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**TRANSCRIPT - GR 12 03 21 *"The Challenging Realities of Diagnosis: from A to Zebra" –* Joshua Black, MD and Michael Perry, MD from the Ohio State University**

**UVA Chiefs**

00:16:49I've sort of been handed over to our presenters today so today we're going to go to faculty from the Ohio State University good grand rounds on reducing diagnostic errors.

* 00:17:00herself she's very severe very good Medical School training rights at university, followed by pediatric residency and chief residency at nationwide children's hospital in Columbus Ohio.
* 00:17:10stuff they're very talented he answers apartment and your my State University College of medicine in 2018.
* 00:17:16As expected, with anyone who's a former chief resident doctor areas in its own institution in various ways.
* 00:17:22Including serving as the medical director of possible pediatrics quality and safety and Chairperson of the diagnostic excellence Canadian one.
* 00:17:30Recently, he go on through the chapter on diagnostic errors and their associated can advice excellent to secretaries colleague Dr Gospel block.
* 00:17:38After block chain is India, the University of Nebraska and completed his residency training and internal medicine and pediatrics at Ohio State University nationwide children's hospital doctor by Tony is a faculty 2011 with the joint.
* 00:17:51hospital medicine and division of multi factor block is placed many trials I don't have a stage of teaching the leadership roles in both divisions.
* 00:18:00And an international impact in primary care work in a longitudinal clinic in Jamaica.
* 00:18:04Dr bikers also lead voice in the hospital medicine committee on the topic of diagnostic care with prior internal and external presentations on approach to do some diagnostic air with our residency morbidity and mortality conference focused on reducing diagnostic error by identifying.
* 00:18:21we're extremely excited to have Dr Perry and black but that's good.

**Josh Black**

00:18:27Well, thanks.

* 00:18:28Thank you very much for that wonderful introduction and Mike and I are extremely honored and thankful to be.
* 00:18:35talking with you guys, even though you're here remotely over zoom or very thankful to be speaking with you here at your ground rounds today so.
* 00:18:43we're very excited to present to you some of the developments here and nation nationwide children's hospital in regards to efforts to combat diagnostic error here.
* 00:18:52Mike and I truly feel that this is the next frontier of quality improvement and healthcare, safety and quality and is a future area brimming with opportunity for improvement and helping out with better patient outcomes so.
* 00:19:10To start with, today, let me get my thing here.
* 00:19:14First off with a get disclosure the way Dr Perry and myself have no disclosures or financial interest to disclose today.
* 00:19:24I didn't want to start off this presentation, a bit differently than a lot of other grand rounds, so this pain, maybe you've seen this before, is by Frida Kahlo and it's called the broken column.
* 00:19:34But if you were not aware, she suffered immensely throughout her adult life with a delayed diagnosis of spinal bifida and then complications from a motor vehicle accident, she suffered in her 20s she end up having greater than a dozen surgeries over her lifetime and suffered immensely as a result of that.
* 00:19:53I mean this pain, she is encased in the metallic polio, spinal brace after one of our operations and is clearly enough, and a lot of obvious pain and suffering.
* 00:20:02I really like to use of the crumbling classical Greek column to kind of represent her her spine and her state of mind at the time of yet another operation.
* 00:20:12And it's a pretty striking into a new into our mind, and yet this opinion really contains still a lot of her dignity and humanity is still intact.
* 00:20:21With her eye contact and her visual appearance, so I really love this painting, and I think it's a great metaphor for not only the patient experience when a diagnostic error or delay diagnosis happens, but as well for providers as we go through.
* 00:20:36The second victim phenomenon, whatever you know diagnostic error happens clear the patient is the most clear the clearly affected.
* 00:20:43But a lot of us internalize a lot of feelings of fear shame guilt self loathing those kind of feelings whenever these things happen.
* 00:20:51And Mike and I want to very clearly from the outcome, say that you know talking about these things is very difficult, and this is, we want to change the stigma associated with this and make things better, so I know for me.
* 00:21:04One of the more defining instances in my life when I was a it was a junior attending and I was caring for a two month old.
* 00:21:10who had was admitted with failure to thrive and since I am grand rounds that's basically a baby, who is not gaining weight so.
* 00:21:17It was a pretty routine admission the baby was admitted the medical World Cup was negative the patient gain weight with appropriate CD schedule and you know it seemed everything seemed to be okay.
* 00:21:26mom seeing was young, but seemed involved with the care, and so we elected to discharge the patient, and I really didn't give much thought to the station afterwards, however, eight weeks later, I learned that the mother had actually murdered her son.
* 00:21:42A short time after that, and then I was the last healthcare professional to see that child and initially I felt for and shock at this and then that kind of quickly changed into shame self loathing you know how can I miss this I was a pediatric resident I went to a top residency spot.
* 00:22:00You know my whole identity was wrapped up in protecting children helping children, how can I miss neglect and child abuse its most severe.
* 00:22:08form, and you know, no matter what my partner's told me about how I didn't miss anything or did everything correctly, it just didn't help.
* 00:22:16I want to change that so that the next generation of students and residents and junior faculty don't have to feel those and we can kind of start to break down some of those barriers so.
* 00:22:27Today we have I can have two fans here.
* 00:22:32For objectives for today so first off, we want to state the prevalence and the impact of diagnostic air.
* 00:22:38Secondly, we want to highlight how cognitive biases effect an accurate diagnosis and then finally work, so the bulk of our time is discuss strategies to mitigate diagnostic error on both an individual level, as well as on the system's level.
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**Michael Perry**

00:22:55So for today's presentation this is going to be our roadmap, as we go through the talk and stresses already said, I also want to extend my.

* 00:23:02thanks for having us here today and getting to talk about a topic very dear to both of us so to start off we really want to talk about first is what just exactly is the diagnostic error when we're talking about those.
* 00:23:16So, to provide a little historical context we've been talking about diagnostic errors, since at least 1957 and this article.
* 00:23:23They did a review of autopsy cases and found that the most common misdiagnoses even back then were infection Neil Plaza them in surgical conditions of the abdomen.
* 00:23:33And i'm sure for many of you sitting in the audience, these are conditions that we continue to struggle with today.
* 00:23:38Fast forward to November 2021 and this great article just recently came out in JAMA talking about the need for diagnosis, to be a fundamental part of clinical medicine and this idea of diagnostic excellence.
* 00:23:49So, even after 50 years we continue to strive and talk about how we can make diagnostic excellence, the next frontier of quality and safety work.
* 00:24:01So what exactly as a diagnostic air this definition has really evolved and changed over the years.
* 00:24:06dating back to us as early as 2000 the institute's of medicine published into areas human building a safer health system they've defined diagnostic errors, maybe an error delay in diagnosis failure to employ indicated testing or even using outdated tests or therapies.
* 00:24:23Five years later mark raipur the founder of the society to improve diagnosis and medicine simplified the definition and call it a diagnostic error, a diagnosis that was either delayed wrong or missed.
* 00:24:35And then 10 years later, the national academies the medicine released their.
* 00:24:39foundational definition, where they defined a diagnostic air as a ferry failure to establish an accurate and timely explanation of the patient's health condition, but also making sure that we had to timely communicate that explanation to the patient.
* 00:24:57So that foundational definition came out of this work called improving diagnosis and healthcare and this this.
* 00:25:03Book really has served as the framework for diagnostic error research over the last six years and it's really lead to many organizations.
* 00:25:11Taking up the call and trying to tackle how we, as institutions can reduce diagnostic errors.
* 00:25:17And as you see some of the groups here listed there's the society to improve diagnosis and medicine there's corey there's the Joint Commission so there's a nice mixture of for profit and nonprofit organizations and I think they all really.
* 00:25:30answer the call and in this talk from or excuse me this quote from the book talks about how healthcare organizations.
* 00:25:35have an obligation to monitor the diagnostic process and identify learn from and reduce diagnostic errors and really this needs to be an essential component of all our quality improvement and patient safety programs.
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**Josh Black**

00:25:50So the next step on our roadmap today is to kind of understand a little bit of context about diagnostic errors so before we can began to mitigate them or to combat them, we need to understand where and when they are occurring.

* 00:26:03So first off let's start with a personal reflection questions so think back to where you work most commonly whether you're maybe on a primary care track and working clinic or your.
* 00:26:12You know resident you're doing combination of clinic and wards or you're making on a hospitalist attending and you're on the wards only.
* 00:26:18Think about what are the most common diagnostic errors that you are seeing in your practice Okay, if you are like most.
* 00:26:27physicians the United States or most centers in the United States, you may have kind of a megan clean of may we're seeing a lot of this this month or i'm seeing a lot of cases like this, or maybe you reflect back your most recent morning report or m&m.
* 00:26:40m&m and say oh we've seen a lot of cases and m&m this this year about this thing, so I must be missing a lot of those.
* 00:26:46Well, the truth is, is that most healthcare systems do a very not a very good job of moderate diagnostic errors tracking them and figuring out where our blind spots are.
* 00:26:57So, to understand this context, a little bit more, we have to start with some of the insurance data so.
* 00:27:03Some of the best data from this comes from the malpractice insurance industry and this data is from a company called Corby’s, which is one of the nation's largest malpractice insurance in 2018 they published a comprehensive review.
* 00:27:14Looking at the leading causes of malpractice claims and.
* 00:27:18The number one cause of malpractice suits as well as and top cause of payouts was diagnostic related.
* 00:27:28Issues now I can imagine, most people here are probably thinking well mount the malpractice data is probably heavily skewed toward the most serious instances of their selection bias us with us and I definitely do agree with you, but this is definitely useful data as a jumping off point.
* 00:27:51Now Courtney’s did a nice job of breaking this down even further, so instead of just looking at diagnostic related issues they asked.
* 00:27:57Where did along the diagnostic journey did the breakdown occur exactly and what they found was in about a third of cases inadequate history was the top cause of the diagnostic air.
* 00:28:09The number two cause was interpretation of lab tests or procedure tests, etc, like that, so if you combine those two roughly half of all.
* 00:28:18diagnostic errors were due to inadequate history or interpretation of lab tests real bread and butter kind of stuff the remaining 50% without with communications.
* 00:28:29transfer a proper referrals getting the results in the right position that kind of stuff.
* 00:28:34And a lot of that has already been explored and QA projects, I know, certainly here at our institution i'm assuming that yours as well, but those are being investigated heavily.
* 00:28:43But for that other 50%, this is an area for opportunity for improvement okay on the right there, we have a data from pediatrics this comes from a.
* 00:28:52Malpractice insurance company called the doctors company shows very similar amounts to roughly about 40% was due to inadequate history and similar amounts of lab interpretation, etc.
* 00:29:07The next where are these diagnostic errors occurring, and it should come as no surprise to anyone that the most diagnostic errors.
* 00:29:13And the most malpractice insurance claims are occurring, where a lot of diagnosis is made, so this is in clinic is is in the emergency department, this is an urgent care okay.
* 00:29:22I, in a way, I kind of like to call these diagnostic island So these are often solo practitioner areas where you have a lot of time constraints, you have limited amount of time you have lots of patients.
* 00:29:33And you have a lack of immediate expertise, you know, while I’m on the wards I can console gee if I have a question.
* 00:29:39or Dermot there's a rash with your in clinic you don't have opportunities for that.
* 00:29:43Additionally, you may not have advanced diagnostics available for you in a clinic setting or an urgent care setting so it's should come as no surprise, these are coming there I highlight this because if you are to design a system that's going to help monitor.
* 00:29:57As well as mitigate any diagnostic errors, you should count target the areas where these are occurring, the most frequently.
* 00:30:04So we do know that the insurance data is probably skewed in a certain direction and we do know that.
* 00:30:11That there is more to the story than just the insurance data so let's look a little bit about what's been published in the medical literature.
* 00:30:17And I phrases that put this in as a pyramid here because I put the top, the most serious diagnostic errors of tip and then probably at the bottom, where the how common they are in general.
* 00:30:28Amongst the most serious cases like in our pediatric autopsies they find Type one autopsy results of was a misdiagnosis led to the child's death.
* 00:30:38occurred in about five to 16% of autopsies done for pediatric in autopsies, which is quite a high amount.
* 00:30:46And in 10 de re admits there's probably a very high rate of misdiagnosis at that time.
* 00:30:52And then I like this third point here, there was a single Center study that looked at the rates of serious life altering morbidity or death.
* 00:31:01As caused by a diagnostic error their Center and they found a rate of point two 2% of all in patients, so if you extrapolate that out.
* 00:31:11You know Ohio State humongous hospital hundreds of thousands of impatience a year you start to see the problem really quickly, where there is a measurable percentage of people who are seriously injured or hurt as a result of that.
* 00:31:24next thing I’ll highlight is this pediatric pediatricians survey here so pediatricians are no different an internist on surveys, where they recognize that diagnostic errors are very common.
* 00:31:35But where I think it's very interesting is when they ask them how often do you make a diagnostic error, I said, not very frequently so there's some cognitive dissonance between understanding that.
* 00:31:46diagnostic errors are common and yet individual provider say that i'm not the one doing that.
* 00:31:51But clearly, you know if they're that calm and then someone is making them at some point, so a little bit of cognitive dissonance there.
* 00:31:58we'll talk more about that a little bit later and potentially up to 15% of all diagnoses may be inaccurate that's kind of a an estimate or an expert opinion.
* 00:32:08So, not the best evidence for that, but think about that number one you're seeing patients and maybe a roughly 15% of who I’m seeing may be diagnosed and accurately.
* 00:32:18So this has led to the concept, at least in internal medicine and what's called the big three.
* 00:32:23So these include vascular events such as the York disease, am I stroke perform disease infections, such as meningitis endocarditis osteomyelitis and then new placements.
* 00:32:33These make up the majority of not only malpractice claims, but what's been reported in the literature.
* 00:32:39And the point I want to make about this and then we'll probably understands this, is that diagnostic errors are not in general.
* 00:32:47zebras they're not unusual conditions they are the common stuff that we see all the time on the wards on your 100% clinical I take care of these conditions, every day, they can be challenging to diagnose and manage, but they are not rare zebra conditions.
* 00:33:05So we're going to transition now to talking a little bit about cognitive bias and how it affects diagnostic Eric Oh, this is a humongous topic.
* 00:33:14Mike and I could nerd out and talk all day about this, what we're going to cover this in a relatively short amount of time for brevity sake, so we can move on to more practical solutions that we that's available for us.
* 00:33:26So initially let's do something non-medical as an anecdote to describe how this works so lieutenant commander Michael Riley was on duty and the HMS Class three during Gulf War one.
* 00:33:37He was in charge of the radar and early in the morning he pick up to radar signals coming from Iraq headed toward the USS Missouri the flagship of the American fleet 2000 sailors on board.
* 00:33:49He has about 45 seconds to determine whether this is an American fighter bomber coming back or an Iraqi anti-ship missile.
* 00:33:58The miss this is blip is flying in an approved allied airline and is flying the same altitude and rough speed is as a plane.
* 00:34:07So he has to make a snap decision with limited capacity to gain new information, no other information available, he has to make a quick decision with thousands of sailors on on online.
* 00:34:18Well, what did he do he ultimately decided to activate his ships anti-missile systems and successfully shot down an Iraqi anti-ship missile.
* 00:34:29And this became kind of after the war, this was kind of looked at intensely by cognitive psychologists about kind of trying to understand how did he make this snap decision was just a 5050 ball or did he actually have.
* 00:34:41some kind of unspoken expertise with this and the post mortem on this encounter was is that you know by weeks of staring at radar screens and seeing a planes flying back and forth on his radar.
* 00:34:52His brain subconsciously understood subtle differences between elevation and airspeed and behavior that his subconscious brain was able to incorporate that data.
* 00:35:03and understand that something was different when he was the brief he said I can't explain why I knew, but I 100% knew that that was on a plane that I knew was a missile.
* 00:35:13So this is as lead to you know this is part of one anecdote that explain something that I think many of you in the audience have heard about.
* 00:35:20And that is our call our dual system theory of cognition because we won't talk about this much because most of you have heard about this this point so system on is our quick, efficient, low effort influenced by emotional.
* 00:35:32emotional thoughts things like that, where we live, most of the time during the day when we here to Syria frequency and lower abdominal pain we don't have to think about it, we know that's a uti that's how our system helps us get through our day.
* 00:35:44are tied to system is our slow deliberate conscious complex thinking that we have to sit down pen and paper figure things out.
* 00:35:51and work we're encountering new information we use this the points I want to make about this.
* 00:35:57Is that these systems are hardwired into our brain Okay, these are very challenging to overcome these because functional MRI studies have shown that these are intrinsic to how our brains developed so.
* 00:36:11These pathways are hardwired baked into our brains and so overcoming them is tremendously difficult.
* 00:36:17The other point I want to say is it's a commonly stated myth, in my opinion that type to system thinking or slow deliberate thinking is more accurate okay as a mentor of mine once told me that.
* 00:36:30Type two system thinking, the only guarantee you get with, that is, if you will arrive in an answer slower than what type one says Type one thinking there's no guarantee that you will become more accurate with that and we'll talk a little bit more about that it has become a lot.
* 00:36:50Alright, so this leads us to a good opportunity to talk about cognitive bias so.
* 00:36:54As we mentioned before, a lot of these cognitive biases that affect us when we're on the wards are hardwired into our brain okay.
* 00:37:02Our brains develop, so that if we recognize a threat, we did not stop and make a pros and cons list or a spreadsheet to have decide whether we should run or stand or fight.
* 00:37:13So these made has allowed us to make rapid decisions with limited information and so these biases that have come in the modern world are manifestation of that so availability bias.
* 00:37:24You only know what you know, or when it's in front of your brain anchoring bias you tend to kind of favorite what first popped in your head and then search satisfying where you seek out information that supports your initial impression.
* 00:37:36So these are hardwired processes that are in our brain and are very difficult to overcome.
* 00:37:43Next, we have a cognitive biases and emotional reaction so think about when you're doing your overnight call might flown overnight on a night call and you're getting just page like crazy.
* 00:37:54And you might start to feel frustrated or angry or one nurse on during the day that just just hammer page and all day about little stuff.
* 00:38:01and eventually you get frustrated and angry and this can color you're thinking so be aware of emotional reactions, because these can affect your as a cognitive bias as well.
* 00:38:12So next is what's called overwhelmed processes and policies, so this would be like you know you'd have that frequent flyer in the emergency department who's there every month for the same thing, and just as soon as the same.
* 00:38:23The same thing, yet again, another one is overconfidence where you know for the you know the last 10 patients that you've seen who've been elderly and confused.
* 00:38:32they've had delirium of general medical cause, and so this 11th person you're seeing must have the same one.
* 00:38:38So these are overlapping processes and our cognitive biases that we come across and and, finally, a very important category or the implicitly learned.
* 00:38:47biases, and these are include racism gender bias implicit bias and then the hidden curriculum that exists that we unfortunately our medical students and trainees learn through unprofessional behavior etc so.
* 00:39:02Another.
* 00:39:05thing is a slide to advance.
* 00:39:08A question for you, so now we've learned a little bit about different types of it reflect on okay.
* 00:39:12So I you probably have learned over the years about different biases and how to fight them and things like that or heard about condom did opt into biasing we don't time to talk about that in detail here today, how do you in your daily practice fight overcome this.
* 00:39:27Well, I would make the argument that awareness of ease is is not sufficient okay.
* 00:39:36So awareness of cognitive bias is not enough to overcome this i'm just going to plant, the seed, because we don't have time to talk about this in general.
* 00:39:44The majority of studies about cognitive D biasing teaching and strategies have not been terribly successful.
* 00:39:51And my take on that is that that's because it's very, very difficult to overcome these a lot of these like I said, are hardwired into our brain.
* 00:39:59they've developed over generations, and so it can be very, very difficult to overcome them so just like you would attempt to keep my project with a pdsa cycle.
* 00:40:09Similar approach to how you should approach, a cognitive bias so, for example, let's say that I’m the pediatric awards and I’m noticing that the residents are.
* 00:40:17tending to say that black American children's with asthma exacerbations there exacerbations are due to non adherence as opposed to divvy disease severity.
* 00:40:27So I started to wonder is this due to social turman health or is this due to implicit bias so being aware of this is not going to help solve this problem as you guys can all imagine.
* 00:40:37So first off, you would have to collect data, and you have to figure out a way to do that correctly and astutely.
* 00:40:44And then you have to educate your you know your trainees and the attendees everything like that you have to standardize approached overconfidence.
* 00:40:52And then the fourth thing is, you have to come up with some kind of means to force a cognitive forcing strategy.
* 00:40:59Whether that's a checklist whether that's a a guideline, whatever it may be finding some way to overcome that cognitive bias and so laissez faire awareness is not enough to overcome these biases in my thing.
* 00:41:15The last biases I want to talk about is the elephant in the room and that's availability bias okay.
* 00:41:20um if you are not thinking of a disease, there is no way that you are going to diagnose it okay.
* 00:41:27And the number one cognitive bias that we see during m&m at nationwide children's hospital is availability bias.
* 00:41:33And the number one cause when they've done ethnographic studies of physicians who have misdiagnoses from a very serious diagnostic errors.
* 00:41:40Is they basically say I just didn't think of it or I didn't think that that was the symptoms are severe enough to cause that Okay, so this is probably the number one bias that affects us.
* 00:41:50So mitigating this or a tackling this can be really challenging, particularly if you are a junior and you're relatively new and you're training.
* 00:41:58Or you know you get to me like me you're 10 years old and you're kind of an old dog it's hard to learn new tricks So how do you tackle availability bias, I want to give you some some.
* 00:42:08Initial stuff you can do an individual level and wait and talk we'll talk about some some things we can do on a systems level.
* 00:42:15So tackling availability bias there's lots of stuff has been proposed, so I think the best one this one takes a lot of work is deliberate practice and feedback.
* 00:42:24And what that entails, is when you make a diagnosis of a patient is that you track that patient you follow them longitudinally and you see if your diagnosis held up and if you were inaccurate.
* 00:42:34You know modulating your behavior your thinking and other way to do this as if you console sub specialists compare your thinking to the sub specialists and if you're thinking is not right, you know, an alternate.
* 00:42:47The next one, and I think that's a really important particularly 2021 some really good well functioning teams, where this is team of hospitals or, this is a team resident team.
* 00:42:56Having a team, or even the MED student can speak up or the resident of the Internet can speak up is very, very important, and the diverse.
* 00:43:04backgrounds and ideas and everything like that are represented, if you have a thing, where the attending his domineering.
* 00:43:11you're not going to get this i'm always amazed me go to Martin reporter case conference is always like a third year MED student.
* 00:43:17or a resident of six months in the training, who comes up with the diagnosis, because they saw it, two months ago right it's about availability bias so having a good, well function team, where people feel free to speak up is critical to this.
* 00:43:29Next is what's called the wisdom of the crowd where basically the more brains, you have involved the more likely, you are to come up with the right diagnosis so like the law of averages means.
* 00:43:38Next is a tactical red team vs blue team, this is adapted from the army, where basically you assign someone to be a contrarian and tell you why your diagnosis is wrong and it helps you kind of think differently about it.
* 00:43:50Next, would be correctly applying basic bayes theorem so I I personally believe that if you apply bayes theorem and pre test ons properly to patients, we can become incrementally better and making diagnoses on a day to day.
* 00:44:05day to day Stanford that's my belief hasn't quite been proven literature yet.
* 00:44:09But the challenge becomes you know, putting good data into this etc it's a whole talk, we can talk forever about it, but I think this is something that's worth using correctly and the next thing that will talk a little bit the rest of us talk about is automated systems and checklist.
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**Michael Perry**

00:44:27Great so really we wanted to use the last half of this talk to really focus on what can we all do, to actually implement practices in our in our daily.

* 00:44:38Either ward's or outpatient clinics or emergency department urgent care to combat diagnostic Erin mitigate some of the harm that's caused by these errors so we're going to talk about individual and system level interventions.
* 00:44:56So, as we, as we start going through some of these interventions, think about if you have the opportunity to leave here today, and you wanted to improve diagnostic accuracy or reduce diagnostic errors which diagnoses or organ systems or patient populations, would you want to focus on.
* 00:45:16So some of these key strategies that we're going to talk about some we've implemented within our systems at Ohio State and that nationwide children's hospitals and others are more hypothetical and things that we would be interested in looking at.
* 00:45:28And are definitely areas of need.
* 00:45:34So, first, I wanted to talk about our diagnostic error measurement system that we have a nationwide children's hospital which we've titled the diagnostic error index.
* 00:45:42And this is our measurement system that we've created over the last several years to really capture some of the most significant and serious diagnostic safety events happening at nationwide children's hospital.
* 00:45:53And as you can see, on the screen, we have five key domains that we use as an our index to capture potential events that may represent diagnostic air.
* 00:46:03So the first one is class one autopsy findings as as josh mentioned earlier the Goldman criteria say that class one autopsy findings are.
* 00:46:11findings that if the medical team had known at the time of the event that would have altered medical care for that patient.
* 00:46:17Second, we review all our institutional root cause analysis conferences third we actually have a voluntary event reporting system that quantifies certain events, as Mr wrong diagnoses, so all those get reviewed.
* 00:46:31Third, we look at resident and surgical m&m cases and then Lastly, we created our own abdominal pain trigger tool, so this is a electronic health record trigger tool patients that are seen in our ED urgent care.
* 00:46:45And for domino pain and then are discharged home, but then ultimately are admitted to the hospital seven days later.
* 00:46:50Are triggered for our ultimate review and then we look to see if there was a misdiagnosis.
* 00:46:57Within those cases and really, what I want to everyone to take away from this is that measurement is important that we need to know how many diagnostic errors are happening.
* 00:47:06But measuring diagnostic errors is extremely extremely challenging and a lot of the diagnostic errors that we are seeing at our institution are extremely common.
* 00:47:16And are not unique or rare zebras and, lastly, we have a very strong institutional culture that prioritizing air reduction, and I think that's really imperative if if you're looking to set out on this.
* 00:47:28journey of reducing diagnostic errors, because you really need to have that non punitive safety culture that is willing to have open dialogue about errors or near misses.
* 00:47:37Because it really helps combat some of that negative stigma that josh talked about earlier that can be associated with diagnostic error.
* 00:47:50So a little bit more detail about our state so from our five domains over the course of 30 months there were approximately 300 cases of potential error.
* 00:47:58And we have a phenomenal multi disciplinary committee that sits down and on monthly basis and reviews all the cases over the previous months.
* 00:48:06And then ultimately we come together and we try to adjudicate if diagnostic errors occurred and through this adjudication process, we felt that 105 diagnostic errors occurred across our institution during this 30 month period.
* 00:48:20And if you're just more if you're wondering of where we are capturing the most diagnostic errors and it's really those last three categories on the on the right, so the voluntary event reporting resident and surgical m&ms and then our abdominal pain trigger tool.
* 00:48:38So what were our overall miss diagnoses and how does this compare to the adult world so as we talked about earlier, the adult big three are vascular events infections and cancer.
* 00:48:48And there are a little bit of similarities, but for our nationwide children's hospital big three.
* 00:48:53We saw more appendicitis fractures and non accidental trauma and I think the biggest thing to take away here is that these are all very common diagnoses for pediatric providers that continue to be missed on a frequent basis.
* 00:49:11So again, if you if you take these diagnosis and compare them against pediatric malpractice claims data again very similar very similar cases.
* 00:49:19meningitis appendicitis neonatal sepsis These are all things that we have to think about on a daily basis and, again, these are not your rare and exotic zebras that you only see maybe once or twice and you're in a career.
* 00:49:36So where do we go next in terms of diagnostic air research well first we really need to talk about patient and family engagement.
* 00:49:42We need to explore new creative ways to engage families and shared decision making the diagnostic process and learning from diagnostic errors that happen.
* 00:49:51Second, we need to get physicians more specific feedback on their diagnostic decision making resource utilization and ultimately clinical outcomes.
* 00:50:01And then, lastly, we need to continue having the commitment for diversity equity and inclusion efforts that really focused on how social determinants of health and health bear health care disparities may impact our diagnostic thinking and May.
* 00:50:15Ultimately, cause diagnostic errors in certain groups.
* 00:50:22So I really wanted to focus on that second point of diagnostic feedback, because I think as providers and physicians This is something we do not get on nearly enough.
* 00:50:31frequent basis, and this was a great article that recently came out from bmj quality and safety in 2021 from Branson at all, and I really encourage everyone to go back and look at it.
* 00:50:41What they talked about in the article is that in medicine, this is a we're really no news is good news type of culture that.
* 00:50:49When we make a diagnosis and the patient walks out the door if we never hear anything else about that patient our mind mind registers that as a win and that really leads to an overestimation of our diagnostic accuracy.
* 00:51:03So this figure from the article talks about what they call the diagnosis learning cycle and what they really want to do is.
* 00:51:11As they talk about is that an individual can generate a diagnosis and.
* 00:51:15And then their clinical decision making in the clinical outcomes would be stored in some type of central repository either the electronic health record or some other form of repository.
* 00:51:25And that, then all this data would be compared and stored and then ultimately when the number of threshold.
* 00:51:32or excuse me, in terms of when a threshold in terms of a number of cases or a period of being on clinical services reached.
* 00:51:39That those outcomes from the repository or shared with an individual, so that they can gain insight and knowledge and then ultimately go forth and improve their diagnostic thinking.
* 

**Josh Black**

00:51:52So the last part of our talk that we're going to do today is, we want to give you guys some idea of ways that you can in current times.

* 00:52:03improve your diagnostic accuracy, as the areas that are coming down the pipeline or future areas for research so.
* 00:52:09You know I think one of the great things about grand rounds and you know we're having people from different institutions and other places, we can kind of.
* 00:52:15look to the seven eight ideas and maybe give you guys a seed to grow and take this into your own institution, and start thinking about these tremendous challenges at your own level so.
* 00:52:29We all know that medical knowledge is exploding and a crazy rate so.
* 00:52:34Right now there's a medical knowledge is doubling every two and a half months and the traditional react, the response to this by the hospital systems has been increasing specialization.
* 00:52:43it's no longer okay just send someone to a cardiologist they may have to go see an amyloid trained specialists in heart failure.
* 00:52:50And you know, one of my favorite authors, who also struggle with diagnosis and his life Dostoyevsky has this absolutely hilarious quote back in 1880.
* 00:52:58About you know patient experience with increasing specialization and I think he was very precious at the time, I think that's what's really funny is from the brothers Karma is off if you guys are interested great book, by the way, plug for a 200 year old book, but you know, whatever.
* 00:53:14Anyway, so we need to come up with new strategies that a little bit more patient centric to get the right patient in front of the right specialist right specialization is not going away but.
* 00:53:26Finding helping that patient navigate through that is going to be an increasing challenge as medical knowledge becomes increasingly more complex.
* 00:53:34So, in addition, there is the challenge of rare diseases okay so Mike and I have been hitting.
* 00:53:40we've been talking and hitting on the point over and over come most diagnostic errors are amongst common diseases and all you guys know about what remains, though, is that there are a whole host of rare diseases, the US.
* 00:53:55rare disease database how has 8000 their separate diseases with an essence less than one in a million okay.
* 00:54:01Now individually you're never you're not likely to see me those diseases in your career but cumulatively you may see up to five to 10% of your service and then time during until we.
* 00:54:14stay on service, you may see all kinds of crazy diseases, I just had last one my cosies osteomyelitis last time I was on service which is an incredibly rare thing.
* 00:54:23So there's a few dilemmas I come up with this there's one is the basie in.
* 00:54:27dilemma which is that because you know the pre test odds are so low for all these diseases, then you should never test for any of them that's a little bit of a dilemma so Beijing probabilities don't help you in these circumstances.
* 00:54:37Availability bias is a huge problem with this right if you've never heard of this particular disease you're never going to think of it or test forward, etc.
* 00:54:44there's often information overload with these patients they they've been in and out of healthcare systems multiple systems, maybe they've gone to the Mayo their back and then the Pittsburgh and abandoned Virginia, etc.
* 00:54:55And so, going through all that data is an overload then there's some I like to call the chronic disease blind spot.
* 00:55:02And that's where you know you're just trying to get the patient back home back in their home environment out of the hospital and so you're ignoring all the chronic complaints which may be a clue in this case.
* 00:55:11And then finally there's you need problems with the symptoms are they so they have GI illnesses or neurological conditions they can be very tricky for arm.
* 00:55:20You know providers to to work through, and you know I like to tell my resume service, you know the old adage you know when you hear heartbeats.
* 00:55:28Think of horses not zebras I like that adage but you know I like to remind them that we work in the zoo not in a ranch so we're going to be seeing zebras on where we work and so be be cognizant of this and we need to develop new strategies to help out with patients who have these.
* 00:55:46So what has been some of the strategies to adopt well on the left is a picture of a B 17 you guys probably recognize this.
* 00:55:54What you may not know about the D 17, which was a World War Two bomber was the very first test flight happened very close to Ohio State at.
* 00:56:02Dayton Ohio and the very first test flight in front of the government in the air force and all people decide they use they're not crashed on takeoff.
* 00:56:09What happened was is the very senior test pilot forgot to take the control lock off and could not take the plane off and it crashed and killed three people sadly.
* 00:56:19So they went back to the drawing board, he said, why did this advanced technologically advanced plane crash on his very first flight.
* 00:56:27Well, what they came back with was that it was too complicated for the average pilot to fly, and so they developed the very first airplane checklists, and this is a copy of it.
* 00:56:38That they came up with that would help the pilots do each of the steps in order now we have kind of use checklists and medicine, not new to the degree that culture has not really responded so far.
* 00:56:54And so there's a few examples where they worked very well in medicine so obviously.
* 00:56:59The pre operative they've been used a surgical site etc they've been used very effectively for central line placements they've been very effective at that literature is very solid about use of checklists and those cases.
* 00:57:11they've also been shown to work very well in the hands of experts with detailed tasks and specifically.
* 00:57:18ekg checklist So if you give a checklist to an expert and have them go through a checklist for an ekg they do a better job than if they were just handed ekg.
* 00:57:27However, where they do not perform very well is, if you give them in a general context, like when they give him the er residency did you think about these things.
* 00:57:36All they accomplished is they drove it one crazy people did not like using them and they slowed everyone down.
* 00:57:42So take home point about checklists are is that they work best in specific scenarios and they work better in the hands of experienced providers versus junior trainees are students, for example.
* 00:57:54So we have here, we tried to adopt something like this and a study, a few years ago here at children's where we tried to institute a kind of a quasi checklist or a cognitive forcing strategy.
* 00:58:05Where we had one undifferentiated abdominal pain came in and we did a diagnostic time out for all these patients and had.
* 00:58:12residency attendees document have better differential diagnosis and our results were very telling in that they were horribly disappointed okay.
* 00:58:21We found that a lot of our residents were doing every work around they could they write out a dot phrase for epic.
* 00:58:26And they would use the same phrase for every patient, they would come through they would you know, for example, this pancreatitis for days and days and days.
* 00:58:34When the lipase was negative on admission and the cat scan was negative there's no evidence of pancreatitis they're still listening to the differential diagnosis so.
* 00:58:43One of the things I learned about this it's very difficult to legislate thinking on a general sense for most people it's just not something that we're very good at.
* 00:58:53So the next evolution of this and i'm sure in Virginia you guys are doing this too is electronic record trigger tools.
* 00:59:01And we have both of these at Ohio State in a children's hospital where combinations of data from the emr is harnessed to flag certain patients have been at risk for deterioration or D compensation.
* 00:59:13For those two to sepsis or we have a generalized deterioration risk index.
* 00:59:18At a children's hospital, I think this is this is, if you don't have this yet all hospitals in the United States will have this probably within five to 10 years OK.
* 00:59:27Now the data is still kind of mixed about it so far, I think there needs to be an evolution of how these work.
* 00:59:32You know there's been some studies out of chop that said that basically all was doing was alerting provide an extra alert to let them know.
* 00:59:41I think that probably some of the benefits of these are going to be an intangible such as increased communication between nurses and doctors.
* 00:59:48or charged ours, being aware of the patient something like that, and so they'll be some heightened awareness, but not necessarily it's gonna be something easy to quantify for a study.
* 00:59:56But this is this is going to be one of the ways of the future is kind of in a way, an outgrowth of a checklist, so to speak.
* 01:00:04So how about machine learning now, this is a big topic and of itself, and I think a lot of people are really interested in harnessing computers to help us in the diagnostic process.
* 01:00:14So machine learning is a way in which the nano understand this very detailed granular level, but basically by feeding enough data into.
* 01:00:23A computer and giving it results, and it can learn based on its results and basically to to come up with an accurate diagnosis and how they do it is they will list either.
* 01:00:34A top three or top five or top 10 and then researchers will quantify how accurate the computers were and getting the correct diagnosis and those various metrics.
* 01:00:43So here's a huge study out of China hundred million data points of an emr in China, and they basically found that they were on par with human doctors.
* 01:00:53The challenge is always inputs these again, are they give work problems to the physicians and word problems and computers and with those with the inputs directed the computers were matching that now.
* 01:01:05There are a couple other studies, where some computer scientist change how the computer analyze the data and actually was starting to outperform this, as you can see in this graph here, these blue dots represented.
* 01:01:19Where the computer outperformed doctors and the Green ones where they did so basically by changing how the computer looked at it.
* 01:01:25The computer was outperforming 80% of physicians and interpretation of some difficult cases so computers are getting better.
* 01:01:33This will likely be part of our lives in the future if we practice over the next two decades.
* 01:01:39So learning to manage this and be aware of this is going to be one of the challenges for the future.
* 01:01:44I think like emr was promised to revolutionize diagnostic medicine and there's been a lot of you know, some improvements some failures, I think machine learning is going to be the same.
* 01:01:55And to highlight that point here is a study of where a computer or in the exact wrong lesson, so they had a machine learning is look at a cohort of patients with asthma and pneumonia and the computer code concluded that.
* 01:02:11The that the asthma was protective of died of pneumonia and everyone here knows that's not the case.
* 01:02:18What it was probably seen is that because the patient and asthma pneumonia the health care providers are probably being more attentive to that patient.
* 01:02:26You know, and being closer and managing them and using more evidence based guidelines, for example, so the computer learn the wrong lesson this case so it's worth noting.
* 01:02:35This is coming as we're going to learn to adapt to it, just like we all did with emr.
* 

**Michael Perry**

01:02:42So, really, we need to start talking about is there ways are there ways to combine human reasoning with Ai or this computer support that josh was talking about.

* 01:02:50And this is an example of some fascinating things that are going on with rare diseases.
* 01:02:55This comes from deep gestalt, which is a proprietary Ai program that actually can use your cell phone to take photos of children with genetic conditions and accurately tell you what type of condition they may be suffering from.
* 01:03:08it's really great it's kind of the future, but one of the problems is that you know, sometimes it struggles, with what may be normal or what may be a normal variant.
* 01:03:17in humans perform actually better at this, so this is one of those things where technology is helpful and getting us to the right diagnosis, but ultimately human reasoning is always going to still be vital in this process.
* 01:03:33Something that's something else that you may have at uva something called clinical decision support software and.
* 01:03:39i'm going to briefly talk about two, we have no financial affiliation with either of these we've traveled them at our institution, the first one is visual by dx which was actually founded by a dermatologist and you can use your cell phone to take photos of different rashes.
* 01:03:54and see what's going on, or see what kind of what is the presumptive diagnosis and I think it's interesting because there was this great article that josh and I were talking back.
* 01:04:01Talking about back from 2006 that was in bmj that was titled googling for diagnosis use of Google as a diagnostic aid.
* 01:04:10And these authors they took New England Journal of medicine cases and by putting in a few key qualifiers into Google.
* 01:04:17They were able to accurately predict the cases that were in New England Journal of medicine they were able to accurately predict 58% of the cases.
* 01:04:25That were in New England journal medicine show shows you that if you have the clinical knowledge and you're able to put in the right information that technology can help us get to the ultimate answer, but again, some of these technologies are limited by what you're putting into it.
* 01:04:44And this is a second clinical decision support software or differential diagnosis generator.
* 01:04:50And this study, out of Canada they actually looked at, if you use these differential diagnosis generators early verse late in the diagnostic process, do they help you reach a clinical decision earlier.
* 01:05:01And as you can see here that it did, improve the number of diagnostic hypotheses.
* 01:05:06Early and late more early and it also increase the likelihood of reaching a correct diagnosis and it being present in the differential diagnosis by seven and 8% respectively.
* 01:05:17So while this seems like a very small number, if you think about it over thousands and 10s of thousands of visits, you could potentially be preventing many miss diagnoses and the preventable harm that's associated with those.
* 01:05:33You know it wouldn't be a talk in today's day and age, if we didn't at least acknowledge that koba 19 in the pandemic we're in and the significant increase in telemedicine.
* 01:05:43So you know, for all of us telemedicine, is the is using technology by medical professionals to diagnose and treat patients.
* 01:05:49This is one of those things that again that isn't going away, but we really need to figure out how to use it effectively and properly.
* 01:05:56And we really need to be mindful that we're not leaving behind certain patient groups.
* 01:06:01Specifically, patients that may have limited English proficiency or patients that don't have access to cell phones or Internet access.
* 01:06:09So, really, we need to file this away and make sure that we continue to utilize it in the future because, again, this is a great way to improve access to care, but we need to make sure we're doing it in a responsible manner.
* 01:06:23And lastly, I really wanted to put out there, that you know more research in this area is greatly needed.
* 01:06:28And as we were preparing for this talk this week, this society to improve diagnosis and medicine just released their seed grant program which is opening for call for proposals to.
* 01:06:39improve diagnostic care in the big three that we talked about or in health care disparities, so I would encourage everyone if this is something of interest to you please go to their website and apply for the grant.
* 01:06:54And Leslie we wanted to just give you some resources this qr code will take you to the society to improve diagnosis and medicines website and they have a great toolbox of.
* 01:07:04Different resources that can be utilized that your institution to help improve diagnostic excellence and reduce diagnostic doors.
* 

**Josh Black**

01:07:14Alright, so just to just to summarize and to bring our message home, so we want to conclude with this kind of three messages here, what can I do what can my division do and what can our hospital do to mitigate this.

* 01:07:27Mike and I firmly believe this is the new frontier of quality improvement and health and safety in hospital settings and really is, you know as crew our projects are becoming.
* 01:07:37You know, are rapidly improving hospital care, you know, we need to find new avenues to help patients out, and I think this is a untapped area that we can.
* 01:07:46So what can I do well, as we talked about those techniques to help mitigate your own cognitive bias are noble endeavors and we shouldn't do that.
* 01:07:55Now, do they work and all the times, no, but we should try and strive to do those should also seek out feedback on your patience and modulate your clinical reasoning.
* 01:08:06If you find that you're making mistakes in certain areas, with it, then what should my division do.
* 01:08:11Well, I think the best thing to do is to start asking the questions of Where are our diagnostic errors occurring what setting what context, what diseases.
* 01:08:20Mike and I firmly believe that you cannot develop a singular plan that will mitigate all diagnostic errors across the board it's just diagnosis is too.
* 01:08:32Specific of a task that requires too much cognitive work that you one size does not fit all and so finding out where the errors are occurring in within your patient population and where to intervene on that.
* 01:08:45start looking at that to something that your division can do and then what can your hospital do so, the hospital can do a couple things they can enable pro protected time.
* 01:08:54For physicians who can who started doing projects like this, they can as like our institution here it's made a one of our six pillars of his 10 year plan so it's become a priority of the administration here.
* 01:09:07And then, allowing emr to be utilized in a way to help look at this and this is a challenge, because I think you know most hospitals don't want.
* 01:09:15You know to be talking about how many misdiagnoses they made, and particularly to be the first one in the area to be talking about their diagnostic error rate.
* 01:09:24Not so great to be the first one there, but you know, we want to change the world, and this is one of the ways we have to start to do that.
* 01:09:32So, in summary diagnostic errors are common expensive and costly to patients and healthcare providers.
* 01:09:38cognitive biases over is difficult and challenging overcome, but we should strive to mitigate it in our daily practice.
* 01:09:45Reducing diagnostic errors requires specific individualized approaches and new tools are coming alive coming down the pipeline and will help out with this, but it will never replace the human provider that's there so with that.
* 01:10:00Mike and I would likely be very open to taking questions, and thank you very much for the privilege of talking with you today we've got a great time.
* 01:10:07Preparing for this and great time talking to you today so Mike I got the chat open here, so it looks like some questions so as a.
* 01:10:15First question is, what is your advice on minimizing diagnostic error, while supporting high value care and diagnostics stewardship boy what a million dollar question because.
* 01:10:26For them.
* 

**Michael Perry**

01:10:37Can you all hear.

* 

**UVA Chiefs**

01:10:39Again we can't hear.

* 

**Michael Perry**

01:10:47troubleshooting I think one of the biggest thing is josh said, this is kind of one of the million dollar questions you know I think one of the biggest things that we talked about earlier is really that diagnostic performance and diagnostic feedback of of how we utilize resources.

* 01:11:04You know, again if if you're looking for rare diagnoses and every kid that comes in, with a headache you CT scan like you're going to find every.
* 01:11:12Brain malignancy but is that proper utilization of advanced imaging, so I think a lot of it comes back to feedback performance or feedback on your diagnostic performance I don't know josh are you able to.
* 01:11:27know you were so.
* 01:11:31You can swing maybe he wants to swing over here.
* 

**Unknown Speaker**

01:11:33and

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**Michael Perry**

01:11:39So the second question regarding the machine learning and matching are outperforming doctors and diagnoses, do you think that speaks more directly to the rising skill of computer programming and predicting reality more objectively.

* 01:11:51I think definitely there's some of it that is involved in, you know as as these databases that a lot of it is.
* 01:12:00that a lot of this machine learning comes from that computers are just getting better that they're able to process more information, more data.
* 01:12:08And as josh is saying that that's a was comparing doctors looking at clinical vignettes, but I think as things go along, and we start figuring out how we can collect some of this data, in terms of diagnostic reasoning and.
* 01:12:21Medical decision making, that we may be able to create these like super repositories that can give us more accurate feedback.
* 

**UVA Chiefs**

01:12:31From the group in here, so what has been your hospitals practice in terms of increase the number of autopsies or perform the settings of unexpected death.

* 

**Michael Perry**

01:12:42yeah great that is a great question so we actually had a quality improvement initiative looking at how to improve autopsies it's really been a struggle.

* 01:12:52I think the biggest thing that we've tried to do is work with our medical providers the frontline individuals who are responsible for.
* 01:13:02You know, talking with families, after an unfortunate you know unfortunate after a patient death to see if we can.
* 01:13:09encourage the family, to get a medical autopsy.
* 01:13:13You know, I will say we've invested a lot of time and resources in that into that over the years and still we have a very, very small number, at least in pediatrics.
* 01:13:22You know I don't know if josh knows more about in the adult world what their their rates are at, but I know it's becoming it seems to be falling out of favor over time.
* 

**UVA Chiefs**

01:13:36And then one more question is how did you how did you sort of change the culture surrounding open or serve honestly discussing diagnostic error at the individual level.

* 01:13:49yeah sometimes easier, we feel like to discuss it in a systems level, but to kind of become vulnerable enough to discuss the ritual levels.
* 

**Michael Perry**

01:13:58yeah I mean it really comes down to you know that idea of a non punitive culture, I know that's easy to say but.

* 01:14:06You know, knowing that it's okay to make mistakes, and that you know that we need to learn from mistakes and improve upon them.
* 01:14:12So I think a lot of it comes from executive leadership and down that you know at our institutional speak that you know they were willing to invest resources in.
* 01:14:22Doing thorough RCA reuse and then proper dissemination of you know what came out of those cases.
* 01:14:28And how we do structured m&m reviews and deciding if there's diagnostic errors or other factors that play into that.
* 01:14:35On the individual level I think it's you know just having those open and candid.
* 01:14:40conversations about you know what happened with the event and then where are the areas of improvement, or what could have gone better.
* 01:14:47it's tough it's probably one of the hardest things is, as we mentioned multiple times you know, there is this there continues to be a stigma around diagnostic errors, but I think the more that we focus on it and try to tackle them, I think that stigma will eventually dissipate.
* 

**UVA Chiefs**

01:15:03Great well we really appreciate you joining us today and, hopefully, you know our hospitals groups cannot continue.

* 01:15:12practicing the space there's so much there's so much to kind of do moving forward so oh.
* 

**Michael Perry**

01:15:18Dr black just came across him just to say thank you.

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**UVA Chiefs**

01:15:22So much.

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**Michael Perry**

01:15:25Thank you everyone.