Health Care Disparities in Non-Small Cell Lung Cancer (NSCLC)

Zach Brunko[1], PharmD candidate; S. Ndujiuba PharmD[2]; BCOP, M. Polson PharmD[2].
[1]University of Minnesota School of Pharmacy, Minneapolis, MN, United States; [2]Magellan Rx Management, Orlando, FL, United States

Background

- **NSCLC has many mutations and has the highest number of actionable mutations of all cancers.**
- **Specifically, in NSCLC molecular testing is required in 100% of patients.**
- Driver gene mutations are found in the cancer tissue sample which includes gene mutations and gene rearrangements that can affect signaling pathways and regulate core cellular processes. Driver mutations may have specific oncology medications that are particularly efficacious for treating these cancers.
- **Testing for molecular mutations is completed using next-generation sequencing that can analyze targeted gene alterations in key genes involved in the development of cancer.**
- **The result once completed using molecular testing identifies the mutation which is then matched to the drug that targets it.**
- Specifically, in NSCLC treating the actionable mutation upfront provides the patient with the best outcomes such as progression-free survival and overall survival. Studies have found that medications that do not target the mutation are much less efficacious.
- **Turnaround time for molecular testing is also important.**
- The expert consensus and guidelines recommend a turnaround time from diagnosis to treatment to be at 15 days and genomic testing completion within 10 to 14 days.
- **Positron emission tomography (PET) is an important tool for both diagnosing NSCLC and staging.**

Objective

Assess whether the administrative claims data reflects the NCCN treatment guideline recommendations for NSCLC and evaluate whether or not disparities exist between groups.

Methods

This is a retrospective, observational, study that used administrative claims data from commercial regional health plans with patients having service dates between 7/1/2018 – 6/30/2021 were considered for the study. The incurred date of the first claim with a diagnosis code of lung cancer was the index date or the initial diagnosis date of lung cancer. Members who were included in the analysis had at least one year of continuous eligibility before and after (inclusive) the index date. Treatment were identified to be all anticancer drugs billed within a 180-day period. These treatments were compared to NCCN guidelines and patients were classified as NSCLC, SCLC, ambiguous, or unknown. Baseline metrics were generated on data occurring in the 365-day period preceding the index date. Follow up metrics were generated using a year of data beginning on the index date.

Inclusion criteria for all 4 observations from the claims data was addition into the NSCLC patient population.

The Exclusion Criteria for 3 of the observations time to molecular diagnostic testing (TTM), time to pet testing (TTP), and time to treatment (TTT) was one of the regions. The Mountain region references (Figure 1) in the Census Regions and divisions of the U.S. This was excluded due to a low count of only 4 patients in that region, and they also contained extreme outliers.

The Exclusion Criteria for the time to treatment was patients not treated with an anti-cancer therapy and patients who did not receive a molecular diagnostic test within 365 days of their initial NSCLC diagnosis. This was also the same for time to testing. For those who received testing for either PET or molecular diagnostic testing outcomes the exclusion criteria was patients not treated with an anti-cancer therapy and did not receive their respective testing within 365 days of their initial NSC cancer diagnosis

Results

Observations

The first observation of this study is to identify whether patients diagnosed with NSCLC received a molecular diagnostic test. During data analysis, the median was ultimately utilized to eliminate outliers from the mean that may potentially skew the data

Other observations include time to testing for molecular diagnostics and PET. Time to testing for molecular diagnostic testing is time from patients NSCLC diagnosis to molecular testing. Time to PET testing is time from patients NSCLC diagnosis to PET scan.

Once they receive their testing, we then looked at patients in time to treatment from initial diagnosis of NSCLC to actual first treatment date whether its chemotherapy, kinase therapy, or monoclonal antibodies or a combination of these therapies.

Figure 1: Patients Receiving Molecular Testing

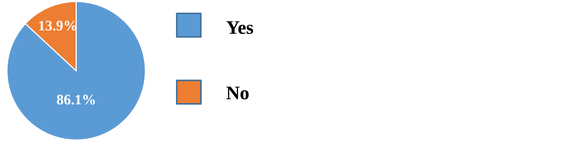

Table 1: Time from Diagnosis to Molecular Diagnostic Testing (TTM)

Row Labels	Median of TTM	Min of TTM	Max of TTM
East North Central	0	-81	24
East South Central	0	-250	117
Middle Atlantic	0	-75	216
New England	0	0	89
Pacific	0	-63	106
South Atlantic	0	-208	343
West North Central	0	-54	8
West South Central	0	-3	131

Table 2: Time from Diagnosis to Positron Emission Testing (TTP)

Row Labels	Median TTP	Min of TTP	Max of TTP
East North Central	-10	-166	25
East South Central	0	-208	115
Middle Atlantic	4	-127	58
New England	-14	-29	11
Pacific	7	-70	322
South Atlantic	3	-242	308
West North Central	7	-60	26
West South Central	14	-141	168

Figure 2: U.S Census Bureau Regions and Divisions

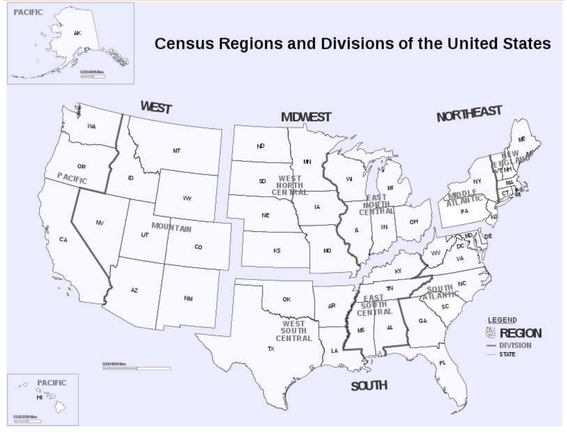

Table 3: Time from Diagnosis to First Medication Therapy (TTT)

Row Labels	Median of TTT	Min of TTT	Max of TTT
F	52.0	-134	365
East North Central	62	21.0	185.0
East South Central	40.5	-63	284
Middle Atlantic	52	-134	154
New England	62	15	75
Pacific	52	8	133
South Atlantic	54	2	279
West North Central	37.5	13	189
West South Central	56	4	365
M	52.1	-328	314
East North Central	65	21	190
East South Central	53	20	264
Middle Atlantic	39	23	84
New England	40	20	59
Pacific	67	-63	314
South Atlantic	35.5	-328	231
West North Central	58.5	22	159
West South Central	58.5	23	159
Grand Total	48.0	-328	365

Results

Figure 1: Patients sampled that were diagnosed with NSCLC received molecular diagnostic tests 86.1% of the time. As a result, 13.9% of the NSCLC patients sampled did not receive testing, so may receive suboptimal care as a result. This is imperative for these patients to receive molecular diagnostic testing as there is clinical evidence that supports the use of targeted therapies.
Table 1: TTM median demonstrated that NSCLC patients received their molecular diagnostic testing same day across the country at 0 days. TTM median displayed a sufficient regional turn around time for testing in concordance with the guideline and expert consensus recommended 10 to 14 days.
Table 2: TTP median showed that NSCLC patients who received a PET scan received it within 2 weeks of diagnosis.
Table 3: TTT median showed, across the country NSCLC patients received their first treatment 48 days after initial diagnosis. This exceeded the guideline and expert consensus recommended of 15 days. TTT median was 52 days after their initial diagnosed. Regional gender disparities were seen. The gender disparity between men and women varied from region to region with some regions having more delays for one gender when compared to others. However, both men and women received treatment at a 52 day median across the nation.

Limitations

Limitations are studies with large sample sizes can detect small differences between groups that are numerically different but might not be clinically significant. The clinical relevance of these differences should be evaluated when observed in certain studies. Another potential limitation includes the COVID-19 pandemic which may have contributed to delays in testing and treatment for patients diagnosed close to March 2020. Another limitation is that we are not able to identify why in some cases patients received testing or treatment much earlier or later than others. For example, in TTM one patient from the middle Atlantic received their molecular diagnostics panel about 7 months after they were diagnosed with NSCLC. Even though they received a PET test early on and didn't have another form of cancer noted. It's unfortunate that we don't know more as to why certain decisions were made in the manner laid out.

Significance

1. The results highlights that some patients for NSCLC aren't receiving optimal care due to a lack of molecular testing. The main take away that NSCLC is one of the most actionable cancers with actionable mutations. It is imperative that 100% of NSCLC patients receive molecular diagnostic testing to guide therapy selection.

2. These results display region and gender disparities in patients time to treatment. In the time to treatment decreasing from 48 to the guideline recommended 15 day turn around time would better align with the national average.

3. The results showcases areas for improvement for NSCLC care. Overall, as previously mentioned, all NSCLC patients getting molecular diagnostic testing and improvement in time to treatment.

References

1.What is Lung Cancer? American Cancer Society. https://www.cancer.org/cancer/lung-cancer/about/what-is.html Published October 1st , 2019. Accessed July 17th, 2022.
2.Wertinger DS, Akerley W, Bepler G, et. AL. Non-Small Cell Lung Cancer Clinical Practice Guideline in Oncology . JNCCN Jul 2010. Volume 8; Issue 7.
3.Ray Turna. Precision Oncology News. Survey of Precision Oncology Programs Shows Rapid Pace of Advances a Major Challenge for Oncologists. Precision Oncology News. Published Dec 20, 2021. Accessed July 17th, 2022.
4.AMA prior authorization (PA) physician survey. American Medical Association (AMA) Published Dec 20, 2021. Accessed July 18th, 2022.
5.Ingersoll R, Pant D. The cost and Complexities of Treating Cancer are Astronomical – and on the Rise. Trapelo. WhitePaper Volume 2.
6.Zhu QG, Zhang SM, Ding XX, He B, Zhang HQ. Driver genes in non-small cell lung cancer: Characteristics, detection methods, and targeted therapies. Oncotarget. 2017 Apr 10;8(34):57680-57692. doi: 10.18632/oncotarget.17016. PMID: 28915704; PMCID: PMC5593676.
7.United States Census Bureau. Wikipedia. https://en.wikipedia.org/wiki/United_States_Census_Bureau. Updated June 11th, 2022. Accessed July 18th , 2022
8.DiStasio M, Chen Y, Rangachari D, Costa DB, Heher YK, VanderLaan PA. Molecular Testing Turnaround Time for Non-Small Cell Lung Cancer in Routine Clinical Practice Confirms Feasibility of CAP/IASLC/AMP Guideline Recommendations: A Single-center Analysis. Clin Lung Cancer. 2017 Sep;18(5):e349-e356. doi: 10.1016/j.cllc.2017.03.001. Epub 2017 Mar 14. PMID: 28377205.
9.Gregg JP, Li T, Yoneda KY. Molecular testing strategies in non-small cell lung cancer: optimizing the diagnostic journey. Transl Lung Cancer Res. 2019 Jun;8(3):286-301. doi: 10.21037/tlcr.2019.04.14. PMID: 31367542; PMCID: PMC6626860
10.Suh WN, Kong KA, Han Y, Kim SJ, Lee SH, Ryu YJ, Lee JH, Shim SS, Kim Y, Chang JH. Risk factors associated with treatment refusal in lung cancer. Thorac Cancer. 2017 Sep;8(5):443-450. doi: 10.1111/1759-7714.12461. Epub 2017 Jun 19. PMID: 28627788; PMCID: PMC5582461.
11.Vansteenkiste JF. PET scan in the staging of non-small cell lung cancer. Lung Cancer. 2003 Dec;42 Suppl 1:S27-37. doi: 10.1016/s0169-5002(03)00302-7. PMID: 14611912.