Dr. Angeli MOELLER

Alliance for Artificial Intelligence in Healthcare:

Remote Patient Care and Artificial-Intelligence as Diagnostic Support

I'd like to cover three topics in my introduction, some of which have already been touched upon, education, coordination. And then the 3rd one coming from the private sector myself, innovation and about how long it takes to take that innovation to a place where it can really start to have impacts on people's lives.

I hope that we can also have a lively Q&A at the end following the introduction.

So education we saw touched upon in the first set of talks. And I'm sure that everyone who would choose to dialog to a webinar like this one, already has a very high level of interest and probably a ground level of education in how the coronavirus is spreading, in how we're also able to use data science and machine learning to tackle that issue. But if we look globally at the response and you saw some of the numbers just there about how do we predict whether or not people are self-isolating, whether or not they understand the importance of self-isolation, whether or not to the opportunity to start downloading apps and which apps to download can help mitigate the spread of the coronavirus? Is this all common information?

And in this kind of pandemic, what we've all seen is it's not just about educating or researchers or leading academic institutes. Everyone needs to understand why the self-isolation is so important, needs to understand how to look at the doubling rate or what sort of things are important to consider as they upload their information in the app. And we've heard something here about misinformation. So how can we then also tackle misinformation by us commutatively actively providing the correct information? So for Bayer, a lot of that has come out in different alliances we're joined. So really the partnerships together with academic groups, partnerships together with public organizations. So we sit on the US chamber of commerce. And they were also working in their preparation for G20, which I'll talk about in a mo-

ment. In addition, within Germany, we've been actively working on the EU commissions guidelines for artificial intelligence, which you heard referred to in the first part of the talks. Part of my team also really worked in detail on those guidelines. We've also been working in partnership with other health industries, so pharmaceutical companies, hospital networks within Germany to put together a single voice on education, a single voice on policy.

So this starts to go into a coordination. So for each of these points, I'd like to get really tangible at some value cases. If we look in the first part around education, we see that artificial intelligence can often be met with a little bit of resistance, a little bit of misunderstanding and fear even. So, before I moved into the field of data science and data engineering, I used to work myself in genetics. And then also in satellite therapies. And here we experience the same situation where there's no good or bad technology. There's just different ways of using a technology. And we have genetic engineering with an excellent example, deep learning and artificial intelligence, now the current topic.

Here, what we're actively doing within the alliance that was referred to in my introduction, the alliance for artificial intelligence in health care, is we're working together with policy makers, and also with healthcare professionals to make sure that they can understand what is the terminology being used, what is important if I'm a radiologist? Then I start to use now a workflow which helps me identify and stratify patients. What lies behind that workflow? How do I know I can trust it?

So the alliance for artificial intelligence in health care, which is made up of 40 different organizations, including academic groups and private companies, one of which is Beyer, wrote a response to the FDA's guidelines for software as a medical device. Now we really look at, what is the level of testing that you have for software as a medical device when it's out on being used for patient stratification and diagnosis? As you have a new dataset, a new dataset may have bias in it. How do you re-validate what you're seeing? As you launch something onto the market how do you continuously have that pharmacovigilance monitoring to show that it's behaving with the accuracy that you expect following product launch? So that education aspect is so critical because without education there will be no adoption. And without adoption, we won't be able to address the fact that doctors are overworked, nurses are overworked. And these new technologies can start to reduce that burden, reduce the burden on our intensive care units, reduce the burden on our healthcare system overall.

That's a very active piece where we're working on education for policy makers and healthcare professionals. But we also see there's an important role to play in education for the general public. At that point, I'd like to talk about a company called

Humor, which is one of the smaller startup companies that Bayer is working with, and also one in which we have an investment.

Humor currently have an agreement with the government in England, in Wales, in the United Arab Emirates, and also in Germany to provide an app which is for patients who have been positively diagnosed with COVID-19, to allow them to self-isolate, but also receive telemetry medicine support, so that they can then have remote monitoring and as far as possible, automated monitoring, so that without human intervention by a healthcare professional, you can start to look at temperature peaks and temperature changes in oxygen levels in the blood, changes in activity, changes in sleep.

Here with the launch of the app, they've already seen a 90% rate of adherence. So 90% of those who downloaded are actively adhering to the schedule and entering their data. This goes into the education informed consent. So they really had in the design videos, communication material that was suitable for the general public, to understand why such apps are important to understand how to engage with such apps, and also to understand, most critically, how will their data be used. I think one of the policy papers that came out recently from the German health association, really said we should make our attention to data privacy, one of our unique selling propositions.

And I think here that's very much played out as we start to see all these COVID-19 monitoring apps. If you would like people to download them, and if you would like people to actually use them and actively allow their data and their mobility to be tracked, then we have to ensure that data privacy is in place, that we have to ensure that data privacy is understood by everyone. So they feel comfortable using the app, so they feel comfortable recommending it to a patient. And so they feel comfortable rolling it out as a policymaker.

So that's the piece on education. And as I said, I'd love to follow up in Q&A.

The next part is on coordination. And I'm sure that many of you here on this phone call, as the pandemic broke out, received, as I did, lots of invitations to take part in different working groups, so many different working groups sprung up with different levels of attention, different levels of focus. I think one of the wonderful things to witness there was how much everyone was really ready to contribute, really ready to shift their work, shift their research, and focus globally on dealing with this pandemic, really ready to roll up those sleeves.

However, in order to be really effective in our response and to really tackle and have the most impact for patients as the pandemic proceeded, we saw the need for a high level of coordination. And that's why it's very important for us not to act

alone in the situation as Bayer, but to really act in a coordinated function. We've seen that, and again, as I alluded to, we are part of the US chamber of commerce, we are also very active in the European Union's artificial intelligence white paper, very active also in the BDI, where we're coordinating together with the rest of the German industry, on our recommendations in response to COVID-19.

But here it's about how do you even bring that altogether into a series of very easy to understand and easy to implement guidelines that every company, even very much companies like ours, can start to implement, but also contribute to. So there one thing which is probably a little bit boring, but I think it's important to say anyway, the common lexicon. You'll see on the G20 recommendations a common lexicon for R&D and artificial intelligence in R&D.

And I'll give you a simple example, the explainable AI. So we talk a lot about explainable AI when we're trying to get deep learning or machine learning computer vision driven solutions into a hospital network. We want the doctors to accept it. We want them to understand it. We want them to really feel safe and comfortable using it with their at-risk patients. But here are we all in the industry using the terms explainable AI in the same way? Do we all understand what that means? Is there a common understanding with policy makers around what does explainable AI mean and what would a black box approach mean? And when would I choose one or the other? And what are the pros and cons and benefits and subtleties of these different types of systems?

So just to have that investment made into upfront definitions and share definitions, is one of the things where I think as a global community, we can really help policy makers to make the right decisions and also help, for investment to go into the right solutions and into the most patient centric solutions.

I think the other point around coordination, we saw a lot of coordination very quickly on the ground in Germany in terms of setting up testing labs. I think that was really influential in how we responded to the crisis. I know at Bayer in Berlin where I work on site, they took some of the laboratories that we normally use in R&D and they really set them up to support COVID-19 testing. It was really that wonderful. All hands on deck response, where everybody sort of put down whatever else they were doing and work together to respond to the growing pandemic. I think the other partner that will come out of coordination and that brings me onto my 3rd part, innovation, is really how do we coordinate now our investments to make sure that as we reopen the economy, we're doing it in a way that is going to be most impactful to try and mitigate what we're seeing as a COVID-19 driven recession.

So how can we be coordinated to mitigate those economic risks? And here, within the innovation, working in Bayer where I am, in a big pharma company, a lot of the innovation that we have, which is all around bringing the right medication to the right patient at the right time. So it is, first of all, the right medication, the drug discovery process, the drug discovery process, $2.9 billion, 15 years. So what we're seeing there is an accelerated effort to really reduce that cost and that time frame. And here investments in public private partnerships such as the IMI MELLODDY project, which is focused on developing approaches for federated learning, where you can train machine learning models over different data sets, which are stored in completely different privacy preserving locations, is one of the investments that was made before COVID-19. But one of the investments into pure innovation through a public private partnership that can now benefit us in a new COVID-19 world where we have to, again, build predictive models like those that you've seen in this call already, but build them across different data sets that we're never going to be able to aggregate into a single data set.

The other part of innovation is really then on regulatory guidelines. So we're all here in this call representing different geography, and those geographies have different regulatory guidelines that will affect the speed with which you can bring a predictive diagnostic algorithm from a research site then onto the market and into hospitals. And a lot of the work that we can do, both through coordination but really driving innovation is then how do we set up those regulatory guidelines? And do we have a level playing field? So is it equally easy to bring that innovation to patients in all of the different geography is that we represent?

So I think that's the 3rd area where we have to be very conscious and can work together to really reduce the hurdle that we have to go through to bring that innovation directly to the patients.

So those are the three topics I wanted to cover in my introduction. I look forward to the Q&A.