CARDIOVASCULAR HEALTH

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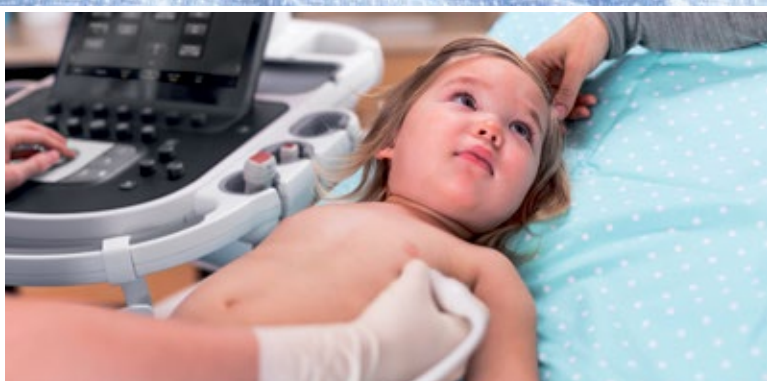

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Chief executives at risk of heart attack

Stressed business leaders under the cosh are often of the age when they are at greater risk of heart attack

MARTIN BARROW

Oscar Munoz was just 37 days into his tenure as chief executive of United Airlines when he suffered a heart attack. On paper at least, it should never have happened.

Mr Munoz is a keen sportsman who cycles and plays golf and tennis. He is also a vegan and is meticulous about his diet. Yet at the age of 56 and newly appointed to run one of the world's biggest airlines, he found himself alone in a hotel room on his hands and knees, in excruciating pain as he struggled to reach the phone to call for an ambulance.

The airline chief has made a full recovery after a heart transplant and is now back at work. His healthy lifestyle probably played a part in helping him to survive his heart attack. At the same time, he was maintaining a punishing work schedule, having come to the job at a critical time in the airline's history.

Mr Munoz was flying around the United States on a 90-day listening tour to meet disgruntled employees and angry customers. He was booked on to regional scheduled flights, with standard seats, and getting little sleep, often replying to emails at 3am. Effectively, he was flying around the country to get yelled at.

His health problems made headlines around the world, as is usually the case when the chairman or chief executive of a major company suffers a heart attack. And his illness was a stark reminder of the strong link between work stress and wellbeing. It emphasised how a gruelling schedule and high-pressure job can become unsustainable.

Yet there is little evidence available to suggest that senior executives in major organisations are at higher risk of cardiovascular disease (CVD) than other men or women of the same age.

Studies on C-suite health and wellbeing often cite research by cardiologist James Rippe at Tufts University in Massachusetts. Dr Rippe studied 200 patients, 75 per cent of whom were Fortune 500 executives. The study revealed that 73 per cent of the participants were living a sedentary lifestyle, which can lead to diabetes, heart disease and many other conditions. To make matters worse, 80 of the 200 patients studied were obese. The study also revealed that a high number had high cholesterol, high blood pressure and a large waist circumference, increasing their risk of heart attack.


Aaron P. Bernstein/Bloomberg via Getty Images

United Airlines chief executive Oscar Munoz

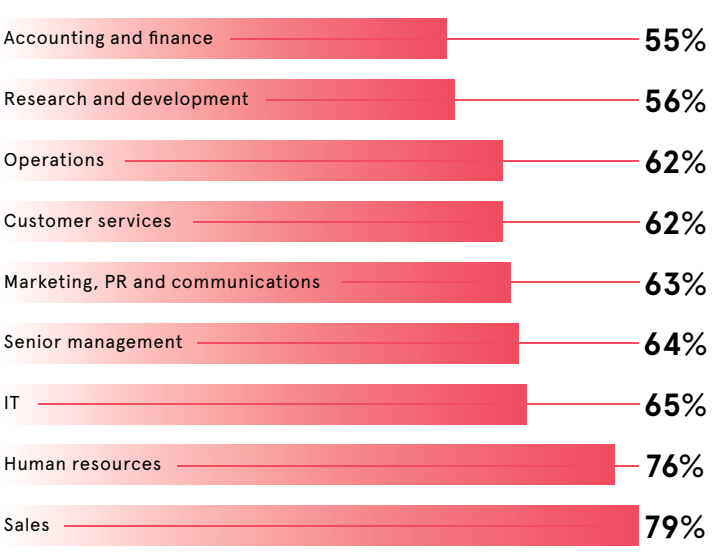
Similarly, a study by Stanford University's Graduate School of Business noted that, on average, seven chief executives of publicly traded US companies die each year. It found that of 161 chief executive deaths from all causes over a 22-year period, half (81) came without notice and nearly half of those (39) were the result of heart attacks.

These numbers are stark, but are not significantly out of line with the general population. Heart disease is still the main cause of death in the UK, where 73,000 people die from coronary heart disease every year. Across Europe, CVD accounts for more than one third of all deaths before the age of 75.

The risk of heart disease is higher among men in their 40s and 50s, the demographic that accounts for many chief executives. The problem for them is that they enter a period of their lives when they are at greatest risk of a heart attack, but with less time than they have ever had to take care of themselves.

Most stressful roles

Percentage of employees in the following departments who have experienced workplace stress



Perkbox 2018

However, as Mr Munoz discovered to his cost, running a global business has never been more demanding. Chief executives are at the centre of the 24/7 economy and are often responsible for operations around the world. They can spend many days on the road away from home, with limited options for healthy eating, exercise and regular sleep.

Not surprisingly, as companies increase investment in health and wellbeing policies at work, they are also paying closer attention to the support available for their senior leadership teams. Even if the risk may be no greater for chief executives than for the workforce at large, the organisational risk is very significant if a senior leader is suddenly taken ill or dies. Their health has implications for employees, shareholders, customers and suppliers.

Evidence also shows that if the chief executive and their team visibly acknowledge the importance of their own physical and mental health, it sends a powerful message across the organisation, at every level.

Business in the Community (BITC), the responsible business network, has worked with leaders of some of the UK's biggest companies, including Anglian Water, Unilever, KPMG, Royal Mail and Sky, to help change corporate culture to encourage employees at all levels to focus on their health and wellbeing.

Louise Aston, wellbeing director at BITC, says: "Wellbeing used to be positioned as a nice to have, fluffy bolt-on, with fruit on Fridays and lunchtime Pilates. However, wellbeing is now a strategic boardroom issue, linked to securing business objectives and driving sustainable performance and productivity. Both the business case and social case are compelling, and employee wellbeing is now firmly established as a core component of responsible business. This includes the whole workforce, including the chief executive."

Finally, it is worth remembering that no amount of preparation and knowledge can definitively protect you from a heart attack. Cardiologist John Warner, president of the American Heart Association, suffered a heart attack at a heart health conference in California last year. He was rushed to hospital, where doctors inserted a stent to open a clogged artery. Nancy Brown, the association's chief executive, notes that Dr Warner's heart attack was clear evidence that cardiac events "still happen anytime and anywhere". ◆

HAPPINESS

A smile a day helps keep the doctor away

Being happy and optimistic can help reduce the risk of heart problems, researchers have confirmed

Dario Valenzuela/Unsplash

MARTIN BARROW

We associate hearts with our most intimate feelings of love, despair, sorrow, joy. When we talk of heart break, sweethearts, a kind heart or the heartless, everybody knows what we mean. The link between our hearts and our emotions is unchallenged. Yet how real is it? Does our emotional health have any impact on our hearts? Can you be spared a heart attack by being happy?

Medical research suggests that happiness certainly can reduce the risk of heart problems. People with a positive outlook, who experience joy, happiness, excitement and contentment in their lives, are less likely to suffer heart disease, according to researchers from Harvard School of Public Health.

They set out to examine the association between positive psychological wellbeing (PPWB) and cardiovascular disease (CVD), conducting a systemic review of all relevant existing research. They reviewed studies examining an association between PPWB and cardiovascular health, as defined by objective indicators such as stroke and deaths due to CVD.

Their research included only prospective studies that followed people over time, rather than examining their histories. They also reviewed evidence on any association between PPWB and health behaviours such as smoking, alcohol consumption, diet and exercise.

The Harvard researchers concluded the evidence indicated that positive psychological wellbeing "protects consistently" against CVD, independent of other risk factors. Interestingly, they noted an advantage of hedonic wellbeing, based on pleasure and enjoyment, over eudaimonic wellbeing, based on fulfilling potential and wider social goals.

Harvard's review of the evidence has limitations, so it is difficult to draw firm conclusions from it on the potential relationship between PPWB and CVD. Many of the studies used to compile their review had limitations in their design and methodology. Even in prospective studies, it is possible that a person may have had early CVD at the time wellbeing was assessed, even though the symptoms had not yet presented. This means the condition may have actually existed before their state of mind at the time had developed.

World's happiest nations

Ranking based on a number of variables, such as GDP per capita, social support, life expectancy and freedom of choice

01 Finland
02 Norway
03 Denmark
04 Iceland
05 Switzerland

World Happiness Report 2018, United Nations

This study was first published in 2012 yet its findings continue to influence the evolution of the way we think about the link between wellbeing and longevity. The modern consensus is that being happy promotes a healthy lifestyle. It helps to combat stress, boosts your immune system and protects your heart, all of which can be expected to help increase life expectancy.

This isn't just something made up to encourage good behaviour, but is rooted in research. For example, last year the *British Medical Journal* published a study which suggested that people with higher psychological wellbeing were more likely to eat healthier diets and take part in physical activity, all of which reduces the risk of CVD.

This study covered almost 11,000 people aged between 45 and 72 randomly selected from Lithuania's National Population Register. It recommended that healthy lifestyle education initiatives should pay special attention to older adults with lower psychological wellbeing, with the aim of increasing physical activity, controlling smoking and promoting healthier choices of food and drink.

A number of prospective cohort studies have linked positive wellbeing to lower risk of heart disease. In the Whitehall II cohort of British civil servants, carried out in the 1980s, nearly 8,000 middle-aged participants responded to questions regarding their optimism, emotional vitality and satisfaction with aspects of their life including work and family.

Compared to those with low levels of emotional vitality or optimism, people with moderate and high levels were 20 to 30 per cent less likely to suffer coronary heart disease within five years. The study also found that greater satisfaction with work and family was also an indicator of reduced risk of heart disease, particularly angina.

Similar results have been reported from nationally representative North American samples. Optimism predicted lower incidence of heart failure and purpose in life was associated with reduced stroke risk among 6,800 older adults in the *Health and Retirement Study*. In the *National Health and Nutrition Examination Survey*, emotional vitality was predictive of reduced stroke risk in more than 6,000 participants. In addition, positive affect was protective against coronary heart disease in the *Nova Scotia Health Survey*. Importantly, the findings of these studies were maintained even after accounting for negative psychological characteristics, such as depression, anxiety and hostility, and biological and behavioural risk factors.

> **The modern consensus is that being happy promotes a healthy lifestyle**

In a sense, the findings of these studies should come as no surprise. We have long known that the risk of heart disease increases among the most deprived communities. Although money does not buy you happiness, it certainly can cushion you against the impact of life's ups and downs, and makes it easier to feel contented and fulfilled for longer. Financial wellbeing can also buy you time and space for exercise, and can make healthier food choices more affordable and accessible. All of which can reduce the risk of poor physical and mental health, including cardiovascular conditions.

Edward Diener, professor of social psychology at the University of Utah, has researched links between happiness and good physical health. He argues that doctors should monitor positive emotions, and not just negative ones, during routine physicals, as they do with questions about exercise, smoking and alcohol use.

"People are doing a lot of things to stay healthy," says Dr Diener. "They are jogging, riding their bikes, eating fruit and vegetables. We want to remind people that there's one more thing you need to work on that can also have a big effect on your physical and emotional wellbeing.

"Learning to enjoy your work, being more grateful and having really positive relationships are important too." ◆

Game-changing technology is a British success story

A dynamic new platform technology is coming on stream to transform heart disease diagnosis and treatment to reduce the economic burden of cardiac care around the globe

Creavo Medical Technologies has created an ingenious application of quantum physics that helps physicians to rule out ischaemic heart conditions in patients presenting at emergency departments with chest pains.

Around 900,000 people who attend emergency departments with chest pains in England and Wales eventually require no further treatment, but they are put on a pathway that involves a battery of tests of up to five hours, leading to a potential hospital stay.

"Up until now, there has been no way of ruling these patients out of a cascade of cardiac tests, so they clog up already overcrowded and under-stress departments, placing hospitals under huge economic strain," says Steve Parker, Creavo's chief executive.

"Vastly experienced emergency department physicians usually know from instinct which patients have heart disease and which haven't, but there is no test they can do to definitively send them home, so the patient must enter the cardiac chest pain pathway. It is time consuming, expensive and frustrating for the physician and the patient.

"But our technology detects a healthy heart and we can do that in a five-minute scan. It can help rule out those who do not need further treatment or diagnostic tests, so they can be discharged immediately."

Creavo's award-winning Corsens system, which measures electromagnetic fluctuations generated by the activity of the heart, has produced positive results from early trials. A much larger study is under way at five busy hospitals in England and it has just started clinical trials in five US hospitals.

The groundbreaking magnetocardiography (MCG) technology has garnered a series of accolades, including two at the prestigious Institution of Engineering and Technology Innovation Awards in November last year, while business confidence is such that the company has raised an impressive £20 million in investment in the four years since it was created as a spin-out from the University of Leeds.

The non-invasive device, a compact portable unit that can easily be wheeled to a bedside, works by placing a dinner-plate-size sensor above the patient's chest area, through normal clothing, to pick up subtle outputs from the heart's magnetic field generated by its electrical impulses. It is calibrated to identify patterns and confirm that the heart is functioning normally.

"We are the only medical diagnostic, which can be deployed in emergency departments, that can detect normality while everything else is looking for a problem," adds Mr Parker, a cardiology and medtech industry veteran, who is helming the company's rapid progress towards market launch expected early next year.

"This area is probably the most significant unmet healthcare need in hospitals in any country with a developed healthcare system."

Creavo's Corsens was also welcomed at the recent European Society for Emergency Medicine conference in Glasgow.

Research would suggest that a typical hospital seeing 300 patients a day in its emergency department could save at least £500,000 a year. Larger hospitals stand to save significantly more. Further studies show that 140 hospitals would have paid back their investment in the technology in four months.

The spark for the technology breakthrough came when Professor Ben Varcoe of the University Leeds School of Physics and Astronomy suffered heart trouble and was told by his cardiologist at the end of a busy clinic: "At last, someone with a genuine problem."

The burden of pushing a procession of patients through cardiac testing and then follow-up clinic appointments was explained, and Professor Varcoe set to applying his knowledge of quantum electrodynamics to map the electrical signals of a healthy heart.

Abnormal patterns in the magnetic fields reflect a loss of oxygen to the heart muscle (ischaemia), indicating the need for further tests and treatment while a heart free from ischaemic issues emits a different set of signals that are picked up by the device.

The company, which is based in Coventry and has Professor Varcoe as its chief scientific officer, is driven by a strong support team built around translating the original vision into an effective and easy-to-use device.

"I have been in cardiology for around 40 years and this is probably the most exciting development I have witnessed," says Mr Parker. "This has the scope to make an instant change for emergency departments, have a positive impact on hospital balance sheets and save patients from the uncertainty of needless testing.

"It is a British success story with technology developed at Leeds University with the first trials done at Leeds General Infirmary, spun out into a Midlands company and our major investor, IP Group, is a British fund. But, most importantly, it is something we can take to the world."

Creavo is now a dynamic force in a £4-billion technology market across Europe and United States, and its development scientists have identified another eight cardiac areas where the platform can be utilised. The issue of sudden cardiac death, which claims 4.25 million lives a year, is the next sector it will tackle.

"The potential of our technology is a compelling story, which is why we have investors from around the world," Mr Parker concludes. "The business case is established, we have clinical evidence with more to come and key opinion leaders back it because they see it as game-changing technology."

Steve Parker
Chief executive
Creavo Medical Technologies

> **This area is probably the most significant unmet healthcare need in hospitals in any country with a developed healthcare system**

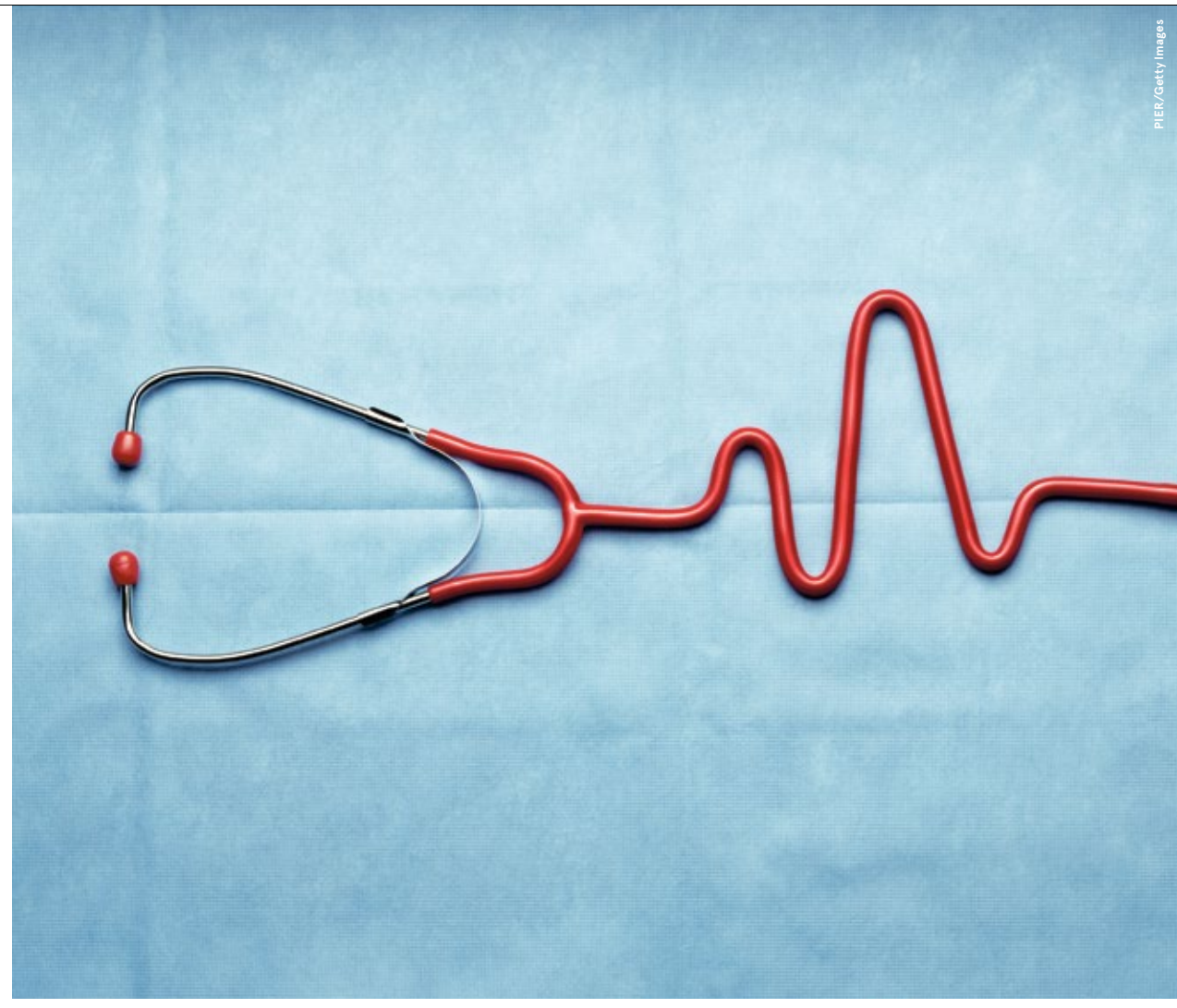
For more information please visit creavomedtech.com

CREAVO
MEDICAL TECHNOLOGIES

IDEAL HEARTCARE

Predicting the future by creating it

In an ideal world, what would the perfect healthcare system look like to treat heart disease?


PIER/Getty Images

DANNY BUCKLAND

In a vision that hovers on a distant horizon, every citizen will recall their blood pressure and cholesterol levels as easily as their bank card PIN.

Most would have trained in cardio pulmonary resuscitation (CPR) and the location of the nearest life-saving defibrillator machine would be triggered by an emergency call.

Drones would fly in medication to beat traffic delays, medical-grade scanning booths could be positioned at supermarkets while condition-tracking sensors would be implanted in our bodies making hospital care an element of heart health rather than the overbearing and budget-draining norm.

The notion of designing a new cardiovascular healthcare system from scratch unleashes creative forces and an intriguing question of what could be possible as the world heads towards a demographic nightmare.

Cardiovascular disease (CVD) claims 17.9 million lives globally while 422 million are living with its debilitating impact as healthcare systems strain to fund treatment. CVD care costs in the United States are expected to rise by 20 per cent to more than $1 trillion by 2030. The world population is ageing and seeing out its twilight years with greater levels of illness, so a new way of addressing the biggest global killer is essential.

Starting with a blank page is an energising exercise in the art of the probable. It is also a reminder of the societal and structural mountains that need to be moved.

Technology is advancing so rapidly that blue-sky thinking soon becomes developmental reality. But experts believe that gadgets and connectivity will not be truly transformative unless they are combined with seismic shifts in health behaviour and care delivery.

"An ideal system would promote a healthy lifestyle and prevent disease in the first place," says Professor Sir Nilesh Samani, a distinguished cardiologist and now medical director of the British Heart Foundation (BHF). "Some of the seeds of poor CVD health are laid very early on, so education in early-years schooling and with the family is a key component.

"A perfect system would have people taking much better control of their own health, along with us utilising big advances in technology. All this comes at a price, but there is lack of precision treatment at the moment, with some people on medication who don't need to be and poor adherence rates, and smart systems of the future would be cost efficient.

"There are tremendous advances and patient empowerment is coming. I am excited that patients are going to be much more in control via monitoring devices and access to their health records. But the biggest gains will be harnessing this in prevention."

The prevention mantra is echoed by Jan Kimpen, chief medical officer at Philips, healthcare technology giants. "If I could design it from scratch, it would be a continuum of care, not the fragmented systems we have now," he says. "We need to live and eat healthy, not use excessive alcohol, take exercise and not smoke, and I would design a system that helps that through digitisation."

"The perfect cardiovascular healthcare systems will feature the use of data, super powerful computing strength, with the wonder of medical advances, inspiring people to play their part in heart health

Apps to guide and nudge behaviour are already available, but they need to be integrated across healthcare and be an essential element of more fluid hospital workflows with minimal hospital stays and aftercare monitored by at-home devices, he adds.

"It is not about the innovation of products, but how we innovate the healthcare system," says Mr Kimpen. "We need to push towards value-based outcomes, not volume-driven systems. I am confident we can build a better future because of two reasons: healthcare costs are growing faster than national economies, which is unsustainable; and patients are becoming consumers and their demands are going to shift healthcare systems. It will not happen overnight but it will happen."

Sensor technology and miniaturisation are already taking space-age devices from the drawing board to the human body, such as Proteus Discover, an ingestible sensor that can track medication adherence and performance, which was approved recently.

But the American College of Cardiology (ACC), in welcoming the potential of technology, cautions about the clamour for direct-to-consumer gadgets.

"You can feel the tension in the cardiac community over this," says Sanjeev Bhavnani, physician scientist and cardiologist at Scripps Clinic and Research Foundation in San Diego, California, who is lead author of the ACC *Roadmap to Innovation* policy statement. "We should be deploying those technologies that are proven. My wishes for the future are that we have an evidence-based approach to technology and that partnerships between stakeholders can generate evidence before consumers purchase healthcare devices."

The use of patient data, artificial intelligence (AI) and linked devices can have a paradigm shift, but the breathless charge for innovation should not eclipse the need for evaluation.

"By 2050, we will see nano sensors embedded in people, implantable technology that monitors health passively and will alert rather like engine check lights

76%

of cardiologists are likely to use connected care technology in their practices, compared with 65 per cent of all healthcare professionals

51%

are likely to use connected care technology specifically for diagnosis, compared with 42 per cent of others

Philips 2017

in cars. Our vital metrics will be monitored all the time, in homes, cars and the wider environment," says Dr Bhavnani. "We are rapidly innovating and the next 20 years will be about how we bring this to the mainstream. It might be every home is going to have mirrors with sensors, which monitor heart rate and rhythm, and there will sensors in the body that detect diseases earlier, when they are more treatable, and that is an exciting prospect.

"Groups are already working on sensors that will detect the likelihood of heart attack before someone even has symptoms."

Collaboration is advancing with Philips identifying its Heart Safe City programme, running in Copenhagen, Seattle and Dubai, as an example. It connects emergency services via an app and trains people in CPR to improve the chances of surviving a sudden cardiac arrest.

The BHF is also working with Microsoft on cloud-based programme that identifies every defibrillator, so members of the public can access a device while ambulances are en route.

"Our big challenge is how we integrate advances with the health system and the lives we live now," says Jacob West, BHF director of healthcare innovation. "We don't want gimmicks and bolt-ons that don't work with the health system. We need the two to converge.

"But it is not that science fiction to think of a world where you have a digital health assistant, a next-generation of Google Home or Alexa, that contains all your personal medical history, and takes feeds from devices and sensor technology, which contain all the medical science and accumulated patient experiences relating to your health. Saying 'Alexa, I have a pain in my chest' could provide you with a credible first-line response in a way that might take you several weeks through appointments at the moment.

"There will be bumps on the road as we mesh more technology into our heart health systems, but none will be impassable."

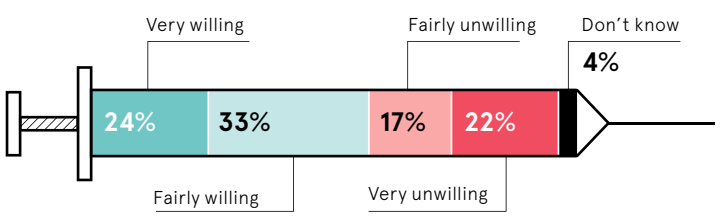
The perfect cardiovascular healthcare systems will feature the use of data, super powerful computing strength, with the wonder of medical advances, inspiring people to play their part in heart health. But the role of controlling and integrating technology, although less glamorous, is a critical component of care that can eliminate inequalities and have a fundamental influence on society and our ability to cope with shifting demographics without bankrupting nations.

The statistics of the future heart health burden are sobering, but there is comfort in the reforming words of Abraham Lincoln, who is credited with saying: "The best way to predict the future is to create it." ◆

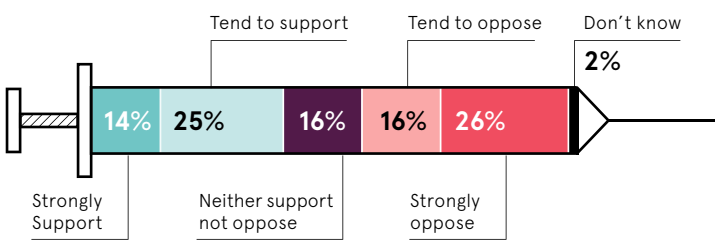
Patient opposition standing in the way of technological progression

How willing/unwilling UK patients would be to share personal data

NHS organisations having access to lifestyle data collected via apps/fitness trackers for use in delivering care



Commercial organisations having access to health data if they are undertaking health research



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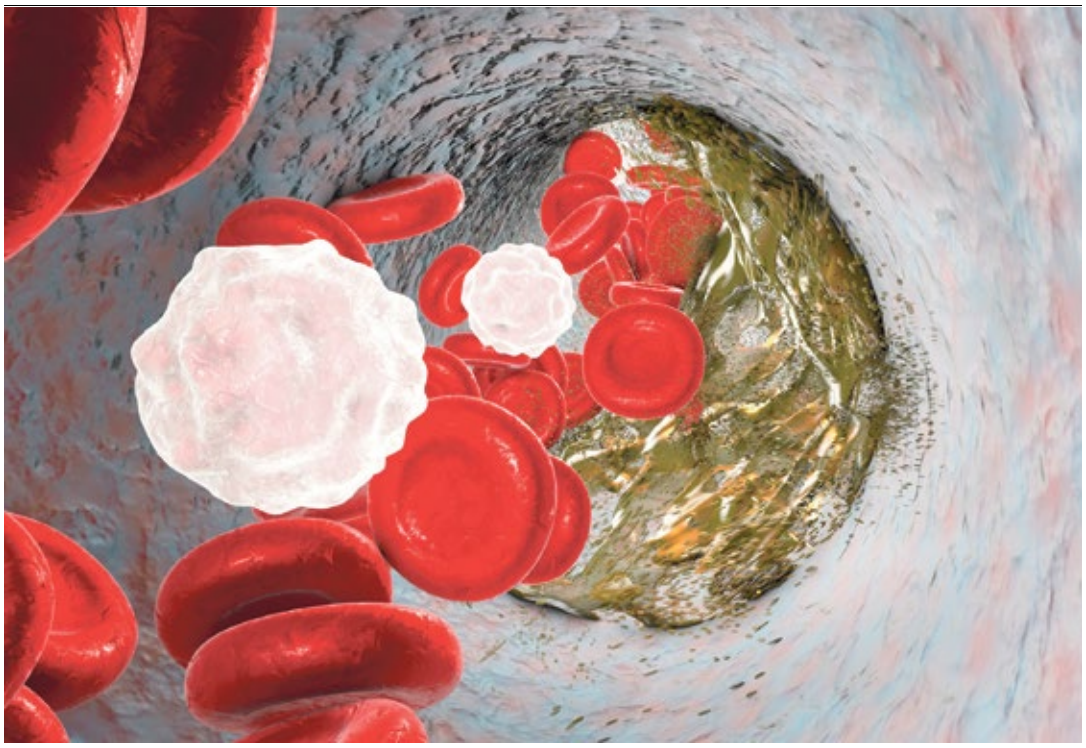


Q&A Beating bad cholesterol

Tackling high cholesterol is critical to addressing one of Britain's greatest health concerns, says **Tunde Falode**, general manager of the diabetes and cardiovascular business unit at Sanofi in the UK and Ireland

What is the burden of cardiovascular disease (CVD) in the UK?
Around seven million people in the UK live with CVD. It is one of the biggest causes of death and disability, costing our health service billions of pounds each year.

What is the link between cholesterol and CVD?
There are two forms of cholesterol: low-density lipoprotein (LDL) or "bad" cholesterol and high-density lipoprotein (HDL) or "good" cholesterol. LDL is the main source of artery-clogging plaque. HDL works to clear cholesterol from the blood.

When there is too much bad cholesterol in your blood, it can form plaque in the walls of your arteries that supply blood to vital organs, such as the heart and brain. In some people, this can cause blood flow to become sluggish or, critically, the artery to become blocked, increasing the risk of a heart attack or stroke.

Tunde Falode
General manager of the diabetes and cardiovascular business unit Sanofi

What should my cholesterol levels be?
More than half of all UK adults have high cholesterol levels, a risk factor for CVD. It is important to have your cholesterol levels tested and, if high, speak to your doctor about ways to lower them.

What causes high cholesterol?
High cholesterol can be caused by a number of factors, but is often diet or lifestyle related as this can affect the amount of fat in our blood and the way it circulates around the body. The following can increase cholesterol levels or affect the ratio of good to bad cholesterol: a diet high in saturated fat; not being physically active; being overweight; smoking; and your medical history, including whether you are living with diabetes, high blood pressure or have a family history of CVD.

However, high cholesterol is not always lifestyle related; it can be inherited. Genetic inherited high cholesterol (familial hypercholesterolaemia) leads to exceptionally high cholesterol levels and, if left untreated, this can lead to early heart disease.

How is high cholesterol treated?
People living with high cholesterol should first look to make positive diet and lifestyle changes to help bring down their risk of further complications. However, if needed, a doctor may also prescribe medication to help lower bad cholesterol levels.

Statins block the enzyme in your liver that helps make cholesterol. They are usually for people who continue to be at high risk of heart disease because they need to be taken for life. There are also medications available that block the absorption of cholesterol from food into your blood. Plus, alternative forms of treatments, which help the liver to lower cholesterol levels in the blood, usually prescribed on top of a cholesterol-lowering diet and where other treatments alone are not sufficient to lower bad cholesterol levels.

How is Sanofi helping to reduce the burden of CVD?
At Sanofi, we are focused on producing care solutions for the NHS to help address two key areas that contribute to CVD risk: the lowering of bad cholesterol in high-risk individuals; and the effective management of diabetes. Our vision is to empower life and we continue to strive to help improve the quality of life of people living with chronic conditions, while also supporting the sustainability of the NHS.

For more information please visit sanofi.co.uk

SANOFI

ASSOCIATED CONDITIONS

Treating the 'knock-on

Co-ordinated healthcare, recognising the links between cardiovascular disease and other conditions, would prevent illness and provide better outcomes for patients

JOHN ILLMAN

More than 420 people in the UK will die today from cardiovascular disease (CVD), accounting for more than a quarter of deaths, according to the British Heart Foundation. CVD is caused by atherosclerosis, a build-up of fatty deposits that restricts blood flow, depriving critical organs of life-sustaining oxygen.

How do the statistical odds stack up against the estimated seven million people at risk? Although CVD is associated primarily in the public mind with heart attacks and strokes, it is also linked to diabetes, chronic kidney disease, peripheral arterial disease and dementia. Many people with one CVD condition go on to develop another.

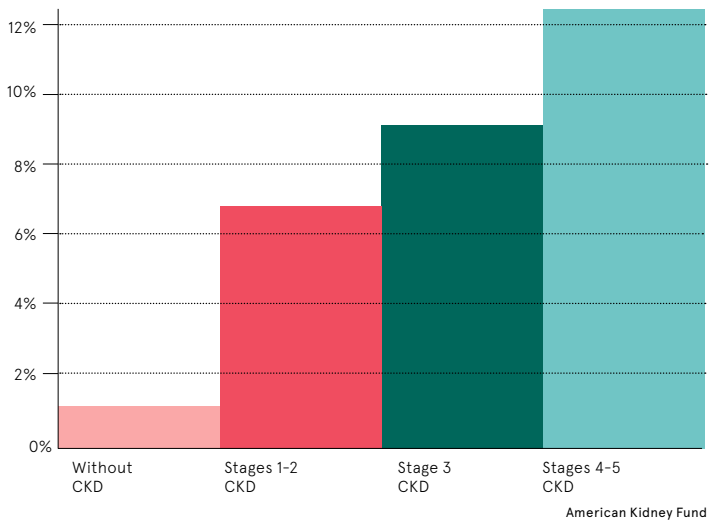
For example, if you have type-2 diabetes, your chance of developing CVD is more than double that of the general population. High blood sugar levels in type-2 diabetes may exacerbate atherosclerosis.

Chris Askew, chief executive of Diabetes UK, says: "Diabetes is the fastest growing health crisis of our time." The number of diagnoses in the UK has nearly doubled in the last 20 years from 1.9 million to 3.7 million. In addition, an estimated one million people have diabetes without knowing it.

The American Heart Foundation estimates that worldwide more than two thirds (68 per cent) of people with type-2 diabetes aged 65 or over will die from some form of heart disease and 16 per cent from stroke.

Heart failure and kidney disease

Percentage of patients suffering from heart failure at different stages of chronic kidney disease (CKD)*



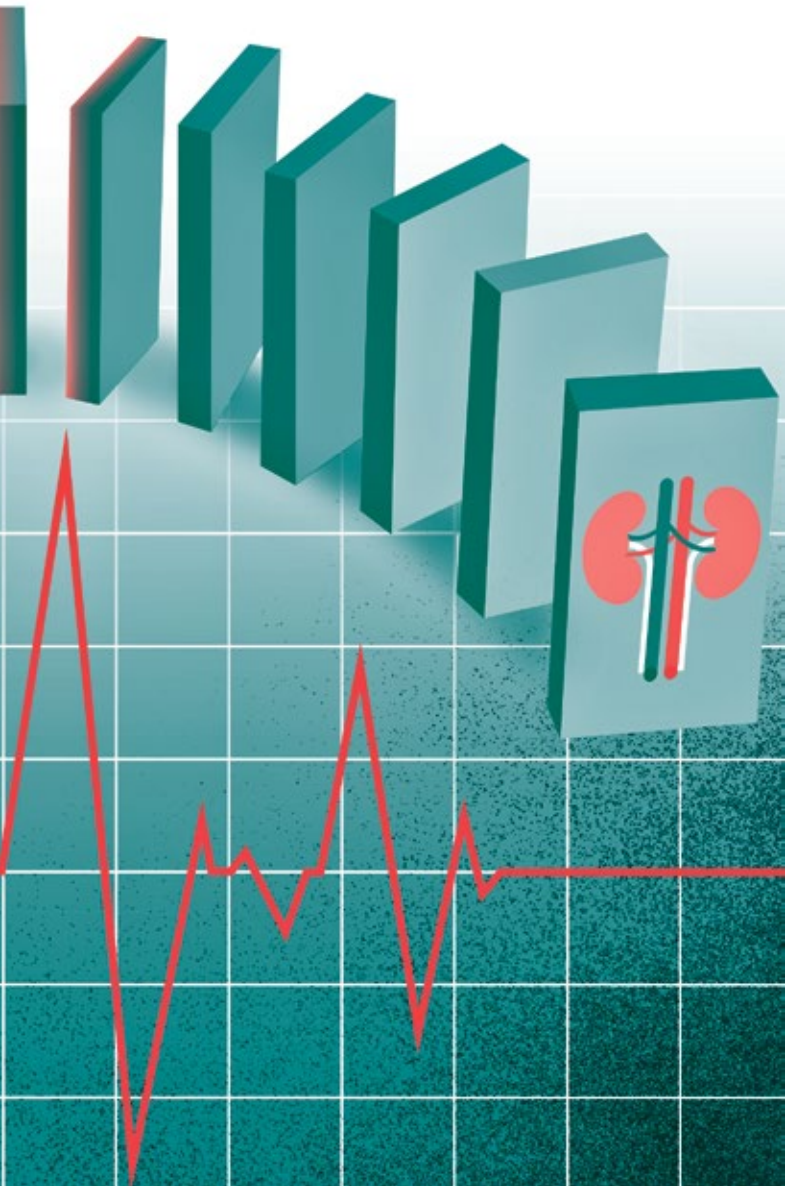
American Kidney Fund

65%
of patients with chronic kidney disease have high blood pressure

68%
of people with type-2 diabetes aged 65 or over will die from some form of heart disease

16%
of people with type-2 diabetes aged 65 or over will die from stroke

effects' of heart disease



Similarly, a problem in either the heart or the kidney can have a sinister knock-on effect in the other organ, leading to failure of both. Chronic kidney disease is becoming increasingly common because of our ageing society and rising rates of diabetes.

Reporting in the British Heart Foundation online magazine *Heart Matters*, researcher Dr Maarten Koeners of the University of Bristol says: "In the UK, kidney disease affects 8.5 to 9 per cent of adults. One in three people will develop some level of the disease in their lifetime. It's a condition that costs the NHS £1.45 billion a year and it kills more people than prostate cancer or breast cancer.

"There are no specific treatments, only treatments for the side effects such as high blood pressure, high blood glucose and anaemia."

High blood pressure is a big focus of his work because both the kidney and the heart help to regulate blood pressure. "More than 65 per cent of patients with chronic kidney disease have high blood pressure," he explains. "High blood pressure will accelerate loss of kidney function, increasing risk of heart disease."

Blood pressure helps to regulate oxygen flow throughout the body, but it is especially important in kidney function. The kidneys make up just 1 per cent of body weight, but 10 per cent of oxygen usage, ten times more than would be expected, says Dr Koeners.

> **A problem in either the heart or the kidney can have a sinister knock-on effect in the other organ, leading to failure of both**

"The kidney is a hard-working organ. Kidneys filter all the circulating blood in your body many times a day [between 30 and 60 times] to produce a total filtrate of 180 litres," he says. "Of these 180 litres, 99 per cent will be reabsorbed to produce a typical 1.8 litres of urine a day. All this activity makes it very susceptible to having less oxygen than it needs."

There are many different ways to treat CVD, but drugs and surgery alone will never be enough to reverse the so-called "Western way of death". A healthy lifestyle is critical. Support from relatives can also help, while also encouraging entire families to lead healthier lives.

Lifestyle changes can produce dramatic results. For example, an estimated 60 per cent of cases of type-2 diabetes could be prevented or delayed by measures such as weight reduction, diet and regular exercise.

The younger people begin such regimes, the better. Post mortem examinations of 200 US soldiers, with an average age of 22, who died in the Korean War in the early-1950s revealed evidence of atherosclerosis in 77 per cent. A further study, in 1993, of men under 35 who died from non-cardiac trauma, such as accidents, showed signs of atherosclerosis in 78.3 per cent.

Restricting development of atherosclerosis in young and old alike would have major economic as well as health benefits. In its recent report, *NICEImpact: CVD Prevention*, the National Institute for Health and Care Excellence (NICE) estimated that, over a three-year period, treatment of high blood pressure could prevent 9,710 heart attacks and 14,500 strokes, saving the NHS up to £274.2 million.

The Department of Health advises that CVD should now be treated as a single family of diseases rather than as a number of separate entities. In its report, *CVD Outcomes Strategy*, the Department of Health says the traditional approach has led to disjointed, unco-ordinated care.

Take the example of a patient, called Julia, who suffered from high blood pressure, heart failure and a heart rhythm abnormality. She then had a stroke. While in hospital she was also diagnosed with chronic kidney disease. Within just one year, she had more than 80 appointments with healthcare professionals. But she felt progressively unwell. A year later she was diagnosed with lung cancer.

According to the journal *Heart BMJ*: "If Julia had received integrated care with her at the centre, rather than care in silos by different teams, it is much more likely that her diagnosis of lung cancer would have been made earlier and might not have been fatal. Her experience of care would also have been better."

Julia's tragedy highlights that prevention is better than cure. This may sound trite, but it could prevent millions of premature CVD deaths and also reduce cancer risks. ◆

High systolic blood pressure

Heightened blood pressure or hypertension puts people at a high risk of coronary heart disease and stroke, as blood vessels weaken under the strain. According to the World Heart Foundation, symptoms includes tiredness, confusion, vision changes, chest pain, blood in urine, nosebleeds, an irregular heartbeat or buzzing in the ears.

Dietary risks

Poor, unbalanced diets are major contributors to cardiovascular disease (CVD), and high intakes of salt, saturated fats and alcohol can lead to increased blood pressure. Heart-healthy foods include fish high in blood-thinning omega-3s, potassium-rich avocados which can lower blood pressure and spinach high in nitrates that are found to widen clogged arteries.

High total cholesterol

Cholesterol is vital for bodies to function properly. However, while HDL or "good" cholesterol moves cholesterol to the liver to be expelled, LDL or "bad" cholesterol takes cholesterol to the arteries, where it may collect in artery walls, cutting blood flow and reducing oxygen to the major organs. High levels of saturated fat in diets, smoking and inactivity can all increase levels of LDL and reduce HDL.

Air pollution

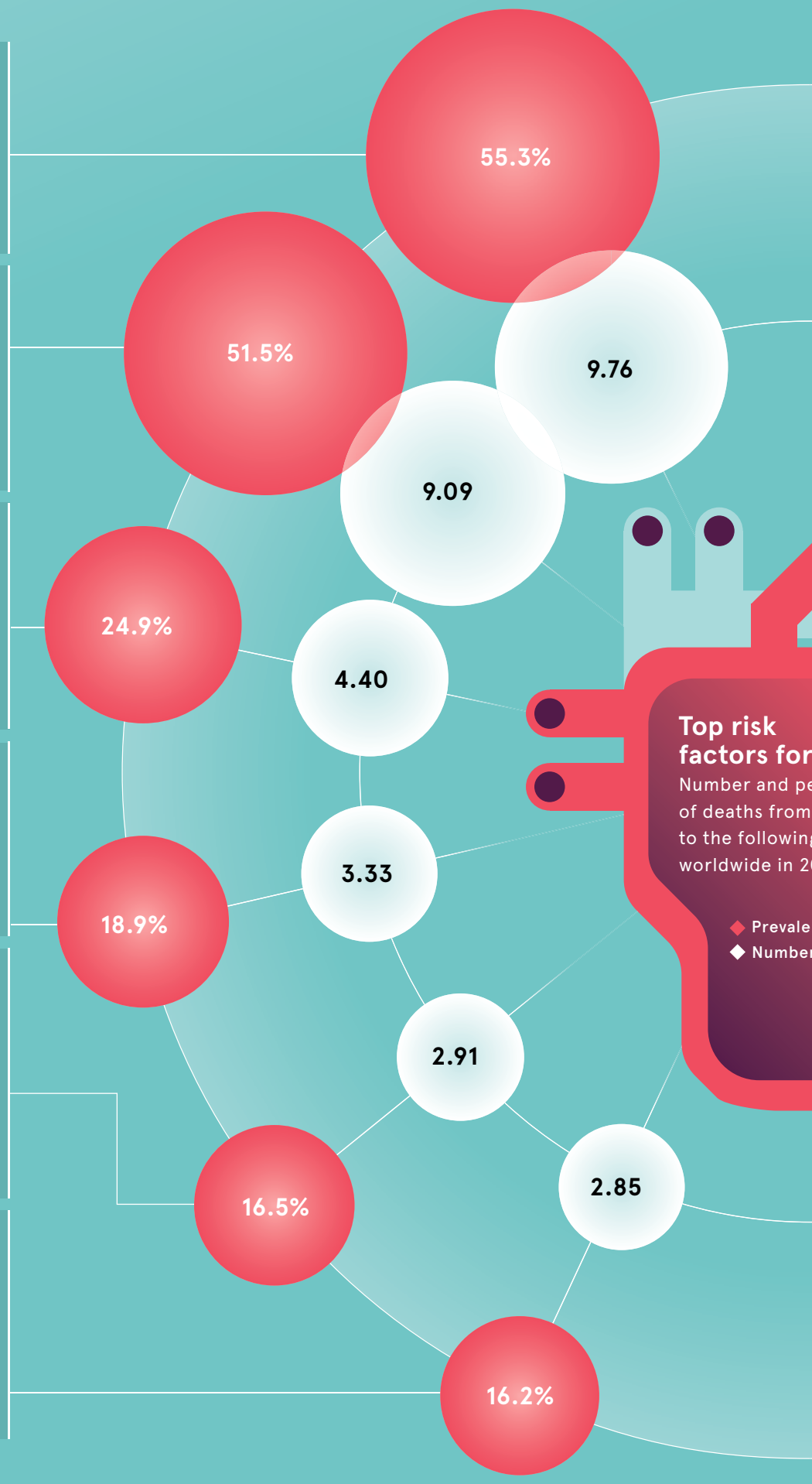
Traffic, power generation, factories or even cooking on a wood stove can increase exposure to the tiny pollution particles associated with CVD. Research shows that pollution can damage the inside walls of blood vessels, causing them to shrink and harden.

Tobacco

One in every six deaths from CVD is attributed to smoking, with smokers almost twice as likely to have a heart attack compared with non-smokers. Tobacco smoke damages the lining of arteries and narrows them through the build-up of atheroma (fatty material), while the carbon monoxide reduces the amount of oxygen in the blood, putting more pressure on the heart to pump harder. Nicotine, as a stimulant, also raises blood pressure by increasing adrenaline.

High body-mass index

Once considered a problem confined to high-income economies, obesity, classified by a body-mass index of 30 or more, is a growing epidemic which is now spreading to low and middle-income nations as dietary habits evolve. Overweight or obese people are more likely to develop hypertension, type-2 diabetes and musculoskeletal disorder, increasing the risk of CVD, according to the World Heart Federation.

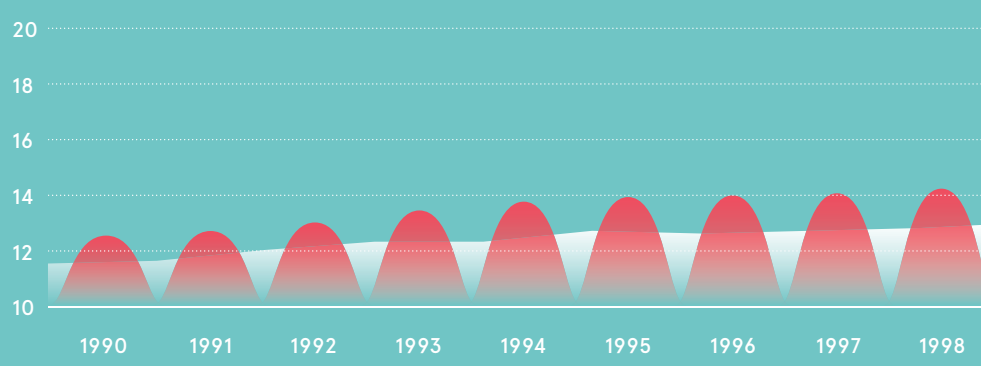


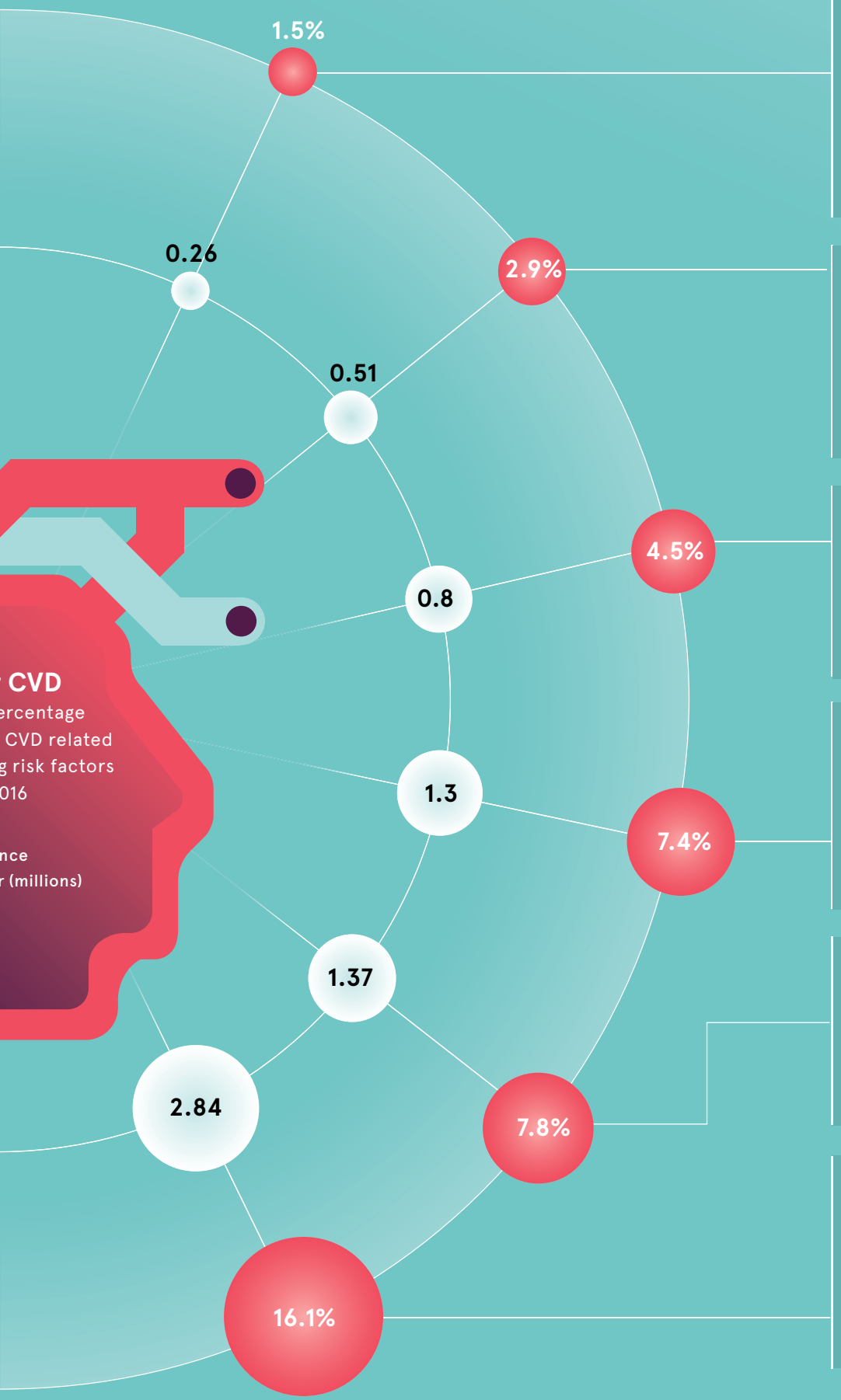
RISKY LIFESTYLES

A whole host of factors, from diet and alcohol intake to physical activity and blood pressure, can affect cardiovascular health. Knowing the importance of each and their impact on the heart can make a huge difference

Global number and prevalence of deaths from CVD

2016 figures in millions; latest data available





Occupational carcinogens

Contact with harmful substances, agents or environments in the workplace are a major concern for employees in industrial sectors, who are exposed to certain carcinogens on a daily basis. According to the World Health Organization, excess exposure to carcinogens can "lead to changes at the cellular level, resulting in the uncontrolled growth of abnormal cells that invade and destroy normal tissues in the lung, blood system, etc".

Lead exposure

While the positive correlation between lead exposure and blood pressure has been known for some time, recent studies have shown that there is in fact no safe threshold for lead exposure. Exposure typically occurs through historic uses of lead in fuel, paint and plumbing, and ongoing exposures through food and industrial sources.

Alcohol use

Alcohol can lead to a temporary rise in heart rate and blood pressure – the most common risk factor for CVD – while long-term, heavy drinking can weaken the heart muscle. Meanwhile, binge drinking can lead to an irregular heartbeat or arrhythmia, which can cause cardiac arrest or stroke.

Low physical activity

Many of the risk factors linked to the worsening of CVD – high blood pressure, abnormal blood lipid and cholesterol levels, poor insulin resistance and glucose intolerance – can be improved through increased physical activity. Most guidelines recommend 30 minutes of moderate-intensity physical activity five days a week.

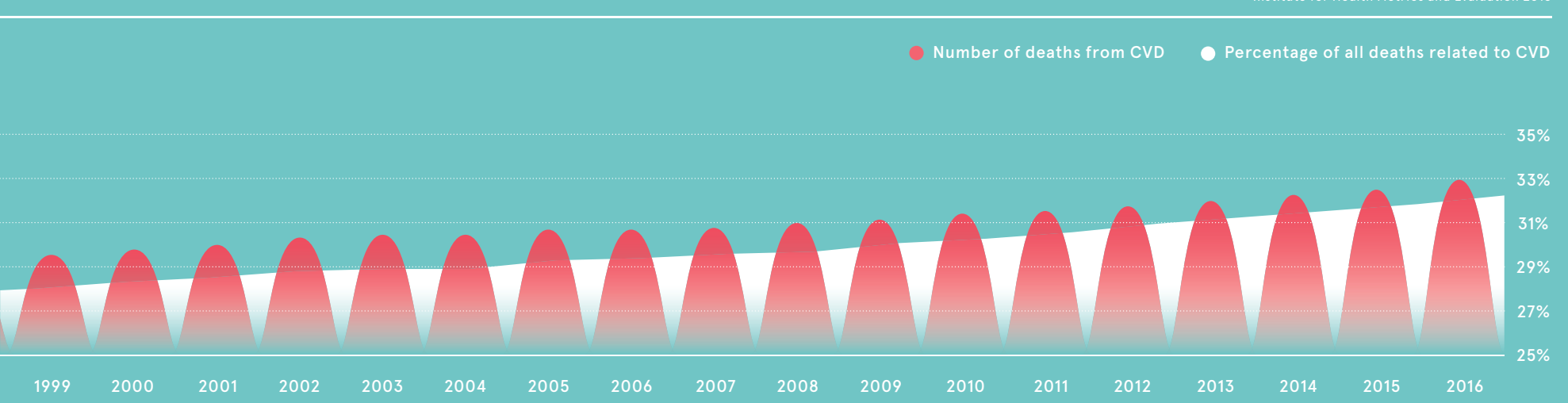
Impaired kidney function

When kidneys are damaged, the hormone system which regulates blood pressure attempts to increase the blood supply to the kidneys. This rise in pressure can damage the blood vessels carrying blood to the kidney filters, and weaken and enlarge the heart muscle.

High blood sugar

When blood sugar levels are too high, body can't break down all of the sugar properly, so more of it sticks to red blood cells and can build up, damaging vessels carrying blood to and from the heart. At the same time, CVD affects circulation, which can cause other diabetes complications such as problems with eyes and feet.

Institute for Health Metrics and Evaluation 2018



Commercial feature

Philips connects people and technology to improve heart health

Philips is working with clinicians treating heart conditions to help improve patient care and outcomes

Each day we learn more about how lifestyle choices affect our cardiovascular health. Public Health England's new heart age test, for example, revealed that four out of five adults have a heart age above their real age.

There is much that we can do to keep our hearts healthy and strong, and to reduce the risk of heart disease. The focus of World Heart Day this year, which is hosted annually by the World Heart Federation, is all about shifting the focus from treating illness to preventative care.

The aim is to encourage people to make a heart promise, a small lifestyle change that can add up to a powerful difference in our heart health, such as eating a healthy, balanced diet, doing 30 minutes of activity a day or giving up smoking, and can help to reduce the risk of developing cardiovascular disease (CVD).

Increasingly, technology plays a role in helping us make the right choices to stay well. But when things go wrong, despite our best efforts, technology is also there to help doctors provide the best care to get us back on our feet.

Many cardiac services are overstretched within the UK, partly as a result of the rise in CVD. This pressure is keenly felt in cath labs, where cardiologists examine the arteries around your heart through a relatively non-invasive catheter to determine the presence of any blockages or narrowing.

However, technology has a role to play in supporting cardiologists with this increasing workload, enabling them to perform procedures more consistently and efficiently, while maintaining the same level of confidence in diagnosis.

Nottingham University Hospitals NHS Trust provides a service to 2.5 million people in Nottinghamshire and surrounding counties. The trust delivers some 1,200 non-surgical catheter procedures a year in just two labs, so the department is incredibly busy with an ever-increasing strain on their finite resources.

As a result of the workload challenges, the trust implemented the Philips Azurion, a new-generation image-guided therapy platform, as a way of enabling them to treat more patients at a lower radiation dose, while maintaining their confidence in offering an accurate first-time diagnosis.

Neil Mesher
Chief executive
Philips UK and Ireland

> We help to create seamless solutions that connect people, technology and data

Andy Rogers, head of radiation physics, leads the team of scientists and technologists who support imaging and radiation safety across the trust. He says: "The Azurion has addressed these challenges, mainly by its ease of use."

The technology is enabling more patients to be treated, which is good for the nation's heart health. Mr Rogers says: "If we have stable staffing and we're able to really drive all the workflow benefits from this machine, then we might be a bit quicker. It is not that we'd do 20 cases instead of five in a day, but each small improvement over the course of a year takes the pressure off, makes for a better working environment and eventually means more patients can get treated."

Another way in which technology can provide support with the current strain on cardiac services is through portability, enabling clinicians to offer services outside the hospital setting and to connect with one another wherever they are in the world. This can overcome the burden on individual trusts, enabling them to share workload and offering the opportunity of a second opinion, in turn providing a superior service for patients.

The Lumify portable ultrasound system, recently launched by Philips, can turn ordinary, compatible tablets into an ultrasound solution, enabling clinicians to live stream images to share with experts anywhere in the world. For example, a midwife in the community could call upon their colleagues in the hospital to receive a second opinion, discussing the ultrasound examination as if they were in the same room.

Using the same technology, an emergency medical technician in an ambulance could stream the live ultrasound exam and discuss a patient's condition with an A&E physician to ensure hospitals have all the necessary information there is to know about a patient on their arrival.

Neil Mesher, chief executive of Philips UK and Ireland, says: "A core focus is to break the boundaries standing in the way of organising healthcare around the patient to deliver better outcomes.

"We help to create seamless solutions that connect people, technology and data. This includes our commitment to preventative care, such as through our partnership with the World Heart Federation for World Heart Day, as well as technology that has been designed to improve care within the hospital setting."

Technology is a critical element in the search for solutions to creating sustainable healthcare systems in the 21st century and supporting cardiovascular care is an important step in the right direction.

For more information on Philips cardiology solutions please visit www.philips.co.uk/cardiology

PHILIPS

4 out of 5 adults have a heart age above their real age

Public Health England

7m people live with cardiovascular heart disease in the UK

545 people visit hospitals due to coronary heart disease every day

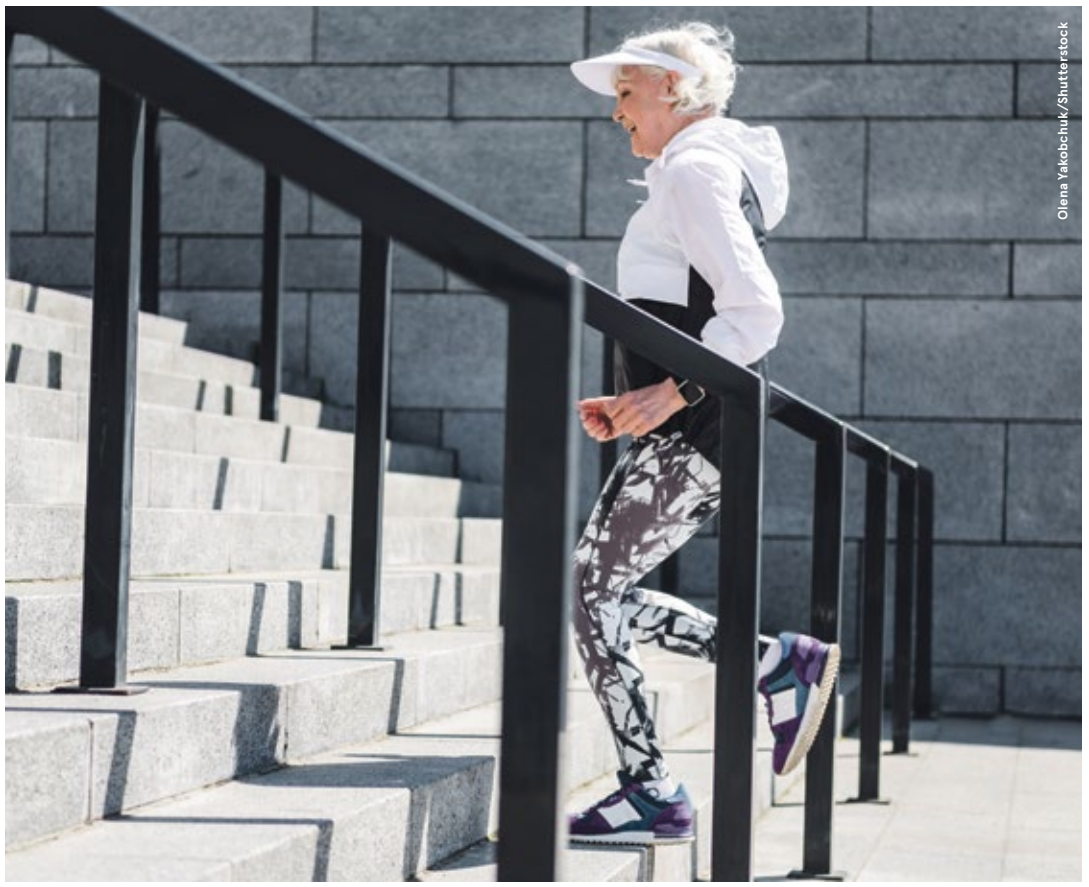
>26% of deaths in the UK are due to heart and circulatory disease

British Heart Foundation

1,200 non-surgical catheter procedures performed a year in just two labs by Nottingham University Hospitals NHS Trust

DIGITAL DEVICES

Tech tools working for healthier hearts



Olena Yakobchuk/Shutterstock

AliveCor

01

Apple

02

As the incidence of heart disease continues to climb with an ageing population, digital technology is transforming every aspect of prevention, diagnosis and management

ANN ROBINSON

Company director Andrew Marvin had to pull out of cycling coast to coast because he was experiencing palpitations and dizzy spells that puzzled his doctors.

"I wore a Holter monitor to record my heart rhythm for seven days, but it didn't record any abnormality because I only get episodes every two to three months," he says. "My cardiologist said that I was OK to cycle because I work out in the gym with no problems. But I didn't feel confident to take on a three-day challenge like the 136-mile UK coast-to-coast ride."

For Marvin, the availability of the Zio service, a small wireless patch worn on the left chest wall that records the heart rhythm continuously for two weeks, gave him the peace of mind to complete the ride this year. "The Pennines were a real challenge, but I made it," he says.

The Zio service is one of many innovations changing the face of detection and management of cardiovascular disease (CVD). It's a remote cardiac monitoring device to detect cardiac arrhythmias, or irregular heart rate, that may cause dizziness and palpitations, as in Marvin's case. Zio is being evaluated by the National Institute for Health and Care Excellence (NICE), and is already used by some NHS trusts and in the private sector.

Christopher Allen, senior cardiac nurse at the British Heart Foundation (BHF), explains why detecting arrhythmias is so important. "An irregular pulse can be a sign atrial fibrillation (AF). Blood clots can form in your heart due to AF and then travel directly to the brain. Strokes caused by AF tend to be quite major strokes as the blood clots can generally be larger in size," he says.

37%

of global consumers would be willing to use an artificial intelligence-enabled heart monitor to take note of symptoms and advise on treatment

PwC 2017

Leading cardiologist Dr Iqbal Malik is cautiously upbeat about a potential role for the Zio service, but says: "Low-tech solutions, such as checking the pulse and blood pressure in those most at risk, are the best way of detecting CVD in the population."

However, for busy people like Marvin, who experience intermittent symptoms and don't have the time or inclination to attend a clinic for an ECG, solutions like the Zio service are very attractive.

Other options include AliveCor, a medical device contained in two small patches that stick on to your mobile phone to record an ECG, and an app by Precordior that is being developed to detect AF also using your mobile phone. The app uses accelerometers, which are built into most smartphones, to detect movements of the heart using gyrocardiography technology.

Using digital technology such as ECG monitoring to detect AF is just one of many ways in which renowned cardiologist Roby Rakhit sees the landscape of CVD developing. Dr Rakhit envisages a role for tech in encouraging people to stay fit and well, and preventing premature CVD. Apps that track activity, exercise and heart rate "allow individuals to take responsibility for lifestyle intervention with potential benefits", he says.

Vitality Health insurance has partnered with Apple, offering discounts for the Apple Watch depending on levels of recorded activity. And some of the best tools to encourage a healthy lifestyle are free; for example, the NHS Couch to 5K tool provides a step-by-step guide to take you from inactivity to jogging five kilometres within nine weeks.

The problem is that individuals who are most at risk of CVD, because they smoke, are overweight and don't exercise, are least likely to engage with any of the burgeoning range of digital options that encourage a healthy lifestyle. The NHS is hopeful that its heart age tool might give people a jolt and shock them into action.

Mr Allen at the BHF says: "The tool is designed to give you an idea of how your lifestyle and risk factors like your cholesterol and blood pressure can impact your heart health. We've found that people struggled to understand how this works on a more 'technical' level, so giving someone a 'heart age' was a much more accessible way for people to have a basic understanding."

But no matter how committed you are to leading a healthy lifestyle and preventing CVD, the day may come when you are diagnosed with high blood pressure, an arrhythmia or heart attack. Once the condition is stabilised and you're out of the danger period, regular follow-up appointments can become time consuming and tedious.

"The problem is that individuals who are most at risk of CVD, because they smoke, are overweight and don't exercise, are least likely to engage with any of the burgeoning range of digital options that encourage a healthy lifestyle

01
AliveCor's KardiaMobile remote ECG is compatible with most smartphones and tablets

02
The newly released Apple Watch Series 4 can take an ECG to detect atrial fibrillation, though it is not intended for people who have previously been diagnosed with the condition

Dr Malik says there's a growing vogue for virtual consultations in the NHS. "It will cut out travel time for patients; young people with a single problem like palpitations will like it, but it may not suit older people with multiple problems who value the social interaction of a face-to-face consultation. And although virtual consultations save travel time for patients, it doesn't save time for doctors."

Doctors increasingly hold virtual clinics in which test results are reviewed and communicated to the patient, saving the need for further trips to the clinic.

And remote monitoring really comes into its own when a person needs a pacemaker or implantable cardioverter defibrillator device to control an abnormal heart rhythm or restart the heart if it stops. Remote monitoring systems are networked communication solutions that enable exchange of digitised data from an implanted or wearable device. A cardiologist can check the data and make recommendations without needing to see the person face to face. ◆

CLINICAL STUDIES

Diversity and imagination in research

Of the 281,000 registered clinical studies recorded worldwide by Statista this year, thousands are of cardiovascular disease which accounts for 31 per cent of all global deaths

JOHN ILLMAN


Joshua Dalsimer/Getty Images

Barber shops

The traditional male barber shop, with the familiar red-and-white-striped pole outside, is assuming a new role as a satellite outreach clinic for treating high blood pressure in African-American men.

Reporting in *The New England Journal of Medicine*, Ronald G. Victor, of the Smidt Heart Institute, Los Angeles, describes a study of 319 men with dangerously high blood pressure recruited from 52 local barber shops.

The men were divided into two groups. The first group's barbers encouraged them to meet specially trained pharmacists who saw them monthly to prescribe blood pressure medication and write progress notes to their doctors.

The barbers encouraged men in the second group to visit their doctor and make lifestyle changes such as increasing exercise and reducing salt consumption.

After six months, almost two thirds of the first group reduced their blood pressure to healthy levels compared with 11.7 per cent of the second group.

What's the secret of this success? Many men do not go to the doctor for regular check-ups, but they do enjoy a regular trim at the barber's shop, a manly environment where they can relax and enjoy the banter of masculine debate.

01

Wrinkle-gazing

No one welcomes the relief maps of creases and furrows we know as wrinkles. They are an affront to our vanity. But wrinkles are now causing a different kind of concern. Deep forehead wrinkles may indicate a higher risk of cardiovascular disease (CVD).

This is actually a good news story because CVD risk factors are predominantly invisible. High blood pressure, for example, is known as "the silent killer" because it is associated with unexpected heart attacks and strokes. Similarly, we do not feel dangerous cholesterol coursing through our veins. But we do see wrinkles.

Yolande Esquirol, associate professor of occupational health at the Centre Hospitalier de Toulouse in France, says: "We explored forehead wrinkles as a marker because it's so simple and visual."

He told the European Society of Cardiology how he and colleagues had assessed forehead wrinkles risk in 3,200 adults. The subjects, all initially healthy, were aged 32, 42, 52 and 62 when the 20-year study began. They were all assigned wrinkle scores: zero indicated no wrinkles and three numerous deep wrinkles.

People scoring one had a slightly higher risk of dying from CVD than those without wrinkles. Subjects scoring two or three had almost ten times the risk of dying than those scoring zero, after adjustments for age, blood pressure, diabetes, education, gender, heart rate and blood fat levels.


wavebreakmedia/Shutterstock

Dr Esquirol says further studies are needed to confirm the results, but physicians could begin risk-free, cost-free wrinkle-gazing immediately. Researchers have yet to discover the clinical relationship between wrinkles and CVD.

02


Kichigin/Shutterstock

Sauna therapy

Most people in the UK probably think of a sauna as a luxury, but Finnish people regard it as a necessity and with good reason. There are reported to be three million saunas in Finland, an average of one per household. The sauna is regarded as a place for physical and mental relaxation.

The American Journal of Medicine recently reported that the risk of developing high blood pressure was nearly 50 per cent lower among men who had a sauna four to seven times a week compared to men who only had one a week.

A sauna may cause a 2C rise in body temperature, resulting in a widening of blood vessels, and in turn an increase in blood flow and reduction in blood pressure. Regular saunas are also reported to improve endothelial function. The endothelium is a thin membrane which helps to regulate blood clotting, immune function and relaxation of blood vessels. Additionally, relaxation of body and mind may also benefit blood pressure.

03

04

IVF babies

Children conceived through intensive in vitro fertilisation treatment may be at increased risk of heart disease in later life, according to a study comparing 65 pre-school IVF children with 57 who were naturally conceived.

The Swiss researchers, from the University Hospital In Bern, believe this may be because artificial reproduction techniques, in which sperm and egg are stored in a medium, may affect blood vessels. The study followed tests with mice which found heart abnormalities were more common in mice conceived by IVF. ◆


2p2play/Shutterstock

OPINION COLUMN

‘Thousands of scientists are making it their mission to beat the heartbreak caused by heart and circulatory diseases’

We’ve made tremendous progress in transforming the lives of people living with heart and circulatory diseases. Since the British Heart Foundation (BHF) was established in the UK, the number of people dying from these diseases has halved, largely thanks to medical research, huge advances in treatments for heart attacks and stroke, and a decline in smoking. But worryingly, progress has slowed in the last few years.

Improvements in survival and the ageing population mean more people are living with chronic conditions and multiple illnesses. We could also see further increases in the numbers of people living with conditions such as high blood pressure and diabetes, which increase the risk of heart attack or stroke.

Experts have predicted that the numbers of people living with diabetes could dramatically increase over the next 20 years. Without changes tackling lifestyle factors, which can cause the disease, such as obesity and a poor diet, the number of people with diabetes in the UK could rise to five million by 2025.

Reversing this trend requires bold action from government to introduce regulatory changes aimed at promoting healthy lifestyles and diagnosing the disease early enough to prevent further illness.

The recent story of Tom Watson should remind us that addressing lifestyle factors can have phenomenal outcomes. The deputy leader of the Labour Party sent his type-2 diabetes into remission after losing more than seven stones in weight, by changing his diet and exercising more.

However, it isn’t always possible to reverse diabetes in this way, which is why we are working hard to find out more about genetic causes of diabetes and how we can prevent damage to the cells lining blood vessels in people with diabetes.

Figures also indicate that around seven million people across the UK are not being treated for their high blood pressure. People with high blood pressure are up to three times more likely to develop heart disease or have a stroke.

High blood pressure, which is often referred to as a silent killer, affects nearly 30 per cent of adults across the UK. Leaving high blood pressure untreated increases a person’s risk of having a potentially deadly heart attack or stroke.

We urgently need to learn from countries like Canada, where knowing your blood pressure has become as common as knowing your weight or PIN. This has led to vast improvements in diagnosis and treatment of high blood pressure, where in the past ten years the number of people with high blood pressure being given the correct treatments has risen from 13 to more than 60 per cent.

It is clear that improving diagnosis and treatment of risk factors, such as high blood pressure and diabetes, has the potential to save thousands, if not millions, of lives. But it’s not a silver bullet.

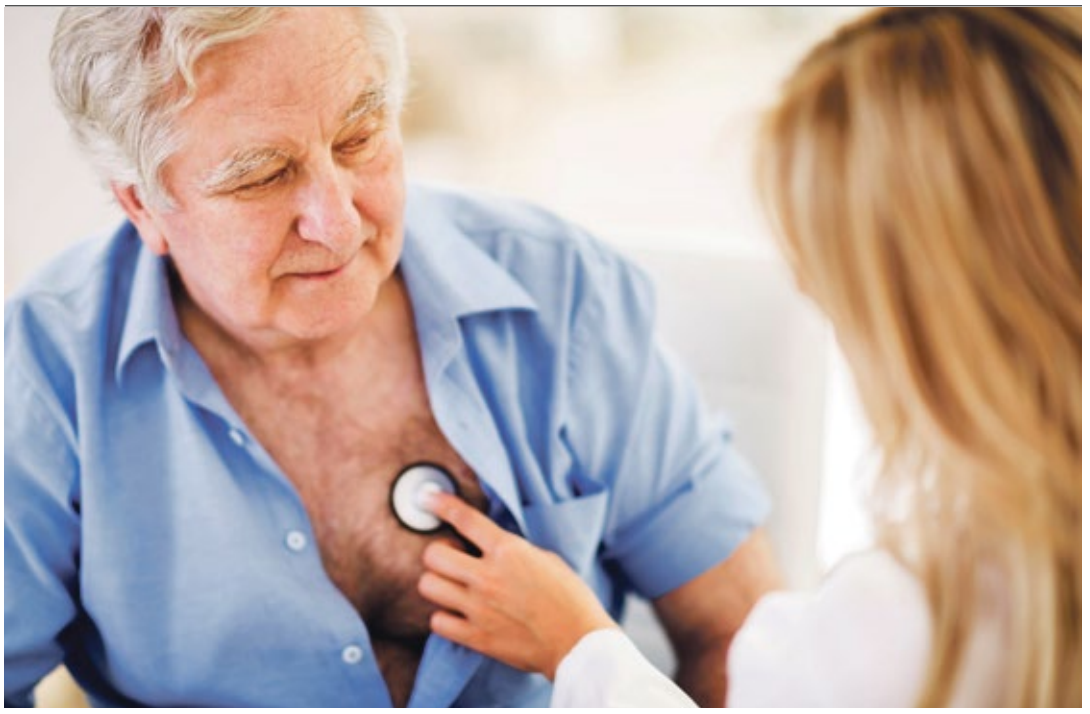
There are many heart and circulatory diseases for which treatments are at best limited and at worst non-existent. A standout example is heart failure, where the only treatment for some is a heart transplant.

It’s research that holds the key to treating the untreatable. That’s why the BHF is investing £100 million every year into research towards improved prevention, diagnosis and treatment of heart and circulatory diseases.

Up and down the nation, thousands of scientists are making it their mission to beat the heartbreak caused by heart and circulatory diseases. As you read this, we are one step closer to finding a cure for heart failure, pioneering new methods of diagnosing inherited heart conditions and further improving surgical procedures.

Simon Gillespie
Chief executive
British Heart Foundation

Commercial feature



Manifesto to beat heart valve disease

A little-known heart condition, which mainly affects older people, is on the increase

Heart valve disease, a condition where the heart valves no longer work properly, affects more than 1.5 million people over the age of 65 in the UK and is expected to more than double by 2056.

Despite these alarming statistics, barely 3 per cent of the population are aware of aortic stenosis, according to a survey for Heart Valve Voice, the UK patient charity for heart valve disease. The survey, carried out this year, also shows that few people would recognise the symptoms, which include chest pains, fatigue and shortness of breath as anything other than signs of ageing.

Heart valve disease affects the flow of blood through the organ. Left untreated, it can lead to heart failure and ultimately death. The condition is often associated with ageing and estimates suggest that by the age of 75, the prevalence of heart valve disease is more than 13 per cent. It is not known to be linked to gender or lifestyle factors.

Many patients remain undiagnosed and outcomes are poor for patients whose condition is not treated. Studies show that people with serious aortic stenosis, one of the most common forms of heart valve disease, have only a 50 per cent chance of survival after two years.

Heart valve disease is a treatable condition if diagnosed early. The doctor needs to use a stethoscope to listen for the characteristic heart murmur or click-murmur, which is usually the first indication of a heart valve disorder. It is a simple step, yet 78 per cent of over-60s in the UK say their doctor rarely or never uses a stethoscope during regular health visits.

Wil Woan, chief executive of Heart Valve Voice, says: “A lack of public awareness of the signs and symptoms of heart valve disease, and the severity of the condition, contributes to under-diagnosis and under-treatment.

“Treating heart valve disease can return people to a good quality of life and normal life expectancy, so it is extremely important to educate and inform people about the condition and also highlight the urgent need for doctors to keep using their stethoscope, which is the key to diagnosis.”

Patients go from stethoscope check for detections to an echocardiography for diagnosis and then forward for treatment.

Heart Valve Voice is joining patient organisations across Europe in launching the European Heart Valve Disease Partnership Manifesto to spread the word about the need for the timely diagnosis and treatment for heart valve disease. The manifesto brings together new evidence and data on heart valve services across Europe, demonstrating the need for change. It also sets out recommendations that are crucial to the improvement of the diagnosis, treatment and care for patients with heart valve disease.

Representatives from each of the organisations, along with MEP Mairead McGuinness, met in Brussels to present the manifesto to MEPs, clinicians, industry representatives and patients. They discussed the issues surrounding heart valve disease and heard from patient Pat Khan about her experiences.

Ms Khan was 55, in 2006, when she had a problem with palpitations, which acted as a red flag and prompted her to see a GP for a stethoscope check. “My heart had been compensating for a defective mitral valve and was getting tired of the extra work,” she says. “This particular valve was ‘leaky’. I didn’t know this and the GP explained that it can be very difficult to detect.”

Ms Khan’s faulty valve was surgically repaired and she was discharged from hospital four days after the operation. Recovery was slow, but with perseverance she extended the length of her daily walks. “I was eager to run before I could walk during the prescribed post-surgery exercise regime and I saw this as an opportunity to be not only myself, but a better, fitter, version,” she says.

3%
of the UK population are aware of aortic stenosis

78%
of over-60s in the UK say their doctor rarely or never uses a stethoscope during regular health visits

For more information please visit
www.heartvalvevoice.com
Twitter @HeartValveVoice

Heart Valve VOICE

No patient left behind: the fight for access to medicines for rare diseases

Funding of rare disease medicines – the challenges

A disease can be defined as "rare" when it affects fewer than five in ten thousand people. In the UK, this means that an estimated 3.5 million people will have a rare disease at some point in their life.

The number of medicines being developed and approved in Europe for treating rare diseases is on the rise, which is also increasing the volume of applications for funding on the NHS across the UK.

A number of funding bodies around the UK are tasked with assessing whether new medicines represent good value for money for taxpayers and should be funded for use by the NHS. In cash-straitened times, these are not easy decisions to make. However, assessing the "value for money" of medicines developed for small groups of patients has a number of innate challenges which these bodies are attempting to address.

Scotland and Wales have recently amended their reimbursement processes for rare diseases. One key change emphasises the importance of both the patient and the clinician's experience in living with, or treating, rare conditions which decision-makers may often not be familiar with. The assessment processes also take into consideration the issues around interpreting data which can only be derived from small patient populations.

Whereas in England the assessment for the funding of medicines to treat rare diseases is fragmented, with a number of possible processes split between two decision-making bodies, the National Institute for Health and Care Excellence (NICE) or NHS England.

When a medicine is assessed by NICE, there are two main mechanisms for consideration of rare conditions. Firstly, the same technology appraisal process used by NICE to assess conditions with larger patient numbers can be applied. This can be problematic when looking at medicines to treat much smaller patient numbers as cost effectiveness, which NICE assesses, can be difficult to quantify. Secondly, the Highly Specialised Technologies programme, which was specifically designed for small patient populations of around 500 or fewer across the country, can be used. This programme was developed following recognition of the challenges inherent in the standard NICE processes being used for assessment of medicines in conditions with very small patient populations.

Medicines with a positive recommendation for use on the NHS by NICE will be funded, by law, centrally by NHS England.

However, not all medicines for rare conditions meet the criteria to be assessed by NICE; these medicines are directly assessed and considered for funding by NHS England. In addition to medical devices and service developments, they are entered into a prioritisation process that takes place twice a year.

This year, NHS England had a total budget of £17.7 billion for the funding and delivery of specialised services, which are provided to people with relatively uncommon and complex needs. After prioritising a number of other statutory commitments and obligations, NHS England allocated a budget of £25 million to new interventions being considered in the prioritisation process. With a limited budget, NHS England then prioritises these new interventions to decide what it might be able to afford.

NHS England uses different methods to NICE; a simplified overview of this process is outlined in the graphic.

The outcome is not, therefore, inherently based on the added benefit to patients or cost effectiveness and ultimately some patients will miss out.

Amount of funding available for medicines and other innovations assessed by this process in 2018/2019 is

£25m

which has not increased since 2016, from a total specialised services budget of more than

£17.7bn

The basis for this funding allocation is unclear

> **Being able to access medicines that help to slow the progression of pulmonary arterial hypertension is of the utmost importance**

Challenges facing the PAH community

Pulmonary arterial hypertension (PAH) is an incurable and progressive illness, which ultimately causes right-heart failure and death. Breathlessness is the most frequent symptom, at first occurring with simple everyday activities such as climbing the stairs, and eventually patients can struggle to breathe even at rest. Left untreated, the prognosis is poor with an average life expectancy after diagnosis for some types of PAH of two to three years, worse than survival rates for some common advanced cancers.

Being able to access medicines that help to slow the progression of the disease is of the utmost importance, as it allows patients to live as normal a life as possible for longer, which is vital for a patient with a life-limiting disease.

In England, PAH medicines are considered for funding via NHS England's prioritisation process. Despite demonstrating sufficient clinical benefit to be considered by this process, a PAH medicine failed to secure funding in May as the budget could only fund treatments in the first three of five priority bands.

This decision has created a disparity in access across the UK as eligible NHS patients in Scotland, Northern Ireland and Wales are now able to receive treatment with this medicine. It has created the situation where patients from Wales are treated in specialist centres in England, while patients residing in England are not yet able to access treatment with this medicine through the same centres.

Commenting on the reimbursement process challenges of the prioritisation process, Dr Jayne Spink, chief executive at Genetic Alliance UK, says: "The series of opaque and seemingly illogical decisions made in the allocation of funding to decision-making processes for rare disease treatments in England are demonstrably inequitable. A more strategic, consultative and transparent approach is called for."

Improving care for PAH patients

A key part of addressing the unmet needs of people with PAH is ensuring all patients with rare diseases get fair and equitable chances of access to innovative new medicines. This may require reconsideration of the various assessment and funding mechanisms in England. In particular, NICE needs greater capacity to evolve its methods so it can appropriately assess more medicines for rare, and not just some ultra-rare, conditions.

With a vision for a normal life for people with cardiopulmonary disease, Actelion has a long-term goal to transform PAH into a chronic and manageable disease. We should all work together to ensure patients get timely access to innovative and beneficial treatments for all rare diseases, which often have devastating consequences for patients and their families.

Simplified overview of how these medicines are reviewed

01 An assessment of the evidence base is undertaken

02 The cost of treatment per patient and the cost to NHS England of treating all patients who might need the medicine/service is considered

03 The clinical evidence and the cost per patient is considered by the Clinical Priorities Advisory Group (CPAG) that NHS England relies on for medicine prioritisation recommendations

04 CPAG meets to rank and prioritise medicines based on clinical benefit and relative cost to treat a patient

05 NHS England considers this recommendation, along with the total number of patients and costs compared with the available budget and makes a decision on what will be funded. This means treatments for cancer, PAH or even surgical techniques can be competing for funding from the same budget

06 If NHS England is unable to fund all prioritised medicines, remaining medicines can go back to CPAG for another try in six months' time. This can happen up to three times

MACHINE-LEARNING

BURGER/PHANIE/Getty Images

Interventional cardiologists during the treatment of myocardial infarction

Machines are learning to spot illness

Applying the power of machine-learning to diagnosing heart conditions is being hailed as revolutionary

OLIVER PICKUP

Almost a third of all human deaths in the world are caused by cardiovascular disease (CVD), so encouraging news about breakthrough developments in diagnoses powered by machine-learning is enough to make your heart skip a beat.

Traditionally, healthcare providers are sluggish to embrace technology and, in addition, the industry is highly regulated, understandably so as people's lives are at stake. However, the growing evidence that machine-learning should be fully utilised is becoming overwhelming.

The meshing of big data and machine-learning enables much speedier and accurate diagnostic processes. It is already proving life-saving in healthcare in general and for those with CVD specifically as related conditions can be identified early, and impending strokes and heart attacks spotted in advance.

"Organisations big and small are applying machine-learning to provide solutions to problems ranging from the collection and interpretation of ultrasound images to diagnosing heart conditions closer to the level of accuracy previously only seen in invasive testing, to solutions looking at the blood vessels in the eye or the electromechanical signals of the heart to predict cardiovascular risk," says Ross Upton, chief executive of Ultromics, which develops echo-based diagnostic support tools for coronary artery disease.

"The impact of machine-learning will be as transformational to modern medicine as the discovery of penicillin was in the last century," enthuses Dr Mitesh Patel, UK medical director of health insurers Aetna International. "Machine-learning has the ability to spot signs of disease sooner than a clinician by comparing more complicated datasets and by reading heart scans at a lower error rate.

"It will read scans more quickly, with more accuracy and allow physicians to support patients by alleviating their workload. Looking ahead, machine-learning will enable low-cost diagnostics to be widely available, providing earlier and more accurate CVD diagnosis than ever before."

Developments in machine-learning diagnosis have come at a critical time. "Life expectancy in Britain is anticipated to increase to 85 years for a woman and 83 years for a man by 2030," says Dr Ronak Rajani, a cardiologist at The Harley Street Clinic, part of HCA Healthcare UK. "If we plot the leading causes of mortality across varying decades, after the age of 50, CVD is top and continues to rise with each decade of life.

"Unsurprisingly, CVD is one of the leading costs to healthcare systems in developed countries. Indeed, it is estimated that by 2030 the cost of CVD alone for governments will far exceed that of the annual military defence budget.

"The problem with big data is that it is too vast, complex, heterogeneous and changes too quickly for it to be used effectively by humans. The brain of a radiologist reporting eight cardiac computed tomography scans in an afternoon must process in excess of 650 million voxels of data, and needs to provide an accurate diagnosis and opinion based on the latest evidence."

This is where machine-learning can make life much easier. Niamh McKenna, Accenture's UK health lead, points to an encouraging project in India. "The cloud-based electrocardiogram (ECG) machine, developed by the startup company Tricog, is having a hugely positive impact in even the most remote locations in the country," she says. "It has changed the 80 per cent chance that a heart attack will take a life to an 80 per cent chance that the patient survives."

Closer to home, the European Union-funded CardioFunXion project involves 3D heart modelling and imagery-based diagnosis. Now tech titans are entering the market, which is expected to be worth $8.7 trillion (£6.6 trillion) by 2020. Google has an artificial intelligence (AI) algorithm that can predict CVD by scanning the back of a patient's eye. And in August Amazon hired Dr Maulik Majmudar, a leading cardiologist, for an undisclosed role.

Dr Rahul Potluri, clinical lecturer in cardiology at Aston Medical School, notes how widespread rollout of heart-tracing sensors is expected "due to the development of the feature on the Apple Watch and other such devices". He continues: "Potentially the ability to monitor heart rhythms remotely in real time is possible and certainly likely to improve diagnosis."

> **The impact of machine-learning will be as transformational to modern medicine as the discovery of penicillin was in the last century**

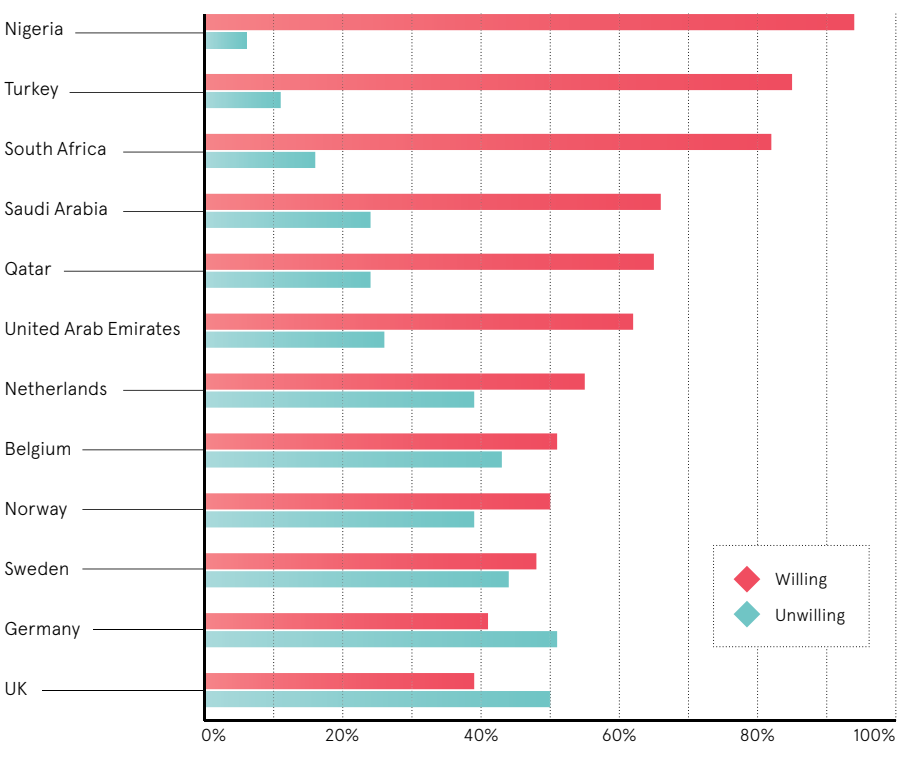
A team at the nearby Birmingham Children's Hospital, led by Heather Duncan, has recently completed a pioneering study known as RAPID (real-time adaptive and predictive indicator of deterioration), the first of its type in the world. "This wireless monitoring is different from many other big-data situations," says Dr Duncan, "because the processing is happening in real time and is based on McLaren Formula 1 telemetry.

"The most recent version of RAPID can give us ten hours' warning [before cardiac arrest], rather than the four hours using routine methods. I'm very excited because I believe that soon all patients will be monitored wirelessly, and machine-learning and smart alarms are the future."

Jeroen Tas, chief innovation and strategy officer for Philips, whose organisation last year launched HeartModel, providing automated 3D echocardiographic analysis, insists cardiologists are urging powerbrokers to embrace machine-learning. "Our *Future Health Index* shows that globally cardiologists are more likely than healthcare professionals, on average, to use connected-care technology in their practice in any way – 76 per cent versus 65 per cent," he says.

But sounding a caution, Accenture's Ms McKenna adds: "The potential for machine-learning in CVD diagnosis is huge, but there are concerns that AI may raise some difficult ethical questions. It is vital we use AI responsibility, with machines spotting anomalies, but humans using judgment and care to avoid bias." Matters of the heart are seldom straightforward. ◆

Percentage of consumers willing/unwilling to engage with AI and robotics for their healthcare needs



PwC 2017

TECH BREAKTHROUGHS

Tech developments are saving more lives around the world

Researchers are using technological advances to develop life-saving medical devices and procedures

ROGER DOBSON

01

Heart patch

A high-tech patch that helps heart muscle cells regenerate after a heart attack is being developed by researchers.

The collagen patch which contains a regeneration protein is placed inside the heart and has been shown to improve heart functioning and survival rates after a heart attack in laboratory animals. The animal hearts recovered and were close to normal working within eight weeks of being treated with the patch.

Most patients survive a heart attack immediately after it happens, but the heart is left damaged and scarred, making it harder to pump blood. Scarring spreads over time and can ultimately lead to heart failure. It is estimated that around half of heart failure patients die within five to six years.

Current treatments are aimed at making it easier for the heart to pump blood, although stem cells are also being investigated as a a way of regenerating damaged hearts.

It is the regeneration of the heart muscle and the problem of scarring, two areas not addressed by available treatments, that are the targets for the protein patch.

Key to the working of the patch, developed at Stanford and other US universities, is a protein called Follistatin-like 1 (FSTL1). Researchers examined more than 300 possible proteins, before identifying FSTL1 after discovering that it can stimulate heart muscle cells to divide.

Their research shows that it can trigger heart muscle cells already present in the heart to multiply and help rebuild the damaged heart as well as reduce scarring.

When it is surgically implanted, the patch has the elasticity of foetal heart tissue and releases the protein over time. Work on pigs that had suffered a heart attack showed the amount of blood pumped by the left ventricle of the heart dropped from the normal 50 per cent to 30 per cent, but was restored to 40 per cent after the patch was used. The pigs' heart tissue also scarred considerably less. Human clinical trials are planned.

02

Artificial intelligence

Doctors are using artificial intelligence and machine-learning to help treat heart patients.

In patients with dilated cardiomyopathy, where the heart's ability to pump blood is reduced because the left ventricle is enlarged and weakened, it's difficult to predict how the disease, which is the biggest reason for heart transplants in the UK, is going to progress and that makes treatment choices harder.

Researchers at Imperial College London, funded by the British Heart Foundation, are looking at how artificial intelligence can be used by doctors to predict the course of the disease.

"We are good at diagnosis, but not so good at prognosis," says consultant radiologist Dr Declan O'Regan, whose team has also applied a similar approach to another heart condition, pulmonary hypertension. "We have trained the computer to recognise features of the heart, so when we give it scans, it can analyse them.

"The computer may be able to spot differences that are beyond human perception. It can also combine information from many different tests to give as accurate a picture as possible. What really matters to patients is finding the right information and the right treatment at the right time."

To train the computer, it is given data from many patients, plus an algorithm or instructions on how to use that information, which includes heart scans, genetic and other test results, as well as survival data. Primed with this, the computer can work out the effects that different factors had, making it possible for it to go on make predictions about other patients.

03

Beatless heart

A new kind of pump may be the answer to the shortage of heart donors for transplants.

The healthy human heart pumps more than 30 million times a year and designers of artificial pumps have been hard pressed to provide that kind of performance in a device that it small enough to implant.

A team at the Texas Heart Institute believe they may have the answer with the so-called beatless heart, which works like a propeller rather than a pump, so there is no pulse.

The simple device consists of a rotor with two blades that spins inside a metal chamber that provides a continuous flow of blood. The smaller blade forces blood through the right chamber to the lungs, while the larger one moves it out of the left chamber and into circulation around the body. The speeds that the blades rotate varies to match the user's needs.

"It has only two moving parts floating in magnetic fields, so it doesn't burn out as fast as an artificial heart with multiple parts," says inventor, Dr William Cohn, director of minimally invasive surgical technology at the institute.

The heart has been tested successfully in animals and in one terminally-ill human patient where it worked for six weeks until his death. A significant advantage of the device over similar gadgets is that it is small enough to be implanted in children as well as adults.

Ultrasound

Using ultrasound to destroy one of the smallest organs may lower high blood pressure, a leading cause of heart attacks and strokes.

The treatment takes out one of the two cartoid bodies, each the size of a grain of rice, which are located in the neck near the arteries that supply the brain and play a key role in the control of blood pressure.

Around 16 million people in the UK have high blood pressure and many sufferers are unaware they have hypertension. Left untreated, it increases the risk of serious problems including heart attacks, strokes and kidney damage.

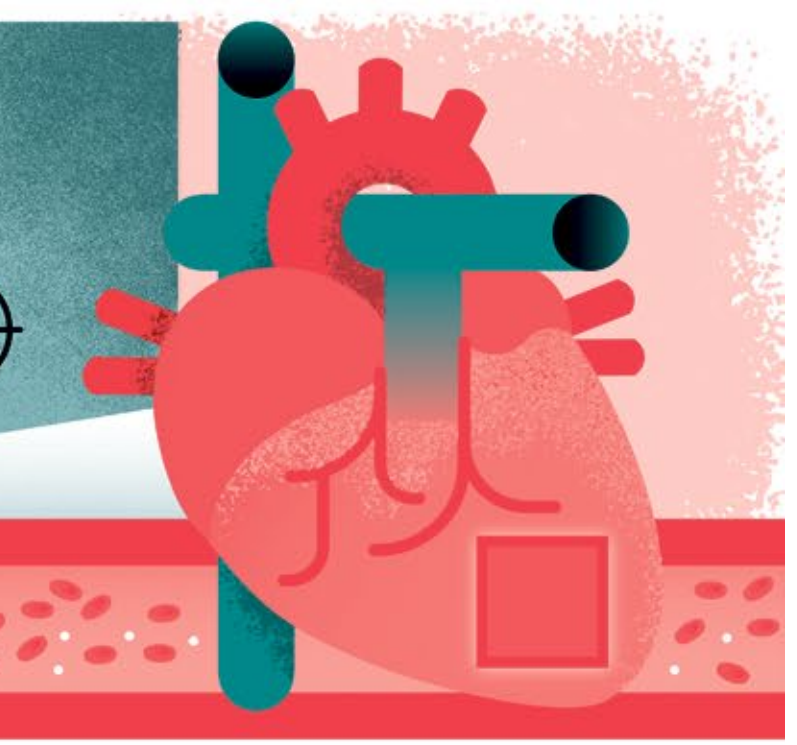
The theory behind the new treatment is that in some people with high blood pressure, the cartoids are hypersensitive and overreact, triggering constant high blood pressure. Researchers say the effect is similar to having a radiator thermostat set too high all the time.

Studies in animals and humans have shown that surgically removing one of the cartoid leads to an immediate and sustained fall in blood pressure, greater in some cases, than that achieved with medication.

The new treatment, which has been on trial at Royal Perth Hospital in Australia and other centres, uses ultrasound energy to destroy one of the bodies.

In the therapy, developed by US-based Cibiam, a catheter or tube is inserted into the femoral vein, which is located in the upper thigh and pelvic region, and navigated through blood vessels to the areas around the cartoids. Once in place, the ultrasound is activated.

04



Holoscope

Surgeons carrying out complex heart surgery can now view and interact with real-time 3D images of the patient's heart.

The image, created from scans and other data, floats in free space in front of the surgeon and can be used to plan and direct surgery in real time.

The Holoscope is the world's first medical holographic system that provides image capabilities for direct and precise interaction both with and within the images. It enables clinicians to have full and direct control of 3D images in real time. They can also rotate, zoom, slice, mark and take measurements within the floating hologram.

Developed by Israel-based RealView Imaging, it uses light shaping technology to create full-colour, high-resolution, dynamic and interactive 3D images, without the user having to wear a headset. It can be turned and flipped as it floats above the patient during the procedure.

The technology is also being adapted to provide similar images of holograms inside the patient during cancer procedures. ◆

05


In every **ordinary day**
we do **extraordinary** things
HCA UK's cardiovascular consultants have dedicated their lives to understanding the human heart. Every day, they work together to keep it beating. They treat patients from all over the world in our three private London hospitals: The Harley Street Clinic, London Bridge Hospital and The Wellington Hospital, each one a centre of cardiac excellence. Here every heart is in the finest of hands. **www.hcahealthcare.co.uk/cardiac**
Image: minimal access aortic valve replacement – Mr Chris Young, Consultant Cardiothoracic Surgeon
HCAHealthcare UK