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ReCent medical news
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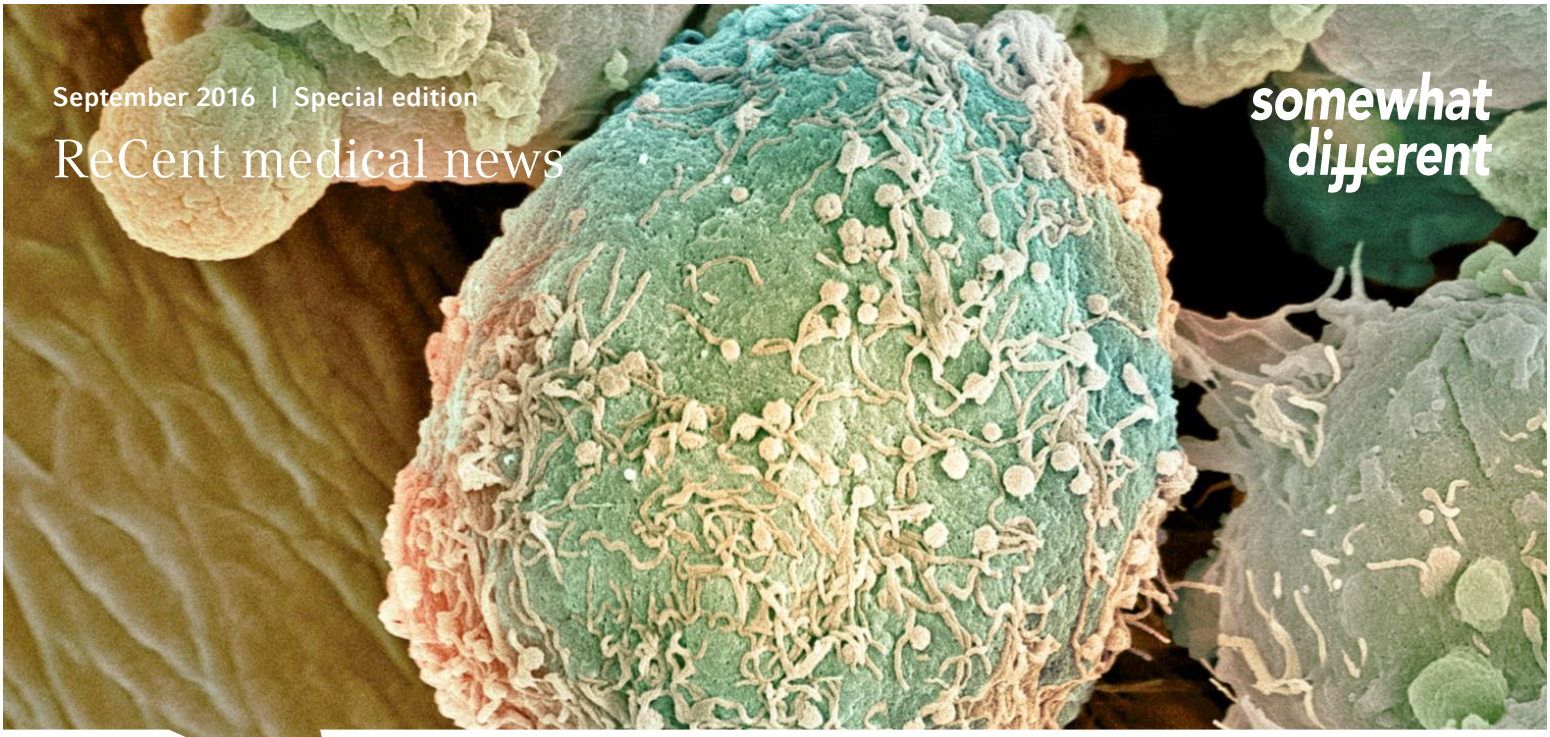

Cancer is caused by abnormal cells multiplying out of control.

What if … we found a cure for cancer?

A "what if" question is an extremely useful question: it enables us to enter the realm of possibilities, identify the most likely scenarios and think through the potential consequences. Based on this analysis, we can highlight the areas that we need to look into now in order to better prepare ourselves for the future.

"What if we found a cure for cancer?" This is a huge topic with the potential to have a significant impact on the insurance industry. Given that 63% of claims on a CI policy are related to cancer[1], it is worth spending the first half of this article looking at a few streams of research that could one day lead to a cure. We shall then consider how a cure could impact the insurance industry in the second half of this article.

Background: research into cancer

It may surprise you to know that only 30% of the GBP 498 million spent in the UK[2] on cancer research was focused on treatment. This means identifying and testing treatments such as chemotherapy, radiotherapy and surgery, as well as complementary and alternative treatments such as supplements and herbs. The remainder was spent on improving our understanding of cancer; for example, how cancer starts, how it progresses, what causes it, how we detect it and how we prevent it. It is only through this type of research that we can arrive at an eventual cure. The picture is similar on a global scale; 27% of the GBP 3.4 billion spent globally in 2008[3] was targeted on treatment; the rest was spent on activities relating to the search for a cure.

A different split of the investment shows that in the UK 54% of research was site-specific, i.e. looking at only breast cancer or prostate cancer (the rest applied to all cancers). On a global scale, 81% is site-specific, owing largely to condition-specific charities in the US. Further to this, there are over 200 types of recorded cancers[4], and each type responds differently to treatment (chemotherapy works well for testicular cancer but surgery can be more effective for breast cancer). Given the above picture, it seems reasonable to suggest that we will find site-specific cures first, before we discover a one-size-fits-all cure.

That said, at its very root, cancer is caused by abnormal cells multiplying out of control. Can we find a cure that tackles this issue directly? What if there was a catch-all cure? We take a look now at the current fields of research that could hold the key to a cancer cure.

[1] Hannover Re UK Life Branch's estimate June 2016
[2] See "The latest data", National Cancer Research Institute
[3] See "Cancer Research Funding from an International Perspective", International Cancer Research Partnership (ICRP), Report 2005-2008
[4] See "What is cancer", Cancer Research UK

Promising research

The three areas of research that we identify here are immunotherapy, finding a way to deactivate telomerase and gene editing.

Immunotherapy

Since the mid-1990s, the field of immunotherapy has received an ever-increasing amount of attention from the US-based Cancer Research Institute and is currently at the heart of its work. Immunotherapy recruits our own immune system in the battle against cancer. The Cancer Research Institute[5] highlights five ways in which this could work:

- **Monoclonal antibodies** are antibodies manufactured in the lab which bind to cancer antigens and destroy cancer cells.
- **Checkpoint inhibitors** which disengage the immune system's brakes so that it can attack the cancer cells directly.
- **Cancer vaccine** similar to those used to prevent diseases like measles or chicken pox.
- **Adoptive cell therapy** in which certain cancer-fighting cells, called T cells, are extracted from the body, multiplied in great numbers and then reintroduced. This effectively gives a kick-start in fighting cancer.
- **Oncolytic virus therapy** where a virus is used to infect cancer cells in order to destroy them.

Immunotherapy has appeared in the press recently too, including for example the use of Pembrolizumab for patients with advanced melanoma.

Deactivating telomerase

Cancer Research UK gave an excellent explanation of how telomerase works in our body[6]. The cells in our body (more specifically, the chromosomes in our DNA) divide constantly so that we remain healthy, whilst our old and dead cells get replaced. These chromosomes have protective caps at the end of them, called telomeres, which are often likened to plastic caps at the end of shoelaces.

Over time, after multiple replications, these caps get worn down and our DNA is no longer protected. At this point, a signal is sent to stop our cells dividing further so as to avoid the damaged cell being replicated (this is called programmed cell death or apoptosis). This is a brilliant safeguard against cancer since cancer itself is caused by abnormal cells multiplying out of control.

However, with eight out of ten cancers, this mechanism gets sabotaged. Cancer cells reactivate telomerase, an enzyme that produces telomeres, thereby cheating the system and multiplying without limit. If we could find a way of selectively switching off the telomerase in these cancer cells, we could have an effective weapon in curing the majority of cancers. However, the real challenge is in ensuring that telomerase is deactivated in abnormal cells only, otherwise we could end up with the unwelcome side-effect of an early death.

Gene editing

Gene editing involves inserting, deleting or replacing DNA in an organism's genome. This is an extremely complicated area and progress has been slow. This technique has natural synergies with adoptive cell therapy (mentioned in the immunotherapy section above), where we can extract T cells, edit their genes to target a tumour, multiply their numbers and reintroduce them to the body. There are a few trials using this type of gene therapy in the UK.

Gene therapies can be used to make other treatments, such as chemotherapy or radiotherapy, as well as existing drugs more effective. It may even prove to be the method that is used to deactivate telomerase for targeting cancer cells. One such example of gene editing research is the talimogene laherparepvec (T-VEC) virus, which was created by genetically modifying a herpes simplex virus (HSV-1). It has been modified so that the virus no longer causes herpes, selects only cancer cells for destruction and secretes a protein that is naturally found in our bodies to initiate an immune response. It has been approved in the US for advanced melanoma, and could be useful for other cancers.

The impact on the life insurance industry

The discovery of a cancer cure will have a significant impact on the life insurance industry, in particular the CI product offering. Before we discuss how it impacts the industry, we first define what we mean by a cure.

[5] See "Immunotherapy: 5 Ways to stop cancer", Cancer Research Institute
[6] See "What is cancer", Cancer Research UK

Defining the cure

A cure for cancer could be a discovery that prevents someone getting cancer in the future. In this case, as the treatment gets rolled out across the population, we can start to reduce future cancer incidence rates until this assumption becomes zero. Alternatively, a cure could be an effective treatment of cancer, i.e. it is no longer a critical illness. Here, a person could still be diagnosed with cancer but their 10-year survival rate would be no different to the general population.

However you define a cure, the nature of the cure (i.e. how the cure works) is a crucial element to consider. How effective is the cure at treating all types of cancers? Does it delay the onset of symptoms (buys more time) or does it stop the symptoms progressing further? Are there any side-effects? These are just some of the questions that we need answers to in order to fully assess the impact on CI incidence rates, future trends and the conditions covered in a post-cure world. We now take a look at some of these concepts in detail.

Efficacy: If the cure applies to certain types of cancers only, then they can be removed from the list of conditions covered. For example, if the cure treats all low severity cancers, then our new CI product would just need to include the high severity cancers such as brain, lung or pancreatic cancers. We would need to know which cancers were affected, evaluate the resulting reduction in incidence rates and estimate how the rates would change in the future. As such, the overall pricing impact of a post-cure product could vary significantly, depending on the cure itself.

Delaying the worsening of symptoms: What would happen if the cure simply meant that we stopped cancer from progressing, i.e. you won't get worse but you won't get better either! This could be quite complex to model. For a subset of cancer diagnoses that are severe enough for a claim payment to be made, we would settle the claim, whether this cure existed or not. However, if the diagnosis is not severe enough for a claim payment, we can apply our cure, stop cancer progressing and never pay out. This would mean that there is room to reduce our incidence rates, the extent of which will depend on how early we diagnose cancer. More importantly, these claims incidence rates may change in the future if we find new ways of detecting cancer earlier than before and this pace might vary between different types of cancers.

Prevention: So far, this article has referred to immunotherapy, deactivating telomerase and gene editing in the context of cures for cancer but not as a preventative tool. Theoretically, all these methods could lead to vaccines or early detection tools that could be rolled out by the NHS to all healthy lives as a preventative measure. The cost-benefit analysis for this, the political will and priorities of the government of the day would heavily influence the likelihood of a nationwide prevention programme. If the cure is only privately available, then those who can afford it will benefit the most – in which case, we need to understand how this will impact the insured lives (rather than the population as a whole).

Side-effects: Whilst new treatments undergo rigorous testing before they are made available for mass use, we would need to fully understand any side-effects of the cure and reflect this in our rates. For example, immunotherapies which stimulate the immune system could increase the rates of other autoimmune diseases such as multiple sclerosis, rheumatoid arthritis and systemic lupus erythematosus (SLE). However, other treatments such as monoclonal antibodies tend to have less side effects.

New types of cancers that we did not know about: Rather like how cancer became a more prominent disease as a result of people living longer[7], curing these types of cancers could give rise to new versions that we do not yet know about, i.e. those that affect centennials. Other known diseases could also become more prominent, such as Alzheimer's. For our post-cure CI product, we would need to be mindful of the changes in the trends of non-cancer conditions.

Speed of implementing the cure: This could be relatively quick if the cure works in conjunction with existing treatments. However, if it is something novel, then we will need to have the diagnostic machines built and infrastructure set up, which will take time. We need to have a good idea of how long this period will be if we are planning to launch a cancer-free cover.

Lapses on our existing business

Once cancer is cured, we would no longer include it in our list of CI conditions. This would give rise to new cancer-free policies and could encourage condition-specific cover, such as heart attack cover, stroke cover or Alzheimer's products.

[7] See "What is cancer", Cancer Research UK

It is unavoidable that the launch of a cancer-free product would lead to lapses in our existing CI book. At worst, we would get anti-selective lapses, with healthier lives buying the new cancer-free cover while less healthy lives remain on our books. What is hard to determine is the extent of these lapses. Perhaps older lives are less likely to lapse since they may be unwilling to go through underwriting again, but they may also stand to gain the most from lapse and re-entry as cancer rates increase with age. The first company that launches a cancer-free cover could stand to benefit greatly. They can make full use of the media coverage associated with cancer-cure announcements and offer a distinct cancer-free product to the market that is significantly cheaper than the competitors.

The argument above holds true if we assume that only certain types of cancers are cured, e.g. breast cancer or prostate cancer, and even if it is a subcategory of such cancer. There would still be a push to remove that condition from our new CI product in return for cheaper premiums for the customer.

New markets

Gene editing could enable risks that were previously declined or deferred at underwriting to safely join the 'standard' population with little or no loading. Whilst an exciting prospect, this is a relatively small proportion of lives; genetic specialists estimate that only 2% to 3% of diagnosed cancers are linked to an inherited genetic fault[8]. There is currently a moratorium on the use of genetic information in pricing insurance policies but if someone has had gene therapy in the past, is there scope for insurers to use this to offer cheaper rates? Similarly, immunotherapy or deactivating the telomerase could give us access to previously declined or deferred risks.

Conclusions

It is likely that a cure for cancer will happen in stages with different cancers being cured at different times. A cure here could be something that prevents incidences of cancer in the future or something that means that the cancer is no longer a critical illness. The most crucial element that we need to consider is the nature of the cure itself as it has direct implications for our pricing assumptions (incidence rates, trends, lapses on existing business). With current CI products being sold with long policy terms of 30+ years, it is essential that both insurers and reinsurers keep a close eye on medical advances and assess how these affect future pricing and the conditions covered under the CI product.

[8] See "Cure for all cancers – Hype or breakthrough?", Cancer Research Institute

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