

International Perspectives on Stroke Triage, Diagnosis and Treatment  
A Webinar Series Presented by the American Stroke Association and  
the Society of Vascular and Interventional Neurology

EPISODE 2:  
Diagnosis – Imaging and Resource Utilization

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>> The webinar will begin shortly. Please remain on the line.

>> The broadcast is now starting. All attendees are in listen only mode.

>> Welcome everyone. Thank you for joining us for our four part webinar series international perspectives on stroke triage, diagnosis and treatment. This is the second episode in the series, diagnosis imaging and resource utilization. I am the associate portfolio advisor for the American stroke association. I will start today's program by going over a few important items.

In this webinar is jointly presented by the American stroke association and the Society for vascular and interventional neurology. While there are no CDs available for any of the webinars in this series a certificate of attendance will be available for each live webinar you participate in and fix will be accessible through the follow-up email you will receive. This webinar is being recorded and will be available prior to the next episode in the series.

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You will have the opportunity to submit questions by typing them into the questions pain of the control panel. You may send in your questions anytime during the presentation. We will collect these and address them during the Q&A session at the end of today's presentation.

Our moderators are Dr. Colin Derdeyn and Dr. Jennifer Potter-Vig.

Jennifer Potter-Vig -- earned her doctorate and health services healthcare administration from Walden University. She has over 20 years of healthcare experience working with clinical teams and administration to develop strategic plans, quality management and public health initiatives in education. Note Jennifer will be moderating the audience submitted questions so you may not hear from her but you may receive a message from her through your attendee control panel. I will not pass it over to introduce our panel today.

>> Thank you and I want to say thank you for the ASA and for the SVIN for sponsoring this really great webinar series and I'm excited about the speakers we have and the impact this will have on the stroke care worldwide and it is a privilege to moderate this and also a privilege to have Jennifer here to help with the questions and the chats. So our panel today this is going to pass very quickly our panelists today are Dr. David Liebeskind of UCLA, Dr. Vagal of University Cincinnati, Dr. Marc Ribo in Barcelona and Dr. Leung in Hong Kong.

A professor of neurology UCLA director of the UCLA stroke center and also director of the neurovascular imaging research core which has been the core lab for many of the trials in our space. Leads global efforts to advance data science precision medicine and he is also a member of the WHO Board of Directors and currently the president of the society of vascular interventional neurology and a past president of the American Society of neuroradiology David would like to start?

>> Thank you so much thank you to everybody for inviting me to speak during a few brief minutes as well as to participate with every buddy else on the call it is a great honor. I'm going to provide a little bit of a broader overview as to what we can do in various situations and what the options are in terms of the tools available as well as how it can translate this into practical care steps.

The very brief objectives is to understand what we do in terms of evidence-based guidelines for imaging, to distinguish which imaging is proper based on our clinical assessment, compare considerations in access to stroke diagnosis in various countries and regions of the world because as you know obviously what you have available in one moment or another or region they vary and describe briefly touch upon the role of the mobile stroke units where regions and accessibility are now in flux as well.

The basis of acute stroke imaging is multimodal imaging with either the CT or MRI and when we speak about multimodal imaging this is a distinction to what people have called the plane on contrast, or a standard MRI standard brain sequence MRI where we have vessel imaging Weatherby CTA, the CT approach or MRA as well as perfusion. Multimodal imaging that terminology has been used if we have even just one additional mode of either angiography or perfusion in addition to the tissue imaging. But in general although these things vary institution place to place, you use what you have and this may vary with time of day as well.

In terms of acquisition things at fairly standardized as much as we can expect I would think in terms of how we acquire either multimodal CT or MRI. How we interpret and implement the imaging is a little different. So as you know there are advanced processing methods, pipeline methods to postprocess this imaging which is different from the way it was at least seven or 10 years ago.

And those new innovations have really transformed what we can do virtually and shave time off as well. But a lot of this has to do with what we do and what I truly believe is precision medicine in stroke us where we figure out what the right treatment is for the right patient at the right time and that hinges on the right specific diagnosis so not just acute ischemic stroke but are we dealing with a proximal or distal occlusion, a treatable lesion based on what is going on in terms of tissue downstream. I would argue that imaging is part of

the distinction this go together. They are not separate.

Altogether the most important thing is patterns, not sized so volume is not the most important factor or variable that we deal with when we look at image. And the imaging in ischemic stroke should be about ischemia, bloodflow or perfusion and hemorrhage or likelihood for hemorrhage. Stroke is a vascular event and therefore using imaging that captures these various aspects is probably most important.

Multimodal CT consists of typically these components. I show you one of the graphics for aspect scoring that will be applied to a noncontrast CT. It can be applied to MRI as well any type of brain imaging which is a basic scale to subdivide regions and get an idea about relative volume as well as regional involvement early on in stroke. Ca. of CTA there are many different methods both single and multi phase and these various iterations are geared or focused on various phases of blood flow whether from arterial to later venous phases and then perfusion where look at the entire contrast over time as it traverses the brain and we can use these techniques in various combinations. You can use dCTP alone to generate a CTA and there is information that can give you information on CTP as well so in a way it is a CT with and without contrast.

MRI -- shows in the upper left atypically and this is I apologize if it's not running but basically diffusion flare sequences that acquire in that order very quickly in acute stroke we been doing this 20 years or more followed by MRA and perfusion. Tripoli with MRI or MRA approach multimodal MRI we may halt in between to either make a decision not just a decision but to intervene and treat with I t-PA or to proceed or to go straight to the [indiscernible] depending what we are doing with patients in the scanner. If I would like to argue that this is probably not even feasible with multimodal CT that the approach of treating while you diagnose is a little bit more difficult with CT but for good reason that's because it's so quick that you get all your information you don't even have an opportunity to jump in.

We think about imaging from an ideal standpoint what is the ideal tool we would like give me a perfect definition of ischemic core. I would like to look at the volume of penumbra and do basic math on this and as ideal as this seems is very far from real. This is not what we deal with in a real-world basis it's not just simple math of looking at core and penumbra and coming to a mathematical solution.

That calculation is very very different in different levels of occlusion. A distal occlusion may not have the same degree of perfusion in the penumbral zone or the core. These may be time-based as well so there is a lot of complexity that gets thrown in and when even when you break it down to the most basic variables on perfusion and advanced imaging what's been used in trials are some very complex schemes as well so if you have this and a threshold a volume of cc above a certain threshold on the perimeter map then you have, then you may proceed. And remember these are all probabilistic these are all based on prior treated cases in terms of what you are most likely to see down the road in terms of outcome.

So there is a lot that can be done you hear on a daily basis about AI and a lot that can be done. So in terms of what we can do in a in acute stroke imaging is largely about multimodal CT MRI less so about TCD unfortunately because it does not give these other components and a lot of this discussion will shift in coming years direct to angiocrine you do and angiography suite? Can you stand your grandma subtype up perfusion and residual and sequential reperfusion. Something beyond the decision to go or not to go to the angiosome but during treatment and we also to think about what happens in terms of the typical or prototypical M1 occlusion like about the ideal world to real-world care. And there are a lot of different case examples that could be given in terms of what works what does not work and complexities. There are consensus guidelines in terms of what is done for thrombolysis and thrombectomy. You use what is available, you honed your expertise and have to use the imaging together as much as possible with basic

variables. You cannot just get paged beeped with a command to go thrombectomy so selection still important. There are a lot of disparities all most everywhere you go in terms of what is available. Expertise varies as well. The ability to parse this information acutely changes and all of this is rooted in diagnostic confidence how sure we are in terms of what we are seeing on the imaging in making the decision to go forward but this does vary.

Decision-making imaging is about decision-making and deciding what we are going to do in terms of treatment. Imaging is a component of the clinical evaluation. We cannot interpret things in isolation. Imaging strategies imaging is incredibly important as support tools. These tools include the multimodal CT MRI as well as angiography. Postprocessing is important. We still semi-automated and in real time in routine clinical practice and this includes from the mobile stroke and wherever this is available because advanced imaging is now a reality.

I think that is my last slide. No. Simplification of stroke just one or 2/slides. I would be very careful in terms of if you want to simplify we can reduce things to very basic messages but we have to be very careful about should be image should be not image? What should be absolutely do are not this has a lot to do with what I mentioned in terms of expertise. As much as I would love to say that collaterals are important, collateral circulation is very important but whether you have to image the collaterals or not it depends on what you are doing in terms of making those decisions, in terms of are you properly based to decide with respect to that collateral information?

The least common denominator of stroke imaging all the way to the most complex in terms of advanced imaging ultimately depends on have we used to this information in terms of the real-time decision-making. So finally, I think we have to be speaking about imaging in a real-world not just imagine what we think in terms of penumbra and core. Idealized concepts. We have to think about what happens in the real world when dealing with stenosis and not complete

occlusion. The perfusion patterns are not the same most of the automated approaches have not been validated or properly tested so you are singing and what you are told is truth of core and penumbra is very far from the truth we have to be careful about different postprocessing secret sauce in the mix and aspects you have to be careful because it depends what you are asking in terms of what they are seeing in acute stroke.

I will say this about precision medicine about using the imaging information in that specific individual in understanding how we can tailor the therapy for that particular patient. How would do this on a larger scale is something that we will see in coming years in terms of platform designs of trials and implementation of advanced imaging work available. Hopefully there is time for questions.

>> Thank you David that was practical and forward-looking and interesting as always. I appreciate it.

Our next speaker we have Dr. Vagal who is a professor of radiology advice chair for research at the University of Cincinnati which as you will know is one of the major meccas for stroke clinical trial research. She is a neuroradiologist by training and has been involved in national and international collaborations for stroke imaging including any of the studies coming through Cincinnati and she has a lot of experience with leading image core labs for some of these stroke trials.

>> Let's see, hello everybody I'm very excited to be here and let's dive into a little bit more about diagnosis and imaging. The learning objectives basically am going to build on David's talk but I'm going to dive a bit into what is the evidence-based guidelines what are the guidelines telling us and then how do we distinguish which imaging is proper for the situation.

What is the role of imaging and stroke we will know that these are the multiple questions we would like to answer, is there hemorrhage? What is the location? What is the extent of acute

ischemia? Is there a vessel occlusion, what about the collateral? Is there salvageable brain and we cannot forget about the stroke mimics. So imaging is a triage and treatment selection tool. Here's an important thing to remember as we dive into the evidence.

We have had some great trials since 2015 which have shifted the paradigm for stroke but it's important to remember that none of the trials compared the effect of selection of the endovascular candidates with or without advanced imaging selection because it's always a controversial topic. The guidelines these are the AHA/ASA guidelines with the 2019 update and I think most of us have read this for any of the training on the call I would highly commend going through this document if you've not read it.

We definitely need some kind of a CTA MRI that is the level I evidence. What about the advanced imaging? I'm going to say advanced imaging is going to be perfusion or collateral imaging so what is the premise? Infarct growth is variable, there's going to be salvageable tissue beyond the standard treatment times and advanced imaging can help identify these patients and here's an example and this is slide -- this is diffused two study this is the first patient. Known onset M1 occlusion and the patient came in at around 11 hours from last known and we see a small core not a bad looking study. This is a slow progress.

Second patient similar occlusion but look at that this patient comes in at four hours but has a complete wipeout of the left which tells us what we already know now very well is that infarct growth rates are variable which means we can push the time and study the tissue which means the perfusion imaging can be helpful for patient selection.

What about the guidelines? What are the guidelines telling us? The guidelines tell us when it comes to perfusion imaging from 6-24 hours it clearly says that for some kind of a CTP or with their without MRI perfusion is recommended. Under six hours is the more

controversial category, under six hours do you do perfusion or not? And the guidelines basically say that it is recommended you do a CTA or MRA in preference to perfusion but not of the level of evidence is lower. Why?

What is less than six hours is there a benefit? This paper shows us that there is a higher benefit with use of advanced imaging in fact the trials that used perfusion or collateral imaging -- their odds ratio was higher than the trials without advanced imaging.

What about if the patient selection with perfusion collateral imaging does modify the expected therapy what is the disadvantage? One one thing to be care about -- it can actually also exclude patients of had the potential to respond favorably to this very efficacious treatment and we know from we know that was clearly superior and trials were only basic noncontrast was required.

What about the European guidelines? They are telling us that from 0-6 hour advanced imaging is not necessary that evidence the quality of evidence is the strength of recommendation is weak. Beyond that the strength recognition goes up that advanced imaging selection is necessary.

What about perfusion and the extended time window for thrombolysis? This is a very active area of discussion so we now have some data and this analysis looking at extend --- there's excellent outcomes when patients were selected with perfusion something to remember these trials were before endovascular treatment with standard of care so I think this is still debatable if perfusion can help extend the time window when there is no but again this is a very attractive reason why perfusion can be used to advance to increase our times.

Collateral imaging what is the data telling us? Escape was the only trauma she used it but definitely they used aspects up to 12 hours. They have secondary analysis which supports the role of collaterals.

The Hermes collaboration showed no difficult modification by collateral grade. What did the guidelines tell us?

It may be reasonable to incorporate into decision-making again not a very high level of evidence but again that information is there for us on the CTA so we can definitely use it. What about MRI? I know David said they've been using it I can tell -- I still think CTC workhorse but definitely in these new recommendations thanks to the wake-up trial MR has made it into this guideline wherefore diffusion positive flair negative lesions can be used for administration.

The 2019 update says one more important thing whenever we think of imaging, advanced imaging should never delay for thrombolysis or puncture times if there's one thing that can take away is that whatever imaging we do we cannot delay the treatment yes we are now treating up to 24 hours and yes we have pushed the time boundaries but time is always critical.

Really pushing the time boundaries is artificial intelligence. We have automated aspects automated LVO detection automated perfusion, collaterals basically come on our phone or emails so they are definitely pushing the boundaries but I would suggest the man versus machine, machine can help augment our workflow our times but all this has to rely on our intelligence so we have to be careful when we look at these tools to make sure we are indeed making the right decisions. These tools are there to help us but we have to be careful and this can be literally an hour-long lecture of what are the pitfalls of losing AI tools in stroke imaging.

And finally is the art and science what David already said we know that when we think of imaging we are interested in the pipes the penumbra perfusion the parenchyma but the fifth P is the patient so the judgment is always based on evidence experience and patient factors and this is the million-dollar question. Which imaging paradigm is better for code stroke? Truthfully if this was not a webinar we would all be with our boxing gloves and people are very

passionate about their opinion but here's the answer. It all depends. There is way too much variance. I think it depends on the local institutional preference, the timing of the stroke but the big thing is that we have to create our own best systems of care and those systems start from that 911 call all the way to rehabilitation. Radiology plays a huge parts make sure you have a radiology champion in your stroke team.

In conclusion is a widely changing landscape. Imaging is critical for diagnosis again CT remains the workhorse. We will have to adopt our efficient workflow but remember the clock is always ticking. Thank you very much.

>> Thank you Dr. Vagal and looking forward to panel questions at the end and I appreciate people running on time. Our next speaker is Dr. Ribo interventional stroke around just from Barcelona West on a lot of the seminal work on transfer times direct direct to angio suite work as well and a lot of work on rapid identification. Dr. Ribo?

>> I hope you can hear me well thank you. I think the organizers for this opportunity to share with you basically what we are doing in our network. I hope I can there is a little delay so basically I agree with what David said about what is the idea, tools we have what we need to keep in mind what is possible what is necessary at the end is a compromise that should lead us to what these optimally adapted to your reality. So and I also I agree with what was said before so in order to keep it short and allow an interesting discussion at the end I will just show you here what is the scenario in which we work we have a network that covers 7.5 million inhabitants and about 15,000 strokes per year that we should treat in our network and if we look at what is suggested by the European stroke organization and what is often recommended for us, we should have this amount of stroke unit copperheads of stroke centers and ideally we should be treating about 1500 per year. We have a very good mandatory registry which we are all participating centers in the geography are mandatory reports so we know exactly how many code strokes we have per year

about 6000. How many t-PA treated patients and how many we know if we are far from ideal next to optimal as you can see.

Still we are only reporting about half of the strokes as stroke codes are only half of them are activated as stroke emergencies.

Moreover, our registry helps us know on time and by region what is going on and you could see how year after year where increasing our number of activations and how we are increasing our number considerably and there is a geographical spread at we should work on this differences. Our registry allows town by town alert each code was activated and therefore we can we can work or identify particular stakeholders in each of these regions.

May be heard during the last year since 2017 we were running a trial that directly addresses one very important work should we initially transfer our stroke activations with [indiscernible]. First thing I need to remind and recommend that everybody uses a hospital scale as regimens by most -- that EMS can score the likelihood of large vessel occlusion. We use the RACE scale, if the score is greater than four -- to go to the closest center or to bypass the center to prioritize vascular treatment. The result is we stopped recruitment three months ago and the results of the trial will be presented in a couple of weeks at the European stroke organization conference and we will have a definite answer about which is the preferred option to achieve a better outcome either prioritize thrombectomy -- it is a question worldwide however we believe that we should not offer the traditional approach only one option probably we will need to adapt our [indiscernible]. Based on the data we collected depending on the distance to the receiving center and the time from onset and even the likelihood of the presence of -- we will address all of these issues in the analysis of the RACECAT trial.

What happened in our network during the last years and I made this interesting analysis in which I could show and because we have our detailed registry we could observe how primary stroke centers

increased or performed much better during the trial and they're able to reduce by 23% their door in door out time so that influence the question whether to transport initially our patients if primary stroke centers perform better that is an incentive for them to get these stroke codes initially.

Another effect only happen if we change or decide on transfer algorithms is we can observe here. From 2016 to 2018 while we were bypassing half of the codes because they were randomized we observed there was a decrease in the number of thrombolysis -- if we decide to bypass one or 2% of the stroke codes there would be a dramatic reduction in the number of thrombolysis in the centers and on the other hand we can expect the other way around the comprehensive stroke centers we observed only by transferring by bypassing half of the codes to the comprehensive and increasing the number of thrombectomy if we change protocols to 100% there would be a dramatic increase in thrombolysis in the large centers but that may have a negative impact on the smaller centers that would lose the expertise they may have now in their stroke teams.

Over the last couple of years there was a large increase in the number of thrombectomy, who knows how much could grow if we decided to transfer all to bypass all the stroke codes directly to comprehensive stroke centers? So we will see what happens over the next years in any case I think a good way to proceed is what was described in this paper when you have to deal with primary stroke centers and transfers. What ideally should be done that this ambulance that initially transferred the patient hereto the primary, they should stay at the door there is a high probability they're going to need a secondary transfer in a few minutes so while they assess the patient and they do the imaging that should be medically shared with the receiving comprehensive stroke center, the samplings already stays here and during the door in door out is short and you can transfer directly your patient to the -- the imaging was transferred and the intervention team was already activated. So this way by proceeding this way your primary stroke

center is an extension of your ER at the large center and you are able to dramatically reduce, have a competitive work at all times.

There is always as we say what is ideal in terms of imaging but is feasible but is optimally adapted? There are large discussions about should be performed CTA or advanced imaging or perfusion imaging on all patients or not? This is a debate that will try to show you what we are doing in our sitting here I'm able to advance yes. So again there is a lot of discussions about which is the ideal protocol and a lot of publications discussing these issues. In our reality what we observe in recent studies is that the rate of Aspects decline over time may be significant what we call perfect Aspects of 10 so there is a decrease from time of onset increases but the rate of patients admitted with a very low Aspect that make contra- indicate thrombectomy is really low so why should we screen so much for imaging it advanced imaging in the first six hours? We do not do that in our network. We do not use advanced imaging to select patients in the surly time window.

What about transfer? How often should we repeat imaging when we get the patient? We also performed a study in which we try to predict the comprehensive stroke centers which patients are going to have a dramatic decline in Aspects and we observe that basically we should only repeat the imaging if initially the patient at the primary stroke center had an Aspect score lower than 8 with a combination of a very high NIH. In this case the aspect score on arrival is important otherwise it is really probably not necessary to perform a second imaging.

The use of I t-PA we are going to be hearing more about non-using t-PA when we are able to initiate immediately a thrombectomy. There already two clinical Asian studies showing that is probably not inferior to withhold I t-PA you can start emulate thrombectomy. Soon we will have the results of the direct trial. Something happened with my slides here.

So what is happening in our reality? About imaging and my slides were moving along but in terms of availability of imaging here in our network we observed recently and regarding the use of IV t-PA when we gave it at the primary stroke centers finally 10% of these patients when they got to the comprehensive stroke center they were already - [indiscernible] my message is we should not keep IV t-PA when we are going to transfer a patient from a primary stroke center we may consider this if we are about to start the vascular treatment at the comprehensive stroke center. And finally the last concept I want to comment is the availability of contrast imaging at the primary stroke centers. In this study in our network we observed that up to 40% of strokes at primary stroke center contrast was not available at the centers and what was the impact of contrast imaging at the stroke centers in terms of futile transfers? We will discuss these findings in the upcoming international stroke conference but I wanted to highlight that in many realities it is still not available contrast imaging is still not available especially at primary stroke centers. How can we compensate for this? So the concept I want to include here that was already presented before is the advanced imaging with contrast we still call it advanced imaging but soon we will call advanced imaging some kind of artificial intelligence evaluation of this imaging either with contrast or without contrast and the fact that it probably is easier to implement AI algorithms in these primary stroke centers than to train all the staff there to perform contrast imaging. We are working with software able to predict the probability -- the good thing about this algorithm as they can combine clinical information plus imaging on noncontrast and you can achieve very high values for LODO or noncontrast imaging. And therefore you get this kind of imaging in which you have predictions, low, medium or high prediction based on noncontrast imaging and the scenario in which we are heading -- is this one in which it will predict us what is going to be the likelihood of the number of passes we're going to need with thrombectomy, which is the best approach. We are heading to the scenario so very soon we're going to have these networks in which all the software's will be scanning imaging and will be able to identify patients with

high likelihood or low likelihood of LVO and create initial fast alerts. So these were the concepts I wanted to share with you. Sorry I had some troubles with my slides but I will be happy to discuss at the end with you these concepts.

>> Thank you -- a lot of teasers for information to come up soon.

Professor Thomas Leung is a giant in the field at the University of Hong Kong where he is a professor of neurology and stroke center director. He is an assistant editor of Stroke, cochairs the steering committee for this effort that this lecture is part of. It is all yours.

>> Thank you. Hello friends and colleagues I hope everyone is well in the pandemic.

Asia is home to more than half of the people on this planet but as revealed in this stroke map Asia is also where stroke incidents is the highest. in developing countries with financial constraints the approach has to be pragmatic. I will explain the stroke ecosystem in Asia and discuss disparity between Asia and the West and elaborate and how stroke will affect our choice and interpretation of imaging tests and finally an emphasis on other essential components along the patient journey and solutions to overcome the hurdles.

Nowadays people always like to compare the United States with China in this map of global stroke mortality we appreciate well stroke only accounts for 6% of total mortality in the United States, 20% of overall deaths in China were due to stroke which constitutes more than 30% of the global stroke mortality.

If we take a closer look both the stroke incidence and mortality in China of high income countries as shown on your right by the redlines. What drives the disparity? In the West we know ethnicity, sex and age are the main contributing factors but in Asia where most people are living in lower middle income countries, social economic status and geographic locations as well as living in urban or rural

areas are the crucial factors. Lower middle income countries bear over 80% of the global stroke burden despite about 20% of the total economic resources. Strokes occur 15 years of age earlier often at the peak of productive lives and because of poor health literacy improvement in socioeconomic status in some countries is paradoxically associated with increases in stroke risk and mortality example less exercise when you have a car or obesity from excessive eating.

The second factor underlying the disparity is geographic location. We know in some privileged urban hospitals like in this participating centers in this thrombectomy study published in the New England Journal of Medicine, it could be a short period of time of 37 minutes. Because it is nonuniform care across the country in primitive and remote regions the stroke mortality in rural areas are significantly higher than in urban regions in other words more stroke deaths in rural region although less people are living there.

The Northern Territory of Asia known to have higher prevalence of stroke risk factors. You can see the north rated in this stroke incidence is more pronounced in rural districts than in cities on the graph on the right the slope is really steep in the rural districts.

Ideally we all dream of this chain reaction to happen. The early - - triaged a good outcome. However guidelines that support this promise cannot be realized in many Asian countries because guidelines are from data of high income countries. Developing countries have different risk factors, pathophysiology and management opportunities. For example, in contrast to the well described prehospital management in the AHA guideline, ambulance service is absent in many remote regions. Many cities the ambulance is a paid service like a taxi and there could be no communication between the ambulance and the hospital. Stroke patients could be sent to a hospital emergency stroke treatment is not available.

So even when ambulance service is available in this study in Malaysia 70% of stroke patients still chose to come to hospital by their own transport and this is independently associated with delayed arrival and loss of treatment opportunity. To develop a triage protocol we have to be down to earth to understand the stroke ecosystem of the local community and engage stakeholders. Health literacy, culture beliefs about traditional Western medicine, compliance to treatment the willingness of government and policymakers, the reimbursement system or the enthusiasm of the professional bodies.

In early 2020 a global initiative to promote mechanical thrombectomy, SVIN is now -- for local needs. In the face of local hurdles reformed regional committees to address the bottlenecks and support the local leaders to remove the block.

All the previous speakers agreed that a multimodal imaging test can diagnose large vessel occlusion is now a must. However in Asia there are more causes of large occlusion rather than just a corroded artery. Best of all [indiscernible]. With locoes thrombocystis common. More more disease could be 10 times more prevalent here than in Caucasian populations.

So far we only could infer these diagnoses from -- recital difference in occlusion morphology in this area of artificial intelligence we have no idea how direct software can interpret the perfusion in these conditions. When a small infarct core and large penumbra are seen in a hidden case of more and more disease it can be very tempting for a neural interventionist to put in a stent retriever and then occlude MCA although that penumbra they only represent benign leukemia and the procedure could be futile.

Many studies have shown that thrombectomy for intracranial occlusion -- and could be dangerous in non-thrombotic occlusions. Overall we need more studies in this area.

Healthcare policy is not entirely based on scientific evidence. Overcoming hospital cultures and bureaucratic inertia is halfway to success. It is crucial to have connections and finding the right people to lobby. We always start something simple for example a call from the ambulance to the stroke center to save time but by the time of arrival at the hospital stroke team will already have reviewed the medical history and prepare for scan.

To solve manpower deficiency can take advantage of the broadband to develop networks and tele- stroke systems in remote rural communities so as to increase catchment population for thrombolysis. More solutions may come when more people have a mobile phone than have a toilet.

I heard of a patient to receive a thrombectomy twice in the same year because of the failure to detect afibrillation after the first stroke.

Another app can track the critical times along the patient's journey within the hospital. Through telemedicine we are now having broadcast and live procedure demonstrations to talk to thousands of miles away. Asian hospitals governments are now more willing to invest in stroke care facilities.

SVIN has prepared a white paper on mechanical thrombectomy and is ready to release on world stroke document contains evidence of thrombectomy and procedural care can be customized serving as a backbone to convince the local policy makers to improve stroke treatment. In conclusion we need a concerted effort to strive for health equity. Understanding local stroke ecosystems is critical in Asia. Prioritize imaging scan regardless of which modality or sequences crucial. Novel ideas for using mobile apps and broadband. Thank you very much.

>> Thank you to all of our panelists and now we will begin answering the questions had been submitted during today's

presentation. As a reminder, you can still submit questions through the questions pane in your control panel.

>> Thank you to all of the presenters these talks were outstanding and fascinating. I'm going to I guess I think I will start we only have a few minutes but there are some questions from the audience I will give them preference the first tricycle here is what is the best imaging technique to distinguish an embolic atherosclerotic occlusion of an artery before you do vascular thrombectomy?

>> Perhaps in the last few slides I show an angiogram showing different source coming from the heart from the carotid artery and one from the ICAD and in that scenario -- the previous one -- usually in the ICAD patient you see good collaterals you can see in the middle panel you can see a very shift of the -- [indiscernible]. this is unusual and abrupt occlusion, from the heart. This occlusion actually healthy develop it of this collateral so in this scenario we put in a suction catheter in others you can see it tries to reopening of the vessel but you can see the stenosis there because it is denuded and without the treatment is very to have real occlusion very soon. This is quite a different scenario management strategy now when dealing with a patient with embolism.

Rather than very aggressively to reopen the vessel 20 stenosis.

>> Thank you. We have gotten the green light to extend for another 10 minutes so we will go through questions and a brief wrap up at the end. Another question here from the audience relates to concerns about having IDT PA on board just prior to mechanical thrombectomy and I guess I will direct that one probably to Dr. Ribo. Can you speak to whether or not you find that concern at all and what the risk of uncontrolled bleeding is

>> I think this is going to be one of the big changes in the next it's happening already we have some solid data it's true that it's an Asian population but telling us that, skipping IDT PA is not inferior at all and I said during my presentation the next six months we will

have another major trial from Europe. However as of today is completely, perfectly reasonable to withhold the IDT PA in some situations in specific situations I'm talking always when you can initiate a thrombectomy right away though situations are those in which you can expect that you expect to be implant a stent either on a tandem occlusion or in cases in which you suspect ICAD I think very reasonably we can withhold IDT PA indicates that will allow us to initiate antiplatelet treatment if we could place a stent.

>> That addresses one aspect of the question but another one was I think the concern was about safety doing an arterial puncture and thrombectomy in the setting of t-PA.

>> There is lots of data showing that it is completely safe even in terms of on the puncture side or even -- patients underwent a thrombectomy under t-PA do not have an increased chance of bleeding so this should not be a concern.

>> Wonderful thank you. I'm going to direct this one to Professor Leung although Dr. Ribo you may be able to answer this one. The question is with mechanical thrombectomy only available at few or select hospitals but so important, how will the medical community change in the future? Will this be like the Cath Lab -- I don't follow the rest of it but how do you think we are going to translate all of this into practice?

>> I think it's always good to have more comprehensive stroke centers but at the same time there is sources constrained and we do not want to have dilution of expertise so it's very important for a big country to of networking. We do secondary diversion, there he fast waste of the patient can be transferred to a primary stroke center to a comprehensive stroke center to receive that. Actually we are doing a lot of these in some development countries right now and the responsibility of the primary stroke center to perform at least a vascular imaging most commonly would be angiogram to diagnose the condition and then have transmission of these images to the

comprehensive stroke center through Internet so that they review the condition and receive the patient for thrombectomy that is very likely to be the scenario in the future.

>> Do you see that any differently?

>> I can speak about our sitting here our reality it really didn't make any sense a few years ago we had all our six thrombectomy centers, the same city in Barcelona where half of the population lives of course but in the rest of the territory there were none and this obviously if you think of it does not make any sense. Fortunately we are working in proceeding to a scenario in which we are creating what we call thrombectomy centers in the provinces that will be already able to cover to perform thrombectomy at least during working hours where working toward 24/7 coverage at least for thrombectomy. You don't need to have the expertise for all of those vascular procedures that are not time sensitive and which you need a high expertise. Those can be transferred to a high level of care with high expertise but thrombectomy which are really time sensitive should be offered in places where you can expect a reasonable amount per year of cases probably around 50-70 cases per year.

>> Thank you very much. Just checking the questions here again. At this point we just have a few minutes left and so I wanted to wrap this up by giving each of our panelists a chance to share something some parting words so I will go in order -- if our participants were to take away one point from your talk what would it be?

>> The one point I think is to be virtually present in every respect much in the way that Thomas had referred to that we do things through medical education on a case-by-case basis and across various increase lay transparent boundaries around the world so everything including in terms of patient care and imaging and proper triage for patients with thrombectomy is about the most official and rapid exchange of information and thankfully we have those tools available so use what you have and be present even if virtual.

>> So a mobile unit that has a mobile scanner mobile endovascular suite and then you could use remote thrombectomy from another hospital.

>> Absolutely.

>> Dr. Vagal?

>> I would say just the way we are changing our imaging workflows and paradigms so quickly I would highly suggest having at least one radiology champion in your team. Because it makes a lot of difference how to -- whatever's going on in the trial world and the guidelines we are getting into the real world you need the radiologist, the technologist on board so that would be my biggest advice. Get radiology involved.

>> Thank you. Dr. Ribo we one take-home point that you want everybody here to remember?

>> In terms of imaging I think it's not because you can do it that you should do it. Remember that sometimes not always more is more sometimes less is more and therefore if you don't need this information or you are not going to be changing your what you're going to do just don't do it.

>> Thank you and then finally the last word goes to Dr. Leung.

>> I urged the audience to matter where you are on this planet support SVIN the mission thrombectomy 2020. And please customize the white paper to convince your local policymakers. Thank you.

>> That is a great message. Aurora?

>> Thank you very much for passing it back to me and thank you to all of our panelists and moderators for sharing their time and expertise with us today. This webinar was recorded and will be

available prior to the next episode in the series on our website. There are two remaining webinars in the series so please be sure to register and join us. On world stroke day the American stroke association encourages you to join us for one cycle nation in the society of vascular interventional neurology encourage you to follow their social media accounts for special discount codes on additional educational opportunities. Other upcoming opportunities November include attending AHA scientific sessions at SVIN annual conference. Both will be virtual events this year. Once you leave today's webinar you will receive an email with a short three question survey and we would appreciate if you would complete that and provide your feedback. On behalf of American stroke association, the society vascular and interventional neurology and our moderators and panelists, thank you for joining us today and have a great rest of your day.

[End of webinar]