Why won't people take their statins?

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Cardiovascular disease—the thickening and hardening of arteries causing increased risk of strokes and heart attacks—is the No. 1 cause of death worldwide, according to the World Health Organization. High cholesterol is the primary cause of cardiovascular disease, and it's on the rise in the United States.

Fortunately, cholesterol-lowering drugs called statins are highly effective, inexpensive and well tolerated by most people. But many people don't take them as prescribed.

Why, exactly, do people skip doses of the drug or avoid it altogether? A team of Stanford Medicine researchers, including Fatima Rodriguez, MD, associate professor of cardiovascular medicine; Tina Hernandez-Boussard, Ph.D., professor of medicine and of biomedical data; and internal medicine resident Sulaiman Somani, MD, developed an artificial intelligence algorithm to analyze posts and comments (known as discussions) related to statins on the social media platform Reddit. They found that discussions about statins on the platform are mostly negative and rife with misinformation.

"I would classify almost all of it as misinformation," Rodriguez said. "There's no question that the benefits of statins far outweigh the risks, but we saw a lot of misunderstandings about side effects and unproven alternative treatments to lower cholesterol."

Scouring social media

To find out what's behind statin resistance, the researchers turned to social media, assuming that people might be more honest online than they would with their doctor. A previous study tracked statin attitudes on Twitter, but the researchers thought that Reddit, with its longer character

limit and structured categories (or subreddits) would provide a more comprehensive picture. All that text would be too much for a human to parse, however, so the researchers used AI.

The researchers created an AI platform based on an algorithm that was developed to analyze and parse written content from millions of Reddit discussions and published medical studies. They tasked the algorithm with analyzing over 10,000 discussions about statins and categorized them by sentiment as positive, neutral or negative. The algorithm labeled about 67% of the discussions as neutral and about 30% as negative. Only about 3% of discussions were classified as positive.

The researchers admitted that these results may reflect a negativity bias: People with complaints may be more inclined to share their experiences online, but the results do line up with the findings of previous studies and with what many doctors observe in the clinic. Between 30% and 40% of patients who are prescribed statins don't take them as directed.

The researchers also wanted to know what people were saying about statins. To that end, they asked the algorithm to automatically divide discussions into topics, such as ketogenic diets, diabetes, supplements, side effects, statin hesitancy and pharmaceutical bias. For example, they found many discussions raising suspicions of pharmaceutical companies having financial incentives to manipulate clinical trials of statins—something for which there is no evidence.

"I was not surprised. As a preventive cardiologist, I see this statin hesitancy all the time, but there were some interesting new themes around the ketogenic diet and cholesterol science," Rodriguez said.

The ketogenic diet is a high-fat, low-carbohydrate diet that has gained popularity as a weight loss technique; some also believe it provides other health benefits. According to Rodriguez and Somani, while it can help

people lose a substantial amount of weight, consuming high amounts of fats often leads to high cholesterol.

The researchers found many discussions by people who had lost weight on the ketogenic diet only to learn that they had developed high cholesterol, but they reported feeling healthier than ever before. This led the posters to question the link between low-density lipoproteins, the so-called bad cholesterol, and heart disease—something that scientists and doctors have ample evidence to support. This finding, that enthusiasm for a diet regime could lead patients to question the basic science of cholesterol, was surprising to the researchers.

"It makes a case for why AI is a good tool for this kind of research, because it helped find these new topics that we weren't expecting," Somani said.

Sleuthing out misinformation

The researchers saw other topics of misinformation emerge on the social media platform, including supposed alternatives to statins, such as red yeast rice supplements. According to Rodriguez, red yeast rice does contain a kind of naturally occurring statin, but the levels are so low it won't substantially change cholesterol levels.

"There's this idea that supplements are natural and better for the body, but we've actually done randomized control trials where we give individuals these over-the-counter supplements and see that they do not lower LDL nearly as effectively as statins," Rodriguez said.

The research paints a troubling picture of patient sentiments toward potentially life-saving drugs and evidence-based medicine generally. Many discussions indicated a disenfranchisement with health care and pharmaceuticals. Yet the researchers say that clinicians now have better

insights into how patients think about statins, which can help them fight misinformation.

"It's important for clinicians to be aware of misinformation that's circulating and be able to speak to patients in an empathetic way. It may take more time, but it's certainly worth doing," Somani said.

The researchers say this technique has potential beyond preventative cardiology. Their algorithm could be reconfigured to evaluate sentiments toward many other drugs or toward evidence-based care generally.

"Misinformation is a public health emergency," Rodriguez said. "For clinicians and researchers alike, we need to meet our patients where they are and use this data to engage with them on social media and in the clinic."

Provided by Stanford University

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