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Cancer Screening Leaps Forward

Innovation sneaks up on us: There's a new DNA test that detects more illnesses, earlier.

By

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The Grail building in Menlo Park, Calif.

PHOTO: COURTESY OF GRAIL

So often the future shows up when you're looking for something else. In 2013, DNA sequencing company Illumina bought Verinata Health and began offering noninvasive prenatal testing. Using a pregnant woman's blood, a now-$500 DNA test can spot Down syndrome and other chromosomal conditions. Since then, the use of very invasive needle-to-the-womb amniocentesis testing has dropped.

But that's not the story here. Of the first 100,000 women tested, 10 (or 0.01%) had unusual chromosome patterns. The fetus was fine, but in each case, the mother had cancer of differing types. That was worth investigating—600,000 die from cancer in the U.S. each year—but large expensive clinical trials would be required.

So Illumina spun out a new company named Grail in Menlo Park, Calif., to do what's known as Circulating Cell-free Genome Atlas studies. Running DNA sequencing on regular blood samples, Grail generates hundreds of gigabytes of data per person—the well-known A-T-G-C nucleotides, but also the "methylation status," or whether a particular DNA site's function is turned on or off (technically, whether or not it represses gene transcription).

Most popular DNA screenings for cancer risk test only a single gene site, like BRCA1. But Grail's chief medical officer Josh Ofman tells me, "cancer may show up as thousands of methylation changes, a much richer signal to teach machine learning algorithms to find cancer" vs. a single site. "There are 30 million methylation sites in the entire human genome on 100,000 DNA fragments. Grail looks at a million of them." It takes industrial-grade artificial intelligence to find patterns in all this data, something a human eye would never see.

Mind you, this is not a consumer 23andMe test of your genome that says you might have, say, a 68% chance of getting cancer. Grail is detecting the signature of actual cancer cells in your blood. According to validation data published in the Annals of Oncology, the test can find 50 different types, more than half of all known cancers.

And it can find cancer well before symptoms show up, in Stage I or sooner, when therapies are cheap and effective. If Grail can scale, it will be a massive game-changer. Five-year survival rates can approach 9 in 10 if cancer is detected early, compared with about 1 in 5 in Stage IV.

Sure, we have cancer diagnostic tests today, but they're awful—too many false alarms, as many of us know all too well. The false-positive rate from biennial mammograms is 11% among patients 55 to 79. For a Pap test to identify cervical cancer, it's 6%. For a heavy smoker, the false positive rate of a chest CT scan is 13%. For a PSA prostate test, it can be as high as 75%. That's awful. Oh, and Mr. Ofman says 80% of cancer deaths are from cancers that we don't currently screen for.

The Grail DNA test's false-positive rate is less than 1%. And the company says the test is more than 93% accurate in identifying the type of cancer. Again, if cancer can be found early, treatment is much easier. You can cut it, heat it, freeze it or zap it out, especially since you should know where it is. This is how you save the health-care system.

Though delayed by Covid lockdowns, Grail hopes to roll out its tests in the next six to 12 months. My guess is that the tests will cost about $1,000 at first, but will trend toward $100 over time. Will your insurance pay? Ha ha—try getting a heart scan without chest pains. But it should, and I predict the tests will be covered eventually, for two reasons. First, they will gradually become cheaper than today's awful cancer tests. Second, the savings from early treatment compared with costly and painful Stage IV treatment will eventually show up in insurance company cost-benefit spreadsheets.

Grail is only one player in the booming "liquid biopsy" field. Thrive Earlier Detection of Cambridge, Mass., has a different style of DNA-based cancer blood test. Hopefully competition will drive down costs. Other companies are pursuing clinic or hospital-based blood tests to help figure out the type of cancer and if tumors are responding to treatment. The more the better.

Grail has raised almost $2 billion, including from Bill Gates and Jeff Bezos. Isn't that interesting? Though much maligned as fat cats sitting on piles of gold coins and monopolists out to control the world, Messrs. Gates and Bezos are investing in technology —this is not philanthropy—that may save you or a relative's life someday.

Innovation comes through surprises. This is a big one. And while worrywarts brood over artificial intelligence and robot overlords, early detection of cancer is really what machine learning is meant for. This is the Holy Grail.

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