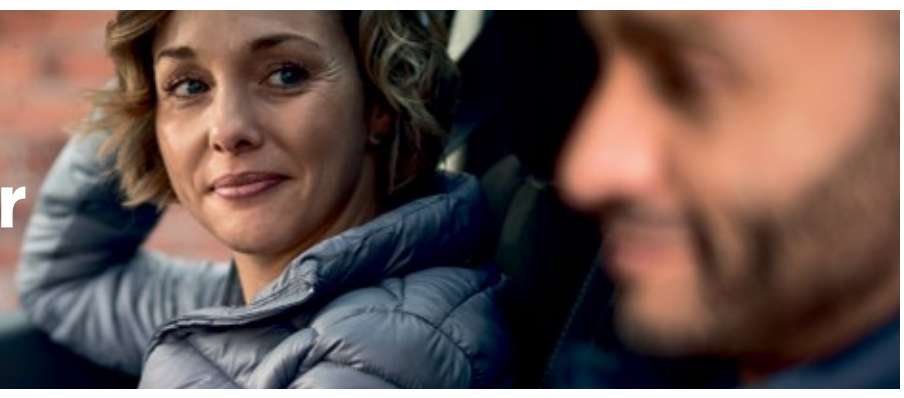
COMBATING CANCER



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COMBATING CANCER

Distributed in
THE TIMES

Time to diagnose cancer early

Despite significant advances in treatment, late diagnosis results in needless deaths and the continuing scourge of cancer

DANNY BUCKLAND

We know the threats. We have the cures. But the chasm between cancer diagnosis and treatment is a deadly stain on the nation's healthcare record.

Our ability to decode cancer's multi-faceted jeopardy has outstripped society's aptitude to modify behaviours and organise the early testing that could mean the difference, quite starkly, between life and death.

Many cancers are detected late into their development when their molecular quirks are causing havoc and a sizeable number are only diagnosed in A&E units when a patient is treated for another condition.

Medical science can now sequence a patient's genome – the individual DNA characteristics that define physical make-up – for less than £500 and immunotherapy can supercharge a patient's moribund immune system to fight off virulent cancers. Yet the comparatively straightforward process of screening people for treatment is misfiring.

It is now a hot political issue with prime minister Theresa May declaring an ambition to have 75 per cent of cancers diagnosed early by 2028, a jump from the current average of 54 per cent, with almost 5,000 extra staff promised by 2021.

But diagnosing cancer is so unreliable that a climate has developed where legal firms trawl for business by bartering late diagnoses into medical negligence lawsuits.

There are three NHS cancer screening programmes which in 2016-17 identified 460,000 people who needed further investigation or treatment. But Penny Woods, chief executive of the British Lung Foundation, voices concern. "By the time lung cancer causes symptoms, it's usually too late. That's why early and accurate diagnosis is crucial for patients with lung cancer," says Dr Woods.

"Currently, too many patients are being diagnosed via the emergency route, with 35 per cent of sufferers diagnosed in A&E. We've seen how successful lung cancer screening pilots have been, where people at high risk of the developing the disease are invited for CT scanning and other lung health checks."

Levels for breast cancer screening are at their lowest for a decade, according to NHS Digital data, while a *Lancet* report revealed UK cancer survival rates have fallen to the bottom half of world league tables for seven cancers and only come in the top ten for two.


Matheus Ferrero/Unsplash

NHS England is now taking screening to the streets, deploying mobile units in supermarket car parks or community centres to change public attitudes.

A pilot programme in Manchester recently scanned more than 2,500 people in three deprived areas of the city, where lung cancer is more prevalent, and discovered 46 cases of cancer. Of these, 80 per cent were early stage one. The scheme, funded by the Manchester Clinical Commissioning Groups and Macmillan Cancer Support, has quadrupled the early diagnosis rates for lung cancer in Manchester.

It is being rolled out to more areas and the results from these one-stop shops, set up in ten areas to catch patients who do not have "alarm symptoms", will inform a more fluid and dynamic approach to cancer diagnostics.

Work at reshaping techniques is progressing at pace with mobile units using 4G technology to give swift results and synchronise with patient records so people can drop in without appointments.

But a plan to start bowel screening at age 50, following Scotland's lead, is delayed in England and Wales, and Bowel Cancer UK reported earlier this month that 28 per cent of hospitals in England were in breach of waiting times for bowel cancer testing.

"There is a lot more we could be doing to reduce late-stage cancer diagnosis. We have tens of thousands of people who are diagnosed with stage-four disease where curative treatments are not an option and that needs to be tackled. We should be making progress on this," says Jodie Moffat, head of early diagnosis at Cancer Research UK.

The government continues to be buffeted by complaints about the devastating consequences of delayed diagnosis and its positive intent faces tough hurdles if it is to revitalise testing while pathology and radiology services are stretched wafer thin.

"It is wonderful to see such high-profile commitment to shifting late-stage diagnoses and getting more people diagnosed early. But it is an ambitious ambition and the government needs to be thinking how it is going to resource its delivery," says Dr Moffat.

Cancer Research UK figures forecast a rising cancer incidence as the population ages. This could mean NHS England will need to perform 44 per cent more endoscopies than current levels, and train cohorts of experts to deliver the tests and interpret results.

Salvation could come from the use of artificial intelligence, which can spot pre-cancerous patterns from quick body scans and patient data, along with the potential from liquid biopsies, blood tests that pick up biomarkers before damaging cellular changes take place.

Software devised by Japanese scientists has shown it can detect early-stage bowel cancer with 86 per cent accuracy, while algorithms are advancing in prostate cancer.

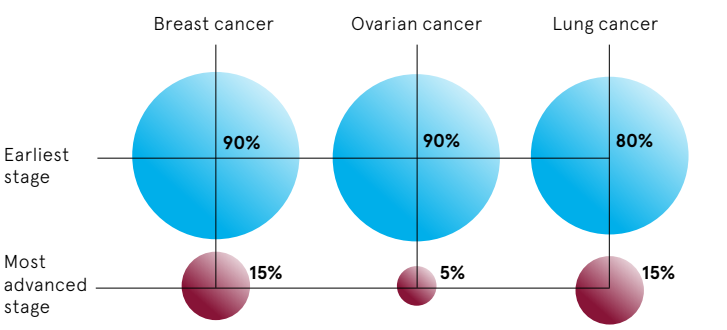
Paul Fitzpatrick, consultant at the Pistoia Alliance, a global not-for-profit life sciences group, believes that industry and the NHS can combine to create a powerful diagnostic and treatment pathway, providing privacy and transparency are enshrined.

"There is a chance to streamline the process so detection is targeted at the right patients, aligning to better treatment options. This will only increase positive outcomes, which will free up resources for the NHS to do other things. This will only work if as a society we're prepared to share our health data," he says.

Cancer Research UK's Dr Moffat concludes: "The research coming forward is hugely exciting. They should help make us better at tailoring services to individual risk and make a significant dent in late stage in the future. At the heart of this is making sure we have a service in which these research advances can be delivered and that will need investments and resources, and require us to think differently." ◆

Importance of early diagnosis

Survival rates if disease is diagnosed at earliest and most advanced stage



Cancer Research UK 2018

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GENOMICS

Harnessing the power of AI to outsmart cancer

Healthcare companies are developing technology which utilises the power of artificial intelligence to analyse genomic data and provide personalised treatment for cancer patients

HEIDI VELLA

A genome is the body's instruction manual. It's made of DNA and there is a copy in almost every cell.

Through genome sequencing and genomics, clinicians can better understand how cancer cells might evolve and what treatments will be most responsive, known as precision and personalised medicine.

Furthermore, genomics combined with technologies such as machine-learning and artificial intelligence (AI) has huge, as yet untapped, potential for determining a healthy person's future risk of cancer.

To sequence the first genome cost $3 billion and took 13 years. But today, Illumina, the NHS's technology partner, can do it for a comparatively mere $1,000, a price drop that is driving innovation in the field.

Building on its groundbreaking Genomics England initiative to sequence 100,000 genomes, earlier in the year the UK government announced a new Genomic Medicine Service is being rolled out for children and adults with rare diseases and some types of cancer, so doctors can provide more personalised treatment.

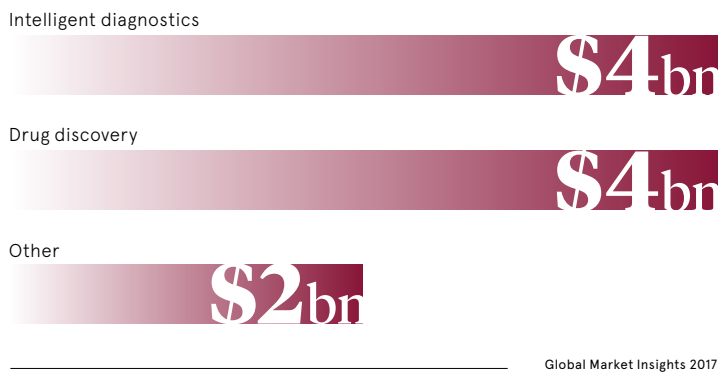
Health secretary Matt Hancock said recently the aspiration is to sequence five million genomes over the next five years.

"Genome sequencing means we can get all the information needed from one test, whereas previously several were required," says Professor Trevor Graham from the Barts Cancer Institute at Queen Mary University of London.

He is conducting early-stage research funded by Cancer Research UK using computers, mathematical modelling and genetic data to piece together a cancer's history to predict how tumours evolve.

Healthcare artificial intelligence industry

Estimated market size by 2024



Global Market Insights 2017

To derive insights from the huge amount of information a sequenced genome produces, clinicians are seeking help from advanced data science techniques.

For example, SOPHiA GENETICS' SOPHiA AI software-as-a-service (SaaS) platform uses algorithmic technology to make genomic data more accurate for diagnostics by cleaning and standardising it, removing anything that could present bias or false results, which is a frequent problem. It then highlights variances in the data that could be causing the cancer and provides treatment suggestions.

"Genome sequencing means we can get all the information needed from one test, whereas previously several were required

"It is up to the clinician to make the final diagnosis about pathogenicity and treatment, but SOPHiA can provide a prediction, as well as identify specific treatments on the market and even link patients to potential ongoing or upcoming drug discovery trials," explains Iole Pezzuto, scientific communication specialist at the company.

The technology is used in 800 hospitals worldwide for hereditary disorders, including cancer, and oncology for both solid tumour and haematological disorders. In September, it opened a US headquarters.

To celebrate this October's Breast Cancer Awareness Month, the company made public new technology that uses similar techniques to help quantify a patient's risk of cancer.

Known as PREVENT, the test is based on ten years of studies. It combines genome sequencing data, provided by a simple mouth swab, and information about lifestyle, including smoking, weight and fitness, with non-modifiable factors, such as age, which is fed into an algorithm to create an individual's risk score.

Dr Jonathan Krell, consultant medical oncologist at Imperial College London Healthcare NHS Foundation Trust, has been trialling the PREVENT technology. He says it has the potential to improve breast screening programmes, so women are checked when they actually need it.

Presently, women are only routinely screened from the age of 50, even though 50 per cent of breast cancer patients are actually younger.

"This technology can help us determine who should be undergoing breast screening at age 35, for example, but who doesn't need it until they are 80," he explains. "From a public health and economic perspective, this will have a huge impact in personalising our screening programmes, because right now it is not good enough to say we screen by age eligibility alone, as that is not the only risk determiner."

The PREVENT model could potentially work for any cancer, but is especially useful for those where there is an effective way to screen patients, for example, with mammograms or blood tests.

"Technology companies are focusing their efforts on combining genome testing and advanced data technologies for more precise cancer treatments, diagnosis and drug discovery

Dr Krell thinks patients could be regularly tested to determine their level of risk and, if necessary, offered preventative surgery or medicine.

"I absolutely believe in the future we will be using platforms like PREVENT in a similar way to how we provide immunisations or check blood pressure and diabetes today," he says.

Prevention and early diagnosis is a growing focus for both companies and healthcare providers. The UK government has said it wants the NHS to detect three out of four cancers at an early stage by 2028. Patients diagnosed early, at stages one or two, have the best chance of long-term survival.

Patients, of course, will want this too. PREVENT, according to Dr Krell, was inspired by home genetic tests like 23andMe, which can provide more than 90 personalised reports about a person's ancestry, health and wellness, through a saliva sample.

In fact, more and more technology companies are focusing their efforts on combining genome testing and advanced data technologies for more precise cancer treatments, diagnosis and drug discovery.

Last December, Google released DeepVariant, an open source deep-learning model that has been trained to analyse genetic sequences and accurately identify variants.

Furthermore, Canadian-based Deep Genomics is developing what it calls an AI-driven platform that supports geneticists, molecular biologists and chemists in the development of new therapies.

"Looking at an individual's genomes and calculating their risk of cancer, and diagnosing tumours based on its molecular genetic make-up, instead of where it is located on the body, is exciting," says Professor Graham. "So is big data and analysis, and it is made possible by the very large access we now have to different sets of data like Genomic England."

Most of these technologies, once approved by a national public health body, are fairly easy to adopt in the clinical setting, because they only require sending away samples or integrating a SaaS programme.

Dr Krell concludes: "There are limitations, but they are great ways of improving how we analyse data. They are expensive, but they will be worth it in the long term." ◆

Case study

Medical imaging

The UK government believes artificial intelligence, or AI, could help prevent 22,000 deaths from cancer each year by 2033 and give patients an additional five years of healthy, independent life by 2035.

An AI-based tool that will help achieve this is radiomics. This is a field of medical study that extracts large amounts of quantitative features from medical images using data-characterisation algorithms.

George Shih, associate professor of clinical radiology at New York's Weill Cornell Medical College and co-creator of MD.ai, a platform that aims to accelerate the application of AI in medicine with a particular focus on medical imaging, says radiomics can help mitigate a global shortage of radiologists.

22K

deaths from cancer could be prevented each year in the UK by 2033 through the use of artificial intelligence

UK government

"There are worldwide challenges accessing medical imaging," he says. "While many countries are increasing their access, they still lack expert physicians to interpret the outcomes and that is where medical AI can step in."

Essentially, algorithms can be trained and built to highlight disease characteristics in medical imaging not visible to the naked eye, and predict the evolution of a tumour.

There are many companies working to commercialise algorithms. DeepMind, for example, is working in partnership with the Radiotherapy Department at University College London Hospitals NHS Foundation Trust to develop an AI system that can analyse and segment medical scans of head and neck cancer to a similar standard as expert clinicians, completing the process in a fraction of the time.

This is important because normally radiographers and oncologists need manually to outline areas of anatomy that need radiotherapy and areas to be avoided, so healthy tissue is not damaged. The company hopes the technology will reduce the time between diagnosis and treatment, improving outcomes for cancer patients.

Zebra Medical Vision, an Israeli medical imaging startup that just raised $30 million in funding, has developed an algorithm for breast cancer detection through processing more than 350,000 anonymous mammogram scans and their biopsy results. According to the company, it can identify breast cancer at a higher accuracy rate (92 per cent) than a radiologist using computer-aided detection software.

SOPHiA GENETICS also has a radiomics solution to predict the evolution of a tumour for treatment monitoring. From two different scans taken weeks apart, using machine-learning and complex mathematical models to do imaging analysis, it can predict its growth.

"This information is so important because the doctors will know, for instance, if they have to do surgery or try a specific treatment, or they will know if in three months the cancer will attack a specific organ," says Dlala Tarik, vice president of marketing at SOPHiA GENETICS.

There is huge potential for radiomics in healthcare, but developing algorithms will require much data and institutions across countries to share their expertise.

OVARIAN CANCER

Portra Images/Getty Images

Ovarian cancer in the UK

6th
most common cancer for women

1/50
women will be diagnosed in their lifetime

60%
of cases in England are diagnosed at a late stage

7.4k
new cases each year, equal to 20 every day

15%
expected increase in incidence rates between 2014 and 2035

Cancer Research UK 2018

Greater awareness is important first step

Underfunded and too often misdiagnosed, ovarian cancer is known as the "silent killer", yet early diagnosis could save many lives

MAGDA IBRAHIM

When Jennie Allen saw her GP with abdominal pain and bloating, the symptoms were initially put down to a bladder infection, then coeliac disease.

But with a mum who had died of breast cancer aged 50, Jennie was determined to get to the root of her pain and constant tiredness.

Despite a second opinion from a different GP, who believed Jennie might have irritable bowel syndrome (IBS), the then-51-year-old business owner insisted on being checked for ovarian cancer and was ultimately diagnosed with the disease.

"It may be easy to get wrong and testing can throw up false positives or negatives, but it's got to be better than the alternative," says Jennie.

She is not alone. Almost half of women wait three months or more from first visiting their GP to getting a correct diagnosis and around 4,100 die each year from the disease.

Yet more than 90 per cent of women will survive ovarian cancer for at least five years if diagnosed early.

"It's a difficult world for GPs because the majority of women present with symptoms that resemble IBS," says ovarian cancer specialist Gordon Jayson, professor of medical oncology at the Christie NHS Foundation Trust.

"Improving survival comes down to awareness and education, early diagnosis, and not giving up on very sick patients. We need to develop a UK-wide strategy to deal with this."

While a Department of Health spokesman said there are currently no plans for a dedicated ovarian cancer strand in its Be Clear on Cancer campaign, charities including Target Ovarian Cancer and the Eve Appeal are working to raise awareness of the disease and its symptoms.

Meanwhile, Target Ovarian Cancer's education modules, developed with the Royal College of GPs and *BMJ*, have so far been delivered to more than half of GPs.

GP Vicki Barber's own mother died of ovarian cancer in 2014 and she trains colleagues at national events to ensure symptoms like persistent abdominal bloating and pain, feeling full, and urinary issues are not misdiagnosed.

"No GP wants to miss a diagnosis of ovarian cancer," says Dr Barber. "It's important we all work hard to ensure more GPs are aware of the symptoms and correct pathway to diagnose ovarian cancer earlier."

In the research community, potentially life-changing studies could make a difference to ovarian cancer detection.

Launched in August, the ALDO (avoiding late diagnosis in ovarian cancer) project will check around 2,000 women every four months using an algorithm known as the ROCA test to assess changes in blood chemical CA125, which typically rises in ovarian cancer.

Although the trial is specifically for women who carry faulty BRCA genes with an increased risk of breast and ovarian cancer, like actress Angelina Jolie, who underwent a double mastectomy and removal of her ovaries, the regular surveillance could give those women more choice about when to undergo surgery, says the project's clinical director Adam Rosenthal.

Dr Rosenthal, consultant gynaecologist at University College London Hospitals, believes early detection through annual screening for the wider population could be just a few years away.

While initial results from the UK collaborative trial of ovarian cancer screening (UK CTOCS) of more than 200,000 women showed screening might prevent one in five deaths, the study did not reach the evidence threshold needed to make it scientifically significant.

However, the project has been extended to gather further evidence on the long-term impact of screening on ovarian cancer deaths.

"The whole world is waiting on this," says Dr Rosenthal. "It's very possible UK CTOCS will show a statistically significant mortality reduction and at that point the NHS National Screening Committee would have to accept that for the first time ever we have evidence that screening the general postmenopausal population for ovarian cancer once a year could save lives.

"The question then is whether introducing a national programme to every woman aged 50 to 70 is cost effective.

"Almost half of women wait three months or more from first visiting their GP to getting a correct diagnosis"

"We've chipped away at ovarian cancer survival, but the only way to make a big difference is by detecting it much earlier, preferably at a pre-cancerous phase like with cervical cancer screening. There needs to be a shift in emphasis and political-level realisation that prevention is cheaper than cure."

Dr James Brenton, senior group leader at the Cancer Research UK Cambridge Institute, says: "When we look at the dismal outcomes for ovarian cancer, it's important to realise there is a combination of early spread, genomic chaos and difficulty in diagnosis.

"Early diagnosis remains the Holy Grail. Blood tests are going to be key and, taking into consideration risk factors, are a relatively simple and cheap way to pick up ovarian cancer much earlier."

Prime minister Theresa May announced plans this month for detecting three out of four cancers at an early stage by 2028, by overhauling screening, including same-day testing centres nationwide, providing new investment in diagnosis technology and boosting research.

However, statistics show ovarian cancer research funding has dipped over the past five years, despite the disease projected to rise 15 per cent in the UK by 2035 to around 8,500 new cases each year.

Annwen Jones, chief executive of Target Ovarian Cancer, concludes: "We need to change the nihilistic mindset about the disease, brought on by low awareness, low funding, late diagnosis and low survival rates, because if we don't invest in more research then it is a vicious circle."◆

Life of living: heralding a sea change in chronic cancer management

Dr Kate Higgs, Ipsen's medical director in the UK and Ireland, discusses advances in cancer treatment focused on improving the lives of patients living with the disease

The story of cancer is evolving and on the whole is less gloomy than it once was. Over recent decades, there has been a sea change in care, management and life expectancy, allowing people with certain types of cancer to live with the disease, rather than die of it. This transformation is the result of huge advances in understanding the types of cancer and mechanisms of how it develops.

At Ipsen, oncology is at the heart of our business and part of our history. We are passionate about supporting people living with cancer and their healthcare teams, and proud to have been working in this area in the UK for more than 30 years. We look forward to future opportunities to make a difference to people living with cancer.

Back in the 1970s, when someone received a cancer diagnosis, there were limited treatment options. As a result, they would immediately put their affairs in order, knowing the worst would be inevitable. Now, it is possible for people to manage living with some types of cancer for one, two or even three decades. Moreover, they may be able to live in relative comfort, another vital advancement in cancer care. We are moving towards an era where some cancers might be classified as a chronic illness, something individuals live with, rather than dying prematurely from.

Cancer survival in the UK has doubled over the last 40 years; compared with the 1970s, when only one in four people would survive their cancer for more than ten years, we now see half survive beyond a decade. Groups such as Cancer Research UK have strong ambitions to achieve further improvements, aiming for three in four people to survive some cancers by 2034.

While we have seen people living longer with cancer, we have also witnessed an increase in the numbers being diagnosed with this disease. Latest statistics compiled by Macmillan Cancer Support in December 2017 reveal the number of people living with cancer in the UK between 2010 and 2015 rose by almost half a million. It is estimated that 2.5 million people are living with cancer in the UK today, a figure that is projected to reach four million by 2030. Clearly cancer and its management will increasingly impact society, but the key word to consider is "living" as more and more people are able to have a life of living with cancer.

For those who do live with a chronic cancer, their disease management requires a balance to be struck between treatment of the cancer and the disease symptoms. Previously the only focus may have been to extend life. Quality of life has become a priority for the healthcare team and person living with cancer. Oncologists and healthcare professionals in the NHS may initially focus on the fact that their patients may be able to live longer, but they also must have an acceptable quality of life while they're alive. Every individual is different in their outlook, with some feeling they may not prefer to live for a few extra months if their quality of life is poor.

At Ipsen we believe cancer patients must have a life worth living. We look carefully at the impact of a medicine on the person because we want to understand how our medicines affect their lives beyond treating the underlying disease. Pharmaceutical companies have an important role to play here. Research efforts focus on medicines to treat the cancer or tumour, which often has a positive impact on the patient's quality of life as a result.

But there has also been a concerted effort across the industry of medicine development to focus on treating the symptoms. These medicines are as important to those living with cancer as the medicines that treat the cancer itself. If you're living with cancer for a number of decades, such medicines could make the difference, enabling you to go back to work, to look after your family, take a holiday and continue living life.

Ipsen is proud to partner with many healthcare organisations in the UK, including the NHS, which continues to be recognised globally as delivering leading research and care for patients. The pace of progress has never halted, with a variety of medicines now available for multiple types of cancer in the UK, many more than just a few years ago.

Yet treatment of some types of cancer has seen less progress than others. There are many reasons for this, one being where the type of cancer is less common, a rare cancer, affecting very few people. From a research and medicine development perspective, this can prove a real challenge for research teams and, of course, those living with certain conditions. A clinical trial for a rare cancer can take much longer to complete as it may take many years to find sufficient patients to take part who meet the carefully developed criteria.

In the UK, one in seventeen people will be affected by a rare disease, including rare cancers, at some point in their lives. In comparison, half the population will be diagnosed with cancer in their lifetime. At Ipsen we are committed to focusing our efforts in oncology to deliver research and advancing care for a range of cancers.

Every individual matters and thankfully, with the continued commitment of healthcare trusts and pharmaceutical companies, more people's lives are being extended, and they can enjoy living those lives, despite having chronic cancer. The achievement in this area deserves to be celebrated and will drive further development. As such, we can be even more optimistic about what the future holds for cancer management.

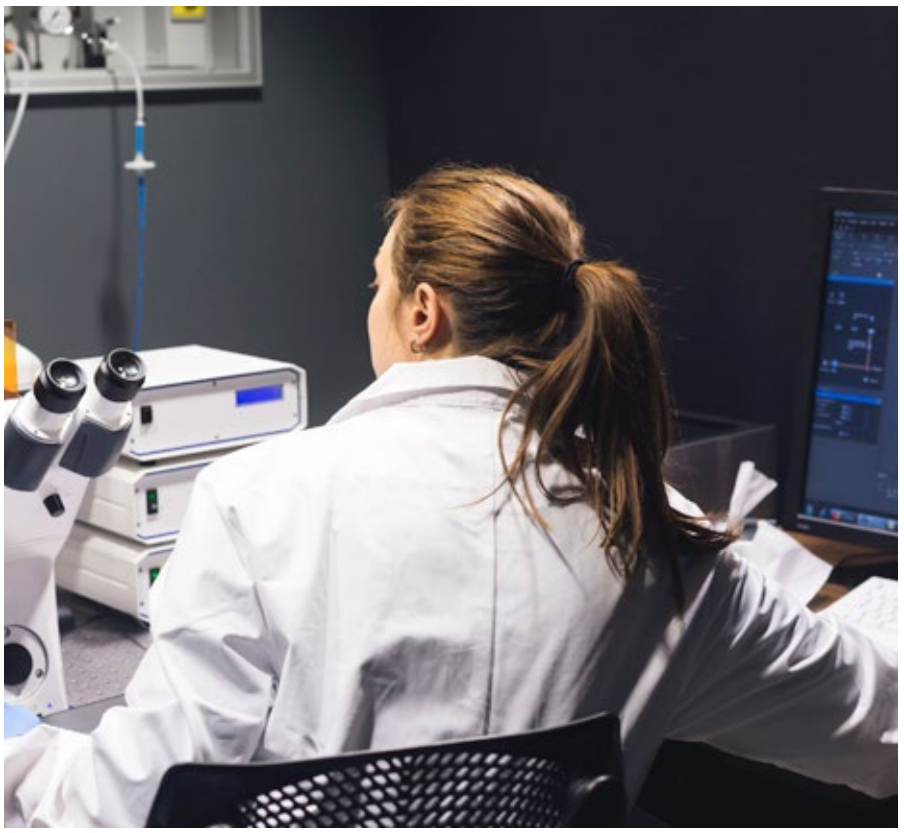
At Ipsen our belief is that patients don't have time to wait. We take a proactive approach as a partner with health authorities, and are proud to work collaboratively to make medicines available for patients across oncology, neuroscience and rare diseases.

2.5m
people living with cancer in the UK

4m
people will be living with cancer by 2030

1 in 2
people will be living with cancer by 2030

10x
improvement in the median survival time after cancer diagnosis in 2011 compared with the early-1970s



> We believe cancer patients must have a life worth living

Dr Kate Higgs
Medical director

Introducing Ipsen

Headquartered in Paris, Ipsen is a leading biopharmaceutical company dedicated to improving lives through innovative medicines in oncology, neuroscience and rare diseases.

Ipsen has a strong presence in the UK as one of three global hubs for the organisation, employing more than 600 professionals across three sites. In the UK the organisation spans three specialties of research and development, manufacturing and distribution, and commercial operations.

Oncology, neuroscience and rare diseases are Ipsen's three strategic focus areas. Its ambition is to be a leading global biotech company focused on innovation and specialist care.

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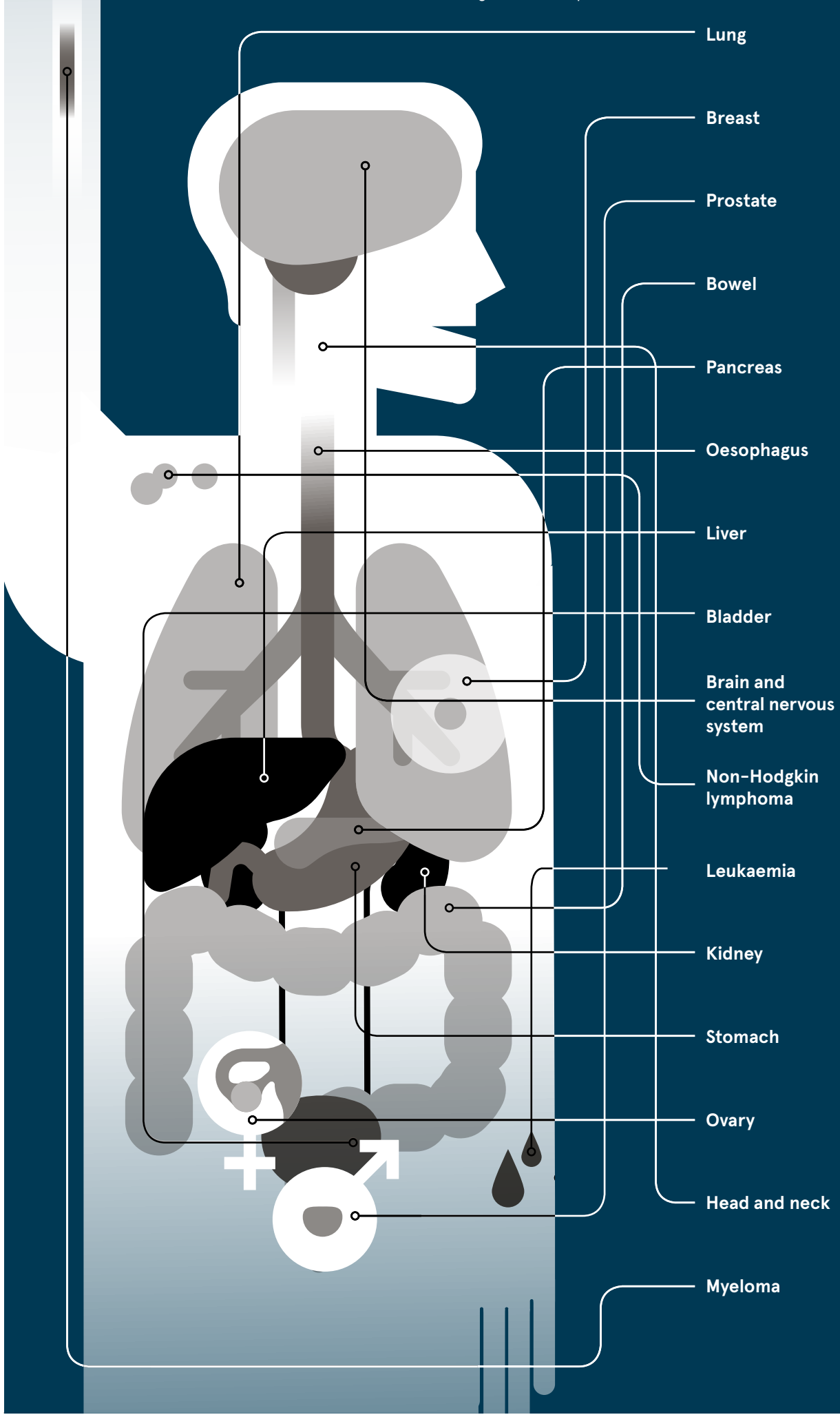
IPSEN
Innovation for patient care

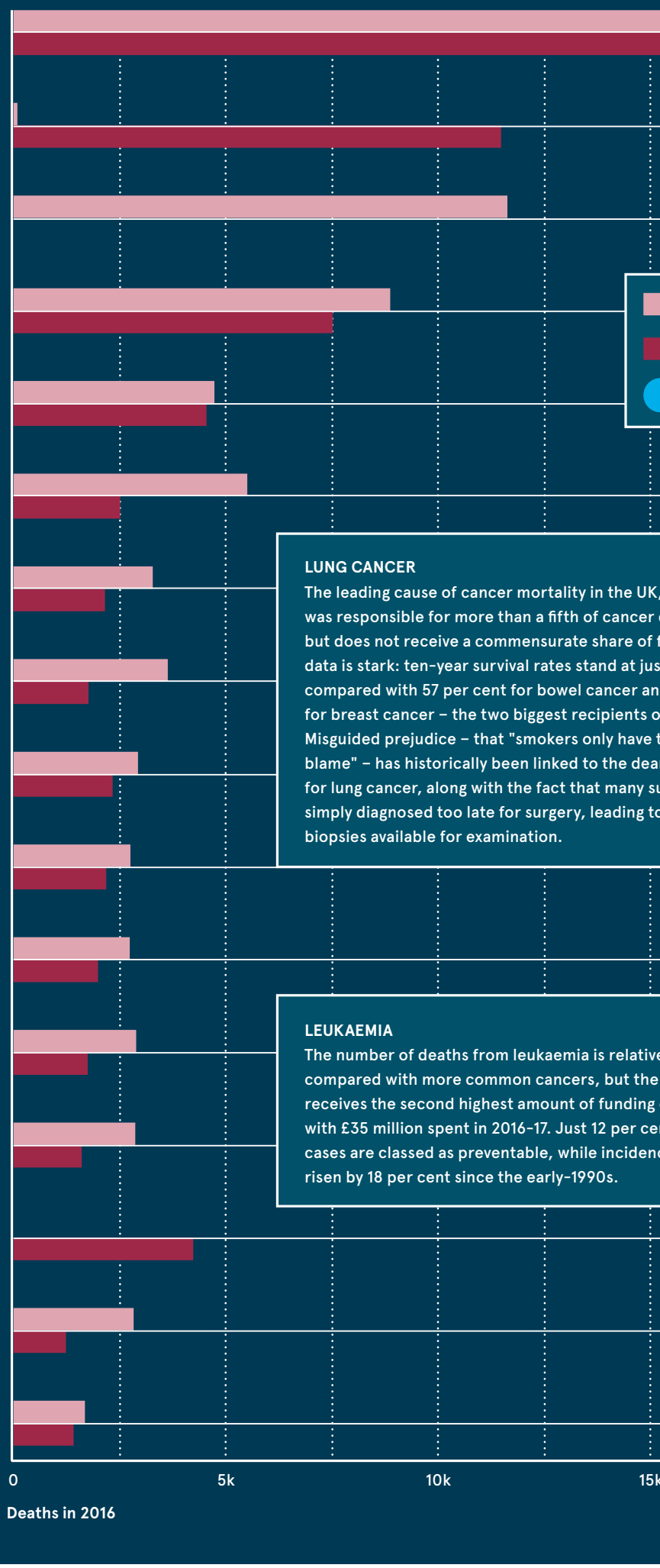
CANCER R&D

Six types of cancer pull in nearly tw
spending. And yet the biggest bene
common or most deadly. This infog
is being directed and the variations

Most common causes of cancer deaths and funding

Deaths in 2016 and 2016-17 funding for cancer-specific research





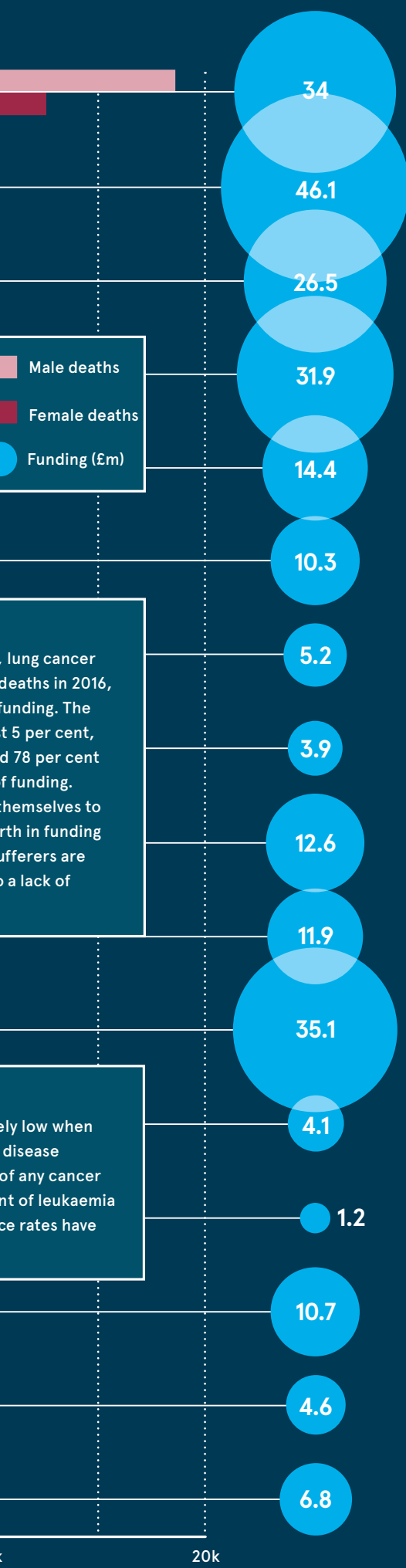
LUNG CANCER

The leading cause of cancer mortality in the UK,
was responsible for more than a fifth of cancer
but does not receive a commensurate share of
data is stark: ten-year survival rates stand at jus
compared with 57 per cent for bowel cancer an
for breast cancer – the two biggest recipients o
Misguided prejudice – that "smokers only have
blame" – has historically been linked to the dea
for lung cancer, along with the fact that many su
simply diagnosed too late for surgery, leading to
biopsies available for examination.

LEUKAEMIA

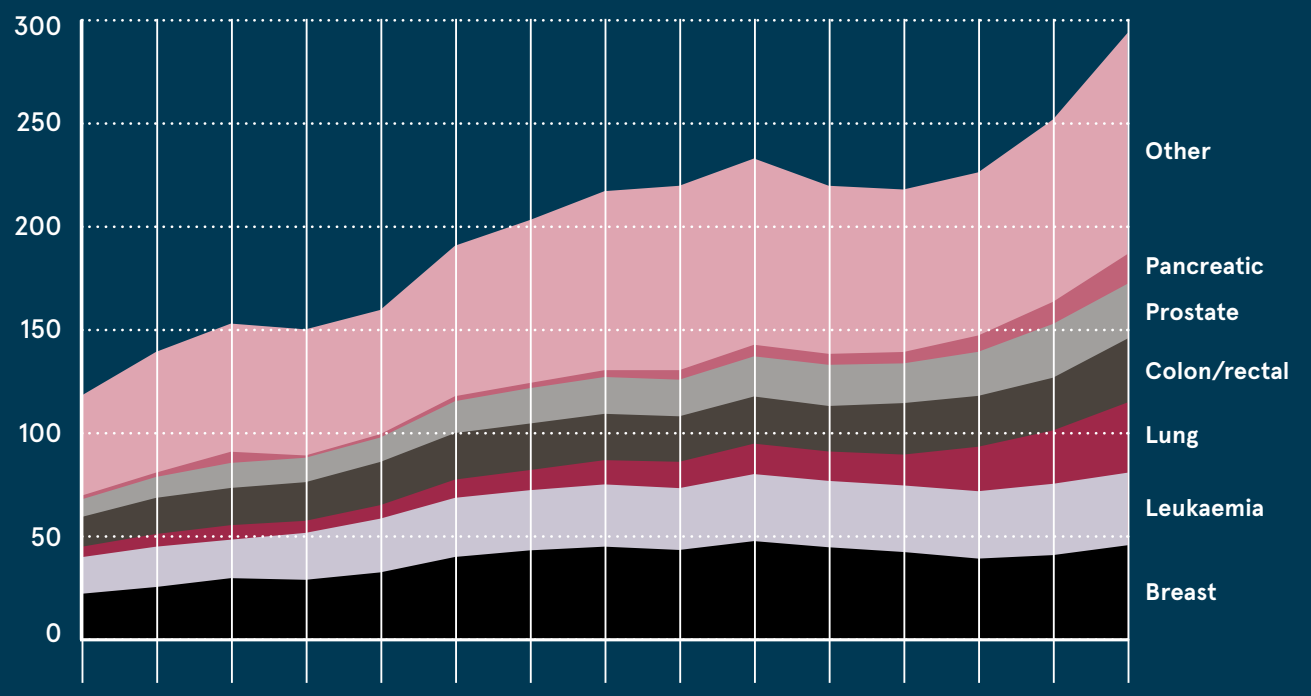
The number of deaths from leukaemia is relative
compared with more common cancers, but the
receives the second highest amount of funding
with £35 million spent in 2016-17. Just 12 per ce
cases are classed as preventable, while incidenc
risen by 18 per cent since the early-1990s.

o thirds of all cancer research
eficiaries aren't always the most
graphic explores where the cash
in funding for different diseases

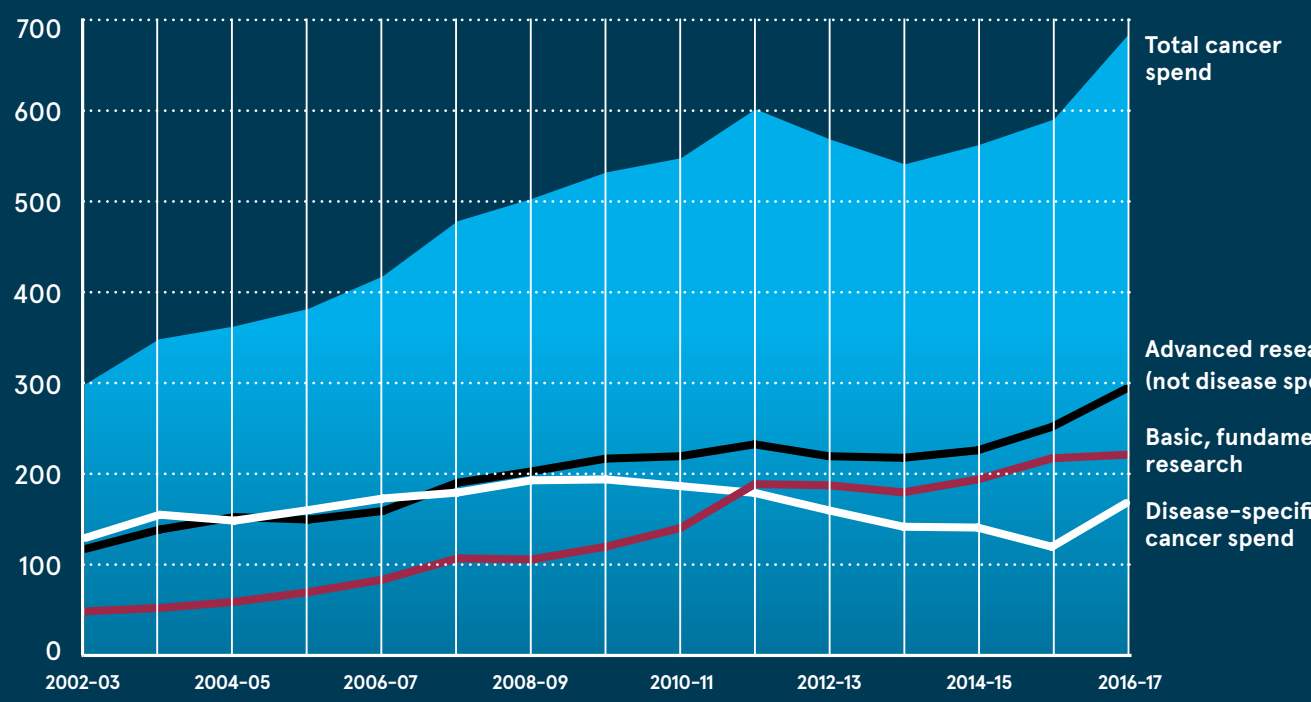


Spending on all disease-specific cancer research (£m)

Spending across top six areas of investment (top recipients in 2016-17)



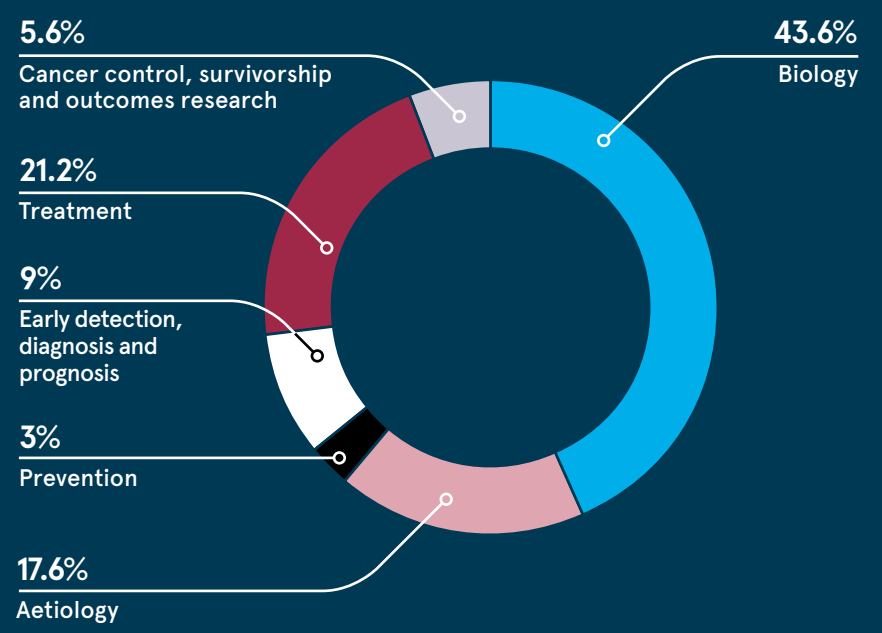
Total cancer researcy spending (£m)



64%

of all disease-specific cancer research spending is attributed to six types of cancer: breast, leukaemia, lung, colon/rectal, prostate and pancreatic

Total cancer research spending by category (£m)



Figures were based on research funding provided by government and charity partners of the National Cancer Research Institute; all partners each spend at least £1 million each year on cancer research in the UK

Commercial feature

All-round approach for cancer care

One in two people in the UK are expected to be diagnosed with cancer at some point in their lives. Fast access to diagnosis and expert treatment, along with holistic support, is essential

Despite accessible information on common cancer symptoms and innovation in treatment, those diagnosed with the condition face numerous obstacles in their care.

Typical concerns include short GP appointments, long waiting lists, restricted access to new treatments and drugs, and limited support around emotional health and financial security.

Public healthcare is changing dramatically in response to these concerns, but the weight of demand on the NHS continues to put pressure on service delivery. Independent healthcare organisations can offer patients faster and more in-depth treatment, however many patients are unsure of the level and duration of support they will receive.

Independent healthcare organisations are seeking to address this concern, and Bupa is at the forefront of designing new, innovative pathways and models of care for its customers, whether they are being investigated or treated for cancer, or simply want to reduce their likelihood of getting the disease.

1 in 2

people in the UK are expected to be diagnosed with cancer at some point in their lives

48,000+

Bupa customers were impacted by cancer

8 in 10

customers changed their lifestyle habits for the better following their health assessment

73%

of customers who had a health assessment witnessed improved health

Among the central pillars of Bupa's offering is its Cancer Promise. This guarantees insured customers with cancer cover, access to eligible and evidence-based breakthrough drugs and treatments, often before they are available on the NHS, regardless of the costs or timeframes involved.

Between July 2017 and July 2018, more than 48,000 Bupa customers were impacted by cancer. For many, the initial journey begins by calling the company's Direct Access service, which offers a fast route to a specialist consultant for customers concerned they may have cancer symptoms.

The service was initially offered to those suspecting breast or bowel cancer, but was recently extended to cover all cancers. There is usually no need to visit a GP; just one call to the dedicated oncology support team, made up of specialist advisers and nurses, who will assess your symptoms over the phone and, if necessary, book an appointment with a specialist.^

"Patients worried about cancer are looking for quick assessments and treatment," explains Julia Ross, Bupa UK Insurance's head of cardiac, cancer and radiology. "If they are sat at home or work worrying they might have bowel cancer, for example, elsewhere they could be waiting up to five weeks before they are told actually it's all fine, which is a lot of stress and difficulty that can be avoided."

For those with cancer, a Bupa recognised consultant can begin treatment rapidly; in breast and bowel cancer patients, for example, the average number of days between calling Direct Access and starting treatment was 33 and 27 days, respectively. This compares favourably with the published national target of 62 days.

Bupa is now working with HCA Healthcare UK to develop criteria for specialist centres for breast cancer, initially focused on quick access to diagnosis, expert treatment and holistic support for breast cancer patients. "We're starting with breast cancer because it is our largest area of cancer. It's early days, but once we've established this model for customers across the country, we'll take these learnings to establish care for the other cancer types," says Ms Ross. "The aim is to optimise cancer services and to ensure they can be exceptionally well governed."

> **Patients worried about cancer are looking for quick assessments and treatment**

The total scope of cancer care provided by Bupa extends from diagnosis through to end-of-life care and also incorporates support to help people cope with living with cancer. In addition to counselling and emotional support services, Bupa has a Survivorship Programme that helps people to focus on the aspects of their wellbeing that they can still control, even while suffering with such a serious illness.

"Research tells us that if you maintain a healthy diet and exercise, you stand a much better chance of being able to manage a difficult treatment regime and also the disease itself," explains Ms Ross. "Our focus is always on keeping the patient at the centre of everything, but also removing them as much as possible from the worry and the stress of the administration."

Some of the services are offered on a pay-as-you-go basis, including a range of comprehensive health assessments which can help to identify potential future risks. Advisers are on hand to offer guidance and advice on lifestyle factors that could be making people more susceptible to getting cancer or other illnesses later in life. This can be ideal for people who may not be experiencing symptoms or have a family history to worry about, but who simply want support to improve their health.

"The usual triggers for people wanting to assess their health tend to be milestone events, such as significant birthdays, or when a friend or family member has been seriously ill," says Dr Petra Simic, medical director at Bupa. "Additionally, parents want to remain healthy for their children and for the sake of the family unit."

Bupa's health assessments can be chosen to suit an individual's priorities and to offer peace of mind. Featuring a key set of tests and measures, some of the assessments can also include testing, where clinically appropriate, for the most common cancers, such as breast, bowel and prostate.

Individuals receive access to a personalised report, lifestyle coaching and a wellbeing app called Boost, enabling them to track progress towards goals set with their adviser. Last year, eight in ten customers changed their lifestyle habits for the better following their assessment and 73 per cent witnessed improved health.

"People have the opportunity to take stock of their current health status as well as highlighting lifestyle factors which may be putting them at heightened risk of cancer and other illness," says Dr Simic.

In today's busy world, taking the time to assess lifestyle and wellbeing can be the first, positive step towards a healthier future. A health assessment can provide education around early detection to improve outcomes, and better lifestyle can also result in significant reductions in overall treatment duration and severity.

Julia Ross
Head of cardiac, cancer and radiology, Bupa UK Insurance

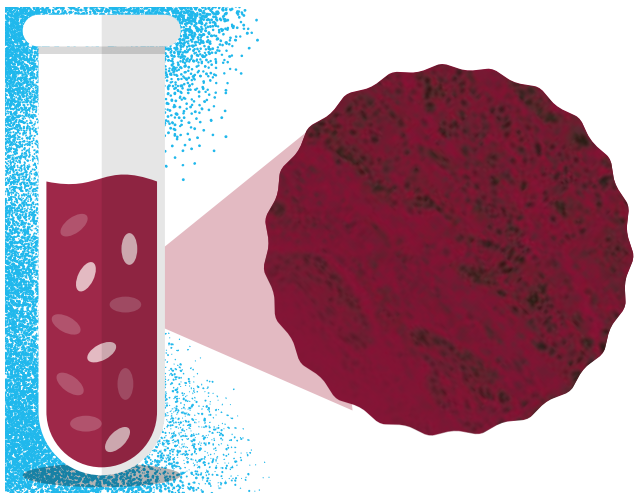
To find out about all-round support for cancer and to access health assessments please visit bupa.co.uk

^ Direct Access telephone services are available as long as the symptoms are covered under the policy. If your cover excludes conditions you had before your policy started, we'll ask you to provide evidence from your GP that your symptoms are not pre-existing for a period of up to two years from the policy start date before we can refer you to a consultant through the Direct Access service. Always call us first to check your eligibility.

From home testing to tiny bubbles and smartknives

Research and innovation are transforming the way we treat cancer and bringing hope to millions of people diagnosed with the disease. Here are five of the most exciting developments

MARTIN BARROW



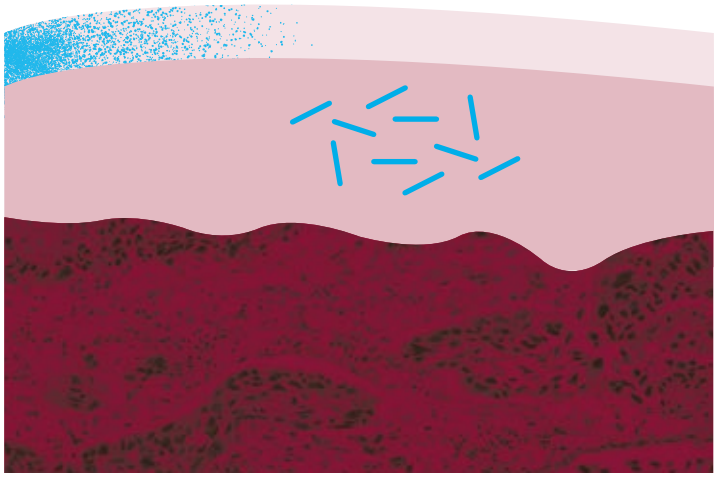
01

Liquid biopsies

Set to be a game-changer in cancer testing, liquid biopsies are a simple, non-invasive alternative to surgical biopsies. The non-invasive nature of liquid biopsies, which require only five millilitres of blood, means they are much easier to tolerate and the procedure is quicker than a surgical biopsy. They work by assessing mutations and other changes in DNA shed from tumours in the blood, providing deep insights into the earliest signs of cancer. These traces can give clues about which treatments are most likely to work for the patient. Much of the early research on liquid biopsies has been on lung, breast and prostate cancers, but this technology is expected to have an impact on all types of cancer. It is still relatively early days and more validations are needed in clinical trials. We still don't know enough about the variation in the accuracy of the test among tumour types and stages of the disease. Research is underway to establish whether these biopsies give a representative sampling of all the genetic clones in a tumour or whether there is a bias to specific sub-regions. But the potential for liquid biopsies is very exciting.

Brachytherapy

The oldest form of radiotherapy, brachytherapy is being given a modern role thanks to technology that enables treatment with high precision. Brachytherapy is used to treat cancer of the prostate, cervix and brain by planting and leaving radioactive seeds or pellets at the site of a malignant tumour. Traditionally, it involves radioactive materials such as iodine or palladium. Now researchers have achieved positive results with cesium, finding that implants provide stable control of tumours while limiting the risk of radiation side effects. Special machines called afterloaders hold the tiny radioactive source, which is smaller than a grain of rice, in a safe place, until it is needed for treatment. Specialist radiographers and physicists use complex computers to plan the treatment to sub-millimetre precision, which can manipulate the radiation

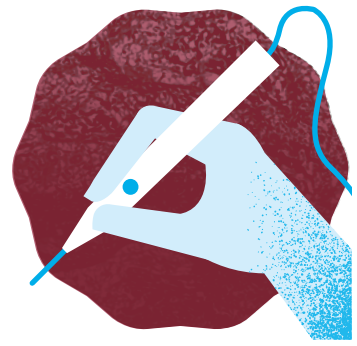


to precisely match the area that needs to be treated. As the radioactive source is so close, and sometimes even inside, the tumour, a high dose can be delivered to damage and kill the tumour cells, while limiting the impact on healthy areas of the body.

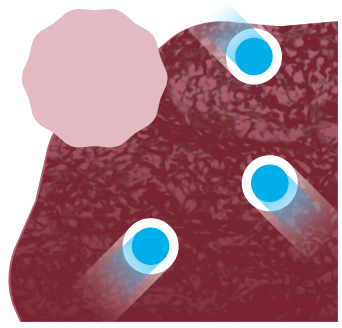
02

iKnife

An intelligent scalpel, the iKnife can tell surgeons if the tissue they are cutting is cancerous. Developed at Imperial College London, the knife is essentially a very accurate molecular weight scale, otherwise known as a mass spectrometer. As the knife burns through the tissue, molecules are released in a puff of smoke, which can be sucked up and analysed by the mass spectrometer. Scientists can use this to build up a picture of different tissues to tell them apart. The iKnife works by matching its readings during surgery to a reference library to determine what type of tissue is being cut, giving a result in less than three seconds. In the first study to test the invention in the operating theatre, the iKnife diagnosed tissue samples from 91 patients with 100 per cent accuracy, instantly providing information that normally takes up to half an hour to reveal using laboratory tests. This study was limited to patients being tested for ovarian cancer, but scientists are testing the iKnife for breast and brain cancers.



03



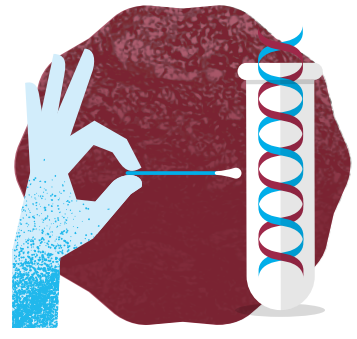
Nanobubbles

Tiny bubbles are at the heart of a promising innovative treatment for cancer. The nanobubbles, known as liposomes, are commonly used in pharmacology to encapsulate drugs, making them more effective in the treatment of disease. Now scientists have been able to engineer these liposomes to discharge their drug cargo on demand, once activated by standard X-rays. Initial testing has shown this technique to be highly efficient in killing bowel cancer cells. Made out of similar material as cell membranes, these bubbles are relatively simple to prepare and can be filled with drugs before being injected into the body. The challenge is to control the timely release of the drug from the liposome. One way to do this is to trigger the collapse of the liposomes, in effect burst the nanobubbles, when they are needed. This is achieved by embedding gold nanoparticles and a photosensitive molecule into the wall of the liposome. The liposome is then destabilised by being exposed to the radiation from a standard X-ray, causing the release of the drug. Researchers at Australia's Macquarie University, where tests have taken place on bowel tumours, report encouraging results.

04

Genetic kits

Home-testing genetic kits for cancer risk are entering the consumer market. Although their development is still in relatively early stages, experts believe the kits will eventually become more widely available as the technology develops. This year the US Food and Drug Administration gave the go-ahead for at-home genetic testing kits without prescription for three BRCA gene mutations linked to breast and ovarian cancer. The kits use a saliva sample which is then analysed to decide whether further tests are needed. As more than 1,000 known BRCA mutations exist, the current tests are far from comprehensive. While a positive result indicates increased risk, a negative result does not guarantee that someone is only at average risk. At present, direct-to-consumer genetic testing is about prompting a discussion rather than making treatment decisions. However, experts agree that in the near future home testing kits will speed up the diagnostic process, enabling the early identification of people at risk of cancer and the timely beginning of treatment. ◆



05

IMMUNOTHERAPY

Checkpoint inhibitors offer brigh

Harnessing the power of the body's immune system to fight cancer is one of the most exciting breakthroughs in treatment, but there remains much to be done and understood

JONATHAN NACKSTRAND/AFP/Getty Images

JOHN ILLMAN

When James P. Allison of the United States and Tasuku Honjo from Japan won this year's Nobel prize for medicine, the Nobel committee hailed their work as "an entirely new principle for cancer therapy", which has fundamentally changed the outcome for some advanced cancer patients.

The two Nobel laureates' research led to the development of a form of immunotherapy called checkpoint inhibitors. These release the brakes on the immune system, blocking proteins that stop it from attacking cancer cells.

They act on T-cells, white blood cells that can identify and kill cancerous cells; a single T-cell can kill thousands of cancer cells. T-cells have proteins that turn on an immune response and other proteins that turn them off. These are called checkpoints.

Cancer Research UK explains: "Some checkpoint proteins help T-cells to become active; for example, when an infection is present. But if T-cells are active for too long or react to things they shouldn't, they can start to destroy healthy cells and tissues. So other checkpoints help to tell T-cells to switch off.

"Some cancer cells make high levels of proteins. These can switch off T-cells when they should really be attacking the cancer cells. So the cancer cells are pushing a 'stop button' on the immune system; the T-cells can no longer recognise and kill cancer cells."

Also known as monoclonal antibodies, checkpoint inhibitors stop the cancer cell proteins from pushing the stop button. This switches the immune system back on, enabling T-cells to resume their search-and-destroy mission.

The Nobel laureates succeeded where others had failed by working out the interaction between cells and fine-tuning the immune system.

The bearded, jovial, 70-year-old, harmonica-playing Dr Allison, chair of immunology at the University of Texas, developed an antibody to block a checkpoint protein called CTLA-4. This led to the first checkpoint inhibitor. Licensed in the US in 2011, ipilimumab became the first treatment to extend survival of patients with late-stage melanoma skin cancer.

> **"It's a great emotional privilege to meet cancer patients who've been successfully treated with immune checkpoint blockade**

Follow up studies showed that 20 per cent of patients lived for at least three years, but many survived for ten years or more – a spectacular result.

Dr Allison says: "I never dreamt my research would take the direction it has. It's a great emotional privilege to meet cancer patients who've been successfully treated with immune checkpoint blockade. They are living proof of the power of basic science, of following our urge to learn and understand how things work."

The Nobel laureates' work also helped to establish treatment for lung, kidney, bladder, gastric, liver, cervical, colorectal, head and neck cancers, and Hodgkin's lymphoma, a cancer in the lymphatic system, which helps to drain fluid and waste products from the body.

But while between 20 and 30 per cent of cancer patients respond extremely well to checkpoint inhibitors, most do not. Drug companies have been trying to increase success rates with two-drug cocktails. Worryingly, some of these combinations are said to be based more on guesswork and crossed fingers than good science.

Dr Allison explains: "One challenge is that the clinical success has outrun our scientific knowledge of how these drugs work and how they

Case study

CAR T-cell therapy

A cancer therapy known as CAR T-cell is generating immense scientific interest. T-cells, the workhorse of the immune system, are removed from the patient's blood and genetically engineered to produce receptors known as CARS. These enable T-cells to recognise and attach to cancer cells.

The harvested cells are expanded into hundreds of millions of cells to create what is, in essence, a living drug. These are infused into the patient in the hope that they will further multiply and kill cancer cells.

CAR T-cell therapy has achieved spectacular results in treatment of acute lymphoblastic leukaemia, the most common form of childhood leukaemia.

Dr Martin Pule, senior lecturer in haematology at University of College London Cancer Institute, says: "It's amazing that 95 per cent or more of these children with refractory or relapsed ALL go into remission and about two-thirds stay in complete remission." Refractory patients do not respond to initial therapy and relapsed ALL is the leading cause of death from childhood cancer.

But CAR T-cell therapy doesn't always work if, for example, previous chemotherapy has damaged a patient's T-cells.

Another problem looms. The first CAR T-cell therapy, tisagenlecleucel (Kymriah), for children and young adults with the most common form of ALL, was recently priced at $475,000 for a one-time treatment. The vast majority of patients treated so far have been in clinical trials financed by drug companies.

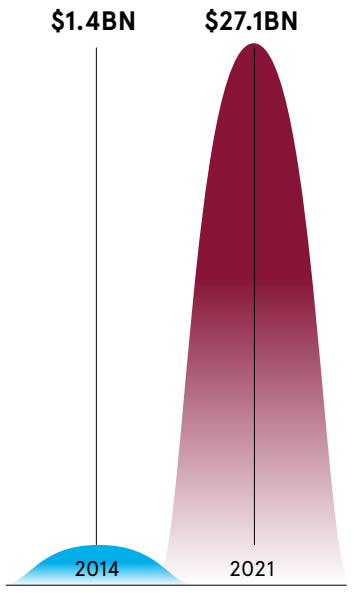
How CAR T-cell therapy works

1. A patient's white blood cells are collected through a process call apheresis
2. The T-cells are isolated and genetically engineered to produce disease-attacking cells called chimeric antigen receptors (CARs)
3. CAR T-cells are then multiplied to create what is, in essence, a living drug
4. These are then infused intravenously back into the patient's blood

Above
Thomas Perlmann, secretary of the Nobel Committee for Physiology or Medicine, announces James P. Allison and Tasuku Honjo as the 2018 winners for their achievements in cancer treatment

nt new hope

Cancer immunotherapy sales projections



Decision Resources 2016

might best be combined with other therapies to improve treatment and reduce unwanted side effects."

Side effects can be severe because checkpoint inhibitors boost all immune cells, not just the ones that target cancer. Overactive T-cells can generate nausea, skin problems, appetite loss, diarrhoea, breathlessness and a dry cough. Checkpoint inhibitors can also disrupt the liver, kidneys and hormone-making glands such as the thyroid.

Unfortunately, combination therapy, such as ipilimumab and another checkpoint inhibitor nivolumab, has been shown to exacerbate side effects in patients with advanced melanoma.

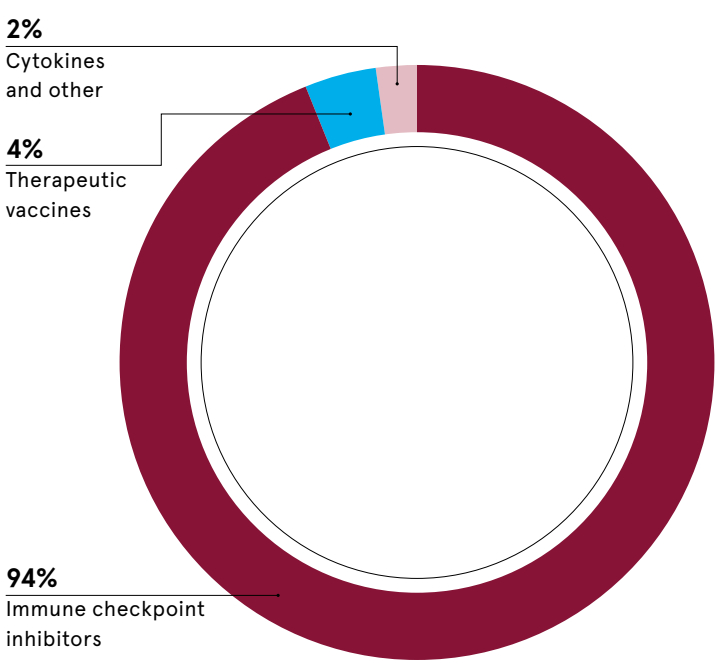
One combination that has been conclusively proven to work involves twinning a checkpoint inhibitor with chemotherapy, a mainstay of cancer treatment for more than 70 years. But chemotherapy is also associated with debilitating side effects such as hair loss and vomiting.

All this explains why more than 1,500 treatment trials are underway in what is, in essence, one of the biggest ever games of pharmaceutical roulette. The potential financial rewards for Big Pharma are breathtaking as a winning treatment could generate, in theory, hundreds of millions of dollars of profit. But according to one recent estimate, widespread use of immunotherapy agents in the US alone could cost $174 billion.

Costs in the UK are substantially less than across the Atlantic. For example, pembrolizumab, which can extend the life of some patients with lung cancer for a year or more, has a full list price of £84,000 a year, but the manufacturers Merck, Sharp and Dohme have given the NHS a confidential discounted price. This followed a trial in which it was shown to extend life by 16 months more than standard chemotherapy. About 1,800 UK patients a year are eligible for treatment.

The more successful the new treatments become, the harder it will be to juggle demand with resources. Deloitte's, specialists in tax and risk management, recently reported that it costs the world's top bio-pharma companies more than $2 billion to bring a drug to market. ◆

Cancer immunotherapy market breakdown



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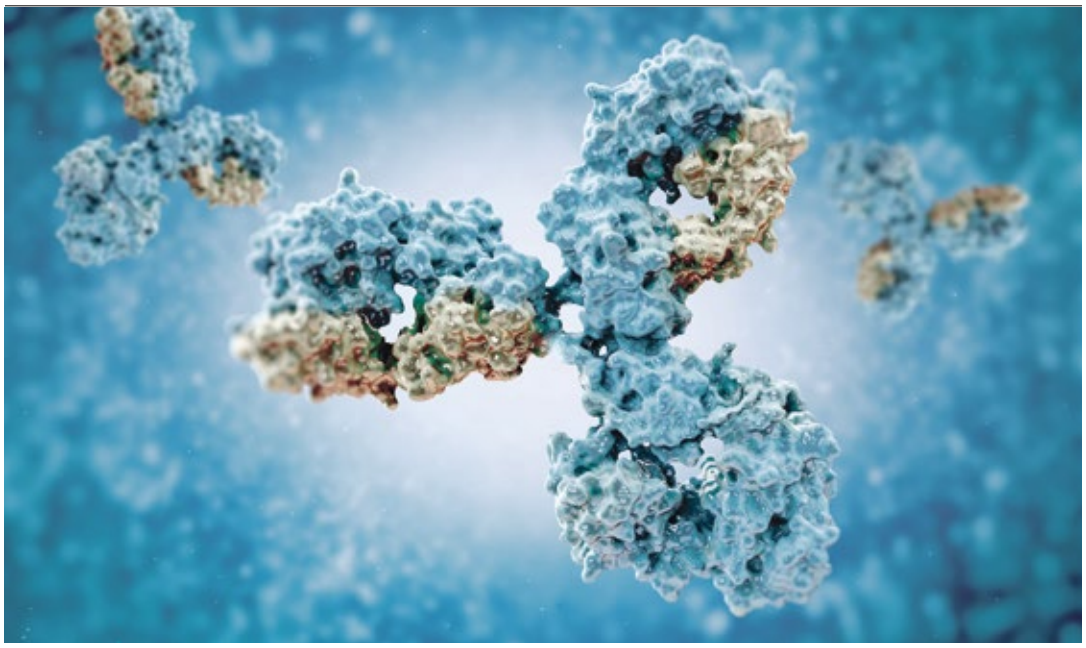
Commercial feature



Q&A Targeting cancers

Christian Rohlff tells of advances in combating cancer

You founded Oxford BioTherapeutics in 2004. What makes it different?
We have created, to our knowledge, the only existing detailed molecular library of the cancer-immune cell interface (or synapse). We have used this to develop a number of novel drugs targeting various sub-types of different solid and hematological cancers, including those refractory to conventional treatment.

How does it work?
We use this library, in conjunction with our unique cancer target discovery methodology, to identify various novel cancer cell and immune cell receptors. These receptors are expressed uniquely on either cancer cells or on immune cells within tumours, but not on normal cells. Identifying these cancer-specific receptors has helped us to develop a number of innovative drugs that exclusively target cancer cells or immune cells within a tumour.

Bringing a new precision to cancer drug targeting?
Yes. Our programme differs from the more conventional, generalist approach which targets all fast-growing cells, including healthy ones such as bone marrow, reproductive and hair cells. Our hope is that, using our approach, we can minimise severe systemic side effects which, as yet, remain one of the challenges and concerns of conventional chemotherapy.

So your approach could point to a kinder, softer future with a massive reduction in harrowing side effects in cancer treatment?
This is what we expect. The potential benefits are tremendous. As is well known, side effects from most conventional cancer chemotherapy can cause debilitating and sometimes life-threatening, complications. To put this into perspective, a recent study by Public Health England and Cancer Research UK has placed 30-day treatment mortality figures for systemic chemotherapy for breast and lung cancer at three in one hundred patients (Wallington et al, Lancet Oncology 2016).

What about the current state of your pipeline?
Initial testing of our drug candidates has revealed anti-tumour action in patients who have not responded to state-of-the-art immuno-oncology therapies. We already have a number of candidate drugs targeting solid and blood cancers in our pipeline, two of which are in clinical trials in Europe. A third will be tested, for the first time, in patients next year.

What more can you say about your immuno-oncology discovery platform?
Of critical importance is our discovery of a novel mechanism by which cancer cells escape from immune surveillance and what we can do to prevent this. We have also finessed our research tools to mimic, as closely as possible, the tumour environment within the patient while conducting our laboratory studies. In addition, we work with cancer cells and corresponding immune cells within the tumour obtained from human biopsy specimens.

This eliminates the need for animal models, the biology of which differ from humans. In turn this limits the extrapolation of possibly misleading animal findings to human populations. We have taken great care to ensure that our research is both patient centric and humane.

How do you see targeted cancer treatment evolving and the future role of Oxford BioTherapeutics in the field?
This depends on what you mean by "targeted". Patient selection is a key part of our strategy. Certain large pharma companies have shown the importance of patient selection to achieve better response rates. We use a tissue staining methodology on biopsy specimens to identify the presence of molecular target(s). Patients possessing these targets are candidates for our drugs. In addition to better response rates, patient selection translates in lower healthcare costs, which is an important consideration in the context of new medicines.

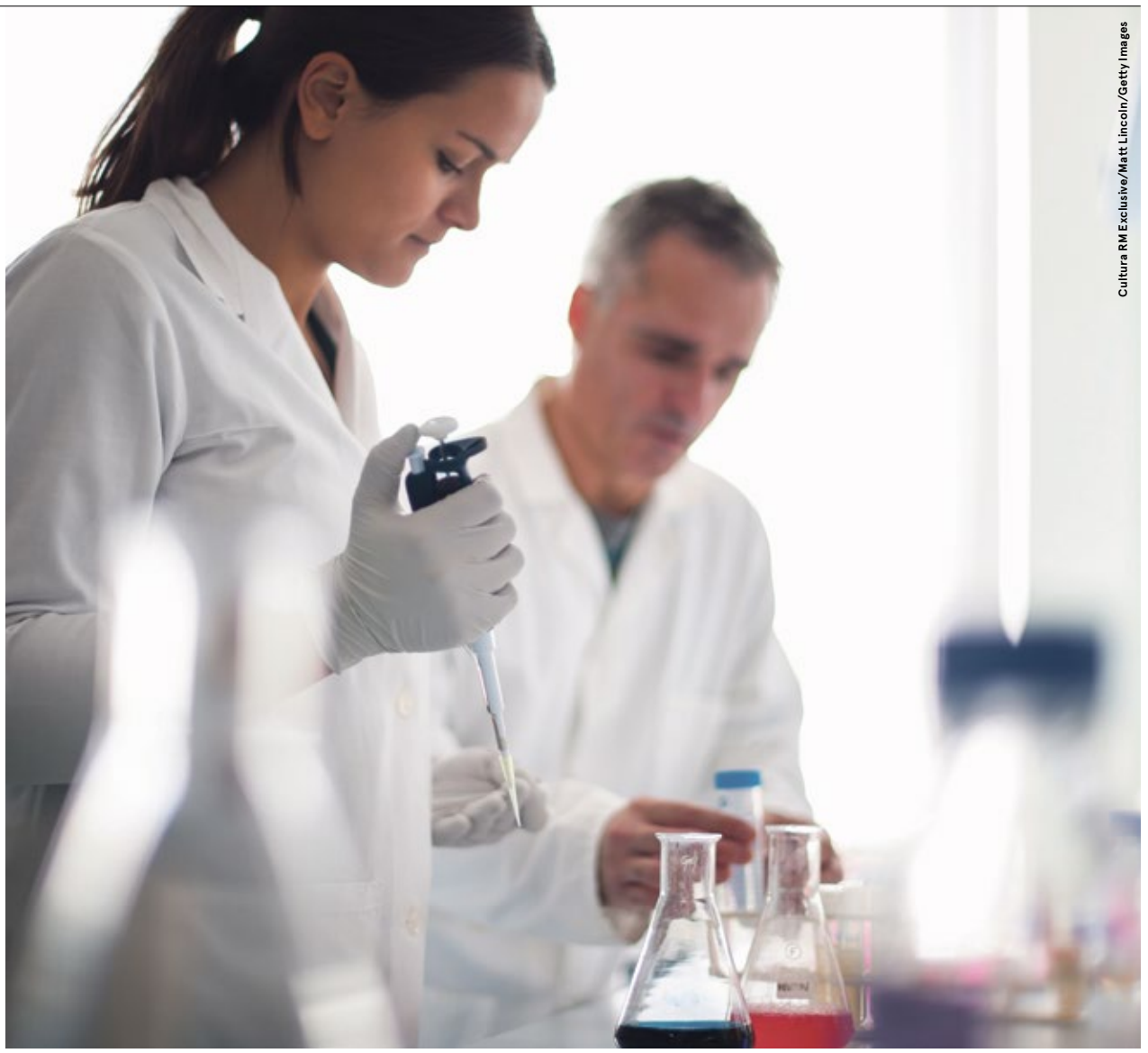
If by targeted therapy you mean drugs that specifically target cancer cells while not harming normal cells, we have already contributed much in the field and I am confident that we will carry on doing so – we have established a very strong platform remarkably quickly.

Christian Rohlff
Chief executive and founder

For more information please visit www.oxfordbiotherapeutics.com

OXFORD BioTherapeutics

CLINICAL TRIALS



Cultura RM Exclusive/Matt Lincoln/Getty Images

Fast track, more choice, less certainty

Acceleration of drug trials offers the potential to bring life-prolonging treatments to patients more quickly, but some physicians warn that research risks being dumbed down

JOEL CLARK

Americans suffering from kidney cancer now have access to a new method of treatment after the US Food and Drug Administration (FDA) approved sunitinib. Randomised trials showed that following surgery to remove kidney tumours, an average patient taking this new drug could survive without a recurrence of the disease for almost seven years, just over a year longer than without treatment.

Disease-free survival is what is known as a "surrogate end point", a measure of a drug's efficacy that can be used as an alternative to overall survival, long seen as the gold standard when testing new treatments. Rather than waiting many years to see how long a drug will prolong a patient's life, researchers analyse how long it prevents the disease from returning or how long a tumour is prevented from growing, thereby accelerating trials and bringing drugs to market more quickly.

While the FDA approved sunitinib, in November 2017, on the basis of disease-free survival, research has shown that the drug actually has no benefit to overall survival. In other words, it might extend the length of time a patient will live without the return of the cancer, but it won't extend the patient's overall lifespan. Cases such as these have prompted some physicians to question whether the acceleration of drug trials can lead to inappropriate approvals.

"Everybody should really want the same thing here, which is drugs that improve how long patients live and how well they feel, but actually this is becoming the exception rather than the rule. Many drugs are now approved on the basis of whether they shrink the tumour or delay the time until the tumour grows, but they don't necessarily help patients to live longer or better lives," says Vinay Prasad, oncologist and associate professor of medicine at Oregon Health and Science University.

Changes in drug trials have occurred gradually in recent years and will still vary in different jurisdictions, but there is often less reliance on overall survival, given that it can sometimes take longer to gather that data, while regulatory demand for randomised trials, which can be costly, time consuming and resource intensive, is falling.

Approval agencies, such as the FDA, the European Medicines Agency and the UK's National Institute for Health and Care Excellence, have come under growing pressure to find new treatments for deadly diseases such as cancer, and in some cases they are less inclined to wait years for researchers to gather the most robust efficacy data.

"The combination of patient demand for life-saving drugs and the explosion of new medical techniques and treatments has put pressure on regulators to facilitate early access, and made them more disposed to rely on early-phase data and surrogate end points. This doesn't always translate into helping patients to live longer," says Peter Hall, oncologist and senior clinical lecturer in cancer informatics and health economics at the University of Edinburgh.

For patients living with cancer, the impact could be seen in two ways. On the one hand, if regulators approve drugs without requiring many years of research and trial data, they have access to a greater number of promising new treatments. But with less reliable data on those drugs, they cannot be certain of the impact they will have on their quality and quantity of life, and are therefore less able to weigh up their willingness to bear toxic side effects.

Not everyone sees it this way, however. Razelle Kurzrock, chief of the haematology and oncology division at University of California San Diego School of Medicine, believes the acceleration of trials is to be welcomed and has brought quality new treatments to patients much more quickly. Randomised trials may not even be ethical, she argues, if it is clear that a particular drug has the potential to prolong life.

"This is a transformative era in cancer treatment and regulators are approving breakthrough drugs that have high response rates and minimal side effects – very different from what was available previously. Subjecting patients to randomised trials for drugs that we know to be effective risks randomising patients to death, so this cannot always be seen as the gold standard," says Dr Kurzrock.

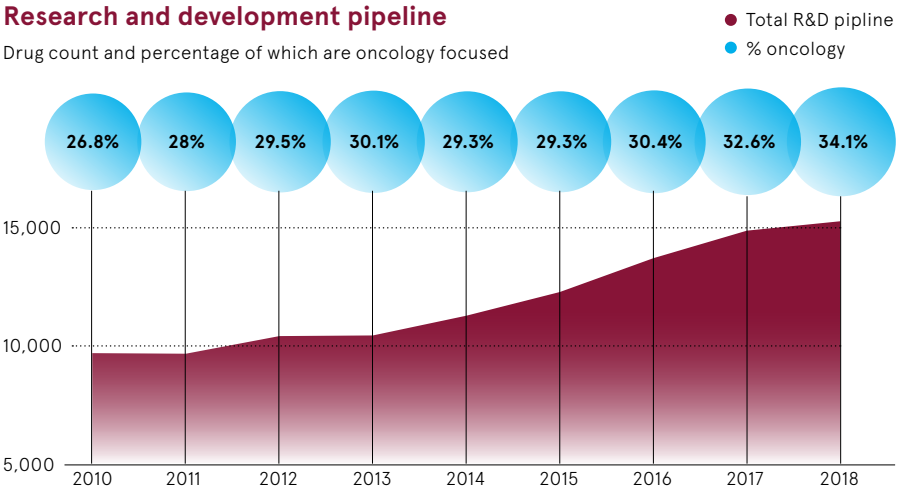
In the UK, agencies have sought to strike a balance between gathering robust evidence of a drug's efficacy while also answering patient demand for early access. The NHS Cancer Drugs Fund (CDF), originally created in 2011 and reconstituted in 2016, addresses promising treatments with immature data by making them available to patients, but compelling the manufacturer to collect more data and conduct further trials before long-term decisions about the drugs are made.

"It is still early days and we have yet to see whether it is operationally sustainable, but the CDF is seen to be prudent and innovative because it enables the early access that patients are demanding, while also managing the risk that comes with early approval," Dr Hall concludes. ◆

"Many drugs are now approved on the basis of whether they shrink the tumour or delay the time until the tumour grows, but they don't necessarily help patients to live longer or better lives

Research and development pipeline

Drug count and percentage of which are oncology focused



Pharma Intelligence/Informa UK 2018

OPINION COLUMN

‘Potential of repurposing drugs which may have unexpected anti-cancer side effects’

Angus Dalgleish
Professor of oncology
St George’s, University of London

Although there have been many dramatic breakthroughs in chemotherapy, often guided by genomics, in immunotherapy, radiotherapy and surgery, there are still many cancer patients who progress in spite of these advances. In an attempt to analyse reasons why patients do not benefit from these advances, in-depth analysis of patient populations for trials has revealed interesting new insights.

Indeed, meta-analysis of the survival of melanoma patients in this country show that in addition to known factors such as lymph node spread, the level of vitamin D3 was just as significant in that the lower the level the worse the outcome. This is important as it can readily be corrected with oral supplementation.

Detailed analysis of a breast cancer trial revealed that patients who were on metformin had a better outcome than those who were not. This was doubly surprising in as much as only patients with diabetes mellitus type 2 would have been taking metformin and these patients on alternative treatments such as insulin would have been expected to do worse than non-diabetic patients.

Metformin works by blocking glucose uptake in cells. Tumour cells consume more glucose than their normal counterparts, hence the metformin could be selectively interfering with the tumour cell metabolism and its need for glucose. Further research has revealed, in addition to this, metformin also inhibits a vital signalling pathway which has been targeted by the pharmaceutical industry with several new drugs.

This raises the whole question of the potential of repurposing drugs developed for a different reason which may have unexpected anti-cancer side effects. Perhaps the most successful example of this is thalidomide. This drug was developed decades ago and thought to be useful for the nausea of pregnancy. Unfortunately, it was the cause of severe birth defects and withdrawn. It was resurrected, when in desperation, it was given to a man with severe skin leprosy whose itching gave him chronic insomnia, resistant to all other sleeping agents. As he was a man, his doctor gave him thalidomide for its somnolent properties and, unexpectedly, it cured his leprosy.

This was not due to a direct attack on the infectious mycobacterium, but on the powerful auto-immune activity it induced, which attacked the skin among other organs.

Its ability to damp down excessive auto-immune reactions was then tried in other severe steroid-resistant conditions with success and its efficacy was shown in early trials of HIV-infected patients who often present with marked auto-immune conditions.

It was also noted to be effective against the weight loss seen in several cancers and, in particular, multiple myeloma, a cancer of the bone marrow. However, thalidomide is toxic when given continuously, particularly with regards to the nervous system. It was therefore suggested that minor variations on the basic thalidomide structure should be made, and these compounds tested for activity and toxicity.

The first of these to be successfully tried in the clinic was known as revlimid and is now licensed worldwide as Lenalidomide as a first line treatment for multiple myeloma and is also reactive against many other conditions including lymphomas. Lenalidomide was one of the biggest-selling drugs in the world last year and has none of the major side effects of thalidomide.

Recently, there has been much interest in cannabis oil, mainly from patients, and its possible use in cancer management. Although the beneficial effects on the symptoms and hence use in palliation have been recognised for decades, derivatives such as CBD (cannabidiol) have been shown to have significant indirect activity and are about to be trialled in the clinic.

Commercial feature

World without fear of cancer

A world free from the fear of cancer is a vision for many, but for Varian Medical Systems it is a reality that can be achieved

Wrestling control from cancer’s multi-factorial grip will be hard, but Varian is forging ahead with diagnostics, genomics, artificial intelligence and an array of innovation to create a new wave of precision medicine.

Advances in radiotherapy techniques, pioneered by Varian, have created highly efficient systems that can target tumours and spare nearby tissue for vastly improved outcomes for patients.

Harnessing that high-tech success with the analytical power of data and potent therapies will be crucial to forging a fresh template for treatment for an ageing population with predicted rises in cancer incidence.

By 2025, the number of patients needing radiotherapy in the UK will have risen from 50 per cent to 60 per cent, yet funding for advanced radiotherapy is lagging behind demand, according to the Manifesto for Radiotherapy, backed by Varian and a cross-party group of MPs.

Varian’s commitment to technology has helped develop radiotherapy so precise and with minimal side effects that patients can continue working during treatment, yet only 5 per cent of the NHS budget is spent on radiotherapy.

As a global leader in developing and delivering integrated cancer care solutions, it believes more investment in the UK can improve access to high-quality radiotherapy and elevate cure rates across the NHS.

60%

of cancer patients will need radiotherapy by 2025, up from 50 per cent now

16%

improvement in cancer survival rates using radiotherapy compared with 2 per cent for chemotherapy

38%

average access to radiotherapy in England although it is needed in more than 50 per cent of cases

Varian, whose technology is in contact with around three million cancer patients a year, is maximising its vast experience in radiotherapy and imaging to create a potent force tackling the disease from a number of therapeutic directions.

By developing powerful therapeutics centred around radiotherapy, Varian has significantly improved successful treatment outcomes with more cancers treated earlier, and it believes that all elements of treatment need to be energised and integrated to achieve a world without fear of cancer.

“Our mission is to get rid of the fear of cancer by using whatever human capital, technology or data we can access,” says Pat Kupelian, the company’s clinical affairs vice president and professor of radiation oncology at UCLA in California.

“Varian is a dedicated cancer company. The entire company wakes up and thinks cancer and breathes cancer. There is no distraction.”

The company is uniquely positioned to offer a complete approach to cancer treatment as it has a generation of knowledge from pioneering the X-ray and radiotherapy procedures that now touch more than 50 per cent of cancer patients around the world.

“We are extending beyond core radiotherapy to major in software, artificial intelligence, imaging analytics, therapeutics, and to where we can detect tumour recurrence and predict responses.”

He believes significant technological and drug development over the next decade will lead to precision profiling of tumours, shorter radiotherapy programmes, empowerment of data and improved care delivery in lower-income countries.

Varian, which employs around 7,000 staff at sites in North America, Europe and Asia, is also expanding its expertise and influence with collaborations, partnerships and acquisitions to enhance its position as a global leader in multi-disciplinary cancer care solutions.

Its recent research document *The Future of Cancer Care: Moving from Promise to Reality* predicts a world in which the personal and economic burdens of cancer can be controlled.

“Cancer is still a very difficult disease to treat and we are not at the point of declaring victory, but you feel there has been a qualitative jump in the way cancer therapies are being applied,” Professor Kupelian concludes. “Varian is ideally placed to tackle cancer. Our capabilities are growing and we are looking at addressing needs across the globe. It is an exciting future.”

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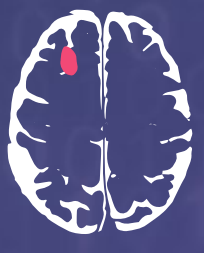

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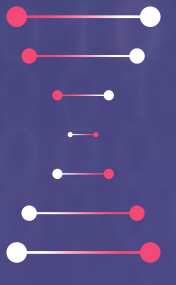

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