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Care pathway of patients with lung cancer: Retrospective study of 100 patients managed at the national institute of oncology in Rabat

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ABSTRACT

Introduction: Primary lung cancer remains the leading cause of cancer-related mortality worldwide. In Morocco, it represents the most common malignancy in men, with often late presentation and limited access to therapeutic innovations. Improving the care pathway is a major challenge to optimize management.
Objective: To evaluate the clinical, histological, and molecular characteristics of lung cancer patients managed at the National Institute of Oncology (NIO) in Rabat, by identifying key delays in the care pathway and barriers to access to precision medicine.
Methods: This was a retrospective descriptive study of 100 patients diagnosed between September and December 2022. Data including delays between diagnostic and therapeutic steps, molecular profiles, and treatment modalities, were extracted from medical records and the ENOVA system,.
Results: The mean age at diagnosis was 64 years, with a male predominance (86%). Most patients (71%) were at stage IV at diagnosis. Adenocarcinoma was the predominant histological subtype (64%). Molecular testing was incomplete or absent in more than half of the patients. No patient received immunotherapy or targeted therapy. The average delays was 13 days between histological diagnosis and medical record opening, 44 days until treatment initiation, and 61 days for the molecular results. Moreover, 42% of patients were lost to follow-up before treatment initiation.
Conclusion: This study highlights significant delays in the care pathway of lung cancer patients, which can compromise access to innovative treatments. Urgent measures are needed to improve multidisciplinary coordination, reduce diagnostic delays, and ensure equity in access to personalized medicine.

KEYWORDS

Lung cancer, care pathway, NGS, targeted therapies, immunotherapy, Morocco.

MAIN ARTICLE

Introduction

Primary lung cancer is the leading cause of cancer mortality worldwide, with more than 1.8 million annual deaths according to GLOBOCAN 2020 [1]. In Morocco, it occupies a concerning position in oncological morbidity, especially among men, with tobacco smoking as the main etiological factor. Two national cancer registries provide epidemiological data: the Rabat cancer registry, in which lung cancer ranks first among men with a frequency of 19.8% and an incidence 7 times higher than that in women (8th rank) [2], and the Casablanca registry, where it also ranks first, representing 26% of cases [3].

Diagnosis is frequently established at an advanced stage, limiting curability and requiring rapid, coordinated, multidisciplinary management. The oncology care pathway is defined as the set of successive steps followed by the patient, from the onset of symptoms to treatment and follow-up. In lung cancer, this pathway is often hindered by diagnostic delays, restricted access to complementary investigations, and breaks in interdisciplinary coordination [4]. Optimizing these delays has a direct impact on prognosis, particularly in locally advanced or metastatic forms.

Histopathologically, lung cancer can be classified into two main entities: non-small cell lung carcinoma (NSCLC), which accounts for approximately 85% of cases, and small-cell lung carcinoma (SCLC), which is less common but more aggressive [5]. NSCLC can be further subdivided into histological subtypes, mainly adenocarcinoma, squamous cell carcinoma, and undifferentiated carcinomas, which are identified by pathology coupled with immunohistochemistry. This classification is fundamental as it conditions complementary investigations, particularly molecular biomarker testing.

Over the past decade, advances in molecular biology have led to the discovery of several actionable genetic alterations that have revolutionized the treatment of NSCLC, especially adenocarcinoma. These include EGFR mutations, ALK, ROS1, RET rearrangements, BRAF V600E mutations, and MET exon 14 alterations [6]. Such molecular findings have enabled targeted therapies (tyrosine kinase inhibitors, TKIs), which offer high response rates, improved progression-free survival, and better tolerance than conventional chemotherapy.

Furthermore, immunotherapy—particularly immune checkpoint inhibitors such as anti-PD-1 (nivolumab, pembrolizumab) and anti-PD-L1 (atezolizumab)—has introduced a new therapeutic era in advanced lung cancers. PD-L1 expression, assessed by immunohistochemistry, is the main predictive biomarker of response. In some cases, chemotherapy–immunotherapy or targeted therapy–immunotherapy combinations have achieved durable responses, altering the natural course of the disease [7].

The rise of these therapeutic innovations has made complete tumor profiling at diagnosis indispensable. Next-generation sequencing (NGS) has become the reference tool for the simultaneous identification of multiple genetic alterations, via tumor biopsy or circulating DNA (liquid biopsy). This comprehensive approach not only guides targeted treatment selection but also facilitates patient inclusion in clinical trials or personalized medicine strategies [8].

In this context, the lung cancer care pathway can no longer be a simple succession of clinical steps. It must now incorporate molecular biology requirements, NGS turnaround times, the availability of innovative treatments, and access to multidisciplinary platforms. A precise evaluation of patient trajectories, from first consultation to treatment initiation, is therefore essential to identify bottlenecks, improve care coordination, and ensure equitable access to therapeutic innovation.

The present study thus aimed to analyze the care pathway of 100 lung cancer patients managed at the NIO in Rabat, highlighting delays, diagnostic modalities, and therapeutic strategies in the era of precision medicine.

Methods

Study design: This was a retrospective descriptive study based on an analysis of the medical records of lung cancer patients managed at the NIO in Rabat. The aim was to describe sociodemographic, clinical, and histopathological characteristics, and steps in the care pathway.

Study period and setting: this study was conducted at the Department of Medical Oncology, NIO Rabat, from September 1 to December 31, 2022.

Inclusion criteria:

- Patients ≥18 years with histologically confirmed primary lung cancer.
- Records containing complete data on the care pathway (dates of key steps: consultations, tests, decisions, treatments).
- Initial management at the NIO, from consultation to treatment initiation.

Exclusion criteria:

- Patients with metastatic pulmonary involvement of secondary origin.
- Incomplete records lacking essential timeline information.
- Patients who started or continued treatment outside the NIO.

Data collection: Data were extracted from the ENOVA system and entered into Excel for analysis. The standardized form included the following:

1. **Sociodemographic data:** Age ans sex.
2. **Clinical and histopathological data:** Histological type, TNM stage, and WHO performance status.
3. **Molecular data:** EGFR, ALK, ROS1, BRAF, MET, and KRAS status; PD-L1 expression; and whether NGS was performed.
4. **Care pathway data:** Dates of biopsy, record opening, molecular requests and results, and treatment initiation.
5. **Delays calculated:**
    - D1: Biopsy → record opening.
    - D2: Record opening → treatment.

- D3: Molecular request → result.
- Global: Symptoms → treatment.

Results

1. Sociodemographic characteristics

The study cohort included 100 lung cancer patients managed at the NIO Rabat. The mean age at diagnosis was 64 years (range 39–93). The majority were male (86%, n=86 vs. 14%, n=14). Mean age was 64 years in men and 61 years in women.
Regarding the site of care, 65% of patients were followed in the Department of Medical Oncology, and 35% where followed in the Department of Radiotherapy.

2. Clinical and histopathological data

a. General condition
Performance status (WHO scale):

- 57% were WHO 1
- 28% WHO 2
- 11% WHO 3
- 4% WHO 4

b. Histological type
Histopathological analysis revealed a predominance of pulmonary adenocarcinoma (64%). Other subtypes included the following:

- Squamous cell carcinoma: 13%
- NSCLC, NOS: 8%
- Small-cell carcinoma: 8%
- Neuroendocrine carcinoma: 3%
- Rare types (sarcomatoid carcinoma, poorly differentiated squamous cell carcinoma, and epithelioid mesothelioma): 4%

3. Stage at diagnosis

According to TNM staging:

- Stage IV: 71%
- Stage III: 19%
- Stage II: 2%
- Unclassified (incomplete workup): 8%

4. Molecular data and innovative therapies

Molecular testing was requested for 46 patients (EGFR, ALK, and ROS1 alterations, and PD-L1 expression):

- Twenty-seven patients (59%) had no available results in their medical records.
- Nineteen had PD-L1 expression results.
- Only two patients had EGFR mutation results.
- NGS was performed in only 4 patients, but the results were not clinically exploitable.

No patient received targeted therapy or immunotherapy, because of to delayed results and limited access to innovative drugs.

5. Therapeutic pathway and treatment modalities

Among 100 patients, 42% were lost to follow-up after the first consultation (24 in medical oncology, 18 in radiotherapy). Among the 58 patients who received treatment:

- Forty-one percent of the patients received palliative chemotherapy.
- Twelve percent of the patients received neoadjuvant chemotherapy.
- Five percent of the patients underwent concomitant radiochemotherapy upfront.
- No patient received targeted therapy or immunotherapy.

6. Care pathway delays

Analysis of delays revealed the following:

- There was a mean 13 days between external histological diagnosis and record opening at NIO.
- The mean duration between record opening and treatment initiation was 44 days.
- The mean duration between the molecular test request and the results was 61 days.

These cumulative delays may compromise treatment efficacy, especially in advanced stages where each week of delay significantly worsens the prognosis.

Discussion

1. Demographic and clinical features

In our series, the mean age was 64 years, which is consistent with the literature reporting that the median age at diagnosis is between 63–70 years [9,10]. The male predominance (86%) reflects regional smoking patterns, although an increaisng incidence among women has been reported in several countries [11].
Poor performance status (WHO ≥2 in 43%) in common, correlating with late diagnosis and a high proportion of stage IV disease (71%).

2. Histological distribution

Adenocarcinoma (64%) was the predominant subtype, aligning with global epidemiological shifts [13,14]. This subtype is common among nonsmokers and is frequently associated with actionable mutations. Small-cell carcinomas (8%) and neuroendocrine carcinomas (3%) were within the expected ranges [15].

3. Stage at diagnosis and delays

Late-stage diagnosis (stage IV in 71% of cases) is consistent with findings in Morocco and other African regions, where >60% are diagnosed at advanced stages [16,17]. The delays were significant: 44 days from record opening to treatment, and 61 days for the molecular results, which exceeded international recommendations (<30 days) [18,19].

4. Prognostic impact of delays

Delays directly affect survival and quality of life. A French population study (ICASa) reported that each month of delay in lung cancer treatment reduced overall survival by 7.6% [20]. Prolonged waiting also increases patient anxiety and reduces treatment adherence [21].

5. Limited access to innovative therapies

None of our patients received immunotherapy or targeted therapies, despite potentially actionable mutations. Barriers included limited NGS access (only 4 patients), unavailability, or lack of reimbursement [22,23]. However, the NCCN and ESMO guidelines stress that complete molecular profiling is essential before any therapeutic decision can be made in advanced NSCLC [24,25].

6. Role of multidisciplinary tumor boards (MTBs)

MTBs are key to ensuring optimal oncologic care. The lack of systematic documentation of MTBs in our cohort may have contributed to suboptimal decisions. Studies have shown that patients discussed in MTBs have better survival and adherence to guidelines [26].

7. Loss to follow-up

The 42% rate of patients lost to follow-up is alarming. The contributing factors likely include geographic distance, economic vulnerability, and lack of patient education. A Moroccan multicenter study revealed that to 30% of cancer patients abandoned treatment when uninsured [27].

8. Improvement strategies

Several measures are needed:

- **Reducing delays:** streaming diagnostic pathways and prioritizing suspected lung cancer cases.
- **Strengthen MTBs:** mandatory documentation of decisions in records.
- **Equitable access:** subsidized national platforms for molecular testing.
- **Patient navigation system:** dedicated staff should be assigned to guide patients through the care continuum.
- **Patient education:** enhance communication to improve treatment adherence.

9. Toward a coordinated pathway

Inspired by North American models, a patient navigation system and shared medical records could reduce delays, improve coordination, and prevent errors [28,29].

10. Study limitations

- This was a monocentric study, limiting generalizability.
- Incomplete data due to missing documents or lack of digital records.
- Long-term follow-up data were unavailable because of early loss to follow-up and a lack of systematic registries.

Conclusion

This retrospective study of 100 lung cancer patients managed at the NIO Rabat highlights late diagnosis (mainly stage IV), prolonged delays in care, and very limited molecular testing and use of targeted therapies. These findings stress the need for a coordinated care pathway that integrates multidisciplinary tumor boards and patient navigation systems, to improve patient prognosis and quality of life. Furthermore, standardizing practices and expanding access to molecular platforms—particularly NGS—is essential to facilitate access to innovative therapies and ensure compliance with international standards of care.

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REFERENCES

1. Sung H, et al. *Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide*. CA Cancer J Clin. 2021;71(3):209–249.
2. Cancer incidence rate in Rabat 2009–2012, Ministère de la Santé, Maroc.
3. Registre des cancers de la région du Grand Casablanca. Rapport 2008–2012.
4. Caisse Nationale de l'Assurance Maladie (CNAM) – *Rapport sur les parcours de soins en cancérologie au Maroc*. 2020.
5. Travis WD, et al. *WHO Classification of Tumours of the Lung, Pleura, Thymus and Heart*. 4th ed. IARC; 2015.
6. Planchard D, et al. *ESMO Clinical Practice Guidelines for advanced non-small-cell lung cancer*. Ann Oncol. 2018;29(Suppl 4):iv192–iv237.
7. Reck M, et al. *Pembrolizumab versus chemotherapy for PD-L1–positive non–small-cell lung cancer*. N Engl J Med. 2016;375(19):1823–1833.
8. Lindeman NI, et al. *Molecular Testing Guideline for Selection of Lung Cancer Patients for Targeted Therapy*. Arch Pathol Lab Med. 2018;142(3):321–346.
9. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. **Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide**

for 36 Cancers in 185 Countries. *CA Cancer J Clin.* 2021;71(3):209-249. https://doi.org/10.3322/caac.21660

10. Siegel RL, Miller KD, Fuchs HE, Jemal A. **Cancer Statistics, 2023.** *CA Cancer J Clin.* 2023;73(1):17-48. https://doi.org/10.3322/caac.21763
11. Couraud S, Zalcman G, Milleron B, Morin F, Souquet PJ. **Lung cancer in never smokers—a review.** *Eur J Cancer.* 2012;48(9):1299-1311. https://doi.org/10.1016/j.ejca.2012.02.023
12. Buccheri G, Ferrigno D. **Performance status in lung cancer: clinical assessment and prognostic implications.** *Chest.* 1994;106(6):1797-1800. https://doi.org/10.1378/chest.106.6.1797
13. Travis WD, Brambilla E, Nicholson AG, et al. **The 2021 WHO Classification of Lung Tumors: Impact of Advances Since 2015.** *J Thorac Oncol.* 2022;17(3):362-387. https://doi.org/10.1016/j.jtho.2021.11.023
14. Torre LA, Siegel RL, Jemal A. **Lung Cancer Statistics.** *Adv Exp Med Biol.* 2016;893:1-19. https://doi.org/10.1007/978-3-319-24223-1_1
15. SEER Cancer Stat Facts: Lung and Bronchus Cancer. National Cancer Institute. https://seer.cancer.gov/statfacts/html/lungb.html (consulté en 2025)
16. Lahlou A, El Fakir S, Chbani L. **Épidémiologie et caractéristiques du cancer bronchique au Maroc.** *Revue Marocaine de Cancérologie.* 2022;14(1):20-25.
17. Ngoma T, Cherny N, Sullivan R, et al. **Cancer care in Africa: a disaster in the making.** *Lancet Oncol.* 2013;14(1):e38–e40. https://doi.org/10.1016/S1470-2045(12)70516-1
18. NHS England. **Cancer Waiting Times Standards: A guide.** 2020. https://www.england.nhs.uk/wp-content/uploads/2020/03/Cancer-waiting-times-standard-guidance.pdf
19. ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up of lung cancer. *Ann Oncol.* 2023;34(1):23-33. https://doi.org/10.1016/j.annonc.2022.10.618
20. Bras M, Galateau-Sallé F, Rolland E, et al. **Time to treatment and prognosis in lung cancer: a population-based study.** *J Thorac Oncol.* 2017;12(8):1113–1120. https://doi.org/10.1016/j.jtho.2017.04.020
21. Carlson LE, Bultz BD. **Efficacy of psychosocial interventions on quality of life and psychological well-being in cancer patients: meta-analysis.** *Support Care Cancer.* 2004;12(12):912-926. https://doi.org/10.1007/s00520-004-0685-9
22. Jafri SH, Siddiqui M, Khan SA. **Access to cancer drugs in low- and middle-income countries: a challenge for oncology.** *Oncologist.* 2021;26(5):e805-e812. https://doi.org/10.1002/onco.13723
23. El Rhazi K, Elkettani C, Serghini M. **Accès aux médicaments anticancéreux au Maroc: état des lieux et perspectives.** *Pan Afr Med J.* 2020;35(2):112. https://doi.org/10.11604/pamj.2020.35.2.23525
24. National Comprehensive Cancer Network (NCCN). **NCCN Clinical Practice Guidelines in Oncology: Non-Small Cell Lung Cancer.** Version 3.2024. https://www.nccn.org/professionals/physician_gls/pdf/nscl.pdf
25. European Society for Medical Oncology (ESMO). **Clinical Practice Guidelines for diagnosis, treatment, and follow-up of non-small-cell lung cancer.** 2023. https://www.esmo.org/guidelines/lung-and-chest-tumours/non-small-cell-lung-cancer
26. Kesson EM, Allardice GM, George WD, Burns HJ, Morrison DS. **Effects of multidisciplinary team working on breast cancer survival: retrospective, comparative, interventional cohort study of 13,722 women.** *BMJ.* 2012;344:e2718. https://doi.org/10.1136/bmj.e2718

27. El Fakir S, Er-Raki A, Akalay O, et al. **Facteurs associés à l'abandon thérapeutique dans les cancers au Maroc.** *East Mediterr Health J.* 2019;25(9):641–648. https://doi.org/10.26719/emhj.19.053
28. Freeman HP. **The origin, evolution, and principles of patient navigation.** *Cancer Epidemiol Biomarkers Prev.* 2012;21(10):1614-1617. https://doi.org/10.1158/1055-9965.EPI-12-1025
29. World Health Organization. **Framework on integrated, people-centred health services.** 2016. https://www.who.int/servicedeliverysafety/areas/people-centred-care/en/