.0)
<i>Overall active treatment</i>	
For the whole sample	31 (47.7)
Recommendation done	22 (71)
<i>Further investigation</i>	
For the whole sample	20 (30.8)
Recommendation done	14 (70.0)
<i>More imaging is needed</i>	
Magnetic resonance imaging	4 (6.2)
Computerized tomography scan	11 (16.9)
Positron emission tomography scan	10 (15.4)
Bone scan	1 (1.5)
Overall, the above imaging were requested for 20 case presentation	20 (30.8)
Recommendations done	20 (100)
<i>Observation only</i>	
For the whole sample	1 (1.53)
Recommendation done	1 (100)
<i>New findings</i>	
New findings in pathology	3 (7.5)
New findings in radiology	7 (17.5)
New findings in staging	5 (12.5)
Overall new findings in tumor board (unique cases)	11 (27.5)

care for cancer patients. Multidisciplinary tumor board is a universally accepted approach to coordinate care and manage lung cancers.⁶ However, the success of the MTB depends on its ability to make a positive impact on the patient care. A previous study assessed the adherence of physicians to the MTB management guidelines and its effect on the patients and it showed a high adherence and a good impact.⁷ In our study, the MTB has provided a positive effect on the patients' diagnostic measures and management plan.

Previous studies evaluated the impact of MTB on cancer care. Improvement of MTB was implemented after a review of lung cancer patients at our institution in 2012 that revealed limited coordination among healthcare providers.⁸ The study showed that only 17% of patients were presented in the tumor board.⁸ A study carried out on head and neck cancer patients showed that the MTB significantly improved the 5 year survival rate from 52-75%.⁹ Another study, highlighted that the risk of recurrence and mortality of breast cancer patients were decreased when discussed in the MTB.¹⁰ Moreover, one of the crucial components to determine the quality of MTB is its adherence to the recent guidelines. A study carried out on 3185 patients of 3 different tumor boards showed that 80.1% of all recommendations were followed with decreased deviance over the years indicating improved efficacy of MTBs.¹¹ The adherence to MTB recommendations in our study was 71% compared to another study in which adherence was 87%.⁷

Study limitations. Our study include being a single center study with a relatively small sample size. However, all patients were included. Another limitation is a lack of MTB assessment regarding the effect on quality of life, reflecting the retrospective nature of the study. However, these data will be used for a prospective quality improvement project to measure patients reported outcomes.

In conclusion, this study demonstrated that discussion of cases of lung cancer in MTB had a positive influence on coordination of patient care. An appropriate implementation of the MTB to other cancer types could enhance cancer patients' care coordination.

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