

**SPEAKER:** So it's my pleasure to introduce Dr. Rahul Kashyap who is a physician researcher in Critical Care Medicine and assistant professor of anesthesiology. He obtained his medical degree at the MGR Medical University in India and then moved to Mayo Clinic. He had previously trained at the All-India Medical Institute.

He serves as associate director for the Critical Care Research Fellows at Mayo. He's also served as associate editor for the International Journal of Medical Students and a reviewer for many other journals. He's coauthored 60 peer reviewed journal articles with over 630 citations. He's had numerous recognitions for his work, which is primarily focused in the area of critical care of medicine, and he's currently pursuing his masters in clinical research through CCATS. The title of his talk, I guess, is up there. It's about the checklist for early recognition and treatment for acute injury and illness.

**RAHUL KASHYAP:** Today I'll be talking about CERTAIN, which stands for Checklist for Early Recognition and Treatment of Acute Illness and Injury, and it's a journey. I'm the face of the team. There's a lot of people I'm working with, some of them are here in this room itself, [INAUDIBLE] one by one. But it's a team work. Huge work was done many years back, 3, 4 years back under Dr. [INAUDIBLE]'s team. And I'm here to present some of it, not all of it.

Disclosure summary-- the planning committee doesn't have any disclosures. The CERTAIN and Aver tools, they are IP protected and the Mayo Clinic has conflict of interest. It has been done with guidelines of Mayo Clinic Conflict of Interest board. And they have the financial contract to a company. I do not have any financial interest or any stake in that company at all. I have some Mayo Clinic funding, and I'll not be discussing any of the off-label drugs in this talk.

Learning objectives-- After completing, these are three things you should be able to summarize, some of the ongoing efforts we are doing in this project. We will discuss or you'll be able to discuss those efforts in content development, remote education, and some web-based application. We have our designer right here. And I'll discuss some of the opportunities in pediatric pharma that CERTAIN will be talking about.

I have 95 slides. I'm just kidding. No, I don't. It's less than 60 slides. But this is an overview of our slides. I'll be making a background, talking about why we need to worry about it.

Second thing, talk about in one or two slides why the golden hour is important for critically ill patients, introducing the tool itself-- we checked it. It might work here. So I'll go online and try to show you how it could be quickly done-- a couple of slides, and get off for remote education and implementation, some technical description-- don't ask any questions. We have Mr. Lei Phan in the team. He can answer those questions for you. He is the one who provides those slides-- and a few last slides if we have time to talk about that pediatric CERTAIN or pCERTAIN.

So before the file starts, CERTAIN is an electronic checklist, web-based, [INAUDIBLE] on iPhone, on Android-based applications, to paper form as well. But before I start talking about checklist, I think I should talk about the use of checklists in health care setting at all. There are two physicians who have learned most in this area.

Dr. Atul Gawande, he's the author of the book Checklist Manifesto. He's a physician who first brought the idea of checklist into the scene. And he's implemented surgical safety checklist in operating rooms.

The second person is Dr. Peter Pronovost. He brought that checklist idea in ICU. He provided checklist regarding day to day care that involves daily downs, involves bundle compliance for ventilator, for centerline, and daily calls for the checklist. So these two guys, they laid foundation for use of checklist in OR, in ICU.

I'll take it a little bit further. We are way behind in medical field in using checklist. The two other industries which work better than us are nuclear industry and the airlines industry. Let me give you a grim picture.

If we translate the amount of error we are doing in medical industry every single day-- I'm not talking about major faults like you leave a foreign object in the body. I'm talking about not giving antibiotic on time, leaving catheter longer than you're supposed to leave. If we count those things, we're talking about roughly 700,000 errors for one million events happening in ICU, in hospital, in health care settings.

Let's translate those numbers to airlines industry. That means if the airline industry started having those errors, then every single day one Boeing 747 is going down. Imagine that. If that started happening, will we ever fly? We won't. We won't.

But that's the situation right now, that these things are happening. And the reason that the nuclear industry and airline industry have brought down their error rates to a lower level or Six Sigma level is that they use those paper-based checklists. I've seen when I enter the plane that those pilots who went ahead of us, they're sitting down and going through those paper checklists on a clipboard and checking, checking, checking, checking. Now they use iPad. It doesn't matter. But they have used it. They are using it, and they brought down those errors. So it's an important area, and then we have not done well in doing so.

If you notice the year there, it's 1964. Peter Safar, another person, he had significant effort bringing CPR, cardiopulmonary resuscitation. How many of you guys are ACLS or BLS trained? 30% of you guys. So ACLS, ABCD, the checklist approach.

This thing what do you see in the slide, it was done in 1964, almost 50 years ago. He had all those things talked about that time and published it. I would bring attention to one area, if I can have it. See hypothermia? He talked about it using a checklist ABC and hypothermia there. We end up implementing hypothermia in 2005, so we were delayed by 50 years. If anybody's interested in that part, you'll be surprised to hear that it was part of in 1964.

So what we have learned from practice in ICU care that if you do the right action at the right time, especially early in the critical illness, you save a life. Patients is the one-- he or she gets benefited. Otherwise errors and delays, they are mostly related with poor outcome and costly complication. That's true. It happens every single day.

It's been well known since 1974. He published another example of this one. So we have taken too long to implement those things. They were there in front of us. Other industries are doing it. We're not doing them enough.

So now we all know that the critical care support for potentially reversible acute illness is one of the most cost effective interventions. That's the final frontier. But incomplete knowledge of our clinicians, our clinical providers, off the evidenced-based support RRRR, the guidelines, and delays or error in providing the delivery or process of care that offset this potential benefits of critical care support.

What are the barriers? Number one, we are human beings. We do make mistakes. We do errors.

And to give an example, if you are a clinician, you're taking care of two patients in an acute care setting in an emergency department in ICU or any other acute care settings. If you have two patients, you do a phenomenal job. You do all data search. You find the best care practice, and then you deliver your best medicine.

But at the same time with similar resources, you have 20 patients. You ought to miss things out, and that's the whole point. We rely on our brain a lot. We refuse to take help. And we do errors.

Our idea is to bring those patient [INAUDIBLE] pertinent data and divergence guidelines in a single page in front of you by internet, by phone, by paper checklists. It doesn't matter what mode we use. But they are in front of you, so you don't have to rely much on your brain. Of course, you have to use your medical knowledge, but making sure that you aren't missing the clinical evidence.

And the second barrier is the nature of critical illness. It's not straightforward. I'm not saying that ICU is more complex. Everything else is complex, it's a little more complex than anything else. What do you guys see there? Anybody?

A frog, yes. We do see a frog. If you tip your head, one on the side, and you might be able to see a horse. It's an old trick. I didn't expect this to work, but it still works.

So point is in ICU, you know the same presentations sometimes will look like a frog or sometimes look like a horse. You ought to miss a horse if you are not looking for it. To give an example, in cardiac part or anything else, a chest pain or a cardiac event can mimicked a tummy pain like, [INAUDIBLE] could come and then just say, well, I'm having dyspepsia, tummy pain, and they end up having MI. I lost patient in my hands back into 2004 back in New Delhi when I was not trained enough. I didn't know much.

So things, the way they looked like, they might be different. And then we ought to miss those things out. So we need to do something, which can provide us differentials so we don't miss at least the life threatening situations, which can kill a patient from the minute to a few hours.

Third barrier-- we talk about barrier number one. We are humans. We do mistakes. Barrier number two-- that things are complex when you are rehabilitating patient.

Third thing is information overload. We live in an era of when we have all information on our palm. We have so many EMRs. If you deal with those electronic medical

records mixed last word on this issue we're going epic way and many things. We are over-burdened by this information overload. And what happens when that burden comes to you and then you are cognitive you're overloaded, as well.

To give an example, the latest guidelines, sepsis guidelines, there are 57 pages in that guideline. And to treat a patient with sepsis, septic shock, you just need this one table which you see on your screen. And I think it's on page number 43 or not.

So the point is, when you're treating a patient acutely in ER, in ICU, having that 57 pages even on your phone or up-to-date will not help you unless you know where to find the information you're looking for.

What we need is we just need to extract those high value data both from patient side, and from the practice side. And package display the data in front of health care providers. Team Dr. Pickering, Vitaly Herasevich, Ognjen Gajic, they have done that. They did simulation exercises. We looked at it. We asked people to use one of the novel interfaces they defined. To me, a home run of our system. We have seen it.

They looked at it and what they found is when people when they use existing EMR versus the-- people who use novel interface versus the existing EMR, they had less time taken for doing those tasks. They has less cognitive overload, which was measured by NASA-TLX alpha score. And they did less errors when they use a novel interface.

So the idea is, if we can package our information in a way which can have us all information available in one sheet, one page, or one place, we don't have to go to a different place. It helps us take care of our patient.

From the group recently published, Marija Vukoja is one of the lead author. She's the PR for the whole project. I'm the co-PR and International Director for the Study, Dr. Gajic, Professor Gajic, he's an overarching provider. He's taught of this idea many years back and then Oguz Kilickaya, Dr. Dong, and a few others, we worked together to go to many iterations.

We did like seven iterations. We failed six times. And then when I show you the next couple of slides, that's going to be our seventh version, which we keep on updating here. Lai can talk more about it. Every day we go to him and say, Lai can you fix this thing? Can you add this thing or not?

So coming back to the tool. I spent last 10 to 12 slides making a case that we have barriers. We have issues going on with our care in health care settings. We need to use checklist approach to make sure that our patient doesn't suffer.

Now I'm showing you our model, our checklist, which is an electronic checklist. We have two modules. One is ELITE module for admitting the patient, when the patient comes in. And second is that Rounding module, when patient was admitted yesterday, now you're rounding today with your team, multidisciplinary team. And you're making goals for the patient that what patient should be doing today, or what patient-- or what the team will be planning for the patient today.

That's what the tool looks like. It has three parts. If you see, this one is your demographic section. You can fill it. And I'm going to show you in a minute live. If it works. This is a demographic section. You can fill the data. Anybody can fill the data.

It doesn't talk to EMR. The CERTAIN doesn't talk the EMR. Their version, it talks to EMR. It pulls the data automatically. This one is-- we did-- we designed it to be used in any [INAUDIBLE] setting. That's why it's a standalone on purpose.

The second section, this is your action part where you make-- this is your checklist. You put your admission history, medication, any allergies, put your point of care, labs, values, or any change. And I'll show you in a minute when we go there.

I forgot it was assessment section. So let's go to our internet to see if it works well or how can I show in less than one minute how does it work. I've typed my password a couple of times in front of everybody so-- all right. I'm going just going to-- and these are all dummy patients. There's no real patient data right here. So there's no PHI problems.

So that's what it's looked like. Patient came to me. I realized patient was having some ARA compromise. It is a visual color coded. If which can kill a patient, go there's a poor entry. I see the mottling Answer is pain, pain responsive. If there's no focal deficit, or anything like that, I quickly go-- I think patient came and they said patient's blood pressure is 80. I checked it quickly.

Patient has a chronic renal failure. No known medications. We don't know that are no known allergies. Quickly, if you have vitals values, you can quickly go and type in actually your heart rate. If it is 120, or you can just say up or down if blood pressure is low or high. And if you're double click, it'll become red.

So it's everything in front of you right there. A prompter, a person, a junior resident, a nurse, somebody else sitting in the background, listening to patient's history can quickly keep doing those things when you are actually doing your-- taking care of the patient.

You come back. This is the meat of the thing. You'll say it looked like it might be sepsis. Let's type in and see what we get it. As soon as I clicked sepsis, see what changes. Aha. I get a diagnosis support card. Which tells me it could be the definition. This is diagnostic. What you should-- things you do now. Once you stabilize the patient, what these things should be done after that.

But you see here? It gets me that give antibiotics, food bolus, vasopressors, steroid. Suggested interventions are right there. And actually, I can click those, choose if it is a lung problem. [INAUDIBLE] if I put patient's weight right there, I lowered it. Which should be 65 or 75.

I can order it and it should go-- if you go back here, you'll see that it's been all write. It's prepopulated with the lab, vascular excess, and oxygen part. And you can do your own QI, quiet improvement projects, auditing it, and then it's always done, it goes compare part.

Same thing with antibiotics, same thing with fluid, and whatnot. I can search for anything else. There are algorithms. If you have, let's say, shortness of breath. If I click it, it gives me a decision support tool to see with this, if we have this, consider this.

And I didn't create it. There was a team. Each card is known as-- we call it a card. It's a syndrome card, or procedure card, or medication card. Junior people, resident fellow, junior faculty did all those cards. Those cards were sent to international exports at Mayo and outside. They review it. They signed off on those cards. They came back. Got blessed by steering committee. And then they go for uploading. And Elizabeth has provided me a slide. I'm going to show that slide quickly.

That's our admission. You can actually print it. And in resource pool setting, it could be a part of for patient' EMR. If you go in Rounding part, I'll talk about it. Same Rounding checklist. You go quickly, you can find out, write down if they need sedation break, or they are delirious. To do those things, you can save them. Keep going in many different parts, saving it.

Once you're done, you can actually go and print it and then have it with the patients.

How many of you remember in the past, where patients-- in movies when patients were lying on the bed. And on the foot hand there was a clipboard lying there, and those patient's medical charts were right there.

If nothing works out, having-- putting those checklists, printing it out, so at least everybody is on the same page about patient's goal. We are not-- oftentimes not whole team knows what's going on with the patient.

Nurses are the best at working for the patient. If you listen to them-- as a junior resident, when I learned back there, they are the best friend, because you know nothing. They have been there. And then as you learn, they are there with the patient all the time. They don't leave patient's side for Grand Rounds, or anything else. Or [INAUDIBLE] they don't change their shift as quickly we do. So quite a lot.

I've taken a lot of time. I'm going to go back to my presentation. Oops. I close this, I should go back automatically. There we go. OK.

So I've showed you the interface, the assessment phase, and then that decision support part where it gives you the latest guidelines. And we update them pretty frequently. Every card get updated every year. We have expiry. We call it apoptosis state. And then we have already added our ebola card. And we are working on the mars card, as well.

So as the evidence become available, we go to our write-- the authors, they write it. And then get it reviewed. It's a lengthy process, but it happens.

You can keep track of actions. There are time in the bottom. And if you start CPR, it gets you the timer as well. I showed you the Rounding-- a Rounding tool that it-- system-based care. Print it out. And then everybody can do it under those patients.

Paper version. Some of the ICUs did not have internet, so we had our paper version to go with it as a booklet. We have a tiny booklet to go. And those checklists I showed you for admission part and Rounding part are separate checklists for paper version, as well.

I like these slides. Tell me how you like it. Give me smiles or clapping. You can tell me. So let's imagine this maze is a clinical problem. And we have four clinical providers. He or she, doesn't matter. I'll use both the terms.

So see how they approach these clinical problems. And don't tell me then there's a way outside it. No thinking outside the box here. It has to be inside the box. So there's no way outside. You have to go through this maze, OK?

So let's see. It's a complex clinical problem to be dealt in ICU or ED, or any acute care setting. And see how our first guy do it. Like this gentleman or like lady, how he or she is going to approach it.

He or she tries everywhere and fails. He or she doesn't have any idea. Let's see what our second person does. So she or he has an idea that's a wrong idea. He or she fails. Third person, he's a smart, or she's a smart dude, or smart person. What he or she does goes there, knows what to do, takes her or his own time, and finally take a good decision, and then does it.

But what's the problem is, he or she is not organized. And it delays. And we are talking about acute care setting. You can't take a couple of hours just to decide, should I give aspirin or not, or should I just give this antibody or not.

Let's see our final guy. Or girl. Pretty fast, huh? So thing is, we don't know if he or she knows that. Are any-- he or she does have any idea. But point is, he or she is certain.

The whole idea is that how it should work or should work out is it doesn't matter that you know or not. As far as you have guidelines at your hand tap, which can tell you if this happens, please do this. If these three things happen, make sure that you don't miss out on these three things which can kill patient from few minutes or a few hours. And that's a whole point.

So hypothesis. It's a project. I'm presenting it as a project. It has to be a study. And so in this project, we are doing this study. The hypothesis was simple. That we said this care assisted by decision support tool, CERTAIN here, that improved the process of care and outcome in these critically ill patients.

It's-- I just tried clinicaltrials.gov. These are the details. We have inclusion exclusion criteria. We are looking at 15 or 29 or 30 ICUs. Looking somewhere from 1,000 to 5,000 patient to be enrolled there. All our prospective patients inclusion area, 18 here in the US, outside is more than 16. At this point, we have all international center. No US center are taking part. And exclusionary criteria is pretty straightforward. That they should not be complete-- they should not be non-complicated. They should not be readmissions. Not just uncomplicated surgeries. Routine-- routine post-operative admissions, and transfer from other ICUs.

Our data collection happens on REDCap. Through Mayo external REDCap. Only de-identified patient data get entered there.

These are nice pretty-- nice little graph there which shows our centers around the world. We tried to have one in Australia, but they could not do it. But we have a couple of centers in India, JSS one in Mysore. And one in Rourkela. A couple of centers in China. Actually, four centers in China. One in Mongolia.

When we present this data, are these graphs in international meetings, people get surprised. Like, how did you get a center in Mongolia. And that's all our PIs and mentors who have connections there, who have worked with some of these folks before, and they suggested some-- or quite a few in Middle East, in Eastern Europe, three centers in Africa, a couple of in South America, and Central America, as well.

This some of the-- our study. How we do it. So we have three months of baseline recollection, once they have their IAB approved. They collect up to 50 patient, 50 or 100 patient at that center. Then they move into our training phase, where we ask them to come for our remote education.

What we do is we assess them how they're doing. We give them some scenarios, see if imagine you get this patient. We showed that, displayed them our vitals in labs, and all those things. And we assess them how they're doing it.

It's not we are teaching them medicine. We're just assessing what your baseline you're doing it. Then Dr. Dong's team, they send them training materials. Videos to watch, materials to read for a couple of weeks. And we get them our hands on for the CERTAIN too.

While they're going through this process, they'll come back again after two to three weeks. And now we do the similar scenario, by this time their showing us how they use the checklist when they do the scenarios. Once we have those first batch of trainers trained, we call them our train-the-trainer program.

Then they start training a couple other folks at their centers. When they reach the critical mass, that means they have at least one person trained how to use a CERTAIN checklist. They start using them on actual patients.

Once they reach that compliance of 80%, that means 80% new admitted patient who meets the criteria, the CERTAIN was used during admission for Rounding days. That means they have completed their implementation, and now they'll start collecting the post-data collection.

So we have baseline data collection, training part going on, and then the post-data collection. Our idea is we are a couple of centers who are now in post phase. We have centers in all three phases. Our idea is to find out how they improved in their process of care and outcomes. We aren't comparing any centers to the other centers. They're comparing them to themselves, pre and post design.

We use quite a few fancy tools. I didn't know anything about Trello. Anybody has heard about Trello except [INAUDIBLE]? OK, I didn't know anything about it until two months ago and then we use it.

This is our working sheet. If we need to have some task done from one of our content management person or from our programmer, we just go there, add those things. We look at our task and then just do it. And you can move these tiny slides from here to here, and the centers move from one phase to another phase.

What we're assessing-- what's our outcome assessment? Basically, we're looking for better care, better health, and lowering the cost-- that by using it, you can have a patient stay in ICU for 5 days or 10 days and have a urine catheter infraction going on. You can cut short that time period and save cost and they go better satisfaction for them and family and for health care providers as well.

This is my last slide, just 3/4 way done. A couple of our members, [INAUDIBLE] sitting in the audience. Can you raise your hand, [INAUDIBLE]? OK, then we have Ison, Ronaldo Savia, Dr. Savia is here now.

Dr. Garcia, content expert, perfect, and Jack Ohoro, Vitali Herzovich, Michelle, she's in South Dakota now. One of our PI from Dominican Republic, myself, Dr. Gaech, and Dr. Baron Cobb-- he's a founding director for USID group, which is United States Critical [INAUDIBLE] group. We had a meeting in NCCN for CERTAIN investigators.

Changing gears now, talking about the content, I showed you those syndrome cards. We talked about the syndrome cards or the medication cards. All those-- the procedure cards.

Let me take a step back. My goal from this presentation is to see if you can find something of your interest. We have taken from pharmacists in Mayo.

We have taken help from resident fellows, people who are applying for residencies. You are from one of those countries, you want one of your centers to take part in there.

So reach out to me. I have my email in the hand. Or send an email to my last name at first name @mayo.edu that, you know, hey, I'll be happy to work with you or help you out or maybe I have a suggestion for one of your centers. So just pay attention which area you want to get involved or if you have any suggestions for us.

So our goal for content was to provide high quality content which has the best standard of care and practice, which delivers information in a concise package. If you start mixing up cards in there like a scroll bar down and three pages, then we are defeating the purpose. And we want to minimize the recall bias, recall mistake, when physicians and clinicians do it.

As I mentioned, the certain content cards are divided in four categories-- algorithm, which I showed you, when they have difficulty in breathing and it can walk [INAUDIBLE] algorithm. That gets your differential diagnosis. Syndrome cards, most common findings, therapeutic interventions and management, medication guards. We have family of medication and each medication as well and procedure cards which are diagnostic and information cards as well.

There's a list of card. I'm going to go through it all. This is a busy slide.

Sorry for that, but I really liked it. Elizabeth really liked the slide, so we kept it here. And this is our progress with existing cards, how many we have in each category, how many have been reviewed.

And now this has been a year or more. So now we are updating our cards because I had mentioned we have [INAUDIBLE] date on those cards. They expire exactly from one year when they were finalized, and then we send them to authors and reviewers to see new evidence has come in those fields.

As I mentioned, there is extensive review process. Each card is reviewed by at least two content experts. They get annually reviewed, information shared through Google platform. And we use all this free-- Trello is free, and then we have you zoom in. I'll show you one of the slides. Same thing with+ Google Docs or anything like that. We don't have any specific funding for the project. So it's all mostly voluntary work we get from our team members.

The flow of content management-- how does it work? So our content manager Dr. Garcia sends to authors if a new card or a revision of the guard. They reply back, we send it to the reviewer.

They say-- they sign off on that part and that feeds to our standing committee and then goes towards software, getting translation, and booklet. And I will mention translation yet. Because we're working in different countries and not all of them speak English-- all of them, they speak English.

So we are translating our contents into those languages as well I think. Next slide will shoe it. So these are initial five languages we are working on.

Sixth is French. I don't have any resources to try to store them. Spanish is the number one, Chinese, Croatian, Turkish, and Serbian the language we're working on at this point, and French is our number six. We have to start working on that one as well.

She made it. I did not. And I really liked how she could put certain-- in all languages we have.

Not the last slide, but just to take a pause and acknowledge the people who have helped us making those cards. We have huge help from our Mayo ICU pharmacist, then the reviewers from Mayo Clinic itself, from outside people. We have authors who are clinicians or clinical fellows at Mayo Clinic and many different departments.

Mostly they're ICU. Now they are in pulmonary or in ID as well. And then some research fellows who are looking for residency, and they helped us write those cards.

Couple of slide about remote training and local implementation-- it's been a pleasing experience meeting people online, making friends with them. I can say hello in 16 international languages, and will reply back. And it's very rewarding how we do it. We have first three people come online to get trained on how to use a tool.

Our idea is not to train them how to do medicine. They already know it. They're pretty good at it.

Our idea is that they should not get distracted by a new tool or any new toy for his little boy that they forget about the patient. So we are making sure that they've trained enough how to use it in an efficient way so they don't forget their patient or they don't miss out the things they were doing it already. So that's why we have initial three people trained.

We call them local champions. They start training few other folks and we come in for some of those bonus sessions. We are happy saying we can set up a session and you can get trained with that.

And then we use our huge user community. So we-- through a website, newsletter, we meet every month on Zoom for 40 minutes. It's a free version. We're using it.

And we're using Whatsapp, In some places, it wasn't-- Google was not there. Skype was barred. They could not use it.

And Whatsapp working really fine. We send them messages and they send us-- they have a trouble. So we're using what all available for us.

We don't have a Facebook page yet. [INAUDIBLE], do we? Not yet, not yet. OK.

Nothing on Yammer yet, though, or Twitter. So this is one slide for train-- the trainer part. The pre-training simulation exercise, we do it in online curriculum, as I mentioned the online remote hand-holding or coaching for them, and then the post training. And this we have a study out of it as well.

We are trying to see if remote training as possible, remote education is possible, doing so. And we did last week, and now we're going to do two more in the coming week as well. Using everything what we've learned in last eight to nine years, [INAUDIBLE] has been longer than me. I finished nine years last month. I think you finished 12 years or [INAUDIBLE] equivalent [INAUDIBLE] quality academy.

We both are [INAUDIBLE] fellows working for our goal and through team steps with friends and Dr. Patel in simulations centers. We have trained US Army here in the past few years, medical students, and boys scouts and boys and girl scouts in the field. We have learned those teams steps and some of the things and we're trying to bring those things in [INAUDIBLE] implement modules [INAUDIBLE] implement part as well.

So the examples of these videos, they are on YouTube. They're not open to public. That's a promise we did [INAUDIBLE] this one with our other centers. This is for us to see or them to see what mistakes they do and to improve upon those things.

The huge benefits, I don't need to tell those. We cut costs. That's the biggest thing. You need to travel there or have that cost factor in. It's easy sharing.

You can ask them. Only point is you have to fix the time. So our team has worked at 7:00 Am in the morning to meet time in China or India or we have come online from 8:00 PM to 11:00 PM to meet somewhere in Mongolia. Or in Europe, we have met at like 2:00 PM.

So we met with the team for a couple of hours on occasions to meet their times as well. And again, coming into Trello, it shows us our training and implementation progress in those terms.

Over time for last six or seven months, we have trained 50 plus clinicians around seven centers who are in third phase now. And then we send them a redcap survey saying, once they are in that phase, how many patients you're training. So they are self-reporting their progress, and then we can match them how many people they train.

So it's a pretty robust system. Given limitations that they can report, how many patients they are training-- how many patients they have treated with admission, and rounding certain, how many people they have trained. And they like it when they see this and they can start comparing them to other centers.

But we don't call each other's name. We just give center 1, 2, 3, 4, 5, so they can see where they stand. And that's a good enough motivation for them to do so.

Technologies-- every single thing has been used on the slide we talked about. We have a website on WordPress-- Trello, Zoom, Vchat in China, I think, that's Rocket, Dropbox, Skype, and secured YouTube channels. That's our web site. It's simple-- icertain.org.

I'll give [INAUDIBLE] and go ahead. We manage the website. Let us know if you have any questions or comments to improve the website or the tool itself.

A couple slides on infrastructure-- how are we doing with the time frame? OK, so there were concerns or questions before we started that how you will protect the data if people are putting patient information or how to protect it. Lei is pretty amazing.

Lei, can you raise your hand? He's a programmer in the back. He has helped a lot in terms of securing the database.

I'm not talking about the redcap data. I'm talking about the CERTAIN tool itself. When centers started using those tools to enter the patient data, we told them, follow your local guidelines.

If they don't allow you to put any PH information, don't do it. If they do it, what happens is beyond their firewall, it only gets deidentified and come out there in a central database. Once it goes back, it goes back undefined. So each center can only see their own data. Nobody else can see their data.

And beyond that, if it isn't center depository or [INAUDIBLE] center here, we don't see their client number, name, or anything else. They're not supposed to put their name anyways, but we don't see at all. It generates a steady ID or a patient ID which is unique.

We have-- as I mentioned, it's electronic checklist. We're working on mobile app. iOS has been painful enough.

Androids are a little easy. It's free. We have used MIT web site and then paper version as well.

And it's been a warning, we-- one of the high school students, junior high school students, approached us, saying I want to do summer internship with you guys or one credit course. What can we help with? I say, we are doing this stuff.

How you can help with that? And say, I can work on an app for you. And he did work on an app, and we had our Android rounding app work with him.

And I think I should have a picture of him. That's the guy. He's sitting in the back too. Can you raise your hand, Sal?

Incidentally, our team plays tennis too, and he is a good tennis player-- so good. Like, he's fifth ranked in the state and won a couple of tournaments. So he's learning from us how to do this checklist app, and we're going to learn from him how to play tennis.

So it's very rewarding in many different ways. And as I mentioned, that firewall, no PHI goes beyond it. It's [INAUDIBLE] center. It's pretty redundant, and then that's what Lei has done a good job in explaining to other centers and then explaining to us first so we understand how it is, and then we communicate the same message to other team members as well. It's backed up and deidentified.

The last part, we have 12:40. I have 10 more minutes. I promise I'll be done at 12:50 so we have a few questions or you can leave early to reach to where you need to go at 1 o'clock.

We were doing it for adults, and there was a need that can we do it for pediatric version as well. So Dr. Pati, Dr Core and Grace Ortega, they are taking on this project. It's already underway. [INAUDIBLE] be approved, registered on clinicaltrial.gov.

We have 10 plus centers signed up and now some survey data as well. Three centers are doing data collection right now in [INAUDIBLE] version as well. And this graph shows you, again, we have a center in India, one in Saudi Arabia, Africa, South America, and all over the place. We are having a hard time finding a center in Australia yet or New Zealand. They don't sign up.

It's a survey sponsored our World Federation of Pediatric Intensive Care, 138 point survey, very pretty extensive survey. I was not happy about it. My goal is to have survey less than 10 questions or 12 questions.

But the questions were less, but they had some bypoints in there. 74 centers answered for the survey, 34 countries-- pretty OK. We want to do it in lower, middle income countries, and so end up having in all three categories. Some of the slides are in terms of pick your sources, what they have it.

Not much different, but they have less dialysis equipment or finances are difficult to find and a few things. Surprising-- when we're looking for what kind of diagnoses they have it, they're almost same kind of illnesses except TB was-- I think I have another slide. TB was higher in developing nations and I think elective operations were low in that population as well. Otherwise, they had the same problems as well as in developed nations.

Last few slides-- yay. So what is next? We are doing it. We'll be done with the study in one year.

Idea is we want to look at-- we don't have any centers in US at this point for the study. Idea was to see if we can do it-- prove it in a resource limited setting. A couple of our clinical fellows are working with Dr. [INAUDIBLE].

They came up with the idea can we use it or modify a tool to make it use doing RRT. RRT stands for Rapid Response Team. When you hear those code calls in hospital and there's a team running down with a clinical fellow, nurse, and pharmacists, they are the ones who respond to code 45 on RRTs.

We're trying to see if we can have that tool in hand. Nurse can enter from there. I mean, while they're running to the patient, they know about the patient rather than being there, and they can enter those things. And if they are transferring the patient to ICU, the ICU folks can see it at the same time.

Epidemic surveillance is the one thing we didn't think of. When we start presenting at international meetings, people approached us saying, once you have this network, you can utilize it quickly. Ebola would have been a good part in there.

We don't have [INAUDIBLE] in Africa at this point. But anything here in US-- and we're working on some of those things with congress through [INAUDIBLE] group. i was part of that effort last month, and we'll be going again and presenting that thing in November.

Looking at those effective research and trials, that's always a byproduct when you do those kind of [INAUDIBLE]. And another thing is I have one more slide on this one. Talked about the continuity of care-- We talked about-- we presented this work to army folks as well, and that's a huge-- Colonel Farmer was here.

He's a chair in Arizona now. He developed this air transport for the first time many years back, and I think Colonel Henkins here in trauma surgery as well. And they have concerns that we don't have a continuity of care, not in civilian hospitals-- same in army hospital as well from the front line to the base hospital and further.

So we're working on something, in civilian hospitals at this point. We call it CERTAIN-T, and I have another slide for it. And US has huge interest and we are seeking avenues to have it used as a certification for acute point of care competence use.

People can do it remote education and get certified. And we are working on those things. So you might see that in a year or so from now Mayo Clinic [INAUDIBLE] get approved. And then we start doing some of those certification.

As I mentioned, CERTAIN-T, idea is to have, if it is referring hospital and if it is a Mayo Clinic, [INAUDIBLE] than that. But imagine if it's a referring hospital, small hospital, and this is Mayo Clinic. When patient leaves there in ambulance and comes here, imagine a tool which can feed the patient pertinent data right even before the discharge. Ambulance people can see it before they reach that hospital or they feed it back and forth from that particular tool.

And same time, the receiving hospital is also looking at the same data. It doesn't happen. I can give you an example.

During hand-offs or these times, the differences of fluid given could be from 1,000 cc to 5,000 cc. That's reality. It happens when hand-offs happen.

Or he might have got two or three liters. He might have got two liters. But in reality, he might have gotten five liters or just 500 cc's, just that number. And we know that in sepsis patient, that initial amount of fluid given early enough makes a difference with antibiotics. So the idea is to work on, and Dr. Kelly Bennington, one of the residents, is working with Dr. Jack Ohoro, myself, and Dr. Geich, to look into if he can have the certainty rollout [INAUDIBLE] in a steady form.

Conclusion-- so it's challenging to implement a universal checklist. I didn't mention about a few things. Each checklist, each center has a sticky note. So if they look at the particular syndrome [INAUDIBLE], it doesn't apply on us or we need to have these few things added, they can write that thing in a stick note.

It stuck with them for their whole center. Anybody can watch it. And if we see a constant team, we have capabilities on modifying it for them.

So we're not thinking that one checklist will work for everybody else, wash our hands, and done. No, idea is how we can help them develop it for their own use, what [INAUDIBLE] always did it. When I asked a question to him in one of the meetings saying, what was the biggest challenge you had when you implemented those checklists in Michigan area, he said, I would be totally wrong if I have one checklist for all.

He's had 136 version of those checklists for 436 hospitals. We are not there yet. We are working towards it, and these centers, the knowledge they have, as they're helping us develop this checklist for them so they can utilize it more.

The novel informatics technologies are useful. They are underutilized, and Dr. Dong is a huge proponent of it. He's on Twitter.

He's on Yammer, whatnot. I'm not on it, but he uses it extensively and more than us. And he introduced some of those technologies to us, these communication tools.

We have cut costs. They're zero cost. We don't travel.

They don't travel. They come online. We train them. They use it all online.

Imagine doing it-- everybody is using the same definition. So we are kind of generating common data elements as well. So it's easy to disseminate that knowledge. And this certain platform or network could be used for the things I mentioned in the past, like [INAUDIBLE], research. We talking about continuity of care and then certification, which is something we would think for a while now we are taking that journey now.

This is not a complete slide. I might have missed a few people. But our pharmacy colleagues, we have very, very thankful of their help with their busy practice and all these advisers, people on studies, research fellows, people currently in the past, and a couple of folks I have some pictures there too. Brian Pickering, Vitali Herzevich, they were very instrumental in having a [INAUDIBLE] version of it started at Mayo Clinic homegrown. And August [INAUDIBLE] was one of the visiting clinicians with us from Turkey.

He stayed there for two years. He's one man behind this tool. He made those initial four or five or six words and we all fit together. Now we are up to this final version with the help of Lei.

So in short, we need to be aware and certain to prevent DEATH, which is Diagnostic Error And Therapeutic Harm. I thank my team, this website. Feel free to visit.

My email ID is there. Please shoot an email. Go to our website.

You can contact us through the website as well. We'll be very happy and delighted to hear from you about the presentation, about CERTAIN itself. If you're willing to help in any ways in writing, reviewing those cards, or suggesting any centers inside US or outside the US, we'll be very, very happy to hear from you. I'll strong right here.