

Real Talk about AI and Advancing Cancer Treatments

A top colorectal cancer doc at the University of Colorado shares insights into AI's many pearls — and potential pitfalls.

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[Christopher Lieu](#), MD, trained at a top cancer hospital, yet many of the treatments that were standard of care at that time are no longer used.

When he finished his fellowship in 2011, most patients with cancer were treated with a “one-size-fits-all strategy, with what he calls “chemical-warfare-type treatment.” But now, a rapid evolution of targeted, personalized medicine to treat certain types of cancer has occurred, said Lieu, professor of medicine and [medical oncology](#) at the [University of Colorado School of Medicine](#), and artificial intelligence (AI) is pushing the envelope.

“I treat patients with colorectal cancer. And if you missed one study presented this past January, you’d have missed a change in the standard of care. Between the first and last week of January, everything changed for certain patients with metastatic colorectal cancer. That’s how fast things are moving,” Lieu said.

Treatment for colorectal cancer is evolving as quickly as AI can detect new biomarkers, tailor treatments and optimize clinical trials.

“Without up-to-date knowledge we risk giving treatments that are already outdated. AI can help with this, and in cancer, that can mean a real difference in survival,” he said.

The humble beginnings of cancer treatment

Lieu admits he may be biased, but he believes the advances seen in cancer now make it the fastest-moving field in the history of medicine.

“We started treating cancer with chemotherapies in the 1940s,” Lieu said. “For 50 years, we continued to use these toxic chemicals that kill cancer cells and healthy cells as well.”

Now, chemotherapy use is decreasing due to an increased use of biomarker-directed, targeted therapies. Lieu can even treat his patients with therapies that activate their own immune system

to fight cancer with relatively few side effects.

“That’s a dramatic difference,” he said.

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Christopher Lieu, MD

AI’s role in targeted therapies

Treating colorectal cancer today often starts in the lab where tissue samples from a patient’s tumor undergo a process called genomic sequencing to identify characteristics, or biomarkers.

What’s a biomarker? From the 10,000-foot view, a biomarker answers the question: What makes this tumor different from any other tumor? Once the biomarkers are identified — and matched with a drug that targets that specific gene mutation — it becomes part of the patient’s targeted therapy.

AI has the potential to play a big role in helping doctors know which biomarkers to test for and match with therapy options.

“There are hundreds of biomarkers, and treatment options are changing so rapidly,” Lieu said. “AI may allow physicians to navigate an increasingly complex field and offer patients the most cutting-edge, up-to-date therapies.”

Deep learning through neural networks

Even testing a single patient for biomarkers can be overwhelming.

“If I were to test a patient for biomarkers or mutations, I’d get data back on 800-plus genes. Each tumor type has a different set of biomarkers that can be acted on. AI may be able to help identify which biomarkers are relevant to each disease and look for clinical trials that may be available for our patients.”

Neural networks also help cancer researchers find patterns.

“You can imagine that AI can start to look at 1,000 genes across 50,000 patients along with their

clinical outcomes and start to look for patterns. AI can essentially say to us humans, ‘Hey, I see this pattern, and it might be worth investigating,’” he said.

It’s this kind of deep learning that has allowed biomarker-based treatments and immunotherapies to become increasingly personalized in the treatment of colorectal cancer.

“It’s one thing if an algorithm sends you to a restaurant you don’t enjoy. It’s another thing if you’re making treatment decisions that patients’ health rely on.” —
Christopher Lieu, MD

Keeping the risks in mind

AI is also changing the conversation between patients and providers. Patients are currently and will continue to feed their own unique patient data into AI models such as ChatGPT. People are getting diagnosed with colorectal cancers at younger ages — a pattern that’s been increasing over the last two decades. His patients in this younger demographic are already using AI to do their own research.

“It’s great when my patients ask me about biomarkers, and it’s great when they ask about different treatment plans or clinical trials they’ve found,” he said.

While these can be good conversations, it doesn’t ensure that the information they bring to him is valid. And it leads to a very important point about all artificial intelligence – which he refers to as “junk in/junk out.”

“The problem is that if you put stuff into an AI model that may or may not be correct, you’re going to see these models come up with all kinds of bizarre stuff. It’s one thing if an algorithm sends you to a restaurant you don’t enjoy. It’s another thing if you’re making treatment decisions that patients’ health rely on,” Lieu said.

Feeding AI the right information

The National Comprehensive Cancer Network (NCCN) develops guidelines for all cancer treatment. It’s the information payers use to determine whether therapies or procedures will be covered. While it’s the most up-to-date information about cancer, AI models may not have direct access to the NCCN guidelines.

“Currently, AI will tell you about the NCCN guidelines, but it is not pulling information directly from their guidelines,” he said. “NCCN is in the process of digitizing their guidelines which will be a gamechanger for AI. There’s so much data for cancer, and we need to ensure that the information that’s fed into these AI models is correct.”

Protecting patient privacy and data is also a concern.

“We need to have a lot of safeguards, and we’re being appropriately conservative in navigating how AI incorporates into our day-to-day patient care,” Lieu said.

“Now’s the time. We’re seeing unbelievable advances, and we don’t want to lose that momentum, especially when our patients’ lives are at stake with a disease as deadly as cancer.” — Christopher Lieu, MD

Not losing momentum

While the risks of using AI in the treatment of colorectal cancers — and all cancers — are real, Lieu believes these technologies will continue to help both patients and doctors with their care. From identifying clinical trials to ensuring the best treatment options, using AI to analyze big sets of data can and will help us ask the right questions.

“ClinicalTrials.gov holds all clinical trials, but it’s nearly impossible to navigate. Imagine if AI could read a patient’s chart, identify local and nearby trials, and recommend options. It wouldn’t be perfect, but it would dramatically reduce the number of missed opportunities for eligible patients,” he said.

Lieu is hopeful that patients will continue to understand that AI shouldn’t be viewed as a single source of truth, but rather a tool used for education that can help start conversations with doctors.

“You can imagine AI or large language models supporting both the physician and the patient, making the interaction more productive and the communication much clearer. That way, important details aren’t missed. For example, a doctor might say, ‘I’m not going to follow the AI’s recommendation, but let me explain why,’ which helps build understanding and trust,” Lieu said.

More than anything, Lieu is hopeful that AI will continue to empower researchers.

“Now’s the time,” he said. “We’re seeing unbelievable advances, and we don’t want to lose that

momentum, especially when our patients' lives are at stake with a disease as deadly as cancer."

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