SOCIETY OF ACTUARIES

Innovation and Technology

Cancer Genomics Report Summary

Traditional Chinese (癌症基因報告摘要)

October 2020

Cancer Genomics Report Summary
(癌症基因報告摘要)

ORIGINAL AUTHOR BREAKTHROUGH DEVELOPMENT CO.

SPONSOR Actuarial Innovation & Technology Steering Committee

TRANSLATORS

Yihong Lu
Translation Consultant
LEAD Insurance Consulting

Tinny Tsun, FSA, FCIA

Yuan Yuan, FSA, MAAA
Consultant
Ernst & Young

Cancer Genomics Report Summary (癌症基因報告摘要)

Since 2017, treatment of advanced deadly cancers – particularly lung cancer and metastatic melanoma – has undergone a major paradigm shift. Traditional pillars of cancer treatment – surgery, radiation, and chemotherapy – have moved to 2 new efficacious approaches: tumor genomics and immunotherapy.

自 2017 年起，晚期致命癌症（包括肺癌和擴散的腫瘤）的治療發生了重大的變化。治療方案已由傳統的手法如手術、電療和化療變成用腫瘤基因治療和免疫治療這兩種更有效的療法。

The impact on the insurance industry is becoming increasingly profound. High morbidity and mortality are reduced significantly for roughly 30% of patients in these cancers, and increasingly other cancers, where 5- year survival rates have been below 50%.

這對於保險業有著越來越顯著的影響。對於五年存活率低於百分之五十的癌症，這種療法能幫大約百分之三十的病人降低發病率和死亡率，而對於其他癌症也日漸有效。

Oncologists' new weapon is a class of antibody drugs led by Keytruda® (Merck) that free up the previously blocked immune system to recognize and destroy tumors. Collectively, these drugs are called ImmunoOncology therapies, or I-O, sometimes called 'checkpoint inhibitors.' However, the release of the immune system can be overdone and cause side effects or worse. At least one tumor genetic test, TMB (tumor mutational burden), promises to pre-qualify patients for I-O, to lower this danger. TMB simply counts the number of mutations in biopsied tumor cells, without regard to the gene(s) or other fine detail. Counts over 15 generally qualify a patient for I-O treatment. For those with low numbers a second targeted genomic test, PD-L1, can still rescue and requalify treatment.

腫瘤科醫生的新武器便是一種由 Keytruda® (Merck) 主導的抗體，這種抗體能釋放之前被隔絕的免疫系統，從而識別並破壞的癌細胞。總括而言，這類型的藥物叫做免疫腫瘤治療 (I-O) 或稱為抑製劑檢查。不過，過度釋放免疫系統會導致副作用或對身體有更壞的影響。至少有一種腫瘤基因測試 TMB (腫瘤突變負荷)，保證對符合資格接受免疫腫瘤治療 (I-O) 的病人減低危險。TMB (腫瘤突變負荷) 不需要知道基因的詳情，只需要計算在活體組織檢查中抽取的腫瘤細胞突變數。細胞突變數量超過 15 的病人一般都符合接受免疫腫瘤治療 (I-O) 的資格。如果細胞突變數量較少，病人也可以接受另一種救治方法 – 基因標靶測試 (PD-L1)，並重新獲得治療資格。

The chart below displays lung cancer, where FDA has now moved to approve chemotherapy-free treatments. There are 1.5 million lung cancer deaths annually – higher than prostate, colorectal, and breast cancers combined.

以下圖表顯示美國食品藥品監督管理局（FDA）已批准肺癌病人接受免化療療法。每年有一百五十萬肺癌病人死亡，這遠高於前列腺癌、結腸癌和乳癌死亡人數的總和。

What is the forecasted cost-effectiveness of these drugs? Compared to prior standards of care, which could not increase survival, the combination of TMB and Keytruda appears to be cost-neutral for lung cancer, and cost-effective for metastatic melanoma. More clinical trials are needed to increase confidence of C-E assessments, but an anti-tumor 'memory' effect has been seen after 18 weeks of treatment in the majority of patients in one such study that may eventually limit the expenditures to roughly $70K cost (Keytruda price is ~$23K for 6 weeks).

這些藥物的預期成本效益如何？與先前無法增加存活率的治療標準相比，TMB 和 Keytruda 的組合似乎對肺癌有差不多的成本效益，但是對於转移性黑色素瘤則具有良好的成本效益。在此一類研究中，大多數患者在治療 18 週後，身體會產生對抗腫瘤的“記憶”效應，最終能將支出限制在大約七万美金左右 （Keytruda 的花費是大約每六週兩萬三千美金）。不過，這需要更多的臨床試驗來增加對成本效益評估的信心。

SOA is eager to see more statistics over coming months on the cost comparison of I-O Therapy versus the current Standards of Care. However, the growing numbers of patients with decreased morbidity and mortality will bring significant outcry for coverage. Conversely, shorter treatment windows should limit outlays for insurers.

北美精算师协会（SOA）渴望在未來幾個月內看到更多關於 I-O 療法與現時標準療法的費用比較和統計信息。不過隨著患者數量的增加而發病率和死亡率的下降，人們將會強烈要求得到保障。相反，保險公司的支出亦會因較短的治療窗口而有所控制。

The full research report can be found here: https://www.soa.org/resources/research-reports/2019/cancergenomics/.

請點開□ □ 網□ □ 閱□ □ □ □ □ 報□ □

https://www.soa.org/resources/research-reports/2019/cancergenomics/.

Acknowledgments

The SOA's deepest gratitude goes to those without whose efforts this project could not have come to fruition, especially Yun Gwen Weng, FSA, CERA, FCIA, who organized and oversaw all steps of the process.

This paper was translated from English by SOA members Yuan Yuan, FSA, MAAA and Tinny Tsun, FSA, FCIA, along with Yihong Lu, a translation consultant.

Yuan Yuan works in the Financial Services practice at Ernst & Young LLP where she is a manager in the Insurance and Actuarial Advisory Services team. She can be reached at yuan.yuan@ey.com.

Tinny Tsun is an actuary with almost 20 years of diverse work experience in Toronto, Beijing and Hong Kong. She can be reached at Tinny.tsun@gmail.com.

Yihong Lu is a translation consultant at LEAD Insurance Consulting. She can be reached at https://leadinsuranceconsulting.com.

At the Society of Actuaries:

Korrel Crawford, Senior Research Administrator

Mervyn Kopinsky, FSA, EA, MAAA, Experience Studies Actuary

Jingxin (Jessie) Li, FSA, Lead China Representative

About The Society of Actuaries

With roots dating back to 1889, the Society of Actuaries (SOA) is the world's largest actuarial professional organization with more than 31,000 members. Through research and education, the SOA's mission is to advance actuarial knowledge and to enhance the ability of actuaries to provide expert advice and relevant solutions for financial, business and societal challenges. The SOA's vision is for actuaries to be the leading professionals in the measurement and management of risk.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and nonactuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org