*(PLEASE NOTE: Transcribed automatically by Vimeo, mistakes are possible)*

**TRANSCRIPT – 07 23 21** "Coronary CTA in 2021: The Case for CT-Guided Care" **Todd Villines, MD**

* 00:03:33Alright, everyone we're going to get started with grand rounds.
* 00:03:37All right, alright so welcome to everyone on zoom and here in arca so today, I had the pleasure of introducing Dr Todd the lines of the division of Cardiology.
* 00:03:47Dr villines distinguished career started at the United States military academy at West point, followed by Medical School at the University of Oklahoma college of medicine.
* 00:03:56Dr villines completed his residency chief residency and fellowship training and cardiovascular diseases, at the Walter reed army medical Center and the national capital consortium of Walter reed.
* 00:04:06and national navy medical Center respectively, Dr villines started his career at the uniformed services University of the health sciences school of medicine in bethesda Maryland and rose to the rank of professor of medicine.
* 00:04:17doctor of lines and join our cardiology faculty and as a professor of medicine and is now the Julian rough and beckwith distinguished professor of medicine.
* 00:04:27Dr lines is truly a research powerhouse with over 200 peer reviewed publications to his name, covering a wide spectrum of topics within cardiovascular medicine.
* 00:04:36Whoever he's truly established himself is one of the authorities on cardiac CT he's worked in this field, both as a primary author and now, especially as the editor in chief.
* 00:04:45Of the journal of cardiovascular computed tomography has changed evaluation paradigms and opened up exciting new possibilities within his field.
* 00:04:52For all of his groundbreaking work he was just awarded the gold medal award by the society of cardiovascular computed tomography.
* 00:04:59Which is the highest honor bestowed by the society and recognition of those who have made landmark contributions to the field, it is a true honor to have Dr lines with us at uva and here today at department of medicine grand rounds and with that i'll hand it over to Dr lines.
* 00:05:26All right, I just go ahead and put this one Thank you so much as a door, this is a.
* 00:05:33One step by in there.
* 00:05:35As.
* 00:05:39Well, this is truly an honor to be with you today, this is something that I just really appreciate the invitation and what i'm going to talk about a little bit today my hope actually when I was first invited to do this, several months ago.
* 00:05:51was that we would be talking about the new US chest pain guidelines and so i'm going to talk a little bit about that, and I said, we hope, because at the time, back in the winter, when this invitation came to me.
* 00:06:04The guidelines were supposed to be published in March or April at the latest in May 2021, and so we thought well still be a safe time let's put on the calendar for.
* 00:06:14July and we'll talk about these new guidelines that are coming out, and so, of course, as many of you know they're not here today.
* 00:06:24to dance.
* 

**Unknown Speaker**

00:06:28All right, great.

* 

**UVA IMR Chiefs**

00:06:32yeah it's not good to powerpoints up for some reason.

* 

**Unknown Speaker**

00:06:39yeah.

* 

**Unknown Speaker**

00:06:42Do the sign up.

* 

**UVA IMR Chiefs**

00:06:50yeah.

* 

**Unknown Speaker**

00:06:54Okay, we can do it that way.

* 

**UVA IMR Chiefs**

00:07:02Okay, and let me just make sure I share this.

* 00:07:16Right all right well why don't we can start, so I thought, what I would do today is really kind of get you to rethink or think about.
* 00:07:22How you approach patients who, you see, whether it be in the Inpatient setting or in your clinics, who present with symptoms concerning for possible scheme of heart disease, so it'd be acute or chronic chest pain.
* 00:07:33And I have no no relationship with industry, as was mentioned that you editorial work for the journal cardiovascular CT and several other.
* 00:07:39imaging journals and while i'm going to be talking about cardiac CT I will preface this by saying that, like most people who do cardiac CT imaging we don't just do cardiac cta imaging.
* 00:07:50And so I really enjoy reading multiple modalities, but much of my career and my research focus has been in cardiovascular CT.
* 00:07:57And so, like I mentioned this was my goal, I was hoping to be talking about this guy and this document.
* 00:08:03And I was fortunate to serve as a reviewer this document, but it is still under embargo we're not going to talk about it at all.
* 00:08:08other than to say that I wanted to preface this talk and maybe have this talk serve as a backdrop for when this document is published, it will be published in roughly the next six to eight weeks.
* 00:08:19And so, is now currently embargoed and being finalized for publication, and I think this is going to be a big document because does anyone know when the last ACC American college of Cardiology American heart association guidelines for stable ischemic heart disease was published.
* 00:08:35You would think it may be two or three years ago, but it's been almost a decade ago, and if you think about how much has changed within the literature base and how much has changed within technology.
* 00:08:44With how we evaluate patients with regards to our diagnostic testing changes in proponent essays and changes in imaging during this last decade, this, a lot has happened.
* 00:08:53So, for those of you who aren't really used to looking at.
* 00:08:57coronary CT angiogram so I just wanted to just kind of preface this it's early in the year, and so we probably have some folks are saying.
* 00:09:02gosh what is a coronary CT angiogram, and so this is something this is, I think of it as a non invasive calf and non invasive coronary angiogram where we can see the vessels, the coronary arteries in three dimensions, with very high accuracy and.
* 00:09:17And i'm going to go through some of the visuals of of what this provides you as a clinician this is somebody has totally normal coronary arteries, this is done in a relatively low radiation dose that's.
* 00:09:29You know, when I first started doing this was relatively unheard of, with a relatively low contrast dose of 50 to 60 cc's.
* 00:09:35of contrast, and so the the non invasive ability to do coronary angiography is really the role of this it's a unique test in that way in fact it's unique in that it is as a three dimensional technique.
* 00:09:47It has an ability to assess for both lumen stenosis but also it is allows us to quantify.
* 00:09:55Can characterize the amount of whole heart coronary atherosclerosis beyond just the gnosis, and so this is kind of one of the things that really intrigued me early in my career.
* 00:10:03And of course we can identify stenosis I said, think of this as a non invasive angiogram and this to the left to shows you.
* 00:10:09A coronary angiogram, this is a purely non calcified lesion a severe stenosis of the austral led, and this is what you would see on the corresponding.
* 00:10:18invasive angiogram So when I say, think of this as a non invasive catheterization and money in many ways, how does it compare to what we have historically thought of as the gold standard.
* 00:10:29Right, so when you're seeing patients in clinic and you're saying gosh you know.
* 00:10:32My stress test is abnormal I want to see if this person really has coronary disease we often refer them to the cath lab and consider invasive angiography the gold standard well.
* 00:10:39Modern coronary CT scanners, with significant advances in detector technology can now give us spatial resolution that's equivalent to what we see in the catheterization lab in fact it's in some ways, in some ways.
* 00:10:51superior catheterization because catheterization isn't lumina graffiti right.
* 00:10:55Whereas three dimensional corner 60 actually sees the vessel wall and practice outside of the vessel and so it's very common where we see a cath report that says.
* 00:11:03Normal coronaries and we look at the corner a CT scan we say there anything but normal right they just don't have stenosis, and so we see a lot of.
* 00:11:12atherosclerosis So what is the evidence for using or for you to consider coronary CT well we now you know when I started doing this, I was a senior fellow at Walter reed and my my program director said, you know what.
* 00:11:25This is something that I was interested in atherosclerosis imaging and said, you know what you should go down and do some training and putting in.
* 00:11:31A 64 slice CT scanner just down the road the hospital Center and we've ordered one and we're going to put one in in about six months we want you to no one really wants to do it.
* 00:11:40So you're staying here, why don't you come back and start the program lead to help help lead the program and so at the time, this was back in 2004 2005 timeframe.
* 00:11:49And at the time we were amazed by the pictures, because, as a fellow I was so frustrated I would walk out of the Catholic so many times in fact more than half of the time.
* 00:11:57And I would say ma'am your stress test was was a false positive i'm sorry it suggested abnormality your corners are normal.
* 00:12:04And I thought there's got to be a better way of doing business than our current approach, and so I was excited by this.
* 00:12:10But, at the time, despite getting good pictures people said where's the evidence right where's the evidence yeah you get good pictures where's your prognostic evidence, where is your randomized comparative.
* 00:12:18Effectiveness trial evidence and, at the time, there was none, and since then, what we've seen are probably if you look across imaging modalities.
* 00:12:27The most robust evidence base with regards to when you think of the available modalities that we have, we now have 11 acute chest pain.
* 00:12:35trials and eight stable chest pain trials and this number is probably even dated because I made this slide several months ago.
* 00:12:41But the evidence has been quite robust i'm going to go through some of that with you.
* 00:12:45So, how does it compare to the gold standard from an accuracy standpoint well if you just look at the standard definition, if you look at how accurate is my test historically what people would do is they would say how accurate, is it to.
* 00:12:58detecting a stenosis on tap at least 50%.
* 00:13:02Right, and so you can imagine the CT does pretty well you're comparing an anatomic test to an anatomic test so.
* 00:13:07Its strength is it rarely Mrs severe disease it's per patient sensitivity of 97%, and this is from the most recent large scale Meta analysis.
* 00:13:16The specificity, for example, if I see us the gnosis on cta, and I say it's 60% the Catholic says it's 40% I missed that right, and so you can see the specificity.
* 00:13:26Is kind of on par with our other non invasive tests now, as many of you know we don't just use the gnosis to guide your bastardization procedures, at least, we probably shouldn't unless it's severe.
* 00:13:37And so we tend to use invasive fractional reserve, which is a measure of the human dynamics significance of the lesion we do this in the cath lab.
* 00:13:47And if you use that as the gold standard a stenosis less than 50% on CT you're very rarely missing a human and ethically significant stenosis, but you can see.
* 00:13:58That just like catheterization if I see a 60% stenosis it's a flip of a coin, as to whether that's the gnosis is actually human and ethically significant.
* 00:14:06And so we can see the real advantage of cta is it's high per patient sensitivity, we can say you have no or no significant coronary disease, with high probability.
* 00:14:16And that's really its advantage compared to other testing modalities and when I first started doing this.
* 00:14:22You know, back in the early 2000s, the big issue is that our standards, in fact, the first CT scans I did want 16 slice scanners, I took a long time, we were imaging literally.
* 00:14:31A centimeter at a time or less, and so it took a long time to get through the heart, and for that reason you needed a lot of contrast, and radiation doses were quite high.
* 00:14:40Now we see that, with the scanners, we have here at uva that are scan times are now a fraction of a second amount of contrast, we need is actually.
* 00:14:48significantly lower we do ours almost always with 60 cc's of contrast, or less, and that the radiation doses have become markedly lower in fact.
* 00:14:58Remarkably, lower, and so this is a technique that's here that's available uva called the flashmob, this is a high pitch helical mode with a patient exposure in the scan is just a few milliseconds.
* 00:15:08And this results in a dose that's less than one millisecond.
* 00:15:13And in fact in many patients, and this is one of the studies using this technique, if you have patients who have low stable heart rates.
* 00:15:19Those is equivalent to a chest X Ray around point one millisieverts, this is not a technique, we can use in every patient.
* 00:15:24But if we have patients with slow stable heart rates, who do not have a lot of who do not have known coronary disease, this is something that we're using and a fairly large percentage of our patients here at uva.
* 00:15:34and getting highly diagnostic images for a fraction.
* 00:15:38Of the dose that we used to do and put this in perspective, a chest X rays around point one millisecond a heart catheterization around four to six millisieverts, and so this is a point one.
* 00:15:46let's see if this is not the usual dose our usual doses around two to four millisieverts so putting us in perspective to things like spect where we see an average dose of around 10 millisieverts or nine to 10 millisieverts, this is a relatively dose.
* 00:16:01Attractive technique in 2021 that was not the case 15 years ago and we've seen this this is data from the protection study which surveyed sites around the world and we were a site.
* 00:16:12In this survey at Walter reed and there's probably some experts in Center bias, but what we've seen is nearly an 80% dose reduction, this is really all due to scanner technology maturation scanners rotate faster.
* 00:16:23We can now do use a lot of different detector detector technology and reconstruction algorithms and improve image quality.
* 00:16:31So you know going back in time, why should you you consider corner CT, and I say, consider it because it's not the best test for a lot of patients.
* 00:16:40right but it's a good test for many patients and we see it under utilized in fact, if you look at the practice pattern here at the end around the world around the country, in fact, every institution i've been to.
* 00:16:50We tend to see that non cardiologists traditionally order things like spect as their routines festus because it's kind of what they've done.
* 00:16:59In cardiologist will often use corner CT stress and mark stress pet some of these more advanced techniques and I would like to challenge in fact that practice and empower.
* 00:17:08The Non cardiologist in the Community to primary care doctors, all of you, in your clinics, to consider these advanced tests, because I think we have better.
* 00:17:17Tests than just the routine practice pattern, this goes back, this is a publication we published back in 2011.
* 00:17:24And we said, well, what is the prognostic value and i'm gonna show you what I think the vantage of corner CT really is through these next few slides, and this was back when people said, there was no data for.
* 00:17:33The prognostic value of CT we said well let's just look at a worldwide registry to see.
* 00:17:38And so we looked at over 23,000 patients, and this was a prospective evolving registry that grew to over over 35,000 patients.
* 00:17:46But much like we saw in invasive angiography the more disease, you had if you define it by the number of vessels with stenosis greater than 50% the worst your prognosis.
* 00:17:56And this, this has been extended now from a follow up period now for almost a decade.
* 00:18:01What was interesting though is that the disease that's often it was often dismissed in the cath lab non obstructed disease seen in over a third of patients in this registry had prognostic importance.
* 00:18:12It was very different if you had truly know plaque compared to non obstructive plaque that non destructive black black.
* 00:18:19Was prognostic Lee important, and this non obstructed plaque was black and things that we just didn't didn't see another stress testing modalities, we would tell these people your stress test is normal you're good to go.
* 00:18:30I read a stress test yesterday and a patient who had a heart attack 18 months or sorry 12 months after a normal stress test a stress test was clearly normal.
* 00:18:39and fellow looked at me and said well how did this person have a have a heart attack we looked at the capstone.
* 00:18:43And had plaque rupture event right, so the stress test truly was normal but that person was still at risk.
* 00:18:49And this is some of the early data which showed that the more non obstructed plaque these are stenosis less than 50%.
* 00:18:55If you had non obstructed plaque involving all three coronary artery all systems, the works your prognosis, and this was just looking at very crude outcomes, like all cause mortality and controlling for confounders.
* 00:19:07Well, we now have data out to about 10 years and what we know and when you when you look at prospective randomized trials and registries is that if you truly have.
* 00:19:17No plaque on your coronary CT your event rate is close to zero percent it's not zero percent, obviously, because that is only one part of picture, but it's very unlikely your patients are going to have a coronary after a traumatic event, such as an MRI.
* 00:19:33And this is what we've seen is this ability to truly say that you are normal, not only do you have not has to gnosis but you don't have plaque this has been shown in.
* 00:19:41In multiple studies and that's not why i'm asking you to consider corner city, this is why, because when we look at.
* 00:19:49randomized clinical trials look at comparative effectiveness between standard of care, whatever that might be.
* 00:19:54and use of early corner CT, and these are all in stable patients i'm gonna come back and talk about acute patients, a little later.
* 00:20:02So these patients with chronic stable symptoms people refer to these as chronic chest pain syndrome or stable ischemic heart disease possible Angela.
* 00:20:11And, most of these trials and my point out, in fact, all of these studies on showing you excluded patients who had established corner disease okay.
* 00:20:20Probably not the first or best test in those patients patients who have had stents patients who have had bypass surgeries.
* 00:20:27Okay, these are for patients who come in with undifferentiated symptoms, who have none of those things right, and this is the majority of patients that we see.
* 00:20:35And again stepping outside of the cardiology office right these these patients show up to your emergency rooms, they show up to your clinic practices and they're worried.
* 00:20:46And so what we saw in the Scott heart trial, which was i'm going to talk about a little more in depth momentarily but was a landmark trial that compared.
* 00:20:52The standard of care in Scotland at multiple centers which in Scotland, the standard of care is to do an exercise treadmill tests and then you make a decision.
* 00:20:59Okay, is this really angel chest pain, or is it not, and if you thought it, it could be, you did a stress test, are you sending to the cath lab versus they said well why don't we just do a cta.
* 00:21:09And we'll talk a little bit more about this travel what they noticed is that CT the bows in the ctr had about a 40% reduction in incident and my rates over five years.
* 00:21:19If you look at large scale registries or the promise trial for example within diabetics you saw similar results, and if you do this in a Meta analytic fashion, you can see, about a 30% reduction in mind and you might say yourself a test don't.
* 00:21:32In and of themselves change outcomes right just by ordering a test right.
* 00:21:37you're not going to change outcomes right, it has to be accurate and linked to differences in patient behavior.
* 00:21:44And provider behavior right, you have to make an intervention based on those results, and I think the the trial that suggested that.
* 00:21:52CT could perhaps be more than just a diagnostic test what I mean by that is that I would view this test, because it views non obstructive atherosclerosis.
* 00:22:03As they prevent an opportunity for enhanced prevention, an opportunity to talk to your patients, yes, your chest mean it's not a scheming, however.
* 00:22:11You may or may not have corner atherosclerosis that might influence your risk, perhaps you should change what you're eating change how you're living.
* 00:22:18Change perhaps how intense that we're treating your risk factors, and that was what happened in Scott heart trial what you can see is that trial mandated that you go back and see your physician and.
* 00:22:28Within the first 90 days, and you can see these curves were virtually identical until till the in philly providers actually reviewed the corner and CT scan.
* 00:22:38And what we saw was a significant 40% increase in preventive therapies and those who had abnormal CTS this is predominantly among those who have not obstructive atherosclerosis.
* 00:22:49And what we saw is that this presumably this intervention wasn't based on a difference there were no differences instance or in a difference in bypass referrals there was no difference in any other interventions, other than prevention and informing patient.
* 00:23:03And what they saw was that people had no plaque they said you're good right we don't need to do a lot of interventions and.
* 00:23:10let's let's coach them and keep up the good work, but in those who had plaque they made interventions and majority of patients it wasn't mandated by the way.
* 00:23:16And so, these investigators said, we recommend you consider doing this, but this is really left up in investigators and the patients.
* 00:23:22And we saw that in this trial again this 40% reduction in the primary outcome of coronary heart disease death or non fatal line, these were hard adjudicated endpoints.
* 00:23:31In a prospective randomized clinical trial published in the New England Journal of medicine.
* 00:23:36So I think this gave us the they I think some of the best evidence, and in fact that.
* 00:23:41Using testing as not just a diagnostic tool, do you do need a Catholic or not, you need to stand or not, but can we enhance prevention was something that I was really.
* 00:23:49intrigued by and so within one of these large scale registries This is called the Western Denmark heart registry and in Denmark, as you know, they being a relatively small country, they can track outcomes very accurately.
* 00:24:01across their nationalized healthcare system.
* 00:24:03And so they looked at over 20,000 patients who underwent coronary CT and they looked at the potential benefit of using are allocating status, according to the amount of disease that they had on their CT scan.
* 00:24:14And they estimate, this is this is kind of an estimate i'm gonna show you a couple couple studies that looked at model.
* 00:24:20Because randomized clinical trials doing this or hard to do an expensive to do, but they said let's model, the estimated number of events prevented.
* 00:24:28Based on the literature of what we see for status therapy.
* 00:24:31And they assumed a 22% event reduction per millimeter per liter reduction of Staten therapy, which is really the event reduction right that's been seen in randomized clinical trials.
* 00:24:40And so let's just apply this and let's adjust this for competing mortality statistically kind of a more robust way of adjusting for.
* 00:24:48You know covariance that could affect mortality and not surprisingly, what they saw was that the number needed to treat very significantly by how much plaque you had.
* 00:24:57On CT so, for example, if you had not obstructive corner disease, but a lot of plaque, for example, if your calcium score on during your CT was over 400.
* 00:25:06The numbers needed to treat to prevent event at six years was 27 compared to two almost 10 full higher if you had no corner disease right, so the point being that at least based on estimate data applying stanton's.
* 00:25:20allocating them according to disease severity, at least in this modeling suggested that that might reduce events, and there are several other observational studies.
* 00:25:27In fact, one that sons that we did in the confirm registry, which suggests that the Staten users who had non destructive disease did much better.
* 00:25:34And so my point being is that I would you know if you're ordering CTS or you have CT angiogram on your patient you want to look at them right and perhaps identify opportunities for prevention, but more importantly, many of your patients i've had chest CTS for other reasons.
* 00:25:51And in those patients identifying corner if you've ever wanted to be on the on the ACS service or in clinic you know that this is something that I consider part of assessing preachers probabilities have you seen their chest.
* 00:26:03Have you seen their chest before, and if you have, what does it show you what did you learn from it.
* 00:26:07How much plaque do they have in the reorder in their corners because that's going to refine my creatures probability when they come into me.
* 00:26:14and say Should I be understanding or if their chest pain, I think, is Angela nature right, because I think we do over testing we test, a lot of low risk people who don't need testing.
* 00:26:25And pre test probability can be refined by energy and you're going to probably see that I think in some future guidance.
* 00:26:32So, again, I think the advantages of CT is it allows us to say, not only do you have stenosis or your symptoms likely scheming but allows us to phenotype patients across a wide spectrum of coronary disease that is very unique to coronary CT and geography, I think we're reminded.
* 00:26:50That, if you look in the promise trial, for example, that compared stress testing versus corner CT that most of the events like the patient's stress test, I read yesterday, most of the events actually curtain people normal stress.
* 00:27:05Whereas, if you look at the ctr most of the events occurred and people with atherosclerosis and almost never occurred in the absence of atherosclerosis, and that is, I think the potential advantage.
* 00:27:17And so we're going to I think move ahead is kind of highlight why I think this is a helpful tool and why, if I see somebody who doesn't have known coroner's ease.
* 00:27:24In my clinic presenting with possible scheming symptoms, I can certainly do a stress test, and if they have known corners these I will do a stress test I won't refer them to coordinate CT most of the time.
* 00:27:35But if they don't have known quantities and they're not already being aggressively managed, perhaps I think a corner and cities are very.
* 00:27:42ideal test for that patient, because you know these are three different patients, all of whom would have a normal stress test.
* 00:27:48We have this patient who has plaque which has some what we call high risk features there's bulky plaque it's positively or expand saw remodeled.
* 00:27:56it's involving multiple segments, and it has low attenuation, this is probably a very different patient and this patient has no black at all.
* 00:28:02And here we have a patient of as multiple segment plaque with data suggesting that the risk in these patients is highly variable.
* 00:28:11From very low risk to potentially high risk we might might argue that we treat them differently.
* 00:28:16And so, if we look at, I think the advantage of atherosclerosis imaging including it in your practice, whether it be from non gated chest CTS that your patients have had, or whether it be from corner CT angiography.
* 00:28:29I think the advantage is that it allows us to accurately phenotype the patient sitting in front of you with.
* 00:28:36With risk instead of going back and using things like risk or so thinking about what you do in your clinic when someone says Should I be on this.
* 00:28:43Preventive therapy status or you know just treat my blood pressure or there's a lot of clinical nurse Shelton.
* 00:28:49And we pull out a risk calculator and we say well let's look at what your ages and let's look at what your cholesterol was today let's look at what your blood pressure was today.
* 00:28:59Whether you're smoking today we kind of ignore what their blood pressure was for last 20 years we don't take into account genetics, we don't take into account whether they have smoked for 30 years and quid a month ago.
* 00:29:09And our risk calculators are fairly simplistic they're beautiful in that way because they're easy to use and they're always the starting point right, but the problem is that it doesn't take integrated risk exposure related to environmental exposure lifestyle habits.
* 00:29:24Prior risk factor control, and when you see them that day you say this is your risk, and this is based on a lot of people like you in clinical trials right we actually do epidemiological what we're taught not to do we apply population medicine to an individual right.
* 00:29:41from individuals actually from about a decade ago.
* 00:29:44And so atherosclerosis imaging allows you to probably be more accurate.
* 00:29:50Now is CT for everyone well if you looked at the promise trial which compared CT to stress testing what they found, and this is, you know almost 9000 patients, if you there was a difference in age.
* 00:30:01And so, for example, this study evaluated the relationship of having a positive stress test versus a positive cta and looking at outcomes and what was found is that if you were under 65 CT.
* 00:30:14most strongly correlated outcomes more plaque you had the worst you did, but if you're over 65 actually functional testing did quite well.
* 00:30:20And the authors thought this was due to the fact that many of the older patients had high burdens of corner and calcification that may have limited the accuracy of coronary CT so it's not the test navy and for the extreme elderly.
* 00:30:32Again, this is a modeling draw from that same trial at looked at well gosh if we started with CT testing and patients without known corner disease.
* 00:30:40And we modeled how this would impact care over the lifetime of the patient, so a lot of modeling this was published in JAMA cardiology but what they noticed this is fact that CT was the cost effective strategy.
* 00:30:51And the reason was not because it was more accurate, for us to gnosis it was again based on the fact that.
* 00:30:57If you use CT earlier and you paired it with improved preventive strategies based on atherosclerosis burden, in fact, and you tailor their therapies.
* 00:31:07The the estimated impact was was more significant with CT testing you saw lower mid lower downstream testing and improved outcomes, based on the use of corner CT angiogram for that, for that reason.
* 00:31:20And again, it goes back to the ability to look at plaque, and so this is something was very novel in 2009, and this is a group of investigators.
* 00:31:27who looked at over 1000 patients who had not obstructive coronary disease on CT.
* 00:31:32And they noticed that patients who had these bulky plaques these positive remodel plaques with low attenuation if you had lesions with these.
* 00:31:40you're about 24 fold more likely to have an ACS event in the next two and a half years or close to two and a half years.
* 00:31:47And so it kind of reminded us that it's more than just perhaps the number of segments, but plaque but.
* 00:31:54Actually, what is the plaque look like and there's been a lot of research that i'm not going to touch.
* 00:31:58On all of this, but that we're now moving to an error, in fact, if you read your corner and cta reports today, you may hear comments that this person has.
* 00:32:07No significance to gnosis but they have plaque that looks this way or that way right high respect features are what's called vulnerable.
* 00:32:14In our current reporting system called vulnerable features, probably the best term is what's called high risk plaque features.
* 00:32:19And this is something we are now using and reporting human has prognostic implications and I want you to understand that.
* 00:32:24And so, for example, this is getting from the Scott heart trial, but they took it a step further and it wasn't just me, looking at the plaque saying yeah that's that's.
* 00:32:33Positive remodel I can measure some townsville units and say if it's low or high.
* 00:32:37They actually said well let's use let's use a plaque quantification software, so we can actually quantify this This is where the field is moving.
* 00:32:45let's actually quantify the milliliters of plaque you have per unit of linked or poor unit of volume of your corners, and this is what they did in fact they actually calculated using a software.
* 00:33:00called auto plaque and they said well let's see if that actually predict outcomes better than stenosis are better than things like calcium score so things that we do.
* 00:33:09And in fact what they found is that low attenuation plaque this really dark black which, if you look in histology tends to correlate with in Cap fiber aromas the plaques that are more likely to rupture the more of that you had.
* 00:33:23The worst your risk for am I in fact it was superior incremental and independent just to gnosis calcium score and clinical risk factors in fact clinical risk factors correlated very poorly and.
* 00:33:35calcium scoring and stenosis correlated better with this measure of low attenuation plaque burden, and this is something that we don't currently offer you, but in the future we may.
* 00:33:46write the ability to quantify plaque The problem with this is you've got to be able to do it accurately and going to reproducible fashion and that's what we don't know yet.
* 00:33:54And it's somewhat dependent on CT image quality and so that's what the field is working through is how do we these numbers that we're going to calculate are they reproducible.
* 00:34:02It has to be repeatable right are we measuring what we think we are measured and so that's where the fuel is moving.
* 00:34:10now want to talk briefly about the schema trial.
* 00:34:13And, and hopefully you've heard of the skinny trial with a schema tron was a landmark trial because it tested the hypothesis of whether referring stable patients with moderate or severe ischemia on non invasive testing.
* 00:34:26To the cath lab and revascularization was a beneficial thing to do, we've assumed and medicine, based on retrospective data that it works.
* 00:34:33And we've practiced that way for decades right we said oh my gosh your stress test was really abnormal, we need to go to the cath lab and and put stenson you or maybe even a bypass surgery, but I had never been pressed prospectively tested right.
* 00:34:48And so it was a hard trial to do because, can you imagine randomizing somebody who you saw in clinic with chest pain he's got this really abnormal stress test and you're going to train with medicines.
* 00:34:59really hard for this trial to get done actually took years.
* 00:35:04But it was, I think it really illustrative in many ways, now that question then came up as well gosh you know.
* 00:35:09This was not a CT trial, but what's the what the investigators did it said, you know what we don't want to miss left main disease we don't want to just tell somebody.
* 00:35:16Your stress test was really abnormal we're going to treat you with medicines, what if they had critical f9 disease and they not.
* 00:35:21What they decided to do was do corner CT and homeless patients, so they actually said well let's just do a corner and CT just to make sure they have coronary disease and then make sure they don't have left main disease.
* 00:35:33So, in a way it allowed us to look at well how did CT doing this trial right, this is a very unique population.
* 00:35:40Well, they revert the trial was very well done, it was an nhl bi funded trial.
* 00:35:45The people sent to the cath lab about 80% of them were ultimately we've asked her eyes that conservative strategy patients were treated with the latest and contemporary medications and what was important, is that there was no difference.
* 00:35:57And this comprehensive mace major adverse credit investor event outcome over about 3.3 years.
* 00:36:05There was perhaps some improvement in Angeles very in those patients had severe angina.
* 00:36:10But there was really no difference, and so it really kind of made people step back and say wait a second maybe we're sending too many people to the cath lab and we ought to be using medical therapy first.
* 00:36:21But what we also learned is that perhaps how we're selecting people to cath lab is not.
* 00:36:25Great based on our current functional testing paradigm, and so, in fact, when you did see T in these patients, one in five of these patients who were thought to have moderate severe scheming had no significant ordered sees at all.
* 00:36:40And they were not even enrolled in the trial, so people said, well, maybe we should just do CT first, in fact, if you look closer at the trial what really predicted outcomes was not a schema it was how much disease, you have on your CT or on your catheterization the schema was not predicted.
* 00:36:57So the question is, can we use CT as a gatekeeper you know if you have somebody has a normal stress test well.
* 00:37:03What they found within this trial was that there was a very high concordance rate between CT and invasive and geographies was just published a few weeks ago.
* 00:37:10And jack imaging where they compared CT versus cat and you might say, well, we know the accuracy of CT there's been multiple trials, but we've never tested in this high risk population patients who had really abnormal stress tests.
* 00:37:22And what we found was good CT rarely Mrs disease go back to the statistics, I mentioned earlier it's very sensitive it rarely Mrs disease.
* 00:37:30And so I mentioned this, because now, even in the guidelines that are currently available CT is available as a gatekeeper for patients who have abnormal stress tests, but maybe not rushing them to the cath lab.
* 00:37:42Maybe that's not the way to go, particularly based on this scheme, you try, maybe we should just roll out left main corners is rollout high risk corners, these will seek to treat them medically, otherwise we probably kept many patients.
* 00:37:54And we know that stress testing actually Mrs many patients with left main disease, for example, if you look at retrospect, or some older data, we know that 40% of patients with left hand corner disease have less than 10% of scheming and patients, we would typically just say is low risk.
* 00:38:10And when I say our selectivity for the cath lab can get better this is based on data, and so, if you look across the United States.
* 00:38:16If you go to the cath lab this is large registries or even within the promise trial based on functional testing about 50% of patients have no significant coronary disease.
* 00:38:26or stress test or maybe not getting it right, whereas if you pick people to the cath lab with CT we know they have corners as we've seen it.
* 00:38:34And we know that they're much more likely to have a high higher yield now, we did a trial, called the conserve trial, we said okay let's take people scheduled for the cath lab.
* 00:38:42These are people mostly had stress tests are scheduled to go the cath lab for stable symptoms and let's just do a CT and if it's there's no disease cancelled or cat.
* 00:38:51And so what what was found in fact is that if you do CT nearly 80% of these plan cats were cancelled.
* 00:38:58Because they didn't have severe coronary disease, and in fact this came at a significant reduction in cost and no difference out to about a year of follow up in bars outcomes is appear to be a safe thing to do, using CT as a gatekeeper, it is a non invasive angiogram.
* 00:39:14And so recently, you know how to CT compare to our standard approaches which many offices and round around this community is still referring.
* 00:39:21directly to spect imaging and I would argue that we have better test those better tests are not just corner CT.
* 00:39:26But pet and stress the Mr outstanding tests that I would argue, have advantages over routine spect imaging well, this was a trial that did over 600 patients, I was on the steering committee for this trial.
* 00:39:37that's my disclosure and they did.
* 00:39:41Three vessel invasive frc wire down everyone's coronaries measured whether lesions were functionally significant and they each did corner and CT with what's called ctf Fr versus stress testing.
* 00:39:5280% of the stress test or amelia your present respect and they said okay using an abnormal Fr is the gold standard how accurate was CT how accurate was our our stress energy.
* 00:40:04But what they found is in fact CT was much more accurate at predicting an abnormal invasive if the farm then was stress imaging again mostly spect imaging and the things that correlated with ischemia we're not just the gnosis severity, but how much plaque you had.
* 00:40:23And so, this was really I think I think telling study and, in fact, what it showed is that stenosis was predicted, but if you actually could quantify plaque.
* 00:40:31And more plaque you had it was more predictive and, in fact, if you use a thing called CTE fractional flowers are estimating through.
* 00:40:37Through through complex modeling whether a lesion is flow limiting or not might actually be more accurate than stenosis alone, and this is something that we have here at uva and so.
* 00:40:48In your patients if you're sending them for coronary CT you not just get an anatomic test, where you get stenosis and plaque and usually calcium score.
* 00:40:56But if there's an intermediate stenosis that we think is in a proximal vessel where it might be clinically relevant.
* 00:41:02We can do this what's called ctf Fr where we model what the pressure drop would be across that lesion.
* 00:41:09And it's meant to simulate an invasive FF far vs functional testing with the different modalities that you have and again this is.
* 00:41:17The current vendor uses a thing called computational fluid dynamics it's a company called hard flow we use this vendor here at uva.
* 00:41:24And what it's been shown to be as, at least as accurate, if not more accurate and stress testing in studies involving comparative you know good studies that were these different stress test for compared.
* 00:41:37It has some limitations in that it requires good image quality, so the rejection rates if we do a very poor quality CT they'll send it back to us and say sorry we can't process this so it requires us to do good work.
* 00:41:48But that is something we I think we do good work here, but it is something that we have available for patients who have intermediate stenosis.
* 00:41:56And the value and that this data might change your management, we don't do it in every patient or, in fact, even in most patients.
* 00:42:03But it is something we can try to get some at least estimated physiology and what's important about this technology is it tends to be pretty sensitive.
* 00:42:10meaning if it's normal you look at the comparative trials you're very, very rarely going to be missing something that's abnormal and Catholic.
* 00:42:18So it tends to be fairly sensitive and we use it in that way, and I think in the future, what will have our our our hopefully.
* 00:42:25Software like this, where we can actually quantify plaque and report plaque well we don't have our what's normal right we know things like calcium score, we don't know what's normal amounts of plaque volume and we're still working through that.
* 00:42:36But we do have some suggestions and in fact it's that's plaque volume is most.
* 00:42:40predictive of outcomes, as compared to stenosis so again, this is from the Western Denmark heart registry and they did a calcium scoring as a measure of plaque burden.
* 00:42:48And they said let's look at what's most predictive is it plaque burden or stenosis and, in fact, what they saw was whether you had non obstructed disease or obstructive disease defined as this to gnosis over 50%.
* 00:43:00If you had an equal amount of plaque there was no clinical prognostic difference, and you can think back to the scheme your trial.
* 00:43:07And it really was plaque not stenosis that matter so where are the guidelines moving, I mentioned the guidelines are coming out.
* 00:43:14In the US in the next six to eight weeks well we've been a little bit behind the curve, for in the United States in the UK.
* 00:43:21Their healthcare system what they do is they create guidelines, but they don't let clinicians in the room, they take people who are data analysis right and they say let's use conditions as consultants, but conditions are bias let's just look at the data.
* 00:43:36And so they said let's get a group that does this, and they update their guidelines and they did this in 2016 and basically what they said, is that we are going to stop doing exercise treadmill testing because it's limited accuracy.
* 00:43:48And if you have either typical or atypical angina or non angel chest pain, with an abnormally kg, you should do a corner safety first.
* 00:43:58If you have known coronary disease, you should do functional testing, so they went all in on a CT first strategy in 2019 the ESC kind of basically did the same thing.
* 00:44:08ESC said it's the preferred test and patients who don't come in with a very high priestess likelihood.
* 00:44:15which they defined is basically a 70 year old man with typical engine so unless you are a 70 year old or older man with typical Angela you should do corner safety first.
* 00:44:23As long as you have good access to the testing modality and you don't have known coronary disease and again if you have known corners these you should do functional testing.
* 00:44:31And it's a class one recommendation, in fact, it was a class to a recommendation that it should be considered as an alternative to invasive angiography.
* 00:44:38If you have another non invasive tests it's equivocal or non diagnostic with sending these people reflexively do the Catholic you can get a non invasive cat with CT.
* 00:44:48On briefly close and just the last few minutes talking briefly about cute chest pain, but everything i've talked about so far has been in stable patients, there are now multiple randomized clinical trials and compared cta in the emergency department.
* 00:45:02We did a Meta analysis looking at this and what we found is that you can instead of admitting people doing serial proponents doing a stress test the next day or as an outpatient you can get a diagnosis very early by doing a CT in the emergency department.
* 00:45:14These are typically done and people with low risk presentations know your opponent elevations know dynamic ekg changes right.
* 00:45:20But you can get a faster time to diagnosis, reduce length of stay and potentially uncrowded your emergency room and again.
* 00:45:28You know this Roma cat trial show that against the gnosis if you have a stenosis over 50% you're about 30 fold more likely to have an ACS versus the gnosis matters as the plaque.
* 00:45:41And the guidelines now actually endorses giving an A to a recommendation I anticipate this will even become a class one recommendation.
* 00:45:47Based on them randomized clinical trial evidence, but it's now a class to a recommendation, which means that this is something that can be considered that you can do it's considered a reasonable to do as long as you are low risk when you present with acute chest pain and the.
* 00:46:02Guidelines don't beat us to the punch a little bit made it a class one recommendation.
* 00:46:06In fact it's recommended as an alternative to keep it too invasive angiography to exclude ACS when there's low to intermediate pre test likelihood of corners ease and you have normal proponents and your ECG is not high risk.
* 00:46:21What about in the era of higher sensitivity opponents i'm going to give a little bit of a you know a little bit of a.
* 00:46:28I guess a personal plug here that you know this institution, I think what's the new guidelines come out will be really product to change the high sense if your phone and fifth generation assets.
* 00:46:38we're not currently using them and that will become the standard of care because of its higher sensitivity.
* 00:46:44A what we've seen is that it changes, who you test, so if you have negative high sensitivity fifth generation proponents and your chest pain was more than three hours ago, you probably don't need any testing at all you don't need to do a CT.
* 00:46:57And this is what was shown in the study is that, in fact, you can actually probably it performs very, very similarly.
* 00:47:03What you do by doing a CTS you don't get a follow up visit to the cardiologist you'll get a lot of outpatient testing you get an answer, so I think high since do proponents will change, who we test.
* 00:47:12To those who have equivocal proponents are these funny minor rises or changes in your opponents, but the truly negative proponents and high sensitivity testing probably won't need testing at all.
* 00:47:24Now, this has been look what about the other end of the spectrum and i'm gonna mention this briefly.
* 00:47:29Is that what about the low risk ACS patient right think about the patient who comes into your ACS service, who comes in, with a low level proponent elevation and you're thinking we're going to catch them on Monday.
* 00:47:40Well, could we just do a cta, and this was actually kind of an interesting study because it's not who we would normally recommend using CT.
* 00:47:48But that's what they did, and this was a trial, where they did cath early with a CT prior versus kath within 48 hours.
* 00:47:55And they looked at what was the accuracy and I apologize kind of goes off the screen, but basically what they found is that in about a third of patients, there was no significant coronary disease.
* 00:48:04Either on Catholic corner CT I think you're going to see this number go up when we start using high sensitivity opponent sex.
* 00:48:11So it is an option for you and some low risk patients i'm going to skip through that trial, so I suspect what you'll see is something like this is that if you have someone with acute chest pain, you should.
* 00:48:21Probably look at their prior chest CT imaging, what do you know about them if they have known corner, disease and they can't they're not, this is probably someone who we're going to favor stress testing.
* 00:48:32known corner disease severe coronary calcium if they have a contrast allergy, or you don't have access to a good quality CT or they're in some really irregular rhythm.
* 00:48:42But if they don't have known corner, disease and they don't have these things I think CT really becomes your preferred test in these in these patients with acute chest pain.
* 00:48:51So i'm going to get closer in the last few minutes just talking about testing and women, because I think this is kind of a really hot area in medicine and the question I asked her all throughout this entire presentation is can we do better.
* 00:49:04What we know is that if you look at large scale catheterization registries the number one predictor of having a normal path is being a woman.
* 00:49:13And it has to do with how our non invasive tests, particularly spec and stress ECHO performing women, they tend to be less accurate there's several different features of why that might be.
* 00:49:23And the question is, can we do better, and what we saw within the promise trial was actually that was women who benefited the most from CT.
* 00:49:30And if you look at the test results and event rates CT was very good at discriminating patients who would and would not have events hey women with plaque do worse than women without plaque much more so than men.
* 00:49:44and, interestingly, women are much more likely to have plaque and so discriminating these which you often don't get with a stress test.
* 00:49:52is something that's I think a potential advantage in the acute chest pain population was actually women who had the highest.
* 00:49:58benefit of using early CT they were able to be sent home more frequently, because their tests were normal more frequently.
* 00:50:04They weren't you weren't hemming and hawing about a 40 or 50% stenosis that you saw more frequently in men.
* 00:50:10And so I think it raises this question what we know this is a slide from Patricia Rodriguez from organized emerging fellows who looked at this recently and it's very interested in this.
* 00:50:17And what she did is put together a number of studies, we know that plaque is less prevalent in women they're much more likely to have non obstructed disease as compared to obstructive disease.
* 00:50:28And this may be an opportunity for prevention, because many women are under treated and and many times we say your stress test was normal you're fine.
* 00:50:36And so, this is now being studied this is a group that i'm working with on the warrior trial, and this is a actually a trial it's being funded.
* 00:50:43By the by the by Congress actually interestingly, but it's basically taking women with not obstructive disease.
* 00:50:50and saying let's intensively manage them and treat their respects maybe more aggressively than we would and most of these women are being enrolled from the cath lab or CT so they have non obstructed disease.
* 00:51:00Now I wouldn't be it'd be remiss, not to mention that not all Angela is from epic Cardio coronary disease, we know that that much of the vasculature and most of the vasculature and supplies to my Cardio is in fact that micro vascular.
* 00:51:14And we in cardiology pretty much only focused our efforts on the epicurean corners.
* 00:51:20And so, this is something that realized that many women may have real ischemia on stress test and not have obstructive disease, and this is this concept of what's called I noga or ischemia with non destructive or no obstructive coronary disease.
* 00:51:36And this is an advantage of tests like pat and stress them arrive, because those tests can help you identify micro vascular dysfunction much more accurately than can spec.
* 00:51:47And I think that when I say, we can do better, I think those tests can do better, but what does require you to do.
* 00:51:53Is roll out obstructive EPA cardiac disease right someone has a really abnormal stress test.
* 00:51:58You can't just label them I Nokia unless you've rolled out epic Cardio corners these, and so this is where CT really is, I think a pillar cornerstone for making this diagnosis, rather than sending them to the cath lab.
* 00:52:08Because, if you look at the definition the diagnostic criteria for micro vascular Angela it requires either a CT or an invasive calf, and I think CT is really nicely prime for that.
* 00:52:19And in fact what we know is that, if your patient has no atherosclerosis it's very rare that they have a dysfunctional micro vascular system.
* 00:52:28So a truly normal CT I think you can rest assured that you're not missing micro vascular disease and probably don't need to go on and do testing for that.
* 00:52:37Now we all want to do value based imaging and the thing about CT is that it's a real bargain, and this is just showing you some of the.
* 00:52:46cms payments for the different stress tests that we do, and you can see, that is by far the cheapest of the tests that you could order.
* 00:52:53And you can see less than $200 as far as medicare reimbursement compared to some of our functional tests, which are over $1,000 per patient in fact.
* 00:53:01You might look at this and say, well, great i'm saving money it's actually a problem because many places have no incentive to do this test, it is not a moneymaker right it's it's a money loser right in many ways right.
* 00:53:13But I think it's the right thing to do, for many patients so i'm going to close with this and that I think it's a real time for change and imaging.
* 00:53:20I think we now are moving from a reflexive ordering of a spect scans that we have better test if we have patients with known disease, we have, I think pet which gives us myocardial blood flow.
* 00:53:31And coronary flow reserve, which is which really adds to just whether they have a scheming or not, we have expressed MRI which gives us myocardial definition, can help us sort out the etiology for party mob with ease.
* 00:53:42and so on and so forth, that are simply better tests and a reflective and kind of older spec based treatment pad categories.
* 00:53:51We know that coronary plaque is actual disease ischemia is not disease okay atherosclerosis is disease, this is a Meta analysis, where we show that plaque measurements correlate very well with intro vascular ultrasound.
* 00:54:04And so I think we've asked the right questions.
* 00:54:06But we've asked them in the wrong order right, the primary disease processes is atherosclerosis, yet we start by asking do you have this tertiary physiologic consequence of a disease that I don't even know if you have.
* 00:54:18Right, I want to know, do you have atherosclerosis first, if you do, how much of it, do you have, and maybe I care if you have a steam, even if you're failing medical therapy, particularly based on the scheme you trial right.
* 00:54:31not the other way around we've been doing it, I think backwards for several decades, and so we've asked all the right questions I think in an absolutely the wrong answer, this is a physiologic consequence, this is not a disease, this is disease.
* 00:54:45And I worry when we send people to stress testing, not just about the patients that we how how frequently are we getting it right, but how often are we telling patients you're fine when you're actually not.
* 00:54:55Right this false negative rate of stress testing we looked at a Meta analysis of 23 studies using invasive FFS a gold standard if we focus simply on spec for every patient that a schema identifies as positive it misclassified one patient as negative right.
* 00:55:13we're just not that precise and I think we have better ischemia tests as i've mentioned, and I think we have simply better testing strategies, if you, I think, in the era of chest pain more sensitive test is probably prefer.
* 00:55:25When we know that the prevalence of disease continues to that for severe corners these continues to be low and progressively lower.
* 00:55:33So I think we can do better corners 1821 evaluates and diagnosis actual disease, it is an opportunity for prevention, more than just do you need to go to the cath lab or not, and it does so nowadays at lower radiation that are comparable imaging studies.
* 00:55:48That use radiation and evaluates, as I mentioned the continuum disease from no disease to severe disease and it isn't, in my opinion and opportunity for prevention.
* 00:55:58And so I think getting ready for the guidelines where I anticipate that, based on the trial data that CT will be a class one recommendation.
* 00:56:07are covered coverage for this tests from payers will be progressively better and, in fact, of the last two years, it has gotten much better here in this area.
* 00:56:16From a value based imaging standpoint I think it's invaluable test relative to the cost and that allows you more than just stenosis or scheming so with that i'll pause and take any questions.
* 00:57:05Screening yeah yeah that's that's it's currently not recommended, so it guidelines do not recommend using.
* 00:57:12Screening corner CT there is there are several large scale studies asking that question, the problem we've seen in the literature is, if you want to know.
* 00:57:20I think, for an individual risk right, if you want to get a better assessment.
* 00:57:25We do know that coronary artery calcium scoring is probably a good test in that respect from an individual perspective.
* 00:57:32We know that there are risks forces misclassified lot of people.
* 00:57:35it's hard to beat that, so to say, well, now I need to give contrast and do a game do a contrast study that requires me to give a beta Blocker and many patients.
* 00:57:43And so there's a little more logistically challenging it's more expensive than a calcium score which medicare reimburses at $50 and most places charge less than $150.
* 00:57:51So that's really, the question is is CT better than other CT techniques, we know the calcium scoring is better than risk factor, so you know.
* 00:57:59that's a whole separate talk about the value, whether you should do calcium score or not, but I would say.
* 00:58:03In that patient currently you can consider calcium score in the future we'll see we know the calcium score is a pretty crude test it does really thick slices through the heart it doesn't help.
* 00:58:13quantify non calcified plaque and so it's it's probably not as accurate as a corner CT scan particular when you can quantify all forms of plaque with high risk black features.
* 00:58:23And also see stenosis which is prognostic really important, so I think right now, no i'm not advocating for for screening corner C D, the literature, the evidence does not support it, you can't get it paid for.
* 00:58:34There are people who think gosh you know you can do this at the same radiation is a calcium story to 50 cc's of contrast, which the contrast and do some property right under 60 ceases contrast zero.
* 00:58:45Why not do it right and they're studying that they're people who believe that very strongly that it's a you know we.
* 00:58:51We screen women right for using the women example we do mammograms and women that have the same radiation calcium score, we never looked for count corner disease.
* 00:58:59And that more women die of coronary disease and all forms of cancer combine right, so we don't really look that hard doing but that's still remains to be seen.
* 

**Unknown Speaker**

00:59:14So.

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**UVA IMR Chiefs**

00:59:23it's a much more challenging population, most of the studies with CT have excluded patients with that with that with with any significant kidney disease, because of the contrast exposure.

* 00:59:33We will do it selectively I where I see a stock from Dr Rao I work with her we do it selectively in patients.
* 00:59:40With modern scanners, most of the time we could still get an answer.
* 00:59:43At hybrids of calcium, but it requires exclusive heart rate control and it's not something I would routinely recommend, so I think functional testing and patients with kidney disease is preferred.
* 00:59:52Again, I think we have better functional tests and many of these patients than perhaps, and I think what you're going to hopefully see here at uva is better access to pet scanning and a broader access to stress MRI which I think in the future.
* 01:00:06offers more advantages for your patience and.
* 01:00:15it's hot yeah highly variable the highly variable that's the problem right now is that you see.
* 01:00:21You know if you're at major medical centers no problem right.
* 01:00:24If you're in the Community it's highly variable because there's not a you have to have champion, who believes in the technology it's not a moneymaker if you go to your hospital administrators and say, I want to I want this brand new fancy CT scanner.
* 01:00:35And I want to do the CT program and it requires a lot of work and a beta Blocker patients I you know, have to get paid to do it.
* 01:00:41So it's it's highly variable I think you're going to see that slowly change as a guideline we've already seen a change in the UK where it's now the preferred test its dominant test now and the ESC guidelines we're seeing it done more.
* 01:00:53So I think you'll you'll see a change, but it needs there's a lot of training gaps, a lot of Radio it's not that interested in doing it because, again it's not a huge moneymaker for them we're seeing more and more people get trained in it, though.
* 01:01:05I saw a question here from from the chat from Andy wolf middle age, you know got me going to answer that one yeah so middle aged patient with a typical typical or atypical chest pain.
* 01:01:1655% specificity, or we submitting almost half of our patients to cardiac death, no, it turns out that very few people have.
* 01:01:24stenosis if you if you look at a population, who has who undergoes CT it's well under like about 20% or less that actually have significant stenosis that's.
* 01:01:33If you're using this in lower risk populations, and even then with the schema trial, I would argue, we don't reflexively CAP those people anymore, we say yeah okay you've got a 70% stenosis in your just the right corner yeah should treat that medical.
* 01:01:45And so I think.
* 01:01:47You know that that that specificity that you're quoting is put an invasive Fr probe yeah and I think you can also use ctf afar, and many of those patients and that has been shown to remarkably improve the specificity and we can do that, particularly if it's in a higher risk location.
* 01:02:08Sir, is there.
* 01:02:16yeah so we can do.
* 01:02:19that's kind of a lot higher level use of CT so there's a lot of interest you can actually do what's called cardiac CT profusion where you can actually look at is there.
* 01:02:28Is there a scheme yeah you can look at scar imaging with CT it's not as good as Mr but it's pretty good.
* 01:02:34it's now currently all the literature's and experts centers it's not reimbursed it's not something you can order it's a little more challenging to do because you have to.
* 01:02:43You know shuttle the CT scanner look at the profusion of contrast, in and out of the myocardial.
* 01:02:48I didn't go into this main city is really great for a lot of other indications we use it for pair of angular into providers and patients who have had prior.
* 01:02:54You know buyer prosthetic valves we use it for masses we use it for things people can't get CT we use it in all of our.
* 01:03:01Patients decides are prosthesis and sometimes plan chronic total occlusion interventions, and so the structural use of CT makes up a huge chunk of our day to day contact CT business here.
* 01:03:12And not quite half but it CT CT CT is probably a little more than half of the business.
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**Unknown Speaker**

01:03:19Right.

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**UVA IMR Chiefs**

01:03:27mm hmm yeah, these are all gated cities right, so a lot of your patients have non gated chest CT, whether it be CT pulmonary angiogram and non conference Jesse to you right now there.

* 01:03:41yeah so we can show you how to do that it's really easy seeing calcium in the corners is really easy because it's bright it's dark it looks like.
* 01:03:47it's it's bright it looks like bone and so while you don't you don't score it, you can see, is it a little bit a lot or really a lot right and it turns out, if you put people in those buckets it actually correlates quite well to actual quantification methods yeah.
* 01:04:03And that's something that doesn't take much time to learn right, you can learn that.
* 01:04:10I think we're just a couple minutes over time, so if there's any other questions i'll be i'll stick around at the front, I really appreciate your attention and time and yeah look forward to working for all the new interns welcome and look forward to working with you all, thank you.
* u all right, thank you.