The ACADEMY for Radiology & Biomedical Imaging Research

Advancing Innovation in Imaging Science

The Academy's virtual Congressional Briefing

Medical Imaging and Data Resource Center (MIDRC): Accelerating Innovation for COVID-19 Response & Beyond

March 31 @ 1:30pm ET

via zoom webinar

Full Transcript below:

13:30:25 Hello and thank you for joining us for today's briefing medical imaging and data Resource Center accelerating innovation for COVID 19 response and beyond.

13:30:34 I'm Michael Heintz Senior Director for government relations and strategic initiatives at the academy for radiology and bio medical imaging research, and the moderator of today's session.

13:30:44 The Academy is a nonprofit advocacy organization based in Washington DC with the primary mission to advocate on behalf of all stakeholders in the Medical Imaging Research community for increased support for investments in medical Imaging Research, our membership consists of imaging societies and academic radiology and imaging departments industry partners in over 100 patient advocacy organizations, our advocacy begins with education, which increases awareness and cultivates support.

13:31:13 In that light we are pleased to be presenting today's briefing. Before we begin, please note that we're recording this session for later viewing.

13:31:22 In addition, we engaged auto transcription for closed captioning, and you can toggle the settings using the button, the button at the bottom of your screen.

13:31:30 Finally all attendees are in view only mode, please submit questions via the q & a box at the bottom of the window will accept questions throughout the formal remarks for panel discussion afterwards, please submit those questions at your convenience.

13:31:43 Our goal for this briefing is to prevent present a major infrastructure and research program that will be an invaluable benefit COVID 19 patients, and eventually to patients with other chronic conditions, like diabetes, Parkinson's disease and cancer MIDRC is a true academic and government collaboration funded by the National Institute of Biomedical Imaging and bioengineering at the NIH and executed by the American Association of physicists and medicine, the radiology Society of North America, The American College of Radiology in the University of Chicago.

13:32:15 MIDRC initial goal is to collect images from all over the country of the lungs and other organs of patients with covered 19.

13:32:22 These images will be integrated with clinical information to strengthen the precision of artificial intelligence diagnoses, as, as compared to with images alone MIDRC scientists and other researchers around the world we use those data to train AI algorithms and to develop treatment pathways that improve the quality of care for COVID 19 patients.

13:32:41 We have a distinguished panel of experts representing these partners who are working directly on creating the publicly accessible database of medical images to help accelerate diagnostics and ultimately improve patient outcomes.

13:32:53 Indeed radiologists and images play an important role in diagnosing and treating patient conditions, the MIDRC program is working to create another set of tools to benefit patients.

13:33:02 With that, I am pleased to introduce our panel of experts.

13:33:05 Dr. Bruce Stromberg is the director of the National Institute of Biomedical Imaging and bioengineering at the National Institutes of Health, where he oversees a portfolio of research programs focused on developing translating and commercializing engineering physical science and computational technologies and biology and medicine.

13:33:23 In addition, he leads an IBM rapid acceleration of diagnostics Innovation Initiative, the red X program to increase SARS Kofi to testing capacity and performance is co authored more than 450 publications and holds 23 patents and new technology development,

13:33:38 as well as bench to bedside clinical translation validation and commercialization of devices.

13:33:45 Dr. Chris can DARPA is a cardiovascular and interventional radiologist who's Director of Research Scientist sciences in strategic directions at an Ivy, most recently he was the chief medical officer Chief Scientific Officer and executive vice president of r&d, Adele calf systems which markets a combination device and drug treatment for cancers in the liver. Prior to this, he was a tenured professor and chair of the department of Radiology at the University of Massachusetts Medical School and radiologist and chief at the UMass Memorial Medical Center.

13:34:17 Dr. Mary Ellen Geiger is the principal investigator of the mid range effort. And one of the representatives of the American Association of physicists and medicine in the middle of partnership.

13:34:26 She is the Pritzker professor of Radiology and a distinguished service professor at the University of Chicago. For over 30 years she has conducted research and computer aided diagnoses and multiple forms of cancer, lupus, and bone diseases, including with computer vision, machine learning and deep learning technologies.

13:34:44 Dr. Curtis Langlotz is professor of Radiology and medical biomedical informatics, and the director of the Center for artificial intelligence in medicine and imaging at Stanford University Center conducts interdisciplinary machine learning research that optimizes how clinical images are used to promote health, but the language is representative of the radiological Society of North America on the middle of program cycling lots was a member of the team that implemented the first AI system in clinical practice, and he has published over 100 scholarly articles, as well as the 2015 book, the radiology report the guide to thoughtful communication for radiologists and other medical professionals.

13:35:22 Finally, Dr. Etta Pisano is a professor in residence of Radiology at Harvard Medical School and chief research officer at the American College of Radiology, the final MIDRC program partner.

13:35:32 Prior to her current roles, she served as the Medical University of South Carolina, as Vice President for medical affairs and Dean of the College of Medicine at the University of North Carolina School of Medicine, as the Vice Dean for Academic Affairs, the Kenyan professor of Radiology and

biomedical engineering and the director of the UNC biomedical research imaging center. She's an expert with breast cancer imaging and for almost 16 years, served as the chief of breast imaging at UNC hospitals.

13:35:59 The Academy is grateful to all of our speakers for their time today to provide an update and future look at the direct. As a reminder, we will open the floor to questions at the end of the formal remarks, and please submit them throughout the presentations.

13:36:11 Thank you for joining us today. Dr Tromberg, the floor is yours.

13:36:18 Good afternoon and thank you Michael and to the academy for organizing today's meeting and to all of my colleagues for joining us, the Academy's long standing partnership with an NIBIB and the imaging community has had enormous impact on the development of life saving by medical technologies.

13:36:37 Today's session focuses on MIDRC, the medical imaging and data Resource Center. It's a modest sounding name but don't let that fool you. It's one of the most ambitious and potentially transformational national imaging programs ever launched. MIDRC was forged in the crucible of the COVID 19 pandemic. And it's one of three major game changing initiatives we launched at an ID to urgently address this global crisis.

13:37:05 For those of you who are not familiar with an NIBIB we are proudly, the only Engineering Institute at NIH and our special mission is to support the development of purpose driven technologies to solve hard problems.

13:37:19 Our response to COVID, the ultimate hard problem has been in three major areas imaging and artificial intelligence with MIDRC digital health platforms, and in vitro diagnostics.

13:37:31 The latter two have been supported by our rapid acceleration of diagnostics technologies or red X tech initiative. This is a more than $1 billion effort to develop and commercialize new lab point of care and home-based testing technologies.

13:37:48 As of today, only 11 months after launch radical tech investments have supported companies to produce more than 200 million new COVID diagnostic tests in the US.

13:38:03 Rad X has been a remarkable example of accelerated innovation and impact both in technology development.

13:38:19 and the story for their tireless efforts to launch this exciting program. We're also folks who are MIDRC collaborators across more than 20 academic institutions, and our 30 major image and professional societies, you all hear more details from our incredibly talented MIDRC PIs. Doctors Mary Ellen Geiger, Curt Langlotz and Etta Pisano.

13:38:47 We're extremely grateful for their leadership vision and collaborative spirit.

13:38:51 Both Radx and MIDRC were established with a call to our community to contribute and the response has been spectacular mythic has hundreds of actively engaged participants across the network, developing new validated methods and algorithms.

13:39:07 This will dramatically expand the impact of imaging and make state of the art life changing technologies available to every patient in the country.

13:39:16 Although MIDRC was formed to address an urgent need for COVID-19. We now have the essential infrastructure to extend this concept to virtually any medical imaging challenge.

13:39:28 We can all imagine a time hopefully in the not too distant future, when accessible wearable home based and point of care technologies work together in seamless integration with medical imaging.

13:39:41 When image interpretation, medical decision making and clinical outcomes for everyone, are optimized by algorithms and practitioners who have access to the most powerful and accurate technologies.

13:39:54 And when all of these capabilities are deployed for screening and surveillance. So effectively prevent disease and extend health span.

13:40:04 None of this can happen without significant contributions from an idea be an idea ideas community of technology developers and problem solvers.

13:40:13 This is a brief snapshot of how advances and technologies and new partnerships between government, academia and the private sector can dramatically change our world.

13:40:24 It's exciting to be part of this community of innovators working together to achieve our vision, engineering the future of health for all Americans.

13:40:33 Thanks for your time, and I will now pass to Dr. Kandarpa.

13:40:38 Thank you, Bruce.

13:41:02 Okay, so I'm going to forgo my first slide because it's already been described and go right onto my second slide this resource has been a long time in the making.

13:41:13 Beginning in, 2015 the White House National Science and Technology councils committee on science, along with DNA Hmm, and NIST convened a working group of federal agencies to deliberate on the future of medical imaging in the United States to encourage

13:41:36 These were the agencies, extramural invitees and made basically academic societies and industry participated in the working group.

13:41:48 In December of 2017, the group trip published a roadmap for Medical Imaging Research and Development and one of the key takeaways was to establish a private, public private forum to coordinate efforts and interest in artificial intelligence and medical and medical imaging communities.

13:42:09 Now, at this about the same time, we have, we had the US Congress in language referring to the NIH Common Fund, saying that it recognized and insufficiency and platform technologies and then enter that equipped.

13:42:26 Physical Sciences input towards emerging unmet medical needs and medicine. Obviously, an IBM is all about such things as technical development. So excited some opportunities for both the common find and the NA Vi among them.

13:42:44 Go back to one side was to address the difficulties supporting harvest, I return ideas that might motivate investment in transformational technologies that would be that could have high impact and be timely, given the recent scientific and technological advances, and in unmet medical needs. It was also an indication that we should increase our capacity to partner with industry and develop platform technologies.

13:43:12 Fortunately, our goals were exactly coinciding with what we had just heard from the Congress, and to several workshops that we had organized, we engaged stakeholders around the area of accelerating the clinical adoption of artificial intelligence and medical imaging.

13:43:33 There were several gaps that were identified that you see listed here. The most important one, I think, which would have solved the first to me is the development and creation of an ecosystem of stakeholders to develop clinically validated AI applications that include medical imaging and clinical outcomes. So, by this time, there was a growing consensus worldwide, that they needed to be a state of the art artificial intelligence resource that could help medical imaging applications.

13:44:03 The this created an opportunity for the United States to lead this this endeavor, and by now we knew how and why we wanted to build this, so we're in the process of selecting.

13:44:18 We're in process of trying to demonstrate how would we benefit patients by selecting a high impact clinical use case. And this was around December 2019, but as you all know by early 2020 we already had it on our shores, and it presented us with quite a challenge as Bruce just outlined.

13:44:39 Soon after that what we did was we Bruce and I and others, and decided that coke 19 would make an excellent use case to test and prove the utility of this platform.

13:44:56 So we put out this statement of work, come grow into the requirements to do what we needed. And we got a very soon after we got a response from a consortium of Extramural academic societies the association, physics, American Association of physicists

13:45:13 Later this consortium was named MIDRC, which you're going to be here you, whichever hearing about today.

13:45:23 Now what I'd like to focus on what one thing that MIDRC will do, and that it is it unique in that it will facilitate the commercialization. By partnering with the FDA and industry. And it does this.

13:45:46 The reason this is important is that the world market for medical applications in my medical AI applications medical imaging is projected to triple from this year to the next few years.

13:46:06 Now what you also, what you'll be hearing about from the three next three speakers is no longer an abstract concern, no longer abstract and perceptual, it's an existing models that can contribute to the US medical infrastructure of the 21st century

13:46:30 by providing the highways and bridges that will improve medicine communication practice. So as I was saying, it's important that the FDA is working with us because we can help get some of these AI applications to the market, but also as shown here, you all see that MIDRC is, as we know it now is no longer just a respiratory infection. But, it affects all organs of the body. So MIDRC in by design with aggregated both medical images and clinical data and developed artificial intelligence and then an analytical

computational tools that will be useful to invest not just covered, but also many other diseases and future pandemics which way, which may involve, and any organ or body system.

13:47:18 Therefore MIDRC has the potential to be expanded to a larger resource the best future unmet medical needs. whether it is for personalized medicine offer our collective public health.

13:47:53 Hello, I'm Mary Ellen Geiger from the University of Chicago, first let me thank the academy for organizing this and I'd be for its funding and support and I'm going to tell you more about MIDRC.

13:48:07 So the CO good 19 pandemic presented an urgent and critical public health crisis that required essential biomedical research and development to develop to address surveillance in early detection of the disease differential diagnosis and prognosis, on the severity of the disease.

13:48:27 Predicting and assessing response to treatment of disease and then monitoring the post Covid patient that to this there is an a very important role for imaging and AI.

13:48:39 Now, imaging in the COVID 19 pandemic first started with looking at how COVID 19 impacts along here on the bottom left, you see various presentations of the COVID 19 on chest radiographs on three different patients so you can see it presentations different, and on the bottom right, you'll see various stages of COVID 19 involvement in the one shown on these tests etc. from three different patients. So there is a presentation apparent there however beyond the lung it's also in the heart vessels and brain.

13:49:11 So what we aim to do is to collect medical images and enable and develop artificial intelligent methods to aid in the analysis and interpretation of these medical images to help in this coping 19 pandemic understanding.

13:49:27 And that is where MIDRC the medical imaging and data Resource Center was established in August of 2020. It is the community response a rapid response to the Cobra 19 pandemic.

13:49:42 As mentioned earlier, it is hosted at the University of Chicago and is co led by the three major imaging associations, the American Association of physicists and medicine.

13:49:53 The radiological society North America, and the American College of Radiology, along with the gen three eco system at the University of Chicago.

13:50:03 It is important to note that a dynamic infrastructure for the future was already being planned by these organizations before coconut and coconut accelerated it.

13:50:13 So the goals of MIDRCs are to progress from data to hypothesis to discovery to better understand the COVID 19 disease to accelerate the creation and the transfer of knowledge and to expedite API development to the clinical management of the COVID 19 patient.

13:50:32 This is the center's overall structure.

13:50:36 The center is hosted at the University of Chicago, and the overall science and technology is conducted by the three large organizations, along with University of Chicago's Gen three data distribution center.

13:50:49 The creation of the data base is achieved through two major scientific components, versus the creation of an open discovery data repository. And this is through five technology development projects

as well as three data science of committees and advisory committees and these are co lead across the three organizations where the three organizations ACR Sunday and 8pm all working together to ensure continued quality control and data accessibility would harmonized approaches.

13:51:25 The other big component is machine intelligence computational capability facilities, and these are mainly addressed through 12 collaborative research projects, along with multiple trans MIDRC scientific work groups, and these are designed to include both the scientific opponent and community engagement.

13:51:45 This is the research and discovery part of MIDRC.

13:51:49 One can envision more collaborative projects, as we move forward. And this will stimulate and facilitate collaboration with others who are not yet formally involved with MIDRC, but through grants will be able to access the center resources to develop and test their own AI algorithms, the gen three distribution system is like a front door and we'll make the data and software tools available to users from academia, industry, and regulatory agencies such as the FDA MIDRC includes radiologists and medical

13:52:26 imaging scientists from across the nation, as shown on this map, 23 institutions from academia, community practices and FDA are involved. This merges expert collaboration with community engagement, please see our website for the listing of all investigators.

13:52:44 With this mechanism. We hope to provide high quality and diverse data through comments that would enable researchers to address topics no single archive could yield independently, Madrid consists of two data input portals, one through arson a record and

13:53:05 one through the ACR COVID Imaging Research registry data comes in through there. And after harmonization data quality checks the identification and all.

13:53:26 It sits then on the gen three data comments at the University Chicago, which serves as the output user court.

13:53:28 Then will be accessed by hundreds of researchers and developers of AI for training and testing of AI to reduce bias and enhance diversity in the data, and to expedite translation of AI to clinical care.

13:53:42 Note that MIDRC is an outstanding resource for ai, ai researchers. It is essential that AI algorithms not be trained with data sets that are limited to one population, but rather be trained on data sets that span the diversity of our populations and span the various presentation of the disease itself.

13:54:03 This is also essential for testing the AI, those also have to go through such multi population testing in order to go through FDA to reach physicians and the public.

13:54:18 This is our MIDRC data dashboard that you can assess that I met at a website to see where we're at in our stage of development. Currently we have over 41,000 imaging studies that have been ingested into MIDRC.

13:54:34 And of those, almost 39,000 are undergoing data quality and harmonization. It is that this steps that they are quality check that the diversity is assessed.

13:54:44 And we see where they could have which clinical tasks would be appropriate to the AI.

13:54:50 They after all of that they are released by MIDRC, and that is through the gen three portal.

13:54:56 And our goal is to have 60 curated imaging studies to be released by MIDRC by September, 2021.

13:55:05 Note that a large number of diverse cases that span the presentation of COVID, it is necessary to develop robust and unbiased AI systems, and does both the large number of cases, as well as their diverse distribution is essential.

13:55:22 So what is next for MIDRC will be on chest radiographs and thoracic CTS, we are including images of the cardiovascular system and the neural system.

13:55:33 And also to include images beyond diagnosis and response to therapy, that is to include images to monitor the post Copa patients were also collaborating with the non imaging COVID 19 data comments to integrate across clinical data imaging exams and genomics.

13:55:54 And what about beyond COVID 19.

13:55:57 Well, having developed MIDRC with its infrastructure AI algorithms, and evaluation tools, it will be ready for all images and other diseases, this MIDRC will be a national resource for medical imaging.

13:56:11 It is currently funded for two years to cover the COVID 19 data and AI development. However, it will require additional funds to continue with other diseases.

13:56:23 So in closing, note for a given medical image, a patient has already benefit through medical care, a hospital and Medical Center has already benefited through reimbursement.

13:56:35 Now the public can benefit with the MIDRC, secondary usage of the images, we can all help change the future of medical imaging and increase its impact on public health.

13:56:46 Thank you.

13:56:50 And now I will hand this over to Dr Langlotz.

13:57:00 Thank you Mary Ellen. It's a pleasure to be with all of you today. Good morning, good afternoon. My name is Kurt Langlotz, and I am a radiologist and AI researcher at Stanford University.

13:57:11 And I'd like to add my thanks to the academy for organizing this session and to the NIBIB for supporting this work.

13:57:19 I'd like to focus on why we think this work is so important for COVID, as well as other medical problems, starting with a patient, so a patient who has a cough and shortness of breath, and is worried that he or she may have COVID 19.

13:57:36 If that patient shows up in an emergency room with possible Cobra, the first thing that may happen is the patient would undergo a chest X ray, this x ray was obtained through glass to reduce consumption of PP by the technologists who took the image and it was appropriately interpreted as normal.

13:57:56 When we see COVID images we often see images that look like this. This is severe COVID 19 and the lungs, it's easy to detect.

13:58:06 But the reality is often quite subtle closer to this where we have some patchy airspace capacities in the lower lungs.

13:58:15 And in fact, it can be even more subtle and difficult to detect and consider this in the context of doctors interpreting the images perhaps in a community emergency room who are not trained as radiologists and maybe out of their comfort zone radiologists aren't always available 24/7. The majority of the world's countries are underserved by radiologist and so there's a skills gap, and we need help in interpreting these images.

13:58:45 When we need a closer look at the lungs, we often do a CT scan here's a patient about to undergo a CT scan and getting an injection of contrast and the arm that makes the blood, blood look bright on CT.

13:58:58 And here we have some CT images oriented in the same orientation as a chest X ray and you can see here evidence of COVID 19.

13:59:19 Here's a similar image, and a well-trained radiologist may focus on these areas at the base of the lungs, subtle evidence of COVID 19, but they're also as this finding we know that COVID 19 is associated with a propensity to for blood clots, and this is a blood clot in the arteries that feed the lungs and like this many of the problems that we see in COVID-19 and other imaging or not well suited to perception, things like needle in a haystack are problems that are susceptible to being distracted by other problems on the image on the complex images. Here's an example of an even more subtle cloud of filament this clot in the smaller peripheral arteries of the lung.

14:00:05 So this just illustrates that we need help in interpreting these kinds of images.

14:00:12 So, the data that we aggregate and the algorithms that we develop can do a number of things with COVID 19, we can certainly identify infection, like I showed you.

14:00:23 We can diagnose the disease and distinguishes COVID 19 from other forms of pneumonia, we can access the SS the extent of the disease.

14:00:32 Monitor therapies to see how effective they are detecting the complications like the blood clot I showed you, and even predict outcomes like the utilization the need for hospital admission ICU admission, or even mortality, it, it used to take years to build AI algorithms like this but recent advances in AI. Now with the right training data we can produce these kinds of AI algorithms in a matter of weeks, so let's talk for a minute about the data that's necessary and Chris can DARPA alluded to this earlier, there was a nice recent NIH consensus conference that developed to roadmaps for research in this area and both identified the lack of diverse data as a key bottleneck.

14:01:13 Mostly the data sets, current data sets are small in size and lacking real world variation and developed at single institutions working with single developers limiting diversity and generalize ability, just to reinforce that point this is some work that

we published earlier last year in the Journal of the American Medical Association, looking at all of the research that's being done on computer vision in medicine, and where the data sets come from to train those algorithms.

14:01:41 And you can see that the majority of those data sets come from just three states. So the data really are being used today to develop these algorithms are not diverse and so the results will not generalize well to other populations.

14:01:53 And this is exactly what MIDRC is trying to address by bringing together a diverse data set from across the country.

14:02:01 Why would an organization want to contribute data to MIDRC.

14:02:05 We've all thought and written extensively about the ethics of data sharing, and I've worked with SS ethicists and arrived at this conclusion based on ethical principles of the Belmont Report.

14:02:16 After clinical data are used to provide care the primary purpose for acquiring the data is fulfilled. And at that point clinical data should be treated as a form of public good.

14:02:25 All who interact with our control the data have an obligation to ensure that the data are used for the benefit of future patients and society.

14:02:33 And people have responded to this hundreds of organizations have now expressed willingness to contribute data.

14:02:38 One of the other reasons to contribute data is that we're MIDRC is now cooperating with other organizations like NBC, which is aggregating non imaging data the kind of data that you see in electronic health records from nearly a million COVID 19 patients.

14:02:55 So by teaming up with NCC, we can enable more comprehensive analyses that answer more complex and critical questions about COVID 19.

14:03:04 So I hope I've given you a sense for why we think this work is so important. There's really a strong clinical need for these diverse imaging data sets to address COVID 19, and to develop new algorithms, and to address those questions, not just for covid 19 foot but for other diseases as well.

14:03:21 Thank you very much. At this point, I will turn it over to my colleague, Dr Etta Pisano.

14:03:39 So I'm going to talk about the things we still have to learn about COVID that MIDRC might help with.

14:03:47 We have learned a lot to date, and we have people working within the MIDRC team.

14:03:59 More than the people I'm quoting here but I'll tell you about a project that display no comatose from the University of Pennsylvania and Joel salts from Stony Brook on Long Island, are doing together to assess COVID pneumonia.

14:04:14 We. This is an example of a non conventional pneumonia and that's an example of a very significant COVID ammonia.

14:04:21 And there's been a lot of question, over the course of the last year of how do we predict which patients will progress to the really terrible forms of COVID pneumonia that might progress to death, and art responsive to therapy.

14:04:34 We hope with a number of images we have in the MIDRC archive that we can actually assess these pneumonias and through something called radio mix which extracts imaging features predict which patients will progress, and perhaps even prognosticate or figure out what works with specific treatments. So that's an example of a project that's currently ongoing within MIDRC.

14:05:04 There are also many other things that we could do.

14:05:10 For example, figuring out the long-term consequences to the lungs.

14:05:14 This isn't about the initial treatment, but about the long term problems that might ensue after you've had covered. So this is an example of the progression of someone with coded from the initial pneumonia, to know a little bit further along to clearing

14:05:32 to clearing of actually about one third of people who have COVID pneumonia or severe COVID develop five Brodick changes or scarring of their lungs within six months of the disease onset.

14:05:47 So, with the large data set with clinical data that we have, we might be able to tell and predict which patients are destined to have this long term outcome, and perhaps we can develop ways we can help our clinical colleagues develop ways to prevent it.

14:06:06 In addition, I'm sure many of you who have read about a relatively new, finding and patients with COVID or something that we newly realized.

14:06:15 Some of the patients have were caught characterizing as brain fog sort of a confusion in their thinking and their ability to think clearly kind of excess of fatigue.

14:06:35 This is a seems to be happening in patients who've had COVID even some who've had a symptomatic cope with one study of electronic medical records in California, showed that 32% of patients who had this problem, had had a symptomatic infections.

14:06:45 So this is something we're just now beginning to understand, Senator Tim Kaine reported long term effects from COVID, which may be related to neurologic problems.

14:06:56 This, we believe this is going to be something that will become much more understandable.

14:07:03 Over time, you know, we've had a year of covered.

14:07:07 You know many people believe Cove, it may be a chronic illness, we may end up with recurring episodes of coded over the next decade or so, just like we have the flu every year.

14:07:17 And so it's important for us to understand what's going on with these patients with their brains, not quite getting back to normal.

14:07:26 Here's an example from an early case from Busan China the arrows pointing to an abnormality in the brain a pretty obvious one to a radiologist.

14:07:35 The question is really are these findings, you know happening at the time of illness and a larger group of people than we can currently see.

14:07:45 So we're going to we're going to collect both the lungs cases, the lung images as well as the neuro images, and we will be evaluating whether some of the patients who end up with this brain fog actually could be predicted.

14:08:04 In addition, you know I'm sure many of you have heard of the, luckily rare, effect of COVID on children.

14:08:13 There are some children and adolescents who have been hospitalized for COVID in the United States and around the world. These are unfortunate children because most children are asymptomatic don't even notice they have an infection, there may be something unique about these children that makes them predisposed to covet and makes their brain reaction to covet. These are just showing you in this case you see this dark area in the back of the brain.

14:08:37 This is an example of the inflammatory reaction of the brain to coded. It's very rare, but it's important for us to understand in the developing brain and the I.

14:08:48 The idea is that MIDRC might be able to help us address it by collecting cases from children, and observing them over time, and trying to predict which children are going to have long term Sequoia or consequences of COVID maybe impaired cognition and development. So, this is an important project that I hope will grow out of MIDRC.

14:09:09 In addition, you know, we just need to understand better who's at risk for these complications. So, you know, this is an example of the lung disease, and there's brain diseases well in these patients and it does seem to correlate in this one study with

14:09:23 the more severe lung disease correlating with the more severe brain disease, but we really don't know yet. And we need the MIDRC database, could be very useful resource to help us disentangle this.

14:09:54 So I think the most important point that I'm going to make today is that cold it is a new disease. We are just still learning about it. And what's really very important about the, the images and the clinical data we're amassing is that we don't know yet what questions we want to ask, but the MIDRC archive will help us answer them.

14:10:01 So I think going to questions and answers. Now, I will stop sharing my screen so everybody can come back on video and made available to answer questions.

14:10:13 Wonderful, thank you to all of our speakers for some great remarks and great information on the program. As a reminder, you can submit your questions through the q amp a box at the bottom of your screen, and we will get to as many as we are able to, I'm actually going to start with one that's more process related, which is does data released from Madrid include only radiographs or does it include CT scans as well.

14:10:42 And all I'll add is there are expectations to expand even beyond that.

14:10:50 I'm happy, I'm very good and wants to say, essentially all any images, any medical images acquired on a patient with a that who has had a COVID test can be uploaded into the archive.

14:11:04 So, we are not limiting ourselves to chest x rays. We also are including CT scans or in any other images the patient may have had a follow up question that just came in any plans for including point of care ultrasound images as well.

14:11:21 Yes, any images any medical images at all, including point of care ultrasound.

14:11:26 Great answer the first question on the chat box I guess - Mary Ellen, maybe this is a question for you as somebody at the middle of the major program, which is how is MIDRC, assuring diversity and inclusiveness, especially in smaller medical practices nationwide that may have underserved populations are extremely important to one make sure we have output that serves all the populations in the nation. And also to create unbiased AI algorithms that are robust and generalizable.

14:12:04 So as imaging exams are coming into MIDRC. While we assess the data quality and do they have what clinical data demographics and I'll. We will separate them.

14:12:20 We're 20% roughly will go into what we're calling a sequestered data set. And we're doing this on all groups coming in so that all populations are represented both in training and testing.

14:12:28 We're also working with scientists and engineers who are currently submitting grants, on co bid. and some of these are working with there's one, one in California and one in Florida, where as they submit their grant.

14:12:47 They work with them so that, that one is going out into the rural area to acquire coconut imaging cases, those would be submitted to MIDRC, but that and through that route we help the investigator organize the data set, but we make the data available to all other AI algorithm, developers. And last, I want to point out that MIDRC has a bias and diversity working group to one scientifically look at the effects of bias and the development of AI algorithms, but then also to specifically take those methods and extended to the major concerning parts of diversity, so that we cover all diverse aspects and the nation.

14:13:35 So very much aware of that meat very important.

14:13:44 That both intake organizations the RSA and the ACR have relationships with multiple practices large small urban, rural and diverse areas across the country.

14:13:56 So we're expecting, and seeking diversity of data.

14:14:01 We also think very carefully as Marilyn said about the diversity of the people who are doing this work, and diversity of the patients who are involved.

14:14:13 One of the things that we learn about diversity is that you can't always solve problems of bias just by looking at the data in front of you, you have to ask the right kinds of questions from the start.

14:14:25 So again we're thinking about diversity across those axes that's a very important aspect of this project.

14:14:32 I'd like to add a shout out to one of the people listening in today from Princeton radiology he actually is the first person who contacted the ACR.

14:14:43 I think he's still here.

14:14:46 Can Tom kvetch from Paris Princeton radiology he actually called me in March of 2020 and suggested that Derek, the idea of MIDRC, way before we had started meeting.

14:14:55 He his group has signed a contract and is giving data to MIDRC, so it's a private group based in South Jersey.

14:15:04 Lots of diversity and the people they take care of across South Jersey so I mean that's just one example of how all hands are on deck here, man.

14:15:16 That actually dovetails nicely with a question that was submitted which is how can an investigator propose a collaboration project with MIDRC, or their procedures that need to be followed, or should they just reach out to Mary Ellen or one of the other lead investigators.

14:15:34 They can reach out to any of us we've had a multitude of investigators who are submitting to NIH for their research and development work on coded. And with that, even though, Madrid is open to all of them, we are writing letters and discussing aspects of the collaboration so that study sections, learn about MIDRC and know that this is a real entity that these investigators will have access to the data, but also we work with them, because many of them are collecting their own data.

14:16:10 And then we work with them to funnel that back into MIDRCs so it's a win-win for both. So yes, please contact any of us. If you go to our website MIDRC that org.

14:16:20 There is a Contact link that you can go to and you can also sign up for our newsletter.

14:16:29 Great, and maybe through a continuity of theme here with reasons for optimism, these days with next scenes, being rolled out, and in a number of states cases starting to evade are their thoughts and how Madrid may continue as the pandemic starts to

14:16:50 abate as it as a right now it's a two year program.

14:16:54 Well, as, especially, I don't know that there's a lot of post co bed.

14:17:02 Follow up that needs to be done so I'm COVID, we will continue doing that, however, we're investing, this MIDRC initial contract is for two years, we've been, we're investing among these three organization and the 23 other groups to create this infrastructure.

14:17:20 Once this infrastructure is up. We really owe it to the public to use it for other diseases and other medical images. And so that's what we hope to do.

14:17:35 So, we do have funding for the two years but we want to extend this infrastructure, so that we can aid in a development across various diseases, and Michael, just to add some technical detail to that the beauty that we have in imaging, is that we almost

14:17:53 all 99.99% of medical images now are acquired using a standard called die calm and so all of the infrastructure that we're building would be able to ingest any image from any of those devices across the different modalities different body parts.

14:18:11 And so we're building infrastructure to do that for COVID but it would be easily expanded to include any other disease that would be imaged on are all of the medical devices that are deployed across the country.

14:18:25 And maybe I can add to just sort of an operational point of view, you know, virtually every NIH Institute has a stake in the success of MIDRC and MIDRCs process, the ability of MIDRC to bring out investigators across the country who are working collaboratively with basically the IC. The idea to develop new tools to solve really hard problems so we'll be working all of us together, to encourage support across institutes and even agencies.

14:19:00 So this is a mission, that's really a national mission, and with the successes of MIDRC and COVID. We hope we can build on that and demonstrate the value of it to many other partners going forward.

14:19:14 Michael I was just going to add that you know that Kobe is not going to just disappear I know we've all heard of long haulers and even that seems that vaccinations helping some of them does still be a residual of my population which residual clinical and imaging findings. And this sort of a baseline decided based on information with collecting now be very useful for the future.

14:19:38 So, maybe a little bit more broad based question, which is, how can video replay, what role can Madrid play in an AI or ml technology development and deployment.

14:19:50 I'm going to leave that kind of broad scope, just to let everybody provide their thoughts there.

14:19:58 Well, I.

14:20:01 It was pointed out what MIDRC is working with FDA so let's say an AI algorithm has been developed, it's necessary to develop it on a diverse status said that they will be able to obtain from the MIDRC.

14:20:17 Data comments, along with the clinical data, then once it's developed it needs to be tested and it also needs to be tested on a diverse data set, to make sure it's sufficiently robust.

14:20:30 But at that point, what we, so what major is doing is we're sequestering, some of the data. So that data never leaves MIDRCs, but what we will do is allow investigators to have their algorithms tested against it.

14:20:46 So, then they will get a independent test evaluation, and we be able to maintain the integrity of that test that so that we can give them a performance value.

14:21:02 I''d say that year and when they come back a year later, we will be able to draw again I population data set, focused on their claim. And again test their algorithm.

14:21:10 And so, they will have a while maintaining the integrity of the test set. And in working with FDA, that kind of setup could then lead to having an more efficient route through the regulatory process, because this unique data set.

14:21:30 It could play a role in telling FDA how well, an algorithm, performs, and that way it will expedite getting AI to the public.

14:21:41 So maybe more of a technical question. How can researchers access the major data set.

14:21:49 Okay, well, we invite everyone to go to madrid.org which is our main website. There you can learn all about the investigators are activities there write ups on the various technology development projects as well as the collaborative research projects.

14:22:05 And at that point, you could also click on buttons that give you information how to contribute data, but then you also can go click on one to download data, and you will then be sent to data that MIDRC that Borg, which is the gen three platform from which you can then search, we will have Gen three is being set up so that anyone can browse, if you get to a point and you want to download will ask you to do a simple registration, so that we can continue to keep you informed on the data set.

14:22:43 It's been mentioned a couple of times about the potential for expansion to other disease models in the near or long term. Are there any particularly good candidates, where Madrid can be applied to that, that you folks see beyond COVID like Michael, I,

14:23:06 I think I would start by saying it's impressive, the number of applications that AI is likely to have in radiology and the effect that it's going to have on our practice in the in the coming years.

14:23:17 So, extremely broad but if I were going to focus on specific areas I would say the kinds of problems that humans are not very good at and the computers tend to be good at.

14:23:29 So, these kinds of needle in a haystack problems. So for example, searching for tiny areas of calcification on a mammogram or a tiny lung nodule on a chest CT or those kinds of search problems similar actually in pathology, they're similar kinds of problems looking for that one metastatic cell in a lymph node biopsy and other kind of problem that humans are not as good at is quantification. So, how do we assess the overall extent of disease throughout the body or in a given organ, that kind of thing is done, often in prostate cancer so Gleason grading and that kind of thing would be much more consistently done if it were automated and still with humans in the loop but with these kinds of Al AI algorithms.

14:24:16 Helping radiologists and other imagers, and also Michael. There's nothing about Cogan that ties down MIDRC there, they'll be findings, which will be generally applicable to other disease states as they affect organs. So, it's wide open, is that correct just by.

14:24:39 And I just want to point out the MIDRC is more than just the data set. It's a center. So it's working to collect high quality diverse data, but it's also providing tools for AI investigators to us to, you know, we have one group working on, what are

14:24:59 the MIDRCs needed if you're developing AI for detection, or if you're developing AI for diagnosis, and those tools will be explained and software will be available.

14:25:13 So AI, developers have a jumpstart. We and. In addition, we are putting up information and information on the website. In terms of white papers for example trying to explain what does it mean to have explainable and, or interpreted AI.

14:25:31 So, we're a community and, and we're more. So become a partner with these AI developers along from data, all the way to the public.

14:25:44 And there was another question that came in on the commercialization topic, which is future AI devices will likely need post market surveillance does MIDRC plan to play a role in this post market space.

14:26:00 I'm happy to jump in on that one too. I think MIDRC with this with this component of a sequester data set, that is, that will be kept only for independent testing, could be used at various points

it could be used as someone is developing and they think they're done and they think they have the algorithm they want it independently tested, because of the way we're setting up the data set, if they come back a year later, it's not going to be correlated they can't train to the test.

14:26:32 Now, then it can go through the FDA be cleared by the FDA, and of course, I''ve taken AI systems through the FDA. It is then going to the clinical setting where you have to worry about disaster recovery, you have to worry about cyber security, you have to worry about someone inputting a breast image to a long AI technique. Simple things like that they are not even in the laboratory, or in the FDA, but you know, and then at that point.

14:27:05 We could also use the sequester data set for these posts market evaluations. And so, I don't know if the others want to add the FDA is actually indicated to us that that will be one of the functions if MIDRCs exceed that is post market, helping them do post market surveillance.

14:27:27 So I think we've got time for one more question and I'm going to do this in kind of going around the horn fashion, which really is what has you most enthusiastic about the near term potential for the Madrid program and Dr. Geiger I think we'll start with you.

14:27:46 I'll put you on the spot.

14:27:49 Well, MIDRC is really being advanced by a community. and it's a really broad community of technology developers and people who are very interested in advancing these approaches and disseminating them then and making sure they have impact.

14:28:03 So there is that drive that ambition, it's kind of a movement in a sense. So I'm excited to see, really, truly outstanding cutting edge institutions and people working together to try to develop these tools and validate them, so that everyone in

14:28:19 the country and around the world can benefit from them equally. And that's really our urgent problem that we're trying to address encoded.

14:28:29 And then the idea to build structures that are longer lasting that could on a regular basis, validate and disseminate algorithms and approaches, so that people have confidence in their use I mean there are many AI approaches that are out there that are not actually why they use so it's kind of all about finding truth.

14:29:01 So thanks, Dr. Kandarpa what has you most excited about the MIDRC program.

14:29:07 What am I most excited about. Sure. Yeah, I mean, my most excited because unfortunately COVID is affecting the entire body so although we first thought we'd learn about the lungs and the heart and how to use AI, we're beginning to learn that the entire body is affected so what we will be doing as I said, is collecting aggregating both energy and clinical data around the body, and that'll help us develop systems that will be applicable as we expand to other disease states and organs.

14:29:39 And of course it'll always be future pandemics.

14:29:49 Dr. Langlotz - I'll put this question to you.

14:29:51 I would say the most exciting thing to me is the potential for learning new things. So, I think we've focused a lot on helping us with really hard findings in radiology and how to, how to improve the

performance of radiologists, I believe these kinds of datasets, not just for COVID but for other diseases have the potential to help us understand things we can't currently understand and know about, because we just don't have big enough data sets, like having the EHR codified and available.

14:30:22 The electronic health record. For those not in the know codified available, along with medical images that that is very exciting and could lead to a lot of new knowledge that will help our patients.

14:30:36 Thank you.

14:30:39 Yes, I agree with what's been said and I guess I would emphasize the aspect of community that Bruce mentioned I think it's really phenomenal, the amount of response we've had from healthcare organizations and, by extension the patients that they treat

14:30:55 to be willing to contribute their data to a resource like this, and to someone like myself and all the others who are AI researchers, that's really an incredible resource it's a rare thing, when we have the kind of data that can answer these really important questions about COVID, so I'm excited to see even now some of the early results that we're getting as we build these algorithms and really gratified by our patients and healthcare organizations who've been willing to contribute the data.

14:31:27 Thank you. And Dr Geiger will leave the last word for you to find a use case, and unfortunately took a pandemic to really get it moving quite quickly.

14:31:54 We've only been in existence since August, and so I'm very excited that we won finally do this.

14:32:06 If you're in medical imaging in the US, you probably belong to at least one of those. And now, in the past months, we have been talking with various other smaller imaging organizations.

14:32:18 For example, the American Institute of ultrasound and medicine, the neuro radiology societies where we can work with them as they create their that, you know, we don't need to reinvent the wheel for all these other smaller repositories, we now can serve as a US word bank and have everyone bring in together and work together so I’m really excited about people working together, and also about how this is changing the culture of people having their, you know, it's not, it's coming to the major organizations to help the public so the change in the culture of giving your images is very exciting.

14:33:01 Add to that Michael I'd say what really excited, is if people like they volunteer to be vaccination patients, if they could volunteer images and have their, their organizations or whatever, provide more images and be great because of all the reasons that we said earlier that, you know, they've served that purpose, and for the common good, it'd be nice to share images that that one has.

14:33:32 Wonderful. Well, we have reached the end of our time for this afternoon or this morning if you're on the West Coast or in other parts of the world.