Upfront, comprehensive genetic testing in advanced lung cancer is cost-effective

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An economic model comparing different types of genetic testing in metastatic non-small-cell lung cancer (NSCLC) found that using next-generation sequencing (NGS) to test for all known lung cancer-related gene changes at the time of diagnosis was more cost-effective and faster than testing one or a limited number of genes at a time.

The model included Medicare and commercial health plans with 1 million hypothetical members. In the model, NGS saved as much as $2.1 million for Medicare, and more than $250,000 for commercial insurance providers. The study will be presented at the upcoming 2018 ASCO Annual Meeting in Chicago.

"The field of lung cancer treatment is moving at a rapid pace, and we need to fully characterize genomic changes to determine the best treatment for patients shortly after they are diagnosed," said lead study author Nathan A. Pennell, MD, Ph.D., co-director of the Cleveland Clinic Lung Cancer Program. "Today, many treatment decisions are guided by the presence or absence of certain genetic changes in a patient's tumor, and I expect that several more genes will be identified in the near future. Therefore, it becomes even more imperative to find a cost-effective gene test that can quickly identify a large number of gene mutations that can be targeted with treatments."

Genetic testing of the tumor is crucial to guide optimal treatment for NSCLC. Many different tests are available today, but there is no accepted standard for when and how the testing should be performed.

The authors designed their model to determine which gene testing approach is most cost-effective and time-efficient. The model uses data from the Center for Medicare and Medicaid Services (CMS) and U.S. commercial health plans to estimate costs for each modality.

About the Study

The known genes that are altered in NSCLC includeEGFR, ALK, ROS1, BRAF, MET, HER2, RET,andNTRK1(of those,EGFR, ALK, ROS1,andBRAFcan be targeted with approved treatments). The other genetic changes can be targeted with investigational agents that are being tested in clinical trials. Newer tests also look at PD-L1 expression to predict if a tumor is likely to respond to immunotherapy.

In the model, patients with newly diagnosed metastatic NSCLC received PD-L1 testing and testing for the known lung cancer-related genes using one of four different approaches:

- Upfront NGS (all eight NSCLC-related genes andKRASwere tested at once)
- Sequential tests (one gene at a time was tested)
- ExclusionaryKRAStest, followed by sequential tests for changes in other genes ifKRASwas not mutated (ifKRASmutations were found, the tumor was not tested for other mutations because it is rare to have more than one of these genes mutated in an individual lung cancer)
- Panel test (combined testing forEGFR, ALK, ROS1,andBRAF), followed by either single-gene or NGS testing for changes in other genes

The model assumed that some participants who did not receive upfront-NGS might need to have another biopsy to test for additional genes (due to insufficient amount of tissue from the first biopsy) and that the need

for re-biopsy would be lessened with upfront, comprehensive NGS testing. It also accounted for the time it took to get test results back after biopsy samples were sent to the lab, costs for each type of gene testing, and the estimated number of people with metastatic NSCLC in the U.S. that could be tested.

Based on the number and age of people with metastatic NSCLC in the U.S. annually, the researchers estimated that for 1 million-member health plans, 2,066 tests would be paid for by CMS and 156 would be paid for by commercial insurers. The model also estimated that it would take two weeks for the NGS and panel results to be processed, while it would take 4.7 or 4.8 weeks to process the exclusionary and sequential tests, respectively.

Applying economic factors to CMS payments, NGS testing would save about $1.4 million compared to exclusionary testing, over $1.5 million compared to sequential testing, and about $2.1 million compared to panel testing. For commercial health plans, NGS would save $3,809 compared to exclusionary testing and $250,842 compared to panel testing.

A limitation of this study is that it the model is based on several assumptions. The authors' next step is to look at actual health systems and evaluate these differences, testing cost-efficiency in a real-world setting.

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