Cancer Research UK is the world’s largest cancer charity dedicated to saving lives through research. Our vision is to bring forward the day when all cancers are cured, from the most common types to those that affect just a few people.

Over the following pages, we share some of the ways our life-saving work is helping more people survive cancer than ever before.
INTRODUCTION
02 Who we are
03 How we fund our work
06 Our year of progress
08 Chairman’s statement
09 Patient Editor’s statement

SPOTLIGHT ON...
12 15 years of progress
16 Helping the NHS weather the storm
18 Combatting ‘fake news’ about cancer

PREVENTING CANCER
22 Creating an environment to help people stop smoking
25 Paving the way for aspirin to prevent cancer
27 Tailoring cervical screening for vaccinated women

DETECTING AND DIAGNOSING CANCER
32 Helping GPs diagnose people earlier
35 Developing a breath test to detect cancer
38 Building an international community to spot cancers earlier

DEVELOPING NEW TREATMENTS
42 Discovering better treatments for children with brain tumours
45 Pioneering new treatments with patients in mind
47 Looking to a brighter future for immunotherapy

OPTIMISING EXISTING TREATMENTS
52 Adapting to a changing landscape in prostate cancer
55 Developing an ‘intelligent knife’ for cancer surgery
57 Reducing the side effects of breast cancer radiotherapy

THANK YOU
60 For you, thanks to you, because of you
63 Find out more and get involved

15 years of progress
It’s the end of an era at Cancer Research UK: our Chief Executive, Sir Harpal Kumar, is stepping down after an illustrious career.

Paving the way for aspirin to prevent cancer
We’re funding an international team to answer the final questions surrounding the use of aspirin to prevent cancer.

Developing a breath test to detect cancer
Our researchers in Cambridge are collaborating with engineers to develop a high-tech cancer ‘breathalyser’.

Discovering better treatments for children with brain tumours
We’re opening a new Centre of Excellence to speed up the discovery of new treatments.

Developing an ‘intelligent knife’ for cancer surgery
We’re funding ground-breaking work to develop a surgical knife that can detect cancer.
Cancer Research UK is the world’s largest cancer charity dedicated to saving lives through research. Our vision is to bring forward the day when all cancers are cured, from the most common types to those that affect just a few people.

Cancer poses a huge and growing challenge, with the number of people around the world who receive a diagnosis each year expected to rise dramatically, from 15 million in 2015 to 24 million in 2035.

In the 1970s, less than a quarter of people with cancer survived. But over the last 40 years, survival has doubled – today half will survive. Our ambition is to accelerate progress and, by 2034, see three-quarters of people surviving the disease for 10 years or more.

We’re pioneering new ways to prevent, diagnose and treat cancer, as well as finding ways to optimise treatment. The infrastructure we have created for scientists enables world-class research, and we engage and empower patients, policymakers and the public to make sure advances in research have a positive impact.

None of our life-saving work would be possible without the strength of our fundraising and our outstanding people – our supporters, volunteers, patients and staff.
Our income in 2017/18 was made up of:

**£423 MILLION IN DONATIONS**
This includes:
- **£182 million** from people leaving us a contribution in their will.
- **£192 million** from regular donations, major donations and money raised by local fundraising and corporate partnerships.
- **£49 million** from events, including Race for Life, Pretty Muddy, Shine Night Walk and the Virgin Money London Marathon.

**£104 MILLION FROM TRADING**
This includes **£84 million** raised through nearly 600 shops across the UK.

**£101 MILLION FROM CHARITABLE ACTIVITIES**
This includes royalties from treatments developed from previous research.

**£6 MILLION FROM OTHER SOURCES**
Primarily income from investments, and a small amount of rental income.

Find out more at [cruk.org/accounts](http://cruk.org/accounts)

**OUR INCOME IN 2017/18 WAS**

£634m
In 2017/18, we spent £652 million, including:

**£423 MILLION ON CANCER RESEARCH**
Mainly through grants to researchers, research institutes and our Centres and Experimental Cancer Medicine Centres.

**£43 MILLION ON INFORMATION AND POLICY WORK**
We work hard to increase knowledge and awareness of cancer, and contribute to its prevention and treatment. We also work to influence government policy to make sure that it’s based on the latest evidence.

**£97 MILLION ON FUNDRAISING**
We wouldn’t be able to do any of our work without fundraising, and we think carefully about how we invest to make sure as much as possible is available to beat cancer.

**£89 MILLION ON TRADING AND EVENTS**
This includes £78 million running our shop network, and £11 million putting on events where participants pay a registration fee.

80p of every £1 is used to beat cancer. The remaining 20p goes towards raising vital funds for the future.

For information on how this is calculated, see cruk.org/pence-in-the-pound
How donations fund research

Supporters donate to Cancer Research UK by giving a donation, leaving a gift in their will or participating in one of our events. We also raise money through trading, royalties, grants and investments.

1. FUNDS RAISED
We calculate what funds we have available to award research grants. These funds are placed in investments, and released in subsequent stages.

2. REVIEW AND SELECTION
Researchers submit proposals to us and we rigorously review and evaluate them to select high-quality projects in line with our strategic objectives.

3. GRANTS AWARDED
Grants are awarded to successful applicants. Cash is paid to them in instalments.

4. SCIENTIFIC MILESTONE REVIEW
The progress of each project is thoroughly and regularly assessed before the next instalment of funds is paid.

5. PROGRESS MADE
The project ends and results are peer reviewed and published, or presented at an international conference.

6. PATIENT IMPACT OVER TIME
The findings from our research benefit patients, and ultimately boost survival.

AMBITION
3 IN 4 PATIENTS SURVIVING CANCER BY 2034
OUR YEAR OF PROGRESS

APRIL
Our TRACERx cancer evolution study suggests that signs of lung cancer relapsing could be detected in a patient’s blood before it can be seen on a scan.

MAY
Chemotherapy after surgery improves survival in patients with bile duct cancer, according to a Cancer Research UK-funded trial.

JUNE
Chemotherapy drug capecitabine has fewer side effects but is just as effective at treating breast cancer, according to a study we co-funded.

AUGUST
Targeted radiotherapy could spare women side effects when treated for early-stage breast cancer.

JULY
Our analysis shows that since the smoking ban was introduced in 2007, there are now 1.9 million fewer smokers in Britain.

OCTOBER
Our researchers in Cambridge find that several different types of brain tumour all share a common weak spot.

DECEMBER
Thanks to our campaigning, the Government announces plans for an extra 5,000 NHS diagnostic staff.

NOVEMBER
Researchers show that women who’ve had the HPV vaccine may need just three cervical screens in their lifetime instead of 12.

January
Our researchers reveal details of how alcohol damages DNA, leading to cancer.

May
Plain, standardised tobacco packs come into force around the UK.

June
Our trial shows that giving men the drug abiraterone alongside standard hormone therapy can significantly improve prostate cancer survival.

November
A Cancer Research UK-funded early-stage trial suggests that a drug used to treat ovarian cancer could also help people with certain forms of brain tumour.
NEW CANCER SUPERSTORES

This year we opened four new branches of our pioneering Cancer Research UK superstores, in Crayford, Irvine, Barrow-in-Furness and Rotherham, bringing the total to 15. These large, out-of-town superstores can generate more than five times the income of our more traditional charity shops and are helping us reach completely new audiences – about a third of their customers have never bought from a charity shop before.

In addition to great products, our superstores have community hub areas, which house accurate cancer information, up-to-date campaign information, soundproof rooms with direct freephone access to our nurses, and a space for activities to inform and inspire our supporters.
Of course, the year has not been without its challenges. It has been a difficult time for charities – the whole sector has needed to look at itself and make sure it’s doing everything it can to build and maintain trust between donors and organisations. Brexit is undoubtedly going to pose challenges for the medical research sector and the wider economy, and we need to make sure we find ways to deal with them. The challenges of equality and diversity remain, as exemplified by our gender pay statistics – we’re not where we want to be, and we’re committed to closing the gap.

But above all, we must remain humble in the face of this terrible disease, and thankful to the millions around the UK who believe in our shared mission of 3 in 4 people surviving cancer for 10 years or more by 2034.

Finally, I want to pay tribute to Harpal Kumar, as he ends his tenure as Cancer Research UK’s Chief Executive. I have been immensely privileged to work with Harpal, either directly or in collaboration, during the 12 years of world-class leadership he has given Cancer Research UK. From the outset he has fully embraced the Charity’s mission, with an unwavering commitment to excellence that’s built an organisation able to deliver on its goal.

Harpal, we will all miss you and you leave very big shoes to fill.

But I’m delighted to welcome Michelle Mitchell as our new Chief Executive, who will oversee the next chapter in the story of this extraordinary organisation. We set ourselves ambitious goals, as our supporters and those affected by cancer rightly demand. There are, and in some ways always will be, many challenges ahead – but in Michelle we have a leader with the skills and passion to ensure that we continue our relentless progress against cancer.

Professor Sir Leszek Borysiewicz
I’m delighted and feel privileged to have been asked to be the first patient editor of Cancer Research UK’s Annual Review. The creation of this new role marks another important step for the Charity, putting people affected by cancer at the heart of everything it does.

I’ve been a member of Cancer Research UK’s Your Involvement Network since early 2014, and so have been lucky enough to have been involved in a number of different aspects of the charity’s work. Over this time, the number of staff who have sought opportunities to work with patients and carers like me has increased hugely. Their enthusiasm and commitment to try new ways of working with us has been both exciting and impressive – in four short years, Cancer Research UK has been transformed from an organisation that no one thought of in terms of involving patients and carers in its work – other than volunteers helping to raise money – to one of the leading charities doing this in the UK.

Several of the articles in this year’s Annual Review cover aspects of the Charity’s work that have involved members of Your Involvement Network. It’s been a pleasure to help shape its contents, which I think represent a fascinating tour around the Charity’s wide-ranging activities, from prevention all the way through to treatment. Every article has input from a patient or carer, either to illustrate how the research will benefit patients, or to show how patients and carers can be involved. This further demonstrates Cancer Research UK’s commitment to put people affected by cancer at the heart of everything it does.

For me the most impressive example is in the Grand Challenge, featured as part of the article on international collaborations on page 39, and not just because I’m a member of its Patient Advisory Panel. Launched in 2016, this brave, risky and innovative scheme brings together top-tier, multidisciplinary researchers from all over the world to focus on the biggest challenges in cancer. As such, it exemplifies so much of what makes Cancer Research UK great: it’s bold, ambitious and collaborative, and has the potential to make a huge difference.

People affected by cancer have been involved at every stage of both the development and then running of the Grand Challenge. By involving people affected by cancer in this way, Cancer Research UK took something of a leap into the unknown, but it showed tremendous faith and belief in the benefits that this can bring to research. The 12-strong Patient Advisory Panel has been involved in deciding what the challenge areas would be, and what information would be needed in bids. We also helped make sure that all funded teams would also need to work in partnership with people affected by cancer, played a part in deciding which bids should be funded, and are now involved in monitoring the progress of funded teams.

Throughout all this, we’ve been made to feel part of the team running the scheme, that our contribution is truly valued and helps to make the work funded even better. That means a great deal to all of us who are involved, and gives us confidence that, together with people affected by cancer, Cancer Research UK will continue to make important progress.

Jim Elliott

Jim has been involved with Cancer Research UK’s patient involvement network since it began. Cancer has been a recurring theme in his life for the past 21 years, as a carer and supporter of close family members – including his wife, who died of breast cancer in 1997.
HERE’S JUST A FEW WAYS YOU HAVE HELPED US THIS YEAR...

12,000
The 12,000 patients who took part in one of our clinical trials this year are helping us to develop better treatments.

£107m
People gave us a regular gift, raising £107 million with an average monthly donation of £6.19.

£182m
The incredible total gifted to us as a result of supporters leaving donations in their will.

500,000
Nearly half a million people took part in events including Race for Life, Shine Night Walk and Winter Run.

£84m
People purchased goods from one of our shops, helping raise £84 million.

40,000
We rely on over 40,000 volunteers to donate millions of hours of time.

217
The number of campaign ambassadors who campaigned for us this year, saving lives by persuading politicians to support better cancer policies.

11,000
Our nurses responded to over 11,000 enquiries by phone, email and through the ‘Ask the Nurses’ section of our online forum Cancer Chat, helping people with information and support.
SPOTLIGHT ON...

15 years of progress
Our outgoing Chief Executive shares his reflections on his time at the Charity.

Combatting ‘fake news’ about cancer
How we’re helping cut through the constant cancer noise.

Helping the NHS weather the storm
Our pioneering work is helping the NHS through difficult times.

Read more
It’s the end of an era at Cancer Research UK: our Chief Executive, Sir Harpal Kumar, is stepping down after an illustrious career. Harpal joined us in late 2002 before being appointed Chief Executive in 2007.

We spoke with him about how things have changed in the world of cancer research during more than 15 years at the Charity.

15 YEARS OF PROGRESS

Action against tobacco

“Making tobacco less attractive to kids has to be one of the biggest gifts we can give the next generation. Over the last decade or so, we’ve seen big changes in public attitudes: it’s now far less socially acceptable, and we hope this means fewer young people will fall into such a potentially lethal addiction. But the job is far from done – we still have more than eight million smokers in Britain, and tens of thousands of children taking up the deadly addiction every year.”

PERCENTAGE OF ADULTS IN GREAT BRITAIN WHO SMOKE

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<th>Year</th>
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<tbody>
<tr>
<td>2003</td>
<td>26%</td>
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<td>2017</td>
<td>17%</td>
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The importance of spotting cancer early

“Politically speaking, we really put the importance of early diagnosis on the map. Back in 2003, almost no-one was talking about it. Now it’s right at the top of the agenda – and that’s something the Charity can be very proud of.”

Politically speaking, we really put the importance of early diagnosis on the map.

Improving the UK’s cancer services

“We’ve pushed hard to make sure that governments across the UK have robust plans to keep cancer services focused on what’s important. Over the years, these strategies have done a great job in improving our cancer services. It was a privilege to be asked to chair the Independent Taskforce which wrote the most recent cancer plan for England, and aims to transform people’s experiences of cancer care, as well as their chances of beating the disease.”

Renewed focus on hard-to-treat cancers

“When we made lung cancer a high priority in our 2009 research strategy, it got quite a strong reaction. People thought it was too tough a challenge, they didn’t want to risk their careers on it. That’s changed – just look at lung and brain cancers now – there’s so much high-quality research going on.”

The Crick

“Raising £100 million in just four years to help fund the Francis Crick Institute was an incredible achievement for the Charity. The Institute’s state-of-the-art facilities and world-class scientific minds are already accelerating and deepening our understanding of cancer, ultimately improving the lives of patients across the world.”

£100m raised to fund the Francis Crick Institute – our state-of-the-art research facilities
Translating laboratory insights into patient benefit

“It’s hard to think of a single scientific advance that stands out, simply because there have been so many. What we know about cancer has advanced almost beyond recognition. And the thing that Cancer Research UK has been able to do is to make sure these advances are plugged into big national and international studies that make sure that they have the best possible chance of improving things for patients.”

Radiotherapy

“Radiotherapy plays a vital role in curing cancer, but has often suffered from a lack of attention. Cancer Research UK has an incredible track record in radiotherapy research, but also – more recently – in pushing to modernise the UK’s radiotherapy infrastructure. The recent injection of cash from the Government to upgrade the nation’s radiotherapy equipment was fantastic news.”

The way people talk about cancer

“The language around cancer has completely changed. When I started here, it was something people barely mentioned. But now we discuss it much more openly. We celebrate people surviving it. I’m continually struck by this at Race for Life events. The notices on people’s backs used to be universally in memory of people who’d died. But when you go to a Race for Life today, they’re just as likely to be celebrating someone who’s survived.”
Our growth in size and influence

“I’m leaving a charity that’s much larger, and funds so much more research. And along with that has come a big change in what we do. We’re as much a ‘convener’ as a funder now – we bring others together and we set the research agenda in a way that we just weren’t able to do when I started. When the Government decides to focus on something, we’re generally invited to sit at the table – and we’re listened to.”

Personal highlight

“When I try to think of a moment that sums up just how much progress we’ve made over the years, I keep coming back to April 2014, and being able to make the announcement that, for the first time in history, as many people now survived cancer long-term as died from it. That’s an incredible thing to be able to announce, a phenomenal achievement. Will I ever get to make a more profound announcement in my life? I doubt it.”

And a look to the future?

“I hope it will include something in the area of early detection. We’re getting towards a breakthrough that’ll allow us to detect cancers at an early stage – including some of the most aggressive, dangerous ones – and that’s going to have a huge impact on survival.”

Immunotherapy

“The arrival in the early 2010s of a new generation of drugs that target a patient’s immune system – rather than their cancer – is one of the most important developments in my career. We’re now drawing together the UK’s immunology community to accelerate progress in this field, to develop drugs that work for more people, with even fewer side effects.”

We’re getting towards a breakthrough that’ll allow us to detect cancers at an early stage.
At Cancer Research UK, we’re standing shoulder to shoulder with the NHS.

Most importantly the UK is getting older – two decades ago, only around a fifth of the population were 60 or over – now, around a quarter is. Many of us are leading less-than-healthy lifestyles. New, expensive technologies can mean better survival, but can come with a hefty price tag. Welcome efforts to spot cancers earlier have had knock-on effects on diagnostic services. The lingering impacts of the financial crash a decade ago have squeezed budgets. And successive reorganisations have taken their toll, as has the continued uncertainty over the UK’s future after we leave the European Union.

At Cancer Research UK, we’re standing shoulder to shoulder with the NHS, and working on a range of fronts to try to help relieve the pressure faced by its dedicated staff.

CANCER RESEARCH UK

COMBATTING INCREASING CANCER RATES

Cancers become more common as people get older and as the average age of the population increases, so do cancer rates, which are set to increase significantly in years to come.

To try to counterbalance this, we’re working across the board to help prevent people getting cancer in the first place. This year, our analysis showed the potential benefit: around 135,000 cases of cancer each year are linked to preventable causes.

So we’ve been campaigning strongly for effective legislation and regulation against tobacco and obesity, and to protect cuts to Stop Smoking Services. We work with health professionals and the public, producing a range of materials to raise awareness, and help people understand and reduce their risk.

On top of this, our researchers are working hard to understand even more about the causes of cancer and find new ways to prevent it. Last year we spent £35 million in this area, with a £5 million investment in research on aspirin to prevent cancer.

Read about some of our ground-breaking cancer prevention work.

Our pioneering work is helping the NHS through difficult times.

This year the NHS celebrated its 70th birthday. It was an opportunity to reflect on how, for its entire history, NHS staff have dedicated their lives to helping people with cancer.

But it’s no secret that in recent years the NHS has been struggling. Waiting times have crept up, staff shortages have become a cause for concern, and worrying reports have emerged suggesting that cancer care is being affected.

The reasons why are complex, and due to a combination of several overlapping issues that together are creating a perfect storm.
HELPING MAKE CANCER TREATMENT KINDER AND MORE EFFECTIVE

New drugs for cancer can be more effective, but also more expensive. The UK is lucky to have organisations such as the National Institute for Health and Care Excellence (NICE) to make sure that new treatments are effective and cost-effective. We work closely with NICE to make sure patients get timely access to the best treatments – and are even exploring new ways the NHS could pay for these. We also work with the NHS itself, providing evidence and advice as to where services can be streamlined and improved.

But we’re also working hard on several fronts to make sure cancer treatments are kinder, more targeted and more effective. Our Stratified Medicines Programme is working out how to personalise lung cancer treatment so that patients only get treatments that are likely to work. And we’re working hard on a new generation of treatments that we hope will have fewer side effects, reducing the amount of extra care patients may need.

We’re also funding practice-changing trials looking at whether treatment doses can be safely reduced – again, meaning fewer side effects, but also in many cases fewer trips to hospital. To take just one example, this year several Cancer Research UK-funded trials showed that fewer doses of radiotherapy are just as effective for several conditions, including prostate cancer.

As the NHS moves into its 71st year, thanks to your support, we’ll be continuing to stand with the NHS and its amazing staff, to make sure that they have the tools and the environment to give all patients world-class cancer care.

Earlier-stage diagnosis invariably means more effective treatment options, and better survival. But it can also mean less expensive treatment. For example, treating late-stage ovarian cancer costs around three times more than early-stage disease. So finding ways to help the NHS diagnose fewer people late, and to treat them swiftly, will save resources as well as lives.

Over the last year, we campaigned prominently to make sure the NHS’s diagnostic services are well resourced and funded – resulting in a planned commitment to boost the workforce by 5,000 over the next three years. Our Cancer Research UK GPs and Facilitators are working year-round to keep early cancer diagnosis on the NHS’s agenda at a local level. And we’re pushing hard to make sure NHS Cancer Screening Programmes use the best available evidence and techniques.

We’re also renewing our focus on developing and testing the next generation of cancer diagnostics and investing heavily in this vital area. We’re forging international partnerships with other organisations, bringing researchers together to share ideas. And this year we funded 10 new world-class research projects through our new Early Detection Research Committee – we’re now funding £57 million worth of research on early cancer detection.

As the NHS moves into its 71st year, thanks to your support, we’ll be continuing to stand with the NHS and its amazing staff, to make sure that they have the tools and the environment to give all patients world-class cancer care.
COMBATTING ‘FAKE NEWS’ ABOUT CANCER

How we’re helping cut through the constant cancer noise.

Cancer has always been a complex and emotive topic. But the arrival of social media and the ease of online publishing means myths and misinformation can spread like wildfire, and be difficult to tell apart from reliable, evidence-based information. In the digital age, the sheer volume of information and breaking news at our fingertips can be overwhelming – and this is as true for cancer as it is for any other subject.

At Cancer Research UK we’re not only committed to finding new ways to prevent, diagnose and treat the disease – we also provide balanced, accurate cancer information, for both people affected by the disease and for the wider public. Over the years, we’ve adapted the way we produce and share this information, making sure it’s as up to date and accessible as it can be. In an era of ‘fake news’, it’s a vital resource to help people sort the fact from the fiction.

ABOUT CANCER – OUR ONLINE PATIENT INFORMATION
Our website has thousands of pages of information about virtually every aspect of the disease, written by a team of nurses, regularly reviewed by both patients and experienced clinicians, and read by millions of people every month. “Our knowledge of cancer is constantly evolving as we make progress against the disease,” says Dr Julie Sharp, our head of health and patient information, “so we constantly review our information to make sure it’s as accurate as possible. We also need to keep on top of the latest trends in how people access information online – for example on mobile devices.”

Last year we restructured and migrated more than 5,000 pages of cancer information to a new system, making it much easier to use on a mobile, and easier to find through search engines.

CANCER NEWS AND OPINION
 Barely a day goes past without cancer making headlines in the national media. Often, these stories are written with a general audience in mind, rather than people affected by cancer – their headlines can be sensationalistic, and they sometimes miss important context.

In the early 2000s, we launched a daily cancer news service, written by experienced science writers, who provide regular, balanced takes on important news stories. This includes our award-winning Science Update blog – which celebrated its 10th birthday in 2017. It’s where we add context and expert insight to big stories that hit the national headlines, debunk common cancer myths, and link people through to the evidence behind the headlines.

OUR SOCIAL MEDIA CHANNELS
Our social media channels, including Facebook, Twitter, Instagram and YouTube, are followed by more than two million people. When a controversial topic starts trending, we can engage directly with a huge number of people, linking them to relevant pages on our website or answering their questions.

According to our head of social media, news and content, Cecilia Dominici, the occasionally fractious nature of social media means it’s important to get the tone right. “We always strive to be empathetic and have really refined our approach over the years,” she says. “If there are misleading headlines in the news, we’ll call them out – but with an individual on social media, it could just be someone with a genuine question, at a time where they really need our help.”

“We’re constantly learning, but it’s usually not worth trying to shout louder than the other person. Instead smart targeting can help us get relevant content to the right audiences.”

“If there are misleading headlines in the news, we’ll call them out.

CECILIA DOMINICI, HEAD OF SOCIAL MEDIA, NEWS AND CONTENT
CANCER CHAT – OUR ONLINE FORUM
Our moderated online forum, Cancer Chat, now has more than 40,000 members, who provide peer-to-peer support on everything from signs and symptoms through to treatment and coping with advanced cancer. There’s also an ‘Ask the Nurses’ section, and a ‘hot topics’ area to discuss the issues of the day.

Visit Cancer Chat at cruk.org/cancer-chat

OUR CANCER INFORMATION NURSES
Contactable by phone or email, our team of cancer information nurses have many years of experience, both working in the NHS and in answering enquiries from the public. They get thousands of enquiries a year, on every aspect of cancer care.

“With such a huge amount of misinformation out there, people often wonder what it means for them, or their loved ones,” says Martin Ledwick, our head information nurse. “While we’re not able to give direct medical advice, we’re on hand to provide our callers with the information they need to understand how new developments – including sensationalised headlines – might affect their situation, providing reassurance and peace of mind.”

Call our cancer nurses on 0808 800 4040, 9am-5pm, Monday to Friday

SIX TIPS TO SPOT FAKE NEWS ABOUT CANCER
To help assess whether a news story’s claims stack up, look for the following six things:

1. WHO?
Who carried out the study, and who funded it? Do they have vested interests? Could these interests affect how they interpreted the findings?

2. WHAT?
What did the researchers do? Laboratory studies on cells or animals are vital, but their findings need confirming in people. And did the study prove cause and effect, or merely an association?

3. WHERE?
Where did the scientists publish their findings? Studies in academic journals are usually more robust than those presented at conferences. Be even more cautious if the story is drawn from an interview or opinion piece.

4. WHEN?
When was the study carried out, and how long did it run for? Longer studies can mean firmer conclusions. But studies using data collected a long time ago might not be relevant today.

5. HOW MANY?
How many subjects took part in the research? 10 mice? 100 patients? 1,000? Generally, the more participants, the more reliable the results are.

6. HOW MUCH?
What is the size of the effect being reported? Statistics are an essential part of science, but they can confuse. Look for absolute rather than relative numbers, and remember: a large percentage change of a small number is still a small number.
We’re continuing to fund high-quality research into the preventable causes of cancer, and campaigning for action to help people reduce their risk.

17% of the population of Great Britain still smoke

SMOKING
We’re studying how to help people quit – including using e-cigarettes

Read more
ASPIRIN
We’re answering the final questions around aspirin’s role in preventing cancer

CERVICAL CANCER
We’re tailoring screening for HPV-vaccinated women

135,000 cases of cancer linked to preventable causes

53 new research studies on cancer prevention funded this year

£35m invested in prevention research this year
We’re working on a range of fronts to help those who want to stop smoking – including research on e-cigarettes.

“I started smoking at 17. Back then it was hip and trendy – soft packs were the thing, and customised lighters you got by sending off pack tops,” says Mat Callaghan, a 44-year-old TV director. “Loads of people my age smoked. We didn’t worry about our health – it was cool after school to go and have a coffee in town and smoke.”

“I half-heartedly tried to give up a few times. I couldn’t imagine a day without it. The idea of going without a few cigarettes with my morning coffee was unthinkable.”

But then things began to change, starting with smokefree legislation in 2007 – a law that Cancer Research UK campaigned hard for. “I really found that the smoking ban helped me quit. It was very effective in making it socially unacceptable,” he says.

But then things began to change, starting with smokefree legislation in 2007 – a law that Cancer Research UK campaigned hard for. “I really found that the smoking ban helped me quit. It was very effective in making it socially unacceptable,” he says.

The introduction of standardised packaging – another policy we championed – also made a difference. “Plain packages had a subtle psychological effect on me – losing the ‘brand identity’ you’ve been attached to for 20 years made it all seem suddenly very drab and boring.”

“I gave up when it finally sunk in how desperately unfashionable and socially unacceptable it is now – and for my health too.”

But unlike many people who give up using their local Stop Smoking Services, Mat took a different route: he used an e-cigarette.

“I know so many other people who have gone from 40-a-day to zero with vaping – I knew if it worked for them, it would work for me. So I took time to go and have a consultation in a vaping shop, where they let me ‘test drive’ various different devices. Once I found a combo that worked, I bought a few bottles of liquid and walked out of the shop – and I haven’t touched a cigarette since.”

Electronic cigarettes, or ‘e-cigarettes’, have been around for more than a decade, and almost three million adults around the UK now use one. Rather than burning tobacco, they work by vaporising a specially designed liquid that can contain nicotine – the addictive chemical in tobacco smoke. But their growing popularity has created some challenges, the biggest being that research looking at their safety has struggled to keep up.

This is important. Despite studies suggesting that, overall, e-cigarettes appear to be far less harmful than smoking, there’s a growing misconception that they’re just as dangerous. And this might be preventing smokers from using them to quit tobacco – a deadly, addictive substance that releases more than 70 known or suspected carcinogens when it’s burnt.

Thankfully, this is something we’re addressing, and Cancer Research UK is now one of the UK’s largest funders of research into e-cigarettes. We recently set up the UK E-Cigarette Research Forum, bringing together tobacco and e-cigarette researchers to coordinate activity and focus on unanswered questions. And last year, our researchers provided the clearest evidence yet that these devices are indeed far less harmful than smoking.

The study, led by Dr Lion Shahab at University College London, analysed saliva and urine samples from several groups of people, including people who’d exclusively used an e-cigarette for about a year and a half; cigarette smokers; a group who both smoked and used e-cigarettes; and a group who were using nicotine replacement therapy (NRT) to quit smoking.
I haven’t touched a cigarette since.

MAT CALLAGHAN
In particular, they were measuring levels of 26 potentially harmful chemicals known to be present in tobacco smoke. And their findings were remarkable: a huge difference in the levels of these substances between the different groups. For example, one chemical linked to lung cancer was 97% lower in exclusive e-cigarette users, compared with smokers.

But not only did e-cigarette users have lower levels of these substances compared with smokers, they were also found to have very similar levels to people using NRT – something Lion points out is known to be relatively safe.

“We have three decades of research into the safety of NRT, and we’ve not picked up any significant long-term health issues,” he says.

There was another crucial finding too: people who used both e-cigarettes and tobacco had similar levels of harmful chemicals as smokers, showing that people only seem to reduce their exposure by using an e-cigarette if they stop smoking too.

But the story doesn’t end there, and there are still questions that need answering. Lion notes that, while this study represents some of the best evidence to date on e-cigarette safety, further studies will be needed to be sure, including following up larger groups of e-cigarette users for much longer periods.

In the shorter term, the team’s next step is to look for signs of actual harm in these different groups of people. “We’re now working hard in the lab to assess potential harms from e-cigarettes, including measuring whether if e-cigarettes affect users’ lung function, as they still inhale a mixture of irritating substances,” Lion says. “Cancer Research UK’s support has been vital in allowing us to find out more about the relative safety of these new products, and to encourage a rational debate on their pros and cons.”

“Dr Lion Shahab”

We’re now working hard in the lab to assess potential harms from e-cigarettes.

DR LION SHAHAB
We’re funding an international team to answer the final questions surrounding the use of aspirin to prevent cancer.

Could a daily aspirin prevent cancer? It’s an urgent question, and this year we awarded a £5 million grant to a world-leading team of international researchers to find the answer. We spoke to study leader and cancer prevention expert Professor Jack Cuzick, to find out how they’re going about their task.

WHAT DO WE KNOW ABOUT ASPIRIN AND CANCER?
“The most compelling evidence comes from long-term follow-up of people taking aspirin to prevent heart disease. This wasn’t spotted at first, because these trials saw an impact on heart disease after just three years. But in the early 2000s, a team in Oxford looked at what had happened to people on these trials 10 years later – and lo and behold, they found substantial reductions in rates of bowel, stomach and oesophageal cancers – and also a smaller effect on lung, prostate and breast cancers.

“And then when people looked at similar studies in other countries, they saw the same effect – rates of the same cancer types were reduced, by virtually the same amount. It’s really convincing data.”

HOW DID YOU COME TO BE INVOLVED IN ASPIRIN RESEARCH?
“In 2009, as then-President of the International Society for Cancer Prevention, we set about pulling together an overview of a whole range of possible cancer prevention methods. We looked at all the data on aspirin, and felt that while the evidence was clear for bowel cancer, more follow-up was needed with the other cancers. To our delight that data became available within a year – and it was a bit of a eureka moment. “So we gathered together an international team of experts here in London, to try to work out what to do next. We crunched all the data and estimated that, if people took aspirin for 10 years at any time between the ages of 50 and 70, the overall effect would be about a 10% reduction in the overall number of people getting cancer. But importantly, because some of the cancers aspirin prevents can be really nasty, it could lead to an even bigger reduction in cancer death rates.”

WHY THAT AGE RANGE?
“We had a lot of discussion about the age range. In the end we concluded that there’s not much point in looking at the effect before 50 as these cancers are relatively rare before then, and all you’re going to do is experience the side effects, while after 70, aspirin’s side effects are often serious, leading to complications and sometimes fatality. So we were cautious and figured it was best to look at 10 years’ use between 50 and 70.”

WHAT ARE THE SIDE EFFECTS?
“The major side effect is gastrointestinal bleeding, which can be really serious in some people. There’s also a small increase in a rare form of stroke called haemorrhagic stroke, although aspirin prevents the other form of stroke – ‘occlusive’ stroke – which is caused by blood clots. But haemorrhagic strokes are generally more lethal, so while there’s a reduction in the number of strokes, there’s actually a small increase in stroke deaths. But the benefits in terms of reductions of cancer deaths, and cardiovascular deaths, dominate the picture, it’s about 10 to 1 in favour.”
WHAT DO WE STILL NEED TO KNOW?
“It’s generally true in science that original, empirical observations tend to come before the scientific explanation of what’s really going on, and this is absolutely true of aspirin – we have overwhelming evidence of a cancer prevention effect, but we don’t really know how it happens. So the big focus of our project will be to understand the mechanism, both for cancer prevention, and for the side effects. It’s a huge unanswered question, and a really important one – we have a few clues as to where to look, but it’s really wide open.

“Our other big focus will be on understanding which people will get side effects, and how to prevent them from doing so. And we’ll also be looking at how to put this all into practice, and the challenge of getting the message out there.

There’s still a way to go before people can or should take aspirin routinely without speaking to their doctor or pharmacist first.”

WHO’S INVOLVED IN THIS PROJECT?
“It really is a great group of people with a wide range of differing expertise – clinical trials, basic biology, expertise in side effects... we’ve got patient advocates, population biologists, public health experts, behavioural scientists and health economists.

“We’re linking up internationally too – there’s a group involved from Harvard who are running two huge long-term studies involving millions of people – and they’re collaborating with us and sharing their data and samples, as are team members from Italy and Germany. It’s incredibly exciting.”

HOW’S IT GOING SO FAR?
“Our first meeting was incredibly positive, everyone’s really keen to work together and share data – we’ve got many good datasets and tissue collections and everyone’s happy to share their material with others in the project – and there’s a really positive feeling, we’ve started off brilliantly.

“And of course, the entire project wouldn’t be possible without Cancer Research UK, who’ve had the vision to fund a project that sits right on the boundary between basic science and population science. It’s so exciting – there’s such a huge potential benefit in preventing people from getting cancer in the first place.”

MAIREAD MACKENZIE
CANCER SURVIVOR AND PATIENT ADVOCATE
“We’ve come a long way in the treatment of cancer, and although my treatment appears to have been successful it would surely be better if people did not have to go through this at all.

“We may not be able to prevent all cancers, but if we can prevent some of them, then this surely has to be our aim – and I’m excited to be part of this work as a patient advocate on Professor Cuzick’s study. Prevention is after all better than cure.”

Our first meeting was incredibly positive, everyone’s really keen to work together and share data.

PROFESSOR JACK CUZICK
TAILORING CERVICAL SCREENING FOR VACCINATED WOMEN

Our researchers are looking at how the NHS programme should adapt as HPV-vaccinated girls become eligible for screening.

Ten years ago, the NHS launched a new vaccination programme. Designed to prevent infection with the virus responsible for cervical cancer – the human papillomavirus, or HPV – it’s set to make a big impact on cancer rates, and is now routinely offered to girls in their early teens.

Soon the first group of vaccinated girls, now young women, will receive their first NHS cervical screening invitation. At the moment, the NHS invites women every three years between ages 25 and 49, and then every five years until they’re 64 – amounting to 12 screening appointments over their lifetime.

Both vaccination and cervical screening are intended to prevent cervical cancer. So how often will vaccinated women need to be screened? The vaccine protects against the two forms of the virus most strongly linked to cervical cancer – but other types can cause cancer too. So vaccinated women still benefit from screening – they’re just likely to need less of it. But how much less? 

"The screening programme needs to be able to tailor screening to each woman’s needs.

PROFESSOR PETER SASIENI"
Cancer Research UK’s Professor Peter Sasieni and his team, who work at King’s College London, have begun to answer this question.

“There’s a challenge for the programme of how to adapt rapidly while ensuring that safety’s maintained,” he says. “We need to think how we change a one-size-fits-all screening programme to one that’s adapted to different needs.”

Last year his team created a sophisticated mathematical model, combining real-life NHS screening data with the latest evidence about how often the HPV virus triggers abnormal cell changes, and the rate at which these progress to cervical cancer. This allowed them to predict the optimum screening programme to offer women who’ve been vaccinated.

“It was a pretty formidable task,” he says. “We needed to recruit expert computer programmers to work alongside the statisticians and biologists in the team, to produce something more advanced than anything we’ve previously done.”

First, using biological data and information on vaccination rates, they estimated how many cases of cervical cancer would occur if vaccinated women never received any screening. Then they tested what would happen in their computer model if different screening scenarios were introduced. They then compared these numbers to predict the benefits of different frequencies of screening, looking for the ‘sweet spot’ – balancing the number of screens, the likelihood of missing women at risk of developing cancer, and the overall cost.

“Unfortunately, however often women are screened, and however widespread vaccine use is, some will still develop cervical cancer. We wanted to try to design a programme that minimised this,

“We needed to recruit expert computer programmers to produce something more advanced than anything we’ve previously done.

PROFESSOR PETER SASIENI
while reducing the number of times vaccinated women need to be screened,” he says.

Their results, published in November last year, showed that a total of just three appointments, at ages 30, 40 and 55, offered vaccinated women the same benefit as the current programme – great news for women, and for stretched NHS budgets.

But what about women who, for whatever reason, haven’t been vaccinated?

“The screening programme needs to be able to tailor screening to each woman’s needs,” Peter says, “so it’ll have to be able to offer unvaccinated women the appropriate level of screening. And it also needs to be able to adapt as research produces even better ways to vaccinate women in future.”

This is important – for example there is a newer version of the HPV vaccine which offers protection against many more strains of HPV. It isn’t used in the UK vaccination programmes yet, but that may change in the future. Thankfully, Peter’s team are one step ahead.

“The way we created our model means we can use it to make recommendations for all sorts of scenarios,” he says – and that includes improved vaccines. “But to make this a reality, the NHS will need to have accurate information, not just about whether women have been vaccinated, but also which type of vaccine they’ve had.”

And it’s not just women in this country who could benefit from Peter’s research. It’s likely to have a global impact. “The way we created the model means it can be adapted to help health policymakers worldwide,” he says. “So hopefully different countries can begin to tailor their screening programmes as research continues to make strides in preventing cervical cancer.”

PATIENT STORY

SARAH FARR
CERVICAL CANCER SURVIVOR

“In late 2016 I had a huge shock – I was diagnosed with cervical cancer. My cancer was picked up after an abnormal smear test and subsequent tests. I had no symptoms.

“Thankfully, the cancer was spotted early and I had an operation to remove it. Just over two weeks later my surgeon confirmed that he’d removed all of the cancer and I wouldn’t need any further treatment.

“I’ve become much more aware of my own body and the importance of seeking advice if something’s not right. I’m taking better care of my body by getting fitter, losing weight and eating more healthily. It’s hugely important for me to set a good example to my daughter Maisie. I’m keen for her to have the HPV vaccine when she’s old enough and I want her to get into good habits for the rest of her life.”
DETECTING AND DIAGNOSING CANCER

We’re working on every front to make earlier detection and diagnosis a reality.

46% of cancers diagnosed late*

5,000 extra diagnostic staff promised after our campaign

SUPPORTING GPs
Our GPs are working hard to improve cancer diagnosis

80 Cancer Research UK Facilitators working with GPs nationwide

* ‘Late stage’ defined as stage 3 or 4. Based on 2016 cancer incidence in England (excluding non-melanoma skin cancer), as a proportion of cancers with known stage.
We’re testing groundbreaking new technology

£3.9m new early detection grants

We’re bringing researchers together around the world

£57m total spend on diagnosing and detecting cancer

CANCER BREATH TEST

BUILDING A COMMUNITY

£3.9m
HELPING GPs DIAGNOSE PEOPLE EARLIER

Across England, Cancer Research UK GPs are working hard to improve cancer diagnosis.

In 2015, the NHS in England adopted a new strategy to make sure its quality of cancer care matches the best in the world. A key recommendation was the formation of regional Cancer Alliances, bringing together various parts of the local NHS, together with people affected by cancer, to coordinate, collaborate and improve cancer outcomes in a given area.

GPs have a vital role in diagnosing patients with suspected cancer. So to make sure GPs’ perspectives are represented within the Alliances, we’ve now recruited 20 dedicated Cancer Research UK GPs – who work closely with the Alliances and with our dedicated local network of 80 Facilitators – to keep the focus on diagnosing cancer earlier.

We spoke to Dr Debbie Harvey, a Cancer Research UK GP who leads on early diagnosis at the Cheshire and Merseyside Cancer Alliance, to find out what this means in practice.

WHY IS IT IMPORTANT TO HAVE CANCER RESEARCH UK GPs?
‘A lot of the Alliances’ focus has been around cancer performance targets in hospitals. But a really key area to improving outcomes for our patients is to support GPs as they try to spot people with early signs of cancer. So our role is to make sure that GPs’ issues are kept high on Alliances’ agenda, and that they have a voice in discussions about improving cancer care.’

WHAT DOES THAT INVOLVE?
‘My area – Cheshire and Merseyside – has a population of around 2.5 million people and roughly 360 GP surgeries. We wanted to understand the issues our GPs faced in diagnosing cancer, so last summer we sent out a survey to all GPs in our Alliance.

‘We asked them about a range of topics including their knowledge of cancer, awareness of recent changes in how it’s diagnosed and treated, and where they might need greater support, e.g. through education. We received over 170 responses allowing us to identify key areas to focus on.’

WHAT DID THEY SAY?
‘Among the topics they highlighted, one that came up a lot was something called ‘safety netting’, which several colleagues identified as being managed in a variety of ways or, in some cases, overlooked.’

WHAT IS ‘SAFETY NETTING’?
‘It’s a number of things, all aimed at putting mechanisms in place to reduce the risk of patients falling through the gaps and being lost to important follow-up.

‘In some cases, it’s clear that a person’s symptoms are likely to be cancer, so you refer them for urgent tests. In these instances, safety netting could involve...’
We want to understand the issues GPs face in diagnosing cancer.

DR DEBBIE HARVEY
We’re developing a ‘gold standard’ of what safety netting should involve.

DR DEBBIE HARVEY

“In other cases, you see people with symptoms that are ‘low-risk but not no-risk’ – in other words the patient doesn’t have key features of cancer when you see them, but might develop these in the future. So you might instead tell them about these symptoms, and to make sure they come and see you if that happens.”

WHAT DID YOUR SURVEY FIND OUT ABOUT GPs’ ATTITUDES TO SAFETY NETTING?

“The survey was really enlightening, and revealed some gaps in the understanding of safety netting. A number of colleagues felt that it was the patient’s responsibility to attend appointments, and follow up any test results themselves.

This is of course in part true – patients need to take some responsibility – but as GPs we need to have systems in place to support them.”

WHAT DOES THIS PLAN INVOLVE?

“Three things: First, for Cheshire and Merseyside we’re developing a ‘gold standard’ of what safety netting should involve. Second, in collaboration with our colleagues at Macmillan, we’re looking at software which can support GPs with safety netting. And third, with the Cancer Research UK Facilitators, we’re making sure GPs know about the evidence behind safety netting, and why it is so important.”

WHAT DOES THIS ‘GOLD STANDARD’ INVOLVE, AND HOW WILL YOU KNOW YOUR PLAN IS WORKING?

“A key focus is on clear, transparent communication about what’s going to happen – so always making sure you describe exactly why you’re referring patients for tests, roughly when they might expect the results to come back, and to consider giving them any relevant information leaflets. It’s also about considering booking a follow-up appointment, there and then, as part of a safety netting ‘plan’. “Once we’ve tested and launched the ‘gold standard’ and software support, we’ll then look at the percentage of GP practices actively engaged and using both aspects of safety netting. It’ll be fantastic for patients to embed this in GP practices – it’ll really help improve care and patients’ experience. Cancer Research UK has been instrumental in supporting me due to the Charity’s keen focus on early diagnosis, and none of this would be happening without its support.”

MEENA BHAGAT
PATIENT ADVOCATE
WHO LOST HER HUSBAND TO LUNG CANCER

“I am often having to explain to friends and relatives the importance of going to tests that may seem invasive or unnecessary, but which are a valuable part of ensuring that cancer is detected earlier.

‘Safety nets’ are a really important way of ensuring that people who might not go to hospital appointments or further tests when referred, do actually attend and – just as importantly – that GPs do book a further session to explain things in detail.”
Our researchers in Cambridge are collaborating with engineers to develop a high-tech cancer ‘breathalyser’.

“I never set out to develop a cancer detector,” says Cambridge-based engineer Billy Boyle, co-founder of UK start-up Owlstone Medical. “When I set up the company, we were trying to detect explosives and other chemicals – but then it became clear that this technology could have medical implications too.”

In the early 2000s Billy was studying for a PhD in electronic engineering, and the fad at the time was to develop ‘micro-machines’ – tiny silicon chip-based gizmos like the compass and motion detector in your mobile phone. “I started to wonder whether we could also miniaturise things like smoke detectors, but to detect things at really low levels – and that ultimately led to Owlstone, and the sensor technology that powers the cancer breath test I’m now working on with Cancer Research UK.”

The resulting device is the product of nearly two decades of precision development, and exploits the fact that, as they grow and divide, tumour cells release waste products called ‘volatile organic compounds’ into the bloodstream.

“We’re trying to monitor what’s going on inside a growing tumour.”

BILLY BOYLE
As these travel around the body, they evaporate into the air in the lungs and end up being exhaled – at which point, Billy’s device can capture them in a specially developed material, fixing them for later laboratory analysis.

“We’ve discovered that the molecules in the breath really closely match what we find directly in the blood. Essentially, we’re trying to develop a breath ‘biopsy’ – something that can detect, track and monitor what’s going on inside a growing tumour. If we get it right, it’ll have several big advantages over what’s out there at the moment,” he says.

“For a start, it’s a lot less uncomfortable for patients than an operation or a blood draw – that’s really key for us, patient acceptability – but also, the more you exhale, the more molecules the device collects so the stronger the signal gets. You just can’t do that with a blood test. And so we hope this could detect signs of cancer at a really early stage, when tumours are too small to see on a scan. It’s hugely promising technology – now we need to test it thoroughly in patients.”

Helping Billy put the breath test through its paces is Professor Rebecca Fitzgerald, who leads the Cancer Research UK Cambridge Centre’s Early Detection Programme.

“Over the last few years, we’ve assembled a really incredible network of investigators here in Cambridge, focused on the early detection of cancer,” she says. “As well as laboratory researchers and clinicians, this also includes engineers, mathematicians and ethicists. It’s a wonderful environment to focus on a really urgent problem.”

This year, Rebecca and her colleagues teamed up with Owlstone to launch a new clinical study, to bring the breath test device one step closer to routine use. Known as the PAN Cancer trial for Early Detection of Cancer in Breath, patients with a suspected diagnosis of any of six cancer types – oesophageal, stomach, prostate, kidney, bladder and pancreatic – who are referred to Addenbrooke’s Hospital for investigation, will be asked to give a breath sample in addition to routine tests.

Those who go on to be diagnosed with cancer will have their breath samples compared with the samples taken from those that didn’t. “By comparing these two groups’ breath samples, we should be able to get a really good idea of what we need to look for to detect early cancers – it’s the crucial next step in developing this technology,” says Rebecca.

While Owlstone will be funding the trial directly, none of this would be possible without the support and infrastructure provided by Cancer Research UK, says Billy. “The Charity was instrumental in encouraging me to move into early cancer detection, and its investment in the Cambridge Centre has created a network of researchers with the skills and expertise needed to rigorously test our device. Fingers crossed this technology can make an impact in diagnosing cancers early enough to make a real difference.”

“"We should be able to get a really good idea of what we need to look for to detect early cancers."  
PROFESSOR REBECCA FITZGERALD
SONIA PATTON
BREAST CANCER PATIENT ADVOCATE

“This research is so exciting as it could lead to a simple, non-invasive early detector of cancer with the ability to save so many lives, and reduce the costs to the NHS and beyond.

“The fact that the team are already taking patient acceptability into account is wonderful to hear – it will be pivotal in taking personalised, predictive and precision cancer testing to a new level for patients.”
We’re bringing the world’s best researchers together to focus on detecting cancer earlier and more accurately.

Think of ‘cancer research’ and most people’s minds turn to the vital quest for new ways to treat and cure the disease. But equally important is the race to develop more accurate ways to detect cancer – and progress in this area has the potential to transform things for patients.

That’s because even some of the most aggressive forms of cancer can be successfully treated with existing therapies, if they’re diagnosed before they’ve spread. But data from cancer registries in England indicate the scale of the global challenge: for cancers where the stage is recorded, nearly half are diagnosed at a late stage.

At Cancer Research UK, we’re determined to make inroads in this area – but we can’t do it alone. It’s an effort that will need expertise from a whole range of different scientific backgrounds – engineers and physicists to build new detectors, biologists to understand what to detect, software developers to build the platforms to analyse the resulting data, and clinical, population and behavioural researchers to design studies to bring these new technologies into routine use.

So we’re redoubling our efforts, and building an international community to make early cancer detection a reality. We recently teamed up with two US cancer institutes – the Knight Cancer Institute in Oregon and the Canary Center at Stanford in California – to establish an annual Early Cancer Detection Conference, which brings experts from around the world together to share ideas and discoveries. And this year our new expert Early Detection Committee funded several ground-breaking new projects, bringing researchers together across borders and continents. Here are some highlights:

**FINDING WHO WILL BENEFIT MOST FROM LUNG SCREENING**

Lung screening is a complex issue. Although studies have shown that it can prevent cancers being diagnosed late, the overall balance of benefits versus harms (e.g. unnecessary surgery for people who don’t have cancer) is delicately poised. One of the crucial questions is how to identify people at high risk, to shift the balance in favour of the benefits.

Professor David Baldwin is a Nottingham-based lung cancer expert we’re funding to try to answer this question, in collaboration with researchers in the Netherlands.

**DEVELOPING A URINE TEST FOR PANCREATIC CANCER**

Pancreatic cancer is a devastating disease that is often diagnosed late. As a result, survival rates have barely improved in decades – so diagnosing it early could make a real difference.

Dr Tatjana Crnogorac-Jurcevic has dedicated her career to developing a urine test for pancreatic cancer, and now we’re supporting her to take her research to the next level. Over the next two years she will be collaborating with experts from Vanderbilt University in Tennessee, and Cedars-Sinai Medical Center in Los Angeles, and together they’ll be analysing pre-diagnostic urine samples collected as part of several large international studies carried out in China and the US, to further refine the test they have been developing.

They’ll be sharing access to large, anonymised databases of electronic GP records and developing software to analyse them and try to identify people at high risk of lung cancer, who could benefit from screening.
DEVELOPING A BLOOD TEST THAT CAN IDENTIFY WHERE A CANCER IS
An increasingly high-profile topic in cancer detection are so-called ‘liquid’ biopsies – methods that measure and analyse tiny fragments of DNA released into the bloodstream by growing tumours. In theory, these tests can reveal not just the presence of a cancer, but information about the genetic abnormalities that drive it, which in turn could guide treatment.

But there’s a catch: on their own, current techniques for detecting circulating tumour DNA are relatively insensitive and, crucially, don’t tell doctors where in the body a tumour might reside. Oxford-based researcher Dr Chunxiao Song is working to overcome these issues. We’re funding him to work with experts in China and the US to develop a new detection method that could tell which tissue a cancer is growing in, as well as boosting the potential sensitivity of these tests.

IMPROVING BLOOD TESTS FOR PANCREATIC, OVARIAN AND BOWEL CANCER
Over the years, many researchers have sought to develop blood tests to spot cancer early, based on measuring the levels of individual cancer-linked proteins in the bloodstream. Unfortunately, most of these approaches have disappointed.

Dr John Timms, a London-based laboratory researcher, has an idea to change this. His team, working with experts in Spain, will be reanalysing blood samples taken during previous large cancer blood test trials, measuring multiple different protein levels simultaneously. Armed with knowledge of which participants went on to develop cancer, they’ll use sophisticated computer-based methods to ‘train’ software to identify combinations of proteins that were abnormal in these people. The resulting software can then be used to design the next generation of studies on early cancer detection.

AND A GRAND CHALLENGE TO MAKE BREAST CANCER DETECTION MORE ACCurate
The most ambitious cancer research grant in the world, our Grand Challenge programme awards up to £20 million to international teams of cross-disciplinary researchers to solve some of the biggest challenges in the field.

Last year we shortlisted 10 new teams for awards, two of which were focused on early detection of cancer. And in the programme’s first round of funding, in collaboration with the Dutch Cancer Society, we supported Dr Jelle Wesseling to lead an international coalition focused on improving the accuracy of breast cancer detection. “We’ve had a really productive first year getting our Grand Challenge project off the ground. It’s been so inspiring to work with the other Grand Challenge teams, sharing skills and expertise as we build a community of incredible researchers,” he says.

HELEN BULBECK
CANCER SURVIVOR AND PATIENT ADVOCATE
"An important theme resonating through all of these projects is the importance of data and turning it into information and knowledge. These projects are truly innovative as they pull everyone together to ensure that early diagnosis of cancer is not only being fought in the lab. There’s nothing like collective intelligence for solving problems.”
DEVELOPING NEW TREATMENTS

We’re working on a range of fronts to better understand cancer, and use these insights to develop the next generation of cancer therapies.

£104m spent on understanding cancer biology

£25m commitment to study brain tumours

CHILDREN’S BRAIN TUMOURS

We’re investing in a £3 million new Centre of Excellence

Read more
IN VOLVING
PATIENTS
We’re designing studies in partnership with patients
45 Read more

£98m
spent studying hard-to-treat cancers

IMMUNOTHERAPY
We’re making strides in understanding the immune system
47 Read more

70 early-stage trials ongoing around the UK
DISCOVERING BETTER TREATMENTS FOR CHILDREN WITH BRAIN TUMOURS

We’re opening a new Centre of Excellence to speed up the discovery of new treatments.

A few months after developing devastating headaches, five-year-old Jasper was diagnosed with a type of brain tumour called medulloblastoma. After surgery to remove the tumour, he went through a year of intensive radiotherapy and chemotherapy. It was, his mother Alice remembers, “horrendous”.

“He was vomiting, he was throwing up loads. It was horrible. I felt helpless. I thought ‘I just want to take him home’.

“I literally got to the point of thinking ‘He’s not going to make it through the chemo because he can’t keep anything down’. And even weeks after the first cycle he was still reacting really badly to the chemo. And then six weeks later, he had to go back in again for his next round. And we had to keep going on like that for nearly a year.”

Thankfully, Jasper’s now back to his usual cheeky self – his hair’s grown back, he’s back at school, and he regularly goes swimming and plays rugby with his dad at weekends. Life is back to normal.

But the experience has changed the family’s outlook forever, and Jasper is taking growth hormones as a result of the long-term side effects of his treatment.

At Cancer Research UK, we want to develop the next generation of treatments for children with brain tumours. Treatments that are better, and cause fewer of the life-changing side effects that hit Jasper so hard.

But to do this, we need to revolutionise our understanding of what makes these cancers tick. And so, this year, we opened the Cancer Research UK Children’s Brain Tumour Centre of Excellence – a £3 million investment that aims to accelerate progress in developing and testing new, better and kinder treatments for children and young people with brain tumours.

Professor Raj Chopra works at The Institute of Cancer Research in London, one of two world-class research groups behind the new Centre.

“This new Centre of Excellence is very much a partnership between the Cancer Research UK Cambridge Centre, led by Professor Richard Gilbertson, and several of us here at The Institute of Cancer Research.”
We had to keep going on like that for nearly a year.

ALICE LILLEY
“Ultimately, the new Centre is a partnership between biologists and chemists. The exciting thing about this is it’s the full circle: the biologists develop new, more accurate ways to study brain tumours and to understand their biology, and find possible targets for drugs.

“Then the chemists find drugs where we really understand the chemistry of how they work, and go and test out whether they work against the targets the biologists have identified. It’s testing if the chemistry actually affects and targets the biology in the way we expect it to.”

“One thing we’re focusing on and are very excited about in particular is that, over the years, we’ve developed ways to destroy particular proteins inside cancer cells, allowing us to manipulate how they grow. We’re now going to be using this knowledge to try to better understand exactly how brain tumours develop, and how we can develop new drugs to kill them.”

The team plan to use an array of sophisticated techniques to study how brain tumours work and to identify and assess promising new experimental drugs, which can then be tested in rigorous clinical trials to see if they’ll be of benefit to patients.

“When Richard was working in the US, his team there did initial tests looking at about 1.2 million compounds to see if they killed brain tumour cells in the lab. Now, we’re going to be working with him to see exactly how these compounds work to kill brain tumour cells, and if any of them can be developed into proper drugs.”

It’s vital, cutting-edge work, none of which would be possible without support from Cancer Research UK, says Raj.

“As well as funding the Children’s Brain Tumour Centre of Excellence, Cancer Research UK was the catalyst for this whole endeavour,” he says. “They really brought together the brain tumour expertise of two Institutes that really complement each other. There’s a huge amount of excitement about it, and it’s already given us a platform to develop more collaborations with researchers in other countries.”

It’s urgent work: around 410 children develop brain tumours every year in the UK, most of whom will have intensive therapies to treat their disease. Many experience long-term side effects. And while the majority will be cured, these cancers claim the lives of about 80 children every year. New treatments can’t come soon enough – and thanks to the new Centre, they surely will.”
PIONEERING NEW TREATMENTS WITH PATIENTS IN MIND

We’re working with patients to improve the way experimental trials are run.

There comes a point in all new cancer treatments’ development when they need to be tested in patients for the very first time.

So-called ‘Phase I’ or first-in-human trials are a vital step – but also a challenging one. Patients who take part are usually in the very late stages of cancer, with no other treatment options.

But these trials are often to measure really early things like drug uptake, safety and dosage. Experimental treatments may not work, and can cause unpleasant side effects. And the trials can often involve extra tests or trips to hospital, which may prove time-consuming or intrusive during a very difficult period.

As a result, it’s important that the way these trials are set up and run takes patients’ situations and preferences into account. A trial’s aims need to be clearly communicated to people who are often in a highly emotional state of mind as they come to terms with their prognosis. And they need to minimise invasive procedures that, while they can provide useful data to researchers, may not be ‘mission critical’ for the overall trial.

To help overcome these challenges, who better to turn to than patients themselves?

“Patients often have very high expectations of what enrolling on a Phase I trial can mean, so it’s important that we design and communicate a trial’s objectives carefully,” says Professor Udai Banerji. Udai runs Cancer Research UK-supported trials jointly from The Royal Marsden and The Institute of Cancer Research, London.

“Often the best people to help us do this are people who’ve been in or experienced a similar situation,” he says. “So for several years now, we’ve been involving patients and carers in trial design, and it’s made a real difference.”

“It’s so important to give patients the best experience of cancer care we can.”

PROFESSOR RUTH PLUMMER
One big bonus of involving patients early, Udai says, is that it can speed a trial’s progress through various ethics committees, meaning it opens much more quickly. “We’ve found that patient involvement means we iron out issues early on, and leads not just to much more ethically robust trials, which can then begin recruiting sooner, but also information sheets that are both accurate and understandable. It’s been a real game-changer.”

Another big plus is that it can boost recruitment. For several years now, Cancer Research UK’s own Your Involvement Network has helped the Charity’s researchers design trials with patients in mind. Our Centre for Drug Development, which conducts early-phase trials across the UK, has been committed for several years to adding the patient’s voice to its work. With this in mind, its staff consulted the Network last year about a trial that was struggling:

“At one of our regular meetings last year, we had a presentation from researchers running a trial that wasn’t recruiting patients very well,” says Jim Elliott, a member of the Network who has seen several family members go through cancer. “When we looked at the information they were giving patients, we quickly spotted why: the leaflet inadvertently gave the impression that taking part could delay the routine surgery they were scheduled to have. We made some recommendations, which the team took on board, and we were delighted to hear later that the trial was recruiting patients much more rapidly. It’s great to know that our input has made a difference.”

Researchers around the country are adopting this ‘patient-centric’ approach, including through the network of Experimental Cancer Medicine Centres (ECMCs) that we jointly support. Cancer Research UK’s Professor Ruth Plummer runs the Newcastle ECMC, located at the city’s busy Sir Bobby Robson Cancer Trials Research Centre.

“We have 63 trials currently open, meaning we see around 120 patients a month, many of whom have very advanced cancer,” says Ruth. “It’s so important to make sure that we give them the best experience of cancer care we can – and our Patient Perspectives group works closely with members of my team to achieve this.”

The ultimate goal, of course, is to speed up research and bring potentially effective treatments to patients sooner. “One particular trial was deemed ‘difficult to recruit to,’” says Ben. “However, through working with the Perspectives group, we changed the recruitment strategy – the study now has 47 participants in less than four months. It’s made a huge difference in the pace of research.”
Our researchers are working hard on the next generation of treatments that harness the power of the immune system.

When the drug she was on stopped working, Jolene Dyke only had one option – a brand new cancer treatment called pembrolizumab.

“It was a lifeline – I’ve been on it for two years now. Without it I literally wouldn’t be here,” she says.

Jolene was diagnosed in 2005 after noticing that a mole on her neck had become larger and suspiciously itchy. She had it removed and was given the news she’d feared: it was a form of skin cancer called melanoma, which can – and did – spread aggressively. A few years later, the cancer had spread to her lungs, brain and colon. She had several rounds of surgery, and three different drugs to try to hold it at bay. And then more surgery. Time was running out. But then pembrolizumab became available.

Pembrolizumab is an immunotherapy treatment – it acts on a patient’s immune system rather than their cancer, revealing the disease’s presence to the body’s innate defences. For those it works for, it’s a life-changer. But it’s not without its downsides: it’s given as an infusion, regularly, for years, meaning repeated visits to hospital – and it can cause side effects. Jolene gets the treatment every three weeks – which causes her intense tiredness for several days – and also has regular scans.

“That’s a lot of hospital visits, and a lot of waiting around, when you want to be getting on with your life,” she says. “It’s a relentless cycle – I describe my cancer as my ‘forever’ – it’s not going to go anywhere.”

Her doctors say she’s likely to keep taking the drug for the rest of her life.

But immunotherapy’s biggest drawback is that it only works for some: for every person like Jolene, four others don’t respond – for reasons we still don’t understand. And aside from melanoma and a handful of other cancers, most forms of the disease are even less responsive – including common cancers such as prostate and breast cancer.

So the hunt is on for the next generation of immunotherapy treatments – and Cancer Research UK is leading the way. In 2014, we launched a new funding scheme to bring the UK’s thriving community of immunologists together to focus more sharply on cancer.

“Look to a brighter future for immunotherapy”

Around that time, Dr Alison Taylor’s Leeds-based laboratory team was studying how the immune system deals with viruses. But then they discovered that the molecules they were working on were part of the same process targeted by cancer drugs like pembrolizumab.

“It was a happy accident. Immunotherapy for cancer was a ‘hot topic’, and our work seemed to show that we might be able to improve it,” she says.

We’ve gone from doing lab research on viruses, to working on making better cancer treatments.

Dr Alison Taylor
It’s a lot of hospital visits, and a lot of waiting around, when you want to be getting on with your life.

JOLENE DYKE
“So we thought we ought to look at whether targeting these molecules in cancer, using experimental drugs we already had access to, would help. The support from Cancer Research UK was vital, as it allowed us to move into completely new territory.”

It was a smart move. In 2017 they announced their initial findings, showing in lab-grown cells and mice, that these experimental drugs, currently under development for a range of other diseases, appeared to have a similar effect on cancer as pembrolizumab – but with a crucial difference: these drugs can be taken orally, rather than via a drip. “It was such an exciting finding to see that it had a real effect,” she says.

There’s another dimension to their findings too – the molecules the drug targets seem to act as a ‘control switch’ for other parts of the immune system too, so it’s possible that these drugs might be effective against a wider range of cancers than drugs like pembrolizumab. “That’s the hope, although we need patient trials to prove it,” she adds.

"It’d be such a positive thing, being able to take it as a tablet, at home.

JOLENE DYKE

The idea of developing a pill-based replacement for pembrolizumab is something that’d help people like Jolene. “It’d be such a positive thing, being able to take it as a tablet, at home,” she says. “It is so difficult having that never-ending cycle of hospital visits. Three weeks comes around so quickly – and with my current treatment I do a lot of waiting around in hospital.”

As Alison stresses, there’s a long road ahead – she’s now trying to get these experimental drugs into patient trials as soon as possible. But it’s tangible proof that our plan to bring in fresh thinking to tackle the challenges of cancer immunology is starting to pay off. “It’s amazing really,” Alison says, “we’ve gone from doing lab research on viruses, to working on making better cancer treatments. It’s great to know you’re doing something so worthwhile.”
OPTIMISING EXISTING TREATMENTS

We’re working hard to improve surgery, radiotherapy and cancer drugs, and finding ways to make sure people get treatment that’s most likely to work, with the fewest side effects.

12,000 patients enrolled on Cancer Research UK-supported trials

PROSTATE CANCER
We’re improving treatment for men across the UK

40% survival boost from using abiraterone earlier in prostate cancer treatment
RADIOTHERAPY
We’re improving the way early breast cancer is treated
57 Read more

SURGERY
We’re testing a new ‘intelligent knife’ that can detect cancer
55 Read more

£4.3m
to work out the best way to use cutting-edge radiotherapy
ADAPTING TO A CHANGING LANDSCAPE IN PROSTATE CANCER

Our flagship prostate cancer trial continues to improve the way the disease is treated.

At the turn of the century, doctors treating men with prostate cancer were desperate for a breakthrough.

“Back then, treatment for newly diagnosed advanced prostate cancer hadn’t really changed since the 1940s,” says Professor Nick James, a doctor and cancer researcher based at the University of Birmingham. “We’d give men hormone-blocking drugs to hold the disease at bay, but although these drugs usually control the disease for a couple of years, it inevitably relapses.”

But then several new treatments were approved for men whose prostate cancer had relapsed. And that, together with some emerging new ideas about how to run clinical trials, got Nick and his colleagues thinking.

“In general, drugs that work well in late-stage disease tend to work even better when given earlier,” he says. “So we wondered if that’d be the case here. Could any of these drugs better contain the disease in men before they relapsed?”

“A few of us sat down at a conference and sketched out the idea of this large, complex clinical trial to find out... and I agreed to run it.”

And so, in 2005, Nick and his colleague launched STAMPEDE – a sophisticated UK-wide trial, simultaneously testing multiple different prostate cancer drugs for men with newly diagnosed disease. “We were lucky to have several things going for us – some promising new drugs, a clear clinical need, funding from Cancer Research UK, and some brand-new statistical methods to allow us to crunch all the numbers.”

The trial initially launched with five different groups, combining hormone therapy with three drugs – zoledronic acid, docetaxel, and celecoxib – both on their own and in various combinations, compared with a group of men who only received standard hormone therapy.

“This was very different from normal clinical trials, which usually only test a single new treatment against the current standard,” he says. “Having multiple treatment groups really helped recruit men to the trial, knowing they’d have a much higher chance of getting a new treatment on top of standard care.”

PROFESSOR NICK JAMES
The diagnosis seemed unreal at first.

JOHN HUDSON
“At the outset, a lot of people thought that the trial’s complexity would be off-putting. In fact, we persistently underestimated how many men would enrol – we ended up with such interest that it allowed us to start looking at other treatment combinations too.”

A few years later, another new drug arrived on the scene – abiraterone, a next-generation hormone therapy discovered and developed in part by Cancer Research UK-funded researchers.

“In those days, the norm was to set up a new trial for each new therapy. But we realised that it was far faster, once you’ve got a platform set up, to add new therapies to an existing trial rather than set up an entirely new one,” says Nick. Three months after abiraterone became available for relapsed disease, STAMPEDE was offering it to men with newly diagnosed disease through more than 100 centres around the UK and Switzerland.

Since then, the trial team has included four more therapies, and recruited more than 10,000 men. And its results have changed the way prostate cancer is treated.

In 2015, the trial produced its first landmark result: adding docetaxel, a form of chemotherapy, to hormone therapy substantially prolonged men’s average overall survival from 43 to 65 months as well as halving the risk of severe bone complications. Taken alongside similar results emerging from a US trial, the finding changed prostate cancer treatment around the world.

It wasn’t a moment too soon for John Hudson, diagnosed with prostate cancer shortly after his wife’s funeral. “The diagnosis seemed unreal at first – it was a very hard time. But my oncologist was brilliant and started me straight onto hormone treatment.”

Thanks to STAMPEDE, he says, “they also offered me the emerging ‘gold standard’ of treatment – docetaxel.”

And thanks to its latest result, men with early-stage prostate cancer could have even more options. Last year, further results from STAMPEDE showed that, in newly diagnosed men, combining standard hormone therapy with abiraterone was at least as effective as docetaxel in extending survival and preventing bone problems.

“Finding results like these is such an amazing feeling,” Nick James says. “These are some of the biggest improvements in overall survival I’ve seen in any clinical trial for adult cancers. I really hope these results can change clinical practice like the docetaxel results did.”

STAMPEDE is now looking at several more treatments, with more promising results in the pipeline, including whether prostate radiotherapy can improve things for men with widespread disease.

Meanwhile, John’s still out and about, living well with prostate cancer. The docetaxel and hormone therapy successfully held his disease in check until it started growing again in 2016. A short course of radiotherapy kept things at bay for even longer, before a scan showed further spread late last year – at which point he started taking abiraterone.

“I’m feeling as healthy and strong as I’ve ever done – I wake up in the morning and I feel good. I love being active and I’m still able to do everything I want to. I like spending as much time as possible outdoors, road cycling, playing golf and fishing.”

“The results of the STAMPEDE trial enabled me to get first-class treatment. I’m eternally grateful to everyone who’s taken part in clinical trials in the past, as they’re helping patients like me right now.”
We’re funding ground-breaking work to develop a surgical knife that can detect cancer.

After Carol Stockman had surgery to remove her tumour, test results showed that the surgeons couldn’t be sure that they’d taken all the cancer out. She had to have another operation. And her side effects were a lot tougher the second time.

“Psychologically, I didn’t want another operation – but if it had to be, it had to be. I was still in a lot of pain from the first operation, and they had to delay my chemotherapy.”

Daniel Leff is a breast cancer surgeon at Imperial College London. “Not only do patients not like being reoperated on,” he says, “but if you have to go back into surgery, the risk of problems after surgery also goes up. The risk of infection is greater and the cosmetic outcomes are certainly poorer.”

To try to improve the accuracy of cancer surgery, Cancer Research UK is helping to test an exciting new technology called the ‘intelligent knife’, or iKnife.

Surgeons have been using electricity to cut tissue for more than a century, and use handheld electrical devices to generate heat that seamlessly breaks tissue apart.

But unlike a conventional scalpel, this ‘electrosurgery’ doesn’t cut tissue, it burns it instead. And while this approach is clean and limits blood loss, it also produces a puff of smoke – and this could hold the key to more precise surgery.

“A technology that could guarantee all the cancer was taken out would have really improved things.”

Carol Stockman

Professor Zoltan Takats, an analytical chemist working at Imperial College London, wondered if the smoke contained clues as to the identity of the tissue being cut, and whether this could help surgeons remove tumours more accurately.

This ultimately led to him developing the iKnife – a surgical device that sucks in the smoke as it cuts, and feeds it into a sophisticated detection device that analyses the molecules it carries. Years of laboratory research have shown that this can accurately distinguish cancerous tissue from the surrounding healthy material. But can this make a difference to patients?embros
To find out, last year we began co-funding a pioneering trial, called REI-EXCISE. The study, now in full swing at several hospitals in London, aims to find out if the iKnife can be used during breast cancer surgery.

“Without the support of Cancer Research UK we simply couldn’t have taken the next big leap of doing this ‘first-in-human’ study, and for that we are incredibly grateful,” says Daniel.

The study will recruit 175 women who are scheduled to have surgery to remove early-stage breast cancers, known as a lumpectomy, and will test out the iKnife in cancer patients for the first time.

It’s a vital first step on a long road. If successful, Daniel says, they still can’t assume that the iKnife can be used to guide surgery. A larger trial will be needed to see if the iKnife reduces the number of women having to go back and have another operation.

“Next we’ll need to do a larger trial, where we either give patients the usual breast conserving surgery or iKnife-guided surgery,” says Daniel.

Comparing the number of women going back to theatre from these two groups is the only way to tell for sure if the iKnife could transform surgery for breast cancer. “We can’t get to that stage though until we know it works in the patient. So that’s why the REI-EXCISE trial is so important,” says Daniel.

And while the study is focusing on breast cancer, the device could eventually be used much more widely, in surgery for many other types of cancer – studies are already under way in ovarian cancer.

Meanwhile, Carol has now finished her treatment. “The iKnife isn’t going to help me because it’s still in the developmental stage – but because I’m a retired teacher I’m all for research and education.

“I had a lot of side effects after my second operation for breast cancer. A technology that could guarantee all the cancer was taken out the first time would have really improved things.”

**HOW THE iKNIFE WORKS**

1. **Electricity heats the tip of the iKnife.**
2. **The hot blade causes cells in the tissue to explode, releasing molecules in the smoke.**
3. **The smoke is sucked up into a tube...**
4. **...and fed into a very accurate molecular weighing scale (mass spectrometer).**
5. **The mass spectrometer analyses the molecules and creates a ‘fingerprint’.”
6. **The fingerprint tells scientists the type of tissue being cut.**
REDUCING THE SIDE EFFECTS OF BREAST CANCER RADIOTHERAPY

Last year, our researchers showed that more targeted doses of radiotherapy have fewer side effects but the same impact on cancer.

“It left me feeling quite tired – but I kept myself fit all throughout my treatment,” says Marie de Marwicz. A few weeks earlier, in March 2004, she’d had news that left her feeling numb: her most recent mammogram had found a small, early-stage breast cancer. She’d had surgery to remove it. And now, to help prevent it coming back, she was in the middle of a course of radiotherapy: five days a week, for five weeks.

“I was relieved not to need chemo,” she says, “but although the radiotherapy was much less unpleasant than I expected, as the weeks wore on I became more fatigued, and I had to regularly apply lotion to stop the skin peeling.”

Each year around 34,400 women are diagnosed with breast cancer at an early stage, when the disease is curable. Almost all have surgery, but about two-thirds also have radiotherapy to the affected breast, to further reduce the chances of the cancer coming back.

For a long time, women like Marie were given a ‘standard’ dose of radiotherapy split into 25 sessions, spread out over five weeks. But in 2009, thanks to our landmark studies, led by John Yarnold and Judith Bliss at The Institute of Cancer Research in London, this was reduced to 15 doses over three weeks, delivering a lower dose of radiotherapy in fewer trips to hospital, resulting in fewer side effects.

Based at the University of Cambridge, Dr Charlotte Coles is now part of the team that led this research, and by the mid-2000s, they were looking at how to improve things even further. “We were starting to use more detailed CT scans to plan radiotherapy, and a new, more targeted technology called Intensity Modulated Radiotherapy, or IMRT, had become available. We’d also noticed that, in the uncommon occasions when the breast cancer did come back, it usually did so very near the original tumour,” she says.
“This led us to wonder, could we use more sophisticated 3D imaging, together with IMRT, to target the region around the original tumour and treat just part of the breast, rather than the whole breast, to reduce long-term side effects? So, in 2007 Cancer Research UK funded us to run a new trial, called IMPORT-LOW, to try to answer this question.”

Among the trial’s 2,000 participants was Hilary Stobart, a former radiotherapy physicist who’d recently been diagnosed with early-stage breast cancer. “I used to work in an NHS radiotherapy department, so I was interested in research, and wanted to know if this trial would be of benefit to me and to patients in the future,” she says. “It was quite surreal – I’d spent most of my life trying to avoid radiotherapy beams, and now I had to lie under one.”

Hilary was randomly assigned to have the lowest, most targeted dose. “I had very few side effects – just some soreness at the start but that was it,” she remembers.

Last year, the trial’s initial results, following up women for five years, confirmed what the team had hoped: radiotherapy targeted to the affected area was just as effective at preventing the disease returning, but with fewer side effects.

“We were very pleased with the results.”

DR CHARLOTTE COLES
We were very pleased with the results, which showed low rates of the cancer returning, and few side effects, for all patients in the trial,” says Charlotte. “And around half as many women who had partial breast radiotherapy said the appearance of their breast had changed than those who’d had whole breast radiotherapy. This is something we know is really important, especially for patients’ psychological wellbeing.”

“We’re going to keep following up for another five years, to make sure the initial results hold true. We’ll also be working with researchers at the Cancer Research UK Cambridge Institute to study the biological characteristics of any cancers that do recur, to try and find out more about why this happened.”

The research team is still looking to make radiotherapy safer and kinder. “Cancer Research UK is now funding us to run a study called PRIMETIME, looking at whether women at very low risk of recurrence could even avoid radiotherapy altogether,” Charlotte says. “It’s only been open a year and we’ve already recruited over 400 women. We’re so grateful to the Charity for supporting it.”

Hilary and Marie are now both cancer-free and putting their experiences to use helping others. Marie took part in Race for Life – her ninth – just three weeks after finishing radiotherapy. Since then she’s taken part in many more events to raise money for Cancer Research UK, including the London Marathon. “My experience means I understand all too clearly why Cancer Research UK’s work is so important,” she says.

Meanwhile, Hilary now works as a patient advocate, working in partnership with researchers like Charlotte to help design studies with patients in mind. “Breast cancer treatment has changed so much over the last 20 years, and I kept thinking about the thousands of women who took part in research that shaped my treatment. I want to use my experience to make a difference in the future – and it’s great to be involved in helping Charlotte’s team recruit women to trials like PRIMETIME.”

“I want to use my experience to make a difference in the future.”

HILARY STOBART
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We believe that all our research is vital if we are to save more lives in the future.

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