Artificial Intelligence and Breast Cancer: What Does the Future Hold?

Featuring our panel of experts from Department of Radiology, David Geffen School of Medicine, University of California, Los Angeles:

Jonathan G. Goldin, MD, PhD, Executive Associate Chair and Director Computer Vision and Imaging Biomarker Program

Cheryce P. Fischer, MD, Chief of Breast Imaging

Hannah S. Milch, MD, Assistant Professor of Breast Imaging

National Webinar Transcript

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Jenna Fields:

My name is Jenna Fields. I'm the Chief Regional Officer for Sharsheret, based here in Los Angeles, California. And we welcome you to our webinar, Artificial Intelligence and Breast Cancer: What Does the Future Hold? Today is our closing webinar for Sharsheret Summit: Pink, Teal and You, which brings together thousands of people virtually and in-person all across the country, from October 13th to the 31st. Thank you so much for participating in Sharsheret Summit. We hope you've enjoyed our national virtual symposiums on the latest hot topics in breast cancer and ovarian cancer. And if you haven't tuned in, you can find the recordings on Sharsheret's website and access the most up-to-date data and materials and our digital resource packet on our Sharsheret Summit webpage.

I want to thank our Sharsheret sponsors, Daiichi-Sankyo, GlaxoSmithKline, Merck, AstraZeneca, Pfizer, Seagen, Lilly, Natera, Eisai, GE HealthCare, and Northwell Health Cancer Institute. We could not have done Sharsheret Summit without our incredible sponsors, and even though Sharsheret Summit is coming to an end, Sharsheret will continue to provide you top educational webinar programming with experts all across the country. Our next webinar is going to be this Thursday, November 2nd, at 8:00 PM Eastern. And it's on Caregiving: Giving and Receiving. My colleagues are going to put information on how you can register for our caregiving webinar in the chat right now.

I also want to thank our Summit National Partners, 18Doors, Alpha Epsilon Phi Sorority, Basser Center for BRCA, Cancer Support Communities, Cooperative Agreement DP19-1906 from the Centers for Disease Control and Prevention, Clean Speech New York, the JCC Association of North America, Jewish Orthodox Feminist Alliance, the Jewish Orthodox Women's Medical Association, JScreen, Network of Jewish Human Service Agencies, Oneinforty, OneTable, Ritualwell, SVIVAH, Women of Reformed Judaism, and Woman to Woman. Really so grateful to our national partners throughout Sharsheret Summit and during the whole year. And now, we have a special message from our Sharsheret lead sponsor, Daiichi-Sankyo.

Gissoo Decotiis:

Hello, my name is Gissoo Decotiis. I'm the Global Head of Advocacy and Strategic Relations at Daiichi-Sankyo. We live our corporate mission of passion for innovation and compassion for patients every day, as we work to make a meaningful difference, not only from a therapeutic perspective, but by also helping ensure people receive information and support that they need throughout their cancer journey. We value our partnership, because your organization, like ours, seeks to make sure that people living with cancer are connected with the trusted sources of information and a community of support and that all patient voices are heard. You all inspire my team and me every day, as we work to bring innovative new medicines to the people who need them, through our ongoing research efforts.

Jenna Fields:

Thank you again to our Sharsheret lead summit partner, Daiichi-Sankyo. Today's webinar is being recorded and will be posted on Sharsheret's website along with a transcript. Your faces and names will not be in the recording, and if you'd like to remain private, you do have the option to turn off your video and rename yourself. Or you can call into the webinar and my colleagues have provided that instructions in the chat box for you. You have noticed that you are muted upon entry into the Zoom, and we please ask that you stay muted for this entire webinar. If you have any questions as we're going, feel free to put them into the chat and we are going to leave time for Q&A at the end. We'll do our best to get to as many questions as we can.

As we move into the webinar, I want to remind you that Sharsheret is a national not-for-profit Cancer Support and Education Organization and does not provide any medical advice or perform any medical procedures. The information provided by Sharsheret is not a substitute for medical advice or treatment for specific medical conditions. You should not use this information to diagnose or treat a health problem. And if you have any questions that are specific to your medical care, you may be advised to speak with your medical provider. Always seek the advice of your physician or qualified healthcare provider with any questions you have regarding a medical condition. And now, this evening, we're so honored to be joined by three of our nation's top researchers at the Department of Radiology David Geffen's School of Medicine at the University of California Los Angeles. Jonathan G. Goldin, MD, PhD is Executive Associate Chair and Director Computer Vision and Imaging Biomarker Program.

Dr. Goldin's research is focused on the development of imaging based biomarkers for the early detection of disease and as predictive and outcome measures of treatment using machine and deep learning techniques. He has received both NIH and industry funding for his research, as the principal investigator and co-investigator for over 40 funded studies, and published over 220 peer-reviewed publications and 13 published book chapters. Dr. Goldin has pioneered the implementation of artificial intelligence into routine clinical practice to improve workflow and diagnostic accuracy.

Cheryce P. Fischer, MD is the Section Chief of Breast Imaging at UCLA. Dr. Fischer's interests are focused on patient care and teaching, having trained over 85 breast imaging fellows and innumerable residents in breast imaging. Dr. Fischer and her expert team of breast imagers have been investigating AI and breast cancer screening for many years. And finally, Hannah S. Milch, MD is an Assistant Professor of Breast Imaging. Her current research interests include expanding image-based screening access to local communities, leveraging artificial intelligence technology to improve breast cancer screening outcomes, and enhancing physician wellness. The full bios of all three of our speakers can be found on our website, which my colleague is putting into the chat. Obviously, we are so blessed to be able to have an incredible team of these researchers here with us this evening. And we're going to begin tonight's presentation with Dr. Jonathan Goldin. Welcome, Dr. Goldin.

Dr. Jonathan G. Goldin:

Thank you, Jenna. I appreciate that. And thank you to everybody who's taking some time to listen in. I am the least important member of the trio talking today, and I am really going to just set the scene a little bit about AI in healthcare today. And then, my colleagues will focus in on the topic of interest, which is AI, as it pertains to breast care and particularly breast imaging. When we talk about AI, we all think about cars that go automatically down the freeway, and we know that they go pretty well most of the time until they change lanes at the wrong moment or until they hit a brick wall. And so, AI in medicine, I have to say, is not very different. We're not there yet, but we've come a long way. And you'll see from the presentations by Cheryce and Hannah how real this is becoming.

I just want to give you a couple of terms, so that you can walk around with a little bit more knowledge when you hear different things. Artificial intelligence is a program that can sense, reason, act, and adapt, i.e., behave like a human. To be honest with you, nothing that we talk about today is true AI. Where we really are centered is in an area called machine learning, where we develop computer algorithms that improve the way we do things. And they get better by teaching them with a human eye. And then, there's a buzzword of deep learning. Everybody's doing deep learning these days. Thankfully, I've been doing it for about 20 years of research, and I feel hip. Because all of a sudden, it's cool to say you do deep learning. This is where a subset of machine learning, where the computers train themselves on how to interpret an image.

So just to give you a feel for what this means, if the input is a cat, in a machine learning environment, an expert will say, "This is a picture of a cat." The computer would then try and work out, why did the person say it's a cat? What makes the shape of the cat? What makes it stand out? And create a set of features that then the machine can say, "I see a cat." In deep learning, as you see in the below aspect of the figure, the computer trains itself. And just to show you that a little bit more depth, images are a series of shades of gray, and the computer extracts some features, looks to see if it can make any differences. It goes through multiple layers. That's why it's called deep, because there's multiple layers that it goes down. This is a 1, 2, 3, 4, 5 depth layer and how it depicts the different components.

Okay, you'll be happy to hear, enough about the science. I do want to talk a little bit about when you hear about AI. So in preparation for this talk today, I did a Google search. I put in "AI in breast imaging," and look at the number of hits I got, nearly 47 million hits on "AI in breast imaging." There's a lot of information, there's a lot of research going on, there's a lot of statements being made, but the reality is, before we can put into clinical care, before you can have faith that's being used, and you'll hear from the team who are experts in this in a moment, we go through a couple of phases, where we develop things and verify them. We then do analysis to analytically validate them. But truthfully, clinical validation means that we can absolutely be sure that, when we apply an algorithm, it can detect something, detect a breast cancer, it can tell what the breast cancer is.

So all of these processes have to occur before we can use it in clinical care. So while you might hear that somebody has AI and they have a paper that shows it works, stop them and say, "It takes more than one paper to be sure that it works in clinical practice." Just want to let you know, just overviewing, basically, the way things go on in the world of care, you do imaging, maybe because you have symptoms, maybe because it's mammography screening. We make a clinical judgment based on what we see, and we can use AI to help us see things more accurately or help us get away from noise. We then do treatment planning, and here we can bring in other information. And again, AI may play a role here. Not only do we see something, but we can tell whether we think it's a cancer or not a cancer without a biopsy. And then, we can actually do treatments and measure the outcome.

So when we talk about AI in breast care, it's not just the diagnosis, not just the detection. It's also the diagnosis and the treatment. And just to give you a high level feel for AI, in today's world, we are using AI in places like the lung, for lung cancer screening. The breast is a very hot area of focus, and you will hear from two really amazing experts in this field in a moment. We're using it in the brain. We're using it in the prostate. There are different types of characterization we can do, detecting it, staging it, making a diagnosis, and monitoring change. And so, with that, I'm going to hand you over to Cheryce. I'll stop sharing and let her come on board.

Dr. Cheryce P. Fischer:

Okay. Hi, I'm Cheryce Fischer, and today, I would like to give you some information about AI in mammography and how I foresee it helping us detect breast cancer, especially in women with dense breasts. So let's just go over the basics of mammography. As we all know, mammography, at this time, is the gold standard exam, that we presently have for early breast cancer detection. And annual mammograms are recommended for women over the age of 40. Nowadays, most places are offering 3D tomosynthesis mammograms. And if given a choice, I would highly recommend that you opt for the 3D mammogram, as opposed to the 2D mammogram. There is no significant increase in radiation exposure. The radiology is able to see more of the breast tissue, especially if you have dense breasts. And most insurance do cover the cost.

So what do we mean when we say a woman has dense breasts? Well, the breast tissue is composed of fibroglandular tissue and fat. And I have a example mammogram here on the right side. And fibroglandular tissue shows up as white colored, sort of like this, white colored on the mammogram, and fat shows up as the darker areas. So dense breast tissue contains more fibroglandular tissue than fatty tissue. Dense breast tissue can make it harder to detect abnormalities on mammograms, and I will show you why in a couple of slides. So just know that dense breasts are normal and common. About slightly over 50% of premenopausal women do have dense breasts. About 40% of women aged 50 to 59 have dense breasts. And about 30% of women over age 60 have dense breasts.

So here's some examples of breast density, and I'll show you going from left to right. Breast density is divided into four groups, according to the Breast Imaging Reporting & Data System. We call it the BI-RADS. And the first on the left, we would call a density A, which is almost entirely fatty. So you can see there's some white fibroglandular tissue and more a black, that the fat is black. As you move along the spectrum, here we have a density B, which is called scattered areas of fibroglandular density. And then, we continue moving along the spectrum.

This third image is a density C, which is extremely dense, which lowers the sensitivity of mammography. And as we go to D, that's considered extremely dense, which lowers the sensitivity of mammography. Note that densities A and B are not considered dense, but categories C and D are considered dense. So to put things into perspective, I have an image of a breast cancer. This is an example of a spiculated mass. It shows up as white colored on a mammogram. So you can see how, as your density increases, this white colored cancer can hide amongst the fibroglandular tissue. And this makes cancer detection more challenging for the radiologist, as breast tissue becomes more dense.

So just as we saw, dense breast tissue can obscure potential tumors. Therefore, detection rates can be lower in dense breasts. Also, 2D traditional mammography is not as effective as 3D to visualize some cancers. The following two slides, they're complicated and they're very detailed, but I just wanted to show you, so that you're aware of recommendations from different societies, regarding supplemental screening guidelines, in addition to annual mammography, for different scenarios. And so, on the left side here, this is the population category. And on top, these are the different societies. So ACS is the American Cancer Society, NCCN is the National Comprehensive Cancer Network, ACR is the American College of Radiology, which we follow, and EUSOBI is the European Society of Breast Imaging. So for example, we can take a look at someone who has a lifetime risk of breast cancer greater or equal to 20%. The ACR would recommend annual screening MRI starting at 25 to 30 years of age. And starting at 30 years of age, this person would be recommended to have annual screening mammography.

This chart continues. And here's another example on the second page. Say someone has heterogeneously dense breasts, which was the third breast tissue density that I showed you. It was like a category C, which was the third picture, plus any of the following, if this person had a first or second degree relative with breast cancer at any age and with a prior benign biopsy with proliferative change or had greater or equal to two relatives, from the same side of the family, with breast cancer diagnosis by 50 years of age, the ACR would recommend an annual MRI. So this is stuff you can discuss with your physician and decide if you fall into any of these categories and what recommendations should be followed.

So now that you understand what breast density means to the radiologist and to the patient and how it affects the interpretation of mammograms, let's talk a little bit about AI, artificial intelligence, in mammography. As Dr. Goldin had mentioned, AI is revolutionizing healthcare. AI in mammography refers to the use of computers to assist radiologists in interpreting mammograms. So these systems are trained on very large datasets of mammograms, and they're taught how to recognize patterns and abnormalities in breast tissue. The important part is that these algorithms can detect subtle changes that might indicate breast cancer, even in cases of dense breast tissue, where, as we've seen, cancer can be more challenging to identify.

So how does AI work in mammography? Dr. Milch will go more into detail, but generally, the AI system analyzes the mammogram images for abnormalities, and then, it highlights the suspicious areas for further review by the radiologist. Some of the AI systems can continually learn from the datasets, which will help its accuracy. The benefits of using AI in mammography is that we want to see improved sensitivity and accuracy in detecting breast cancer. And what that means is that we want to reduce our false positives, which means we want to reduce the amount of unnecessary biopsies, recalls, or follow-ups. And we also want to reduce our false negatives, so that we can detect early cancers. And it should also help us with enhanced early detection in dense breasts.

So in summary, what we want from a robust AI system in mammography is for it to improve the accuracy, the efficiency, and early detection of breast cancer, while also, on the other hand, we want to decrease our false positives and false negatives. AI should serve as an aid to helping the radiologists in interpretations, which would lead to better outcomes in our patients. I do not see AI replacing radiologists, at least at this time point, but I see it acting more as a visual helper or aid, with the radiologist making a final assessment, based on his or her experience. With regards to regulation and safety, all of the AI systems that would be used clinically would have to be FDA approved. And of course, there has to always be ongoing monitoring, with updates as needed. So AI technology is continually improving. They are also integrating with other programs, such as risk assessment and breast density. And I believe that AI in mammography will be a valuable tool in improving breast cancer detection, particularly in women with dense breasts. And with that, thank you for your attention, and I will hand it over to Dr. Milch.

Jenna Fields:

While Dr. Milch is getting her PowerPoint up, I just want to thank you so far. This is such excellent information, and thank you to the questions coming into the chat, privately or to everybody. Feel free to keep putting them in. And then, after Dr. Milch is done with her remarks, we will open it up for questions, and I will moderate that Q&A. So please continue to submit questions.

Dr. Hannah S. Milch:

Okay, thank you, Jenna, Dr. Goldin, and Dr. Fischer. I'm now well positioned to elaborate a bit with some examples of how AI works in breast imaging and breast cancer care. So I like to think about AI in breast imaging in three buckets. The first is improving our performance as radiologists. So building off of what Cheryce discussed, basically, the radiologist sits and reads these images. It makes sense that, with all the advancing technology out there, that there would be some assistance from AI or some sort of different aids to help us do better. So that's one bucket, and that's the increased detection of breast cancer and the decreasing of false positives. The second bucket is looking at risk assessment. And this may apply to many in the audience, who may be at increased risk or may be a breast cancer survivor. So everyone has variable risk.

And AI can be a valuable tool in understanding our risks, so not just detection, but also just risk assessment, based on your risk factors, as well as your mammogram itself. There's AI technology that can, potentially, more accurately, assess your risk than the tools we currently have available. So that's the second bucket. The third bucket is kind of an everything else bucket, but it applies to how AI can go way beyond just reading mammograms with us and assessing risks. It can be integrated into so many different aspects of how we take care of patients, to streamline the process for the doctors and for the patients and for all everybody in between.

So this has to do with scheduling, efficiency. There was one question I saw that got submitted in advance about tools to know drug interactions for how that may apply to any preventative medicines you're taking and how that applies to your breast cancer risk or what you can and cannot take. This stuff should all be made more efficient for patients and providers, and that's another really important avenue for AI. And there's a lot of research in that area as well. Today, I'm going to focus on number one and a little bit of number two. Number three, I wanted you guys to be aware of, because there will be a lot more in that space as well. It's not the focus of my talk today though.

So here's an example of an AI tool that UCLA may adopt clinically, and I wanted to show you how it works, just take you through the steps. So these are the three categories that an AI system would show me when I open a mammogram to read. So I'm opening somebody's screening mammogram, and the AI system would put that mammogram into one of three categories, elevated risk, intermediate, and low. So elevated, in this category, greater than 87% of cancers in a screening population would be in this category. So this is your highest risk. This would be a score of 10. So the AI system would give it its highest score of 10. You could also get a score of eight or nine, which is one step below. It's actually a significant step below. The rate of cancers in this group is six in 1000, which is basically the rate in the general population.

And then, in this low group, which we get a score of zero to seven, extremely low likelihood that there is a cancer on that mammogram, 99.97% negative predictive value. So this is very valuable for the radiologist, after it's been well tested in different settings, to potentially have this assist, that you're on high alert that there could be a cancer in this breast or you're reassured that the chances there's a cancer in this breast is extremely low, not zero. The radiologist will still look carefully at that mammogram, but this is just a very helpful second set of eyes on the mammogram to assist the radiologist.

The AI system can also produce a report card. This is how it would look when you actually opened the mammogram. You have some images of the mammogram. This is one that had that highest risk by the AI system, and the system also will flag the area it's concerned about. So here, you see something is flagged in the right breast and their individual scores for those areas as well. So in addition to those three categories, you also get more detailed direction for the radiologist. So especially when you're reading a mammogram with dense breasts or just very many images, the 3D images, sometimes, you have hundreds of images to go through. This is just an extra set of eyes for you to zero in on certain locations, give them another look. And it's just a scaffolding to really support the radiologist in interpreting your mammogram.

So this is one of the only tables that I wanted to show you, just to look at the AI performance. Because as Dr. Goldin and Dr. Fischer alluded to, we're not there yet in the sense that AI can just run away with our mammograms and everyone's mammograms and read it on its own. It's really a very useful assist tool that we are still exploring. So when we looked at 3000 mammograms retrospectively, so we took mammograms that were read by a radiologist and put them through the AI algorithm and said, "How did that AI algorithm do on that same set of mammograms, compared to how the radiologist did?" And these are some of our screening metrics we look at, how many patients are called back, sensitivity, so it's ability to detect cancers, specificity, how good is it at detecting cancers, but not overcalling too many false positives, and how reliable are those negatives, the ones that are given a negative, how sure and confident are you that it's really negative and there's no small cancer hiding in there?

And the point here is simply that it was comparable. These numbers are very comparable, AI to radiologist, very similar numbers. So the take home here is that it's potentially on par with a radiologist, but what we're really interested in is how they perform together. How do the radiologists and the AI system work together to provide the best possible patient care? So these numbers do not reflect that at all. These just show AI in isolation and the radiologists in isolation, and we care about how those two work together, which is what we're studying at UCLA.

I saw a question that was pre-submitted about invasive lobular cancer, so I thought I would reference that here. In a larger study we did of the AI system, it did successfully detect some lobular cancers, that were not detected by the radiologist. In fact, about half of the mammograms that contain lobular cancers not detected by the radiologist were flagged by the AI system when we looked back in time. So we can discuss that more during the Q&A, but my point is it's also valuable for invasive lobular cancers, as well as invasive ductal cancers.

But the jury is still out if it's going to really detect those very challenging invasive lobulars, that somehow allude mammography and even MRI. So I don't have an answer for you on that, except to say that it is capable of catching those lobular cancers, as well as those invasive ductal cancers. I just want to show you a few examples of how this might appear on the radiologist's screen, how we might use it in practice. Here is a mammogram without any AI markings, here's the same mammogram, and you see this little orange circle, and I'm going to show you it zoomed in. These little white dots, which are calcifications, that were not detected by the radiologist, but were flagged by the AI system. And this was a very, very early stage zero [inaudible 00:35:58] to cancer.

Here you see what would be called an asymmetry, where there's some white density, that's a little bit different than the other white densities, and it was extremely subtle, not detectable by the radiologist. But then, you see this circle by the AI system. So this is arguably more important than the one I just showed you, because this is a tiny invasive cancer. So this is important for us to detect early, when cure is highly, highly likely and the morbidity of the treatment is at its lowest. That's just a zoomed in shot, showing you the little cancer right here.

Another example, this is showing a surgical scar. The patient had surgery here, and there was a tiny asymmetric density here. This little white area was also a tiny invasive cancer that the AI system flagged. Zoom in on that. I wanted to show you this. This is a 3D mammogram, where you can see the red circle is flagging an area of distortion. And you'll notice, this is a very dense breast, a lot of white relative to the dark. And this is after the biopsy showing that this is exactly where the cancer was.

So the AI detected this cancer, that was not detectable by the radiologist and then, was found later, a few months later. And we can see here that what they found later was, in fact, the cancer that the AI system had flagged. Finally, this example is showing some limitations of AI. It's not perfect, just like humans are not perfect. The humans miss tiny findings sometimes, and the AI system is also, at this point, still missing tiny findings. So this is a very small cancer in the right breast, that was flagged by the radiologist and was missed by the AI system.

So that was a little bit about accuracy. And I want to now shift to this question of risk assessment and how AI can provide support to radiologists and to patients in risk assessment. So Cheryce went over the different breast densities, which you see here, the four breast densities. These two on the left are considered not dense. These are considered dense. This is the extremely dense. So there are AI systems that will give you a breast density based on a volumetric analysis. So basically, it can aggregate the amount of white, relative to dark, and give you a breast density. So this is D. This is just an arbitrary report from one of those systems. And basically, you open up the mammogram, and it tells you the breast density per this AI system. What do we do now? The radiologist just looks at it visually and makes an assessment about which breast density it is, A, B, C, or D.

So why is it helpful to have an AI system support that decision? A couple of reasons. First is there's a lot of variability in how radiologists rate breast density. There is a certain amount of subjectivity. So by creating a uniform AI system, first, it has been shown to be as or more accurate than human decision-making on this. And second, it kind of levels the playing field. And the density of your breast is very important. It affects your risk status, your lifetime risk of breast cancer, your short interval risk of breast cancer. So this density score is very important, and it affects what supplemental screening is recommended for you, going back to Cheryce's chart on the different recommendations from the different societies. Your breast density is a key part of that formula. So if you have a system that is reliably reporting breast density, it really does affect your risk assessment, your screening recommendations. So that's AI and breast density.

What about risk models? So AI also has a role here. So right now, you may know, from times you've gone to get a mammogram, you may be asked a lot of questions about your personal history, your age, your past surgeries, any family history. All of this information gets funneled into different risk models, that give you a sense of your personal risk of breast cancer. These are three different models that are used. At UCLA, we use this Tyrer-Cuzick model. And so, we use all this information, we generate a percent risk, we put that in our report, and we use that number to inform referring doctors and patients on what their risk is and what additional testing they may need. So can this be better with AI? And it's looking like yes. So instead of just going off of this information, you can actually use the images themselves to help you decide what your risk is. And it is looking like there's data to suggest this will be a more accurate way to assess people's risks.

So in these images here, the way I like to think about this is a picture is worth a thousand words. So when a radiologist opens your mammogram, your mammogram tells a story. We don't just see white and dark. We see post-surgical change. We see clips from prior biopsies. We see calcifications. We see asymmetries. We see all sorts of things that kind of can often tell the story of your personal situation and what may make you more or less at risk for breast cancer. So similarly, AI systems can do the same, and there's a very promising one, that can give you... So this picture is showing a development of a breast cancer over five years. And this system can potentially tell you your risk of developing breast cancer, solely based off of your mammogram, without any of that additional information about family history, et cetera. That can make it even more robust, but it's not necessary. Just the picture alone can allow... The AI system can calculate your risk, your one year risk, all the way up to your five year risk of developing breast cancer, based on the architecture of the breast tissue.

And so, basically, what I wanted to point out here is that this is more information than I understand about how it works. But the point is that it's been shown to outperform the traditional models. It performs similarly across different races, ages, and breast densities, which is critical for minimizing disparities in breast cancer care. And to answer another question I saw in the chat about breast cancer survivors, we need good risk models for your risk, if you're a breast cancer survivor. And so, having this type of uniform and effective risk model could improve your personal recommendations for what kind of screen you need.

So in conclusion, I went through the three important ways that AI can improve breast cancer screening, in terms of detection and minimizing false positives, risk assessment, and workflow, which is a topic for another day. But these are three different areas to think about with AI. And I wanted to finally point out that we are not there yet, as Dr. Goldin and Dr. Fischer alluded to. We are still learning and we are testing out these algorithms, and we want to make sure that there's robust evidence from diverse populations showing that they really work in real-world scenarios. Now, outside of the experimental studies, that kind of get the ball rolling, often lead to FDA approval, they need to be tested in large diverse settings. Thank you.

Jenna Fields:

That was just wonderful. And I feel like we just got a behind the scenes view of what's going on and the latest advances in AI in mammography. Thank you so much, Dr. Milch, Dr. Fischer, and Dr. Goldin. I'm going to ask my colleague to pin all three of you on the screen now, and we're going to dive into our Q&A. And please continue to put questions into the chat. So first question is, how widely is this being used right now? Or at least researched? Where can people go to have mammography done, where AI is being included in assisting their radiologists?

Dr. Hannah S. Milch:

I can take a stab at that. So there are some practices across the country who have fully implemented AI into their screening mammography workflow. You may or may not see an advertisement to that effect, when you show up, especially some private practices may ask for a copay for the use of AI to assist in your mammogram interpretation. It's only being used as an assist device to the radiologist. And some more academic institutions, like UCLA, we are in the early stages of this. And we, as we've all mentioned, want to really confirm how well it works in our population before letting it fully out of the box, so to speak.

Jenna Fields:

Is there a specific terminology that people on the screen can use to ask their provider about this, so they can find out more, to see if they're doing it?

Dr. Cheryce P. Fischer:

I don't think so. I think, if you want to find out if they are, my suggestion is to call up the site and ask them. Just like Dr. Milch was saying, this is in the very early stages. I'm not sure of many places that are using it, clinically. A lot of places are doing research to see how well it performs before starting to use it clinically.

Jenna Fields:

As this patient population, that's participating tonight, how long do you think until you'll see this being used clinically in more places around the country? What's your hopeful best guess?

Dr. Cheryce P. Fischer:

I'd hope like in a year and a half maybe. I don't know.

Dr. Hannah S. Milch:

That's very specific, Dr. Fischer.

Jenna Fields:

We'll have to schedule another webinar in a year and a half and do an update.

Dr. Hannah S. Milch:

I think things are happening very fast. I would say, over the next few years, it will become more widespread.

Jenna Fields:

That's very promising. That's very exciting. Okay, so a question about training datasets. How is that being standardized across different manufacturers of mammography machine? Are you there yet, in terms of working with different mammography companies to standardize this?

Dr. Hannah S. Milch:

This may be a Dr. Goldin question.

Dr. Jonathan G. Goldin:

I was hoping you would take it, Hannah. It's a great question. So I think I mentioned there were 46 million hits on Google about breast in AI. Everybody is developing algorithms. There is a big push to try and understand whether these algorithms are generalizable across different groups of patients. And that's a big debate. In fact, Dr. Milch is running a trial, coming up soon, at UCLA, looking at a particular vendor's AI, that they claim works well.

They have done it in different datasets. But we want to ask the question, does it work for women and men being screened at UCLA for mammography? So I think this is a very important topic. Standardized datasets are very hard to come by. The holy grail would be for all algorithms to be tested on a standardized dataset. Very hard to achieve. So wonderful question, very insightful. But I would just say that this is why we are a little bit more cautious. We've been doing AI research for over two decades at UCLA, certainly in my group, but now, we're just beginning to implement it into clinical practice in different areas. And we are checking that, not only does it work, because the manufacturer says it does, but does it really work in patient care, using patient care outcomes?

Jenna Fields:

And I think I can speak for everyone here that we appreciate that you're doing that verification. And we are getting some interest in the chat about where someone can participate in these clinical trials. UCLA. And perhaps you could send out information that we can share with the follow-up for this webinar. But are there other medical centers around the country that also are recruiting participants for this research?

Dr. Hannah S. Milch:

So there are currently no clinical trials in the United States looking at AI in screen mammography. And there's a few reasons for that. There are some in Europe that have shown promise, but Europe screens women differently than the United States. So we need to validate in the United States. There are places that are using it. There are private practices where there will be a brochure saying, "We have AI. If you want to pay this copay, we can use it on you." But as of now, there are no clinical trials that you can "sign up for to join." But if that becomes something that we can communicate with your group, we absolutely will.

Jenna Fields:

Wonderful. Now, we did get a few questions around ultrasound and if any of this research is being used for ultrasound technology. Or is it really focused more on mammography right now? And as a follow-up question, I thought this was just a good future thinking question, when are people going to be able to do this at home and have their own devices that they can use to send to machine learning?

Dr. Cheryce P. Fischer:

That's interesting. I actually just read something about a woman, she's a doctor, and I forget the specifics, but she was at the bedside of her grandmother, who was dying from breast cancer. And she was looking into developing an ultrasound that would fit into your bra, and you could do monthly ultrasounds. And I thought that that was quite interesting, because I've never heard of that before. But as far as ultrasound is concerned, we have to be a little careful with ultrasound. Wendy Berg, a big researcher, she has come out with a paper, that they did 3D mammograms with screening ultrasounds, and they saw that their added cancer detection rate was only one out of 1000. So it was a very, very small percentage. And there was a lot of unnecessary biopsies. So a lot of false positives come from the ultrasounds, with little yield. And that's essentially what her paper was saying.

Jenna Fields:

I think that's really interesting, because we've been getting a lot of messaging, recently, on people who have dense breasts, particularly younger women, requesting ultrasound as a supplemental to a mammogram. So it sounds like that, obviously, is sort of one of the outcomes of increased use of ultrasound technology. And I guess my question for you is, when people think about their dense breasts and AI, is there going to be more opportunity for women with dense breasts in the future to have more options, other than ultrasound technology and mammography? Sorry, I don't know if that question made sense.

Dr. Hannah S. Milch:

So there are some AI systems specifically for ultrasound. We are carefully looking at them at UCLA. We like to really study and validate before full use, to make sure it benefits our patients. But they could help address some of the issues that Dr. Fischer brought up, by decreasing the false positives, which is a really big issue with breast ultrasound. So an AI system is in place, you can click on a finding, and the AI system could tell you, "Oh, don't worry about this," or "This is suspicious." And you could use that information with your own clinical judgment to maximize cancer detection and minimize false positives. Other modalities in high-risk women, which many dense women with dense breasts qualify for, is MRI, which is our most sensitive test for breast cancer screening, but also, has issues of false positives. But those are the three modalities as of now, the main modalities that are offered. There's contrast enhanced mammography. There are others, but nothing brand new in the pipeline that I can discuss right now. But yes, there is definitely a role for AI in breast ultrasound.

Jenna Fields:

That's great. I'm going to do one more question, because I know that we are running out of time. And this is just really a question of the role of researcher, a radiologist, versus AI technology. Are you seeing, among those that you're working with in your studies, that the radiologist, if they disagree with the AI technology, that systems are being put in place to help check both the radiologist and the AI technology, that they are able to work together?

Dr. Cheryce P. Fischer:

We haven't reached that point yet, but yes, I see what you're saying. You're saying an arbitrator.

Jenna Fields:

Yes.

Dr. Cheryce P. Fischer:

Yeah. And yes, that would make sense, in that, if the AI system picks something and the radiologist doesn't think it's anything... Now, you could say, well, let's say the radiologist really believes that there is nothing there, I don't think you need to arbitrate over that. I think it would only be if the radiologist is also unsure and wants to say pass or fail. Then at that point, there would be a system in place, where there would be a second human reader to help arbitrate.

Jenna Fields:

Wonderful. Well, thank you so much for our wonderful panelists for being here tonight. I know we've come to the end of our webinar. Thank you everyone for your participation in all these great questions. I want to ask everyone to take a moment to fill out our evaluation survey, that's being linked in the chat box right now. This is an evaluation of today's webinar. And anyone who completes the evaluation is in the running for a chance to win a $20 Amazon gift card. So please fill that out right now.

And also, I want to thank again our summit sponsors, as we close out our 2023 Sharsheret Summit, Daiichi-Sankyo, GlaxoSmithKline, Merck, AstraZeneca, Pfizer, Seagen, Lilly, Natera, Eisai, GE HealthCare, and Northwell Health Cancer Institute. As a reminder, our next webinar is this Thursday. It's on caregiving, and my colleague did put in the chat also our webinar coming up in two weeks. That's going to be focused on hereditary risk for cancer in men. So please join us for that as well. And never forget that Sharsheret is here for you and your loved ones. We provide free emotional support mental health counseling, and other programs designed to help navigate you through the cancer experience. All are completely free and confidential, and our contact information is in the chat box now. Thank you again to our incredible speakers, Dr. Milch, Dr. Fischer, and Dr. Goldin. And thank you all for joining us this evening. Have a good night.

Dr. Cheryce P. Fischer:

Thank you.

Dr. Jonathan G. Goldin:

Thank you.

Dr. Hannah S. Milch:

Thank you.

Jenna Fields:

Take care everybody.