Prostate cancer diagnosis—how scientists are working to get it right

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Credit: Cancer Research UK

Almost 48,000 men are diagnosed with prostate cancer in the UK every year. But questions are being asked of the tests used to diagnose these men, and how they might be improved.

The tests used today can be painful, invasive and, unfortunately, not that good at telling doctors for sure which cases need urgent attention, or

which can be watched over time. This challenge is most apparent when looking at the results of screening studies in men without prostate cancer symptoms using the PSA blood test.

But it's an issue than runs right through the process of diagnosing prostate cancer. And one that needs fixing.

"With prostate cancer, we've got the problem that some aggressive cancers are being missed, while lots of harmless cancers are being treated unnecessarily," says Professor Malcom Mason, a Cancer Research UK prostate cancer expert.

There's clearly room for improvement, but what would a good system look like?

"It's not about picking up everything," says Professor Mark Emberton, a prostate cancer specialist from University College London. "It's about picking up the right cancers – the one's that will cause harm and need treating. And avoiding the cancers that won't."

That's what researchers are working towards. And they're starting by improving existing tests that look for prostate cancer.

Specialist MRI – getting up close and personal with prostate cancer

An important step has been getting eyes on the tumour. "For a long time, we diagnosed and treated prostate cancer without ever properly seeing it," explains Emberton. "This all changed with MRI."

This is not just any old MRI. The big interest has been in a special type of imaging called multiparametric (or mp) MRI. It combines three or

four different scans, which can help radiologists build a clearer picture of what's going on in the prostate.

And results suggest it can steer diagnosis in the right direction – by ruling out the need for, or helping guide, follow-up biopsies.

In two studies that involved over 1000 men, scientists found that mpMRI can prevent unnecessary prostate biopsies. The latest results showed that 1 in 4 men with an abnormal PSA test or rectal exam didn't need a biopsy, as the scan showed no abnormalities.

And for men who did need a biopsy, the scan results helped guide doctors taking these tissue samples. This made it less invasive and more likely to pick up abnormal cells than a standard biopsy.

Specialist MRI scans aren't a standard part of prostate cancer diagnosis yet. They're being reviewed by the National Institute for Health and Care Excellent (NICE), which will decide whether or not to recommend the scans as part of standard NHS prostate cancer diagnosis.

And as with any new technique, there's work to be done to ensure that the way the scans are run and analysed is consistent across the UK. Prostate Cancer UK is working with NHS England and hospitals to address issues around access to MRI scanners and specialist training. And we're campaigning so there are enough NHS staff in place to diagnose cancer, including the radiologists who interpret scans.

Putting Gleason grade 'to the test'

Specialist MRI to guide biopsies looks like a big step forward. But what if it could replace biopsies altogether? That's what Emberton and his team are aiming to find out, in a new study funded by the Medical Research Council and Cancer Research UK.

They will combine mpMRI with potential new diagnostic tests – such as looking at DNA shed by cancer cells into the blood – to see if they can predict prostate cancer progression better than the current system: Gleason grade.

"Gleason grade has been the mainstay in prostate cancer diagnosis for many decades," says Emberton. "But the time may have come to challenge it by combining imaging with an understanding of the genetic basis of prostate cancer."

To do this, they'll recruit 1000 men with abnormal results following a specialised prostate MRI scan. As part of the study, the men will have an MRI-guided biopsy, as well as blood and urine analysis. The team will then monitor the men using electronic NHS records until they die.

"We'll be able to track what treatment men are having, how successful it is and what happens to their cancer over time," says Emberton. "And link that back to the information we got during diagnosis."

At the end of the study, they hope to have a new set of tests that not only diagnose prostate cancer, but also help to guide treatment. This would mean that in the future, men could be diagnosed without the need for an invasive biopsy.

It's an ambitious study, and it will be a while before we have results. But, according to Professor Mason, the length of the study is what sets it apart.

"Most studies stop when they get a diagnosis of 'clinically significant prostate cancer', but the issue is we don't know what that actually means. The fact that this project will follow people up and look at survival is a huge strength," he says.

"We'll have to wait a while to get answers, but it will be worth the investment."

What else is happening?

MRI isn't the only focus for prostate cancer diagnosis, scientists are also testing an ultrasound process called shear wave elastography. This sci-fi sounding technique measures how elastic tissue is. And as tumours are stiffer (or less elastic) than normal prostate tissue, it could provide a way to get information on prostate cancer.

Scientists have tested the technique in 200 men who were about to have surgery for prostate cancer. They found that the test could detect prostate tumours, and the results broadly matched Gleason scores. They'll now need to put shear wave elastography to the test in men who haven't already been diagnosed.

As well as improving diagnosis, scientists are also working to identify men who might be at a higher risk of developing prostate cancer. And then work out what to do with this information. Research shows that black men and men with faults in genes called BRCA are more likely to develop prostate cancer. But Mason thinks there's more to learn.

"We have some clues as to who might be more likely to develop prostate cancer, but we need to refine it more. We should look for more detailed genetic signatures and markers that could help us detect risk."

For Professor Rosalind Eeles, based at The Institute of Cancer Research, London, that means focusing on faulty genes. Eeles has spearheaded an international collaboration to give researchers around the world access to genetic samples from men with prostate cancer. It could help scientists identify faulty genes more quickly, which doesn't just help predict who might be at risk, it could also open the door to new treatments.

Beyond diagnosis

Getting diagnosis right is a major hurdle in boosting prostate cancer survival. But without effective treatments, it would all be for nothing.

Thankfully, progress is being made here too.

We're supporting a trial testing combinations of drugs for men with advanced prostate cancer. STAMPEDE, led by Professor Nick James at the University of Birmingham, has been running for 13 years, and has already changed how advanced prostate cancer is treated. It continues to test new drug combinations, with the most recent results showing that adding the targeted drug abiraterone (Zytiga) to standard hormone treatment improves survival by 40%.

And for men with prostate cancer that hasn't spread, incremental improvements in how radiotherapy is given is helping reduce side effects and the number of hospital visits.

Experimental treatments like high intensity focal ultrasound (HIFU) could also make waves for prostate cancer treatment. The ultrasound technique aims to kill cancer cells using high intensity sound waves and initial trial results suggest it may work as well as surgery or radiotherapy. Scientists are measuring the long-term benefits of the treatment.

Scientists are also testing if an experimental laser treatment can help. The futuristic approach, called vascular-targeted photodynamic therapy, was found to be safe in early trials. But more research is needed before we'll know if the treatment can help save lives.

Bringing it home

The goal is clear: to make prostate cancer diagnosis smarter and more reliable.

There isn't a quick fix, but by using new techniques to build a clearer picture of how prostate cancer progresses, that's what scientists are aiming for. And if they can predict how prostate cancer behaves, it might make treatment more personal too.

"We're working towards a system that would allow us to predict how prostate cancer will progress and pick the right treatment for each person," says Emberton.

Provided by Cancer Research UK