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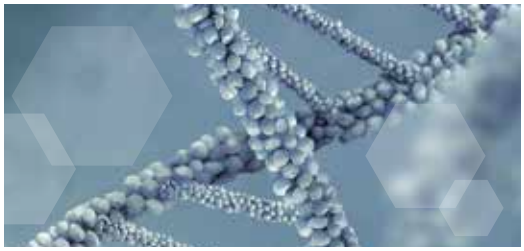
UNDERWRITING FOCUS


New Trends in Personalised Medicine and Insurance Implications

by Dr. Sara Kannampuzha, Gen Re, Cologne, Germany

Some people may wonder about the association between personalised medicine and insurance. One point is clear: If the insurance industry is informed about medical advancements, a huge advantage arises for future underwriting with regards to calculating ratings for specific diseases and also creating digital application forms with simplified underwriting. Generally, every six months we hear about improvements in the medical field, such as new genetic tests, simple blood tests for cancer diagnoses and highly efficient medical devices. What are the new diagnostic methods in medicine and what actually is personalised medicine? And why is this so important for the insurance industry?

The traditional medical approach is to give the same treatment to all patients who have the same diagnosis (usually called "one-size-fits-all" treatment). Personalised medicine, however, goes a step further and bases therapy on a person's unique genetic profile. Medical care is tailored to the characteristics of an individual patient. But personalised medicine is not only about individually tailored medicine or genetics; it is also about preventive care, about detecting health conditions or potentially malignant diseases at an early stage and treating them effectively.[1,2,3]

Personalised medicine exclusively targets the diseased cells without harming the "healthy" part of the body. This increased efficiency goes along with limited side effects. Interestingly, 20% of the treatments approved by the U. S. Food and Drug Administration (FDA) in 2017 were different types of personalised medicine, including molecular therapies, gene therapies, and genetic tests to examine specific health conditions.[4]

Blood tests – Old or gold?

Early detection of a disease enables a more accurate personalised medicine treatment and hence a more efficient treatment. Many people undergo regular routine examinations to obtain an overall picture of their well-being. With the help of different tests, the health of main organs and the blood can be examined. A deviation in certain values will show a higher risk for specific diseases. For instance, a high serum creatinine value indicates kidney dysfunction, or high blood sugar levels may be due to an impaired insulin production. But with advances in medicine, things have changed; new blood tests are able to detect the presence of more and more diseases, e. g. different types of cancer at an early stage, foetus abnormalities or Alzheimer's disease.

Content

Blood tests for cancer

Scientists discovered that with the help of simple blood tests, free-circulating DNA from advanced prostate cancer cells were detected in different individuals, who then were selected to be treated with personalised medical treatment; for example, by inhibiting a specific gene. Moreover, according to recent research results, a new blood test promises early detection of eight different cancer types.[5] This test, called cancerSEEK, is able to scan for early stages of cancer by screening for circulating DNA or proteins that are a part of cancer cells. In contrast to potentially painful biopsies, cancerSEEK is non-invasive and can be done during a routine checkup. The study implied that different cancer types, such as ovarian, liver, stomach, pancreatic, oesophageal, lung, bowel or breast cancer can be detected by cancerSEEK.[6] Unfortunately, this blood test is not currently available at medical health centers but could be in the future.

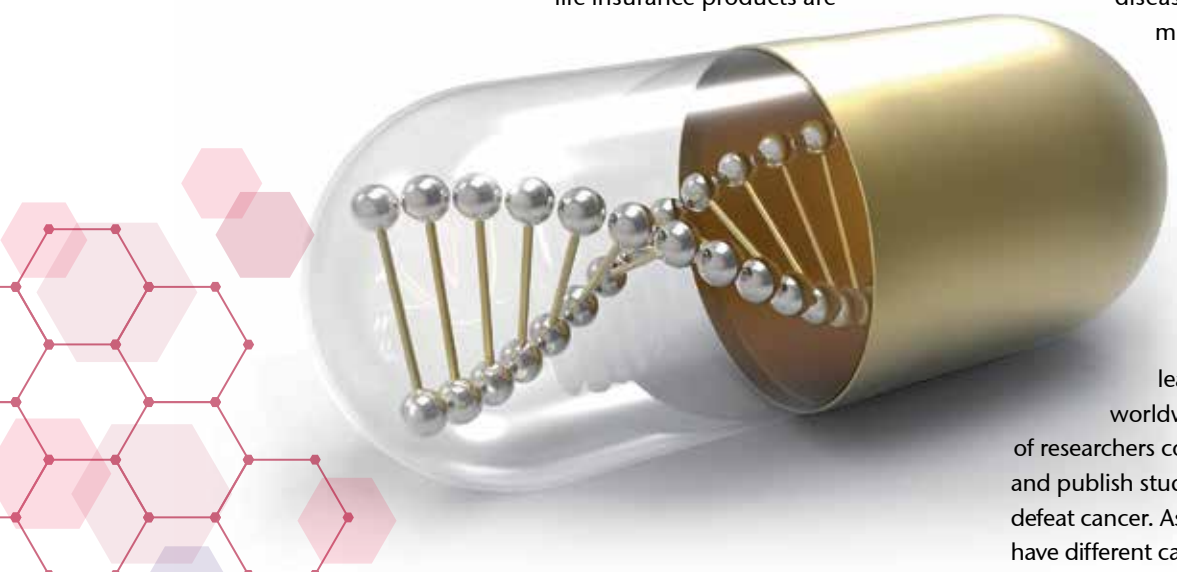
How should insurers work with this kind of information? When different cancer types can be detected in their early stages followed by quick treatment, survival rates will increase and subsequently Life insurance and even Disability cover can be offered to more people. On the other hand, fast detection of cancer can be accompanied with misuse and anti-selection for some insurance products, such as Dread Disease cover. Dread Disease policies covering cancer typically require the finding of malignant cells with uncontrolled growth, invasion of cells and histopathological evidence. But should blood tests become the gold standard for cancer diagnosis, disease definitions need to be reviewed. Early detection of cancer showing only a minimum amount of cancer DNA could result in a claim without the client actually having developed a life-threatening disease. These new advances in blood testing can therefore have a big up- and down-side for insurance companies.

Maternal blood tests

Amniocentesis is a prenatal screening test to find chromosomal abnormalities in a foetus. A small amount of amniotic fluid is withdrawn with a needle for testing. It is now possible to replace this traditional invasive procedure by non-invasive maternal blood tests. If the genes of the foetus can be determined with the help of simple blood tests reducing the health risks associated with invasive procedures, more women will agree to be tested for the health of their unborn child (e. g. early detection of potential Down's syndrome). The accuracy of the test is up to 99.5%.[7] Next to the major ethical issues that are raised by these developments, this topic also carries huge implications for insurance companies. Newborn baby life insurance products are offered starting at age six months. For a foetus, early detection of abnormalities that go along with higher mortality rates can again lead to anti-selection and increased life insurance applications. Therefore, it is necessary that insurance companies are aware of such tests.

Alzheimer's disease

Another interesting topic is that of a simple blood test to detect Alzheimer's disease. Again, identifying minimally invasive and cost-effective blood-based biomarkers for Alzheimer's would be a major step in diagnostics. The main diagnostic factor that Alzheimer's tests look for in the blood is the presence of amyloid beta deposits. A study showed that in approximately 300 patients from Japan and Australia, 90% of the cases showed an amyloid beta concentration in the blood with associated abnormalities in the brain.[8] What does that mean for the insurance industry? Similar to cancer, existing disease definitions in some insurance products (e. g. Dread Disease) should be checked for adequacy as claims can be made for diseases that may never actually become a problem to the person. Also someone who tested positive for an increased risk for Alzheimer's disease can specifically look for that kind of product. Or a person who already knows about increased risk due to a diseased first degree relative, might buy coverage before undergoing the Alzheimer's blood test.



Cancer – How much personalisation is possible?

Cancer is one of the leading causes of death worldwide. Thousands of researchers conduct research and publish studies with the aim to defeat cancer. As different cancers have different causes and factors that

influence the disease, one wonder pill for elimination will never be likely.

Another problem is that cancer is often over-treated – mainly via chemotherapy and radiation. These treatments are rather unpleasant and painful and even associated with developing other cancers. Additionally, chemotherapy and radiation do not only kill the cancer cells but also healthy cells. Here, Multianalyte Assays with Algorithmic Analyses (MAAA) might solve the problem. This is a new trend in personalised medicine where algorithms help choose the right course of treatment for a particular person with cancer or other severe diseases. In the case of breast cancer, the prognostic factors according to the American Joint Committee on Cancer (AJCC)[9] are tumor size, metastasis to lymph nodes, absence or presence of specific biomarkers – such as estrogen receptor, progesterone receptor, and human epidermal growth factor 2 (HER2). But these clinical factors can be misleading when estimating the prognosis and predicting the response to chemotherapy. A study showed that with the help of MAAA, it would be possible to decide whether chemotherapy has more benefits than harm for the treatment of breast cancer.[10] In this way, chemotherapy can be added or left out of the treatment plan. This also improves the prognosis.

> *Different cancers need different treatments*

Additionally, personalised medicine is used for the treatment of colorectal cancer. Studies showed that epidermal growth factor receptors (EGFR) are more highly expressed in some colorectal cancer cells compared to other patients with this disease. In this way, targeted inhibition of EGFR helps to shrink the cancer cells without using aggressive treatment that damages healthy cells.[11]

The higher stages (stages III to V) of skin cancer generally have a poor outcome. Most of these skin cancers show mutations in the BRAF gene. A drug named Vemurafenib is able to target the skin cancer cells and inhibit the mutated gene. This leads to a decreased development of the cancer in 63% of patients with stage III to IV skin cancer and hence to increased survival rates.[12]

In the future, it might be possible that some cancer types can be cured even in advanced stages. For insurance companies, it would be helpful to know which cancer types can be treated in a personalised way and according to that, analyse the long-term outcomes in the future. In underwriting, it is very difficult to accept clients with advanced stage cancer. In the future, if personalised medicine can increase survival rates even for those with advanced cancers (stages IV or V) in individual cases, better ratings can be offered.

Personalised medicine – Our future?

These days we have high expectations that personalised medicine will be able to completely cure many different diseases. In contrast to the past, tailored individual medicine is becoming common and targeted therapies are getting approved by the FDA almost every six months. The National Health Service (NHS) in England describes a vision for 2020 where major changes within medicine will have taken place. We'll see better diagnostic options for cancer as well as rare diseases and will use data combined analyses to visualise the complete picture of a patient's data. By 2025 a new taxonomy of medicine based on underlying cause and personal response is expected.[13] We can say for sure that personalised medicine is not just a hype that will pass but the future of medicine.

According to the British Pharmaceutical Industry, there are great advantages in increased personalised medicine, e. g. patients showing better results as less time intensive "trial and error" treatment is needed.[14] Additionally, personalised medicine is able to target only the harmful cells, therefore reducing side effects and increasing treatment efficacy.[15] It may be difficult to change the entire underwriting process based on the newest developments of precision medicine. First, personalised medicine is currently more expensive as compared to traditional treatments, and second, in some countries this kind of treatment is not readily accessible.

> *Personalised medicine is not just a hype*

On one hand, in the future it might not be possible to avoid accepting simple blood tests from clients that show negative results for different cancer types; on the other hand, it is important to prevent misuse/ anti-selection because of fast and sometimes very sensitive results. One thing is certain though: We need to take these new advancements into account when introducing changes to underwriting processes.

About the author

Dr. Sara Kannampuzha *works as an associate Underwriter in Underwriting Research, Research & Development. She is engaged in the development of Gen Re's underwriting guidelines concerning both medical and non-medical risks and supports Gen Re's international clients in questions of underwriting. She can be contacted at Tel. +49 221 9738 543 or sara.kannampuzha@genre.com*

Endnotes

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