Dr. Barb Jones: Thank you. Can you guys all hear me?

Robert: We sure can. And we can see your mouse.

Dr. Barb Jones: Okay, thank you. So thanks a lot for joining. I have a quick question before I start. So my name is Barb Jones. I’m a pulmonary critical care physician at the Salt Lake City VA. I had a CDA that just finished in September and I’m going to talk about the focus of my research from the CDA which is understanding and improving decision-making in pneumonia. And then kind of some reflections. My first question to the group is, how many of you are CDA awardees? Because I have kind of tailored this for that audience, but I’m just curious. Are you all or are any of you not CDA awardees?

Robert: Attendees, please feel free to use the chat to answer that question. We don’t have a poll previously set up. I’m not sure you’re going get a lot of replies right away Dr. Jones.

Dr. Barb Jones: I don’t see any replies yet, but that’s okay. So I’m going to proceed as though you are CDA awardees. Great. So let’s see if I can advance my slide here. Okay, so quick outline, I’m going to talk about kind of experience with the Career Development Award, and again kind of focused on sort of the little bit more of a personal story then I usually five when I’m just talking about researched. And then the second half of the talk depending on how much time we have; I’m going to talk about pivoting the stuff I learned from the CDA into an IRR specifically and talk about the IRR that is recently funded is kind of my next chapter. And then the third, just kind of talking about what it really means to be an independent investigator.

I’m using this little kid silhouette. For several periods of my CDA had a couple little existential crises. I find them to be healthy, and so when you see this icon, it’s kind of when I had to really stop and think about what I was doing, where I was going kind of a mild existential crisis. And so that’s kind of the symbol for that. So just a little bit of introduction about me and kind of where I started. I was not really bound for medicine in college. I was a philosophy major, and I got interested in medicine when I actually started to see it as this sociotechnical problem. So I was studying history and I took a class in the history department about healthcare in America, and it was a lot of lectures by the Dartmouth Atlas Group. Wennberg and his colleagues.

The picture there is a map of the counties in Maine, and one of the early small area variation studies from Wennberg who was trying to kind of understand practice. And when I saw that across a river you could have completely different tonsillectomy rates and kind of hysterectomy patterns and even stroke care and stuff, it was really quite amazing. It made me think more that medicine was not this rational application of science, and it was really this social phenomenon. And then also, I was learning a lot about social justice at the time, and it also did not seem right. And so that is what inspired me to go into medical school, and I really tried through my medical career, I’ve really tried to get out and look at different settings and try to practice in different settings.

And so I was at the University of Washington, and they have a lot of rural areas, and then I came to the University of Utah where there were lots of opportunities to study kind of rural practice. And I worked in Indian Health Service for a while in Chinle, Arizona. And it’s a picture of a cow grazing in front of the hospital. And then I also worked in the VA Montana system. And these gave me this flavor of kind of what practice was like outside of often what we study, which is the academic tertiary care center. And then I started getting into kind of quality improvements and I worked at the Intermountain Health Group, which is kind of like our Kaiser in Utah and Idaho. And we developed some decision-support around pneumonia. And I thought it was pretty amazing. It definitely was…it was embedded in this electronic health record that was really kind of ahead of its field, and the physicians loved it. And it actually was associated with better outcomes.

But I kept asking questions about how this was going to scale to these very small areas or kind of underrepresented clinics across their system and beyond. And that’s when I really started to get into, you can use the electronic health record and EHR embedded kind of CDS or computerized decision support to improve care and try to standardize it where it’s appropriate. But it’s also maybe a powerful tool to learn when maybe the standards don’t fit a setting or a patient and where there’s deviance. That’s actually really interesting. And so to me, the philosophy of variation kind of shifted from, variation is really this terrible thing. We should just reduce it. Actually, variation might represent areas of uncertainty and places where we could really learn from it. I’m still kind of figuring out how to feel about variation and it’s very complex.

But that’s kind of where I kind of came from before the CDA. And please stop me along the way in the Q&A. I will keep it up. So if you have a question, we have plenty of time to answer. So I have a career development order and it uses informatics methods to understand variation in decision-making in pneumonia across kind of three different methods. So the first is using population analytics. And the two key decisions I decided to focus on for the CDA was, the antibiotic choice and hospitalization. So when patients present to an emergency department across the VA system or anywhere with pneumonia, there is a ton of variation in patient populations.

There is a ton of kind of variation of what that means in illness severity and kind of consequences to the patient. And then there’s a lot of variation in practice. And the cool thing about pneumonia is that there is actually really good evidence-based practice, kind of evidence guidelines that have been curated over decades. And so they started best practice guidelines for pneumonia about 34 years ago, and so they have really refined kind of what practice sort of should be. So there is kind of a norm. But despite that, there is a lot of variation, and so it’s exciting to look at. And then hospitalization decisions. These are tricky patients because they do present with a lot of kind of ambiguous symptoms. They can mimic other diagnoses and it’s kind of a challenge to decide who needs hospitalization versus who should actually do better as an outpatient. And our often threshold really changes depending on the setting.

So that’s kind of aim one is to use the VA beautiful data to look at kind of large data sets. And the key thing that really attracted me to the VA was the amount of small settings and places where a lot of times the mold doesn’t fit. And we could look at those small emergency departments across VA and also just the largeness of it and the longitudinal data sets. So I characterize an 11-year data set to look at kind of temporal trends, but also spatial variation. And then the second aim was to use qualitative methods to interview physicians in the emergency department about their decision-making in pneumonia. And then the third aim was to design and test clinical decision support.

And I have this sort of backward arrow back to kind of learning because the idea behind the decision-support is that if you design it really well, it can be another method to actually understand variation. And so the career goals around the CDA was to develop these skills in a large data sets, population analytics, kind of advanced analytics of big data. Understanding and using qualitative methods to understand provider behavior. Using mixed methods and trying to integrate the qualitative and quantitative methods. And then really learning how to from the ground up design and test clinical decision support. And I used my own VA as kind of the lab for that.

So aim one. The population analytics aim. The first challenge was capturing right study population. So one of the things about pneumonia and the evidence-based around pneumonia is that, all of the observational studies that we have hinge on a diagnosis. And the problem with pneumonia diagnosis is that, pneumonia diagnosis is kind of like a fuzzy thing. So pneumonia has a lot of mimics, and a lot of times, people start out with the diagnosis of pneumonia and actually then it fleshes out by the end of the hospitalization, it might be heart failure. And because there are a lot of…there’s a lot of ambiguity. And actually, we studied this, and it became kind of another project on its own to study diagnosis of pneumonia and to actually study that discordance between when you initially have a diagnosis of pneumonia and a final diagnosis of the pneumonia at the end of the hospitalization.

And in the VA, about 50 percent of the time, people have a switch. And so is actually not quite a match if you try to select your population using discharge diagnosis codes, which are the most reliable coded kind of information in an electronic health record to capture a pneumonia diagnosis. Those actually are not great at studying the initial decision-making. And to me, where all of the kind of magic happens in pneumonia, it’s an infectious disease, it’s really in that first day on that first initial presentation. And to design decision support for that decision space, you really kind of have to study what the physicians are seeing, which is actually the initial diagnosis.

So we use natural language processing and also we use emergency department assigned ICD codes, which are not sensitive but are pretty precise. And we combined natural language processing of ER physician texts from their clinical note to identify assertions of pneumonia. And the key thing that really changes our population when we do this is that, it increases the amount of patients who actually have this possible diagnosis. And these are the patient’s where there’s uncertainty. And so if you see on the other graph on the right, that’s when we did a chart review validation of our NOP tool when we combine it with ICD coding that’s on the right, we were capturing a much larger number of patients. But more importantly, we were testing a large number of patients with diagnostic uncertainty.

And so that was a really important kind of shift of \_\_\_\_\_ [00:11:51] because when we look at all the evidence that’s produced from observational data in pneumonia, typically, they’re using this population on the left here which has mostly patients that at the end of the day have pneumonia. And they may actually be really not including the patients that actually have this uncertainty. And so it’s kind of assuming that the end of the day pneumonia patients are the same patient that emergency physicians are dealing with in the emergency department and they’re really not. And that’s why they have to balance the pneumonia guidelines with heart failure and sepsis guidelines because it’s kind of a mess in the beginning. And so I really tried to match the population that we’re studying with the initial diagnosis of pneumonia. And that took some time, but I think it was definitely worth it.

And then the second big job of the population analytics team is whenever you show physicians or hospitals variation, the first response is typically like, well, this is hard to unpack because the patients are so different. And they are correct. The patients are different. And so it’s really important to try to model kind of the patient factors so that you can really tease out what variation is left when after you account for all those patient characteristics. And so we spend a lot of time taking the EHR kind of measurable variables to characterize patient illness severity. This is not a new kind of frontier in pneumonia.

Pneumonia has had illness severity kind of indices that have been developed by a lot of people from the VA like Michael Fine in the Pneumonia Severity Index to actually help clinicians consider who’s safe to send home from the hospital. And so this is directly also informative to that decision support kind of stuff and that you really need kind of a…decisions in pneumonia really hinge on the characterizing the illness severity of the patient. So everything falls from that. So for decision support, you really have to be good at modeling illness severity too.

And so we published this work that basically compares the different types of clinical severity assessment across the VA and validates some of the PSIs kind of this original score which we kind of adapted for EHR records. And then we also used some machine learning methods to look at and how much did you need to use comorbidities versus physiologic variables. And so that was kind of good scale building in terms of kind of learning how to model. And then the next step, and this is also in this paper if you’re curious is actually modeling the behavior too. So modeling the actual hospitalization decision. You can use the kind of same methods for modeling 30-day mortality as you use for modeling hospitalization using the same kind of patient characteristics.

So once you have a really good illness severity kind of way to characterize illness severity in a large population, then you can do some really fun things with it. and so the first thing we did is just look at trends across years. And one thing that we found was, the VA has had an norming kind of almost overwhelming influx of veterans as most of you guys probably all know since the beginning of our study period which was 2006. But that’s also a huge increase in emergency department visits. And there was also a pretty big increase in comorbidity burden when you’re kind of looking at the comorbidity as defined by the diagnoses of the veterans receive. And despite that, they actually had better outcomes than earlier. The interesting thing is the type of patient that presented to the emergency department. They had more comorbidities, but their physiologic measures were actually a little bit less severe.

But even after accounting for that reduced kind of a slight reduction in illness severity as you can kind of see the dotted lines, which are kind of illness severity models, you can still see that the drop in both mortality and hospitalizations of veterans across the 11-year period kind exceeded any decline in illness severity. And so we published this. I think it’s actually kind of a good story, which at the time I think it came out sort of halfway through the pandemic, so it was kind of a nice thing to remember that we were actually making some progress maybe before Covid.

So the main research focus of the CDA was to kind of look at variation in hospitalization decisions and an antibiotic choice. And so you can do some really fun stuff with map. I would say you’ve always got to make sure it’s okay with operation. So before showing any maps, I wanted to make sure that this wasn’t going to be deleterious to any kind of operations effort, so I talked to my national program directors and other people in central office that are focused on quality to make sure that this was okay. And it was actually really encouraging is a good way to start a conversation with those folks. But this is the map of the United States with the different VA medical centers and just showing the variation in hospitalization. and just for kind of reference, a white means that for that that facility, the observed hospitalization on the top here…let’s take this facility here.

That white means that they were admitting their patients less than 30 percent of the time for hospitalizing patients with a diagnosis of pneumonia. And then a purple kid of is the upper sex title I guess it is. And that’s a facility that was it admitting over I believe it was 80 percent of their patients. So you can see there’s pretty big wide observed range. But again, that could all be reflective of different patient populations. So then we looked at the predicted hospitalizations. So this is kind of variation in illness severity. And then what we did is kind of, we basically just subtracted the observed minus the predicted for a residual hospitalization.

And so this is after I counted for all those patient characteristics, what variation remains. And you can see that be very right kind of lime green hospitals, those were facilities where the hospitalization rate for pneumonia was 20 percent absolute difference. Twenty percent less then what would be kind of predicted for the entire hospital or sorry, the entire VA population if those patient presented to kid of the one VA let’s say. And then kind of the bright red, it’s a little buried, but there is one facility right here which I went to visit in my qualitative work to get to really try to understand. These facilities here with the bright red, are more like the 20 percent access kind of hospitalization than you would expect just based on their patient population.

And then the other thing that we did with the large data sets since you have, 11 years…we had about 297,000 ER visits for pneumonia. You can also unpack where the variation clusters. So if you have let’s say facility variation which you see on the maps, that can be all related to let’s say either the providers are all doing super weird different things, or all the providers are acting the same way in that facility. And so what we do is we do hierarchical regression modeling at different levels of the setting. And so patients are nested in the providers that see them in the emergency department. And we had about I think 12,000 ER physicians across this study period. And then within the providers, the providers and their patients are nested within the facility and then the facilities are nested in the visit.

And so this is a hierarchical regression model. This graph on the right demonstrates kind of a teasing out of where the variation clusters. So a narrow kind of tall band which is not red dash, that’s the amount of variation that’s being contributed by the VISN. And so narrower and taller means that it’s actually less variation. So they’re all distributed more closely together. But the wider and shorter kind of the plot, the lines, and the dashes there on the right, the more distributed and more variation there is at that source. And so from the graph on the right, you can see that there really wasn’t a lot of geographic variation once you accounted for the facility. And the facility and the provider for the hospitalization decision were kind of equally contributing to variation. So within VISNs, there was really a ton of facility variation. Within the same VISN, two facilities could be behaving very, very differently.

And then within that same facility, there was quite a bit of variation just between providers. And then the other thing that we noticed was that smaller or rural VAs, so that could be within the same VISN as say an urban VA, I had quite a bit lower hospitalization risk even after accounting for their differences in patient illness security. So that was interesting. Then again, please if you have any questions, put them into the chat or into the Q&A. So then we looked at antibiotic use and this was presented one of the infectious disease national conferences. And similarly, we saw a huge variation.

I looked at two specific antibiotic choices and that are kind of hot in pneumonia and they’re the…in terms of…typically everyone gets antibiotics for pneumonia. At least they used to. And then the choice is, well, should we be covering for these resistant organisms that people are scared about? So it’s kind of a very psychological decision whether you’re nervous about resistant organisms in pneumonia. You may cover for broad-spectrum antibiotics. And this is kind of hot in pneumonia because the guidelines actually promoted really assessing patients for broad…for resistant organisms and treating pretty aggressively upfront for resistant organisms including MRSA and Pseudomonas.

And then it turned out that the literature that they were using to make that recommendations, so those were early kind of 2000 recommendations, they were actually not great studies. And there were a lot of studies that came out that actually showed that there was less good evidence to support broad-spectrum antibiotic use in pneumonia. And so by 2015, the kind of…it had hit the high watermark and then people were starting to de-adopt. But there were still a lot of facilities as you can see that were using a broad-spectrum antibiotic a lot. So the top map here is variation in anti-MRSA. And then the bottom map here is variation in antipseudomonal antibiotics. And you can see for here, some of the facilities are using these broad-spectrum antibiotics. The white facilities are less than ten percent of the time. So very rarely.

And then some of the physicians at these other facilities that are the dark blue, they’re using more than half of the time, so over 50 percent of the time. That’s the observed variation. And then after modeling for anti-MRSA and antipseudomonal use using patient factors, you can see really the story isn’t changed. So the kind of irony of spending all that work modeling using 68 different very, veery carefully curated EHR variables across the whole system, it really doesn’t matter. But you still have to do it in order to really show, look.

This is not explained by differences in patient characteristics. And you can see there is a huge variation here. And this is a little bit different from the hospitalization decision is that, the variation was almost completely explained by the facility identity. And so physicians at a given facility, they don’t really vary between each other at that same facility. So physicians or the care teams that choose antibiotics for pneumonia are really clustered. They all act the same at VA X versus VA Y. And there was a decent amount of geographic variation, but it was really all explained by the facility.

Robert: Dr. Jones, we got a question into the chat, and I asked her to put it into Q&A, but I get the sense that she’s having a hard time finding the Q&A. So Hilary, why don’t’ I just read it to Dr. Jones. Okay, here we go okay. Do you think this comorbidity increase is real or does it reflect changes in documentation and coding? We saw an increase in coding for AKI that did not correlate with trans and biochemistries over a somewhat similar time period.

Dr. Jones: Yes. So that’s a great point. And who was that? Who asked the question?

Robert: Hilary Mocher.

Dr. Jones: Oh okay. Thank you Hilary. I actually go way too much length probably in the discussion of that paper to talk about just that. Because definitely some of the comorbidities, it is a product of probably better labeling. And one of the hypotheses of well, why are outcomes getting better in pneumonia, is that especially cardiac disease, we all know now that pneumonia actually has a lot of consequences on cardiac outcomes. There’s a second hit when you get pneumonia like a lot of sepsis that you can actually have cardiac events as kind of a second cause of death in pneumonia even after you survived the acute infection.

That’s an example of when we were looking at it, you could see it arise in coronary artery disease, but not arise in myocardial infarctions. Which to me actually means that more people with CDA are actually getting identified appropriately and maybe actually on better therapy for cardiac disease and not getting heart attacks than they were in the early 2000s. And so that’s one where the labeling actually probably is a marker for better control for good primary care for comorbidities. And that’s I think one thing that actually really has improved across this time span for pneumonia is patients are coming in with their diabetes and heart disease actually better controlled.

But there are other things that actually were increasing across the time span. And actually diabetes was one of them. And obesity, we actually put obesity into our model too. These were actually real increases. Another example of one that is probably a label that actually could confirm that there is actually better care is, there was an increase in tobacco use, but not really. It was the increase in identification of tobacco use and that probably means that there’s increase enrollment into tobacco cessation programs which would then give you an encounter that would label you to have tobacco use disorder. And so that’s another example. So you’re spot on.

And the other thing that we did see is that the onus severity actually did decrease. And when we use our illness severity models, the comorbidities don’t actually predict things as well. They don’t really add very much compared to the physiologic variables like the vital signs and the 28 labs that we throw in our model. So that’s kind of interesting that the comorbidities are actually like, if you have enough physiologic markers, they can kind of tell the story of the acute illness. Anyway, so I could ramble on forever about that. But that’s a great question. Anything else Robert or should I move on?

Robert: I think I see a question came into the Q&A.

Dr. Barb Jones: Oh, that’s really interesting. I can read this. Oh, that’s from Hilary. Oh, great.

Robert: So nothing else in the chat just yet.

Dr. Barb Jones: Okay, great. So this is the existential crisis number one of my journey, which was like, so what. So I can geek out about variational all day. I mean, I saw this map in college and I was inspired to measure it. I just think it’s fascinating from a human behavior kind of perspective. But it’s also like, what’s the point? And I think there are two responses that I think really depend on what the source of variation is and why people are variant. So the first response is, if it’s clearly a decision that’s either good or bad. If you have certainty in your evidence that supports a way of doing things in medicine, then what should…what you should be inspired to do when you see this amount of variation is to reduce it and to fix it. And so that leads you down to implementation science.

And for me, a big thing with quality improvement was computerized decision support. You can really embed some of these really, really good practices for pneumonia into care using the EHR as kind of a implementation strategy. And I did the NIH TIDER class which I highly recommend, and I learned all about implementation science. And I was like, okay. So if there’s a clearly right or wrong thing that this is measuring and I’m seeing a ton of variation or disparities in different settings or different patients, then what we should do is really focus our implementation efforts to reduce that.

But then there’s another possible response which is well…or…and this would be kind of Wennberg’s idea which is, or the variation actually represents uncertainty. And do we really…is this variation happening because these are really, really bright very knowledgeable care teams that are varying this widely. Because there’s really a lot of uncertainty in what people should do. And I actually think that with a lot of pneumonia spaces, it’s kind of, that’s more of the reality. Because we have enough uncertainty in our evidence-based that the variation is actually something that we should be pointing or like, wow. That’s representing clinical equipoise. That’s representing two facilities that are high-performing physicians and care teams and facilities that have really thought about this. But they have very different practice norms. And they may not even have any consciousness about those differences. But they are both kind of just interpreting kind of the uncertainty of the evidence differently.

And so that’s actually an opportunity to learn from the variation and we should be pointing our comparative effectiveness research and our causal inference kind of methods to try to understand well, can we see which one of these different types of practice are better? Is there one better than the other. And I see a couple more questions. I’m just going to see. Do you have any comparative data looking at VA system implemented up? Yeah. So great question. And there’s a lot of people in my VA that has studied this for a long time when relating antibiotic stewardship. And definitely…Chris Graber is actually from Los Angeles. Makoto Jones is from Sally City. Matt Seymour is my primary mentor. And my CDA is from here.

But they have spent years and years trying to study kind of what of the core implementation strategies for antibiotic stewardship are really associate with better kind of more judicious antibiotic use. And there are a couple papers that actually use the Hague Survey which is one of these hospital…I can’t remember what it stands for. Hospital something group surveys to kind of look at antibiotic stewardship qualities and kind of the, to what extent is antibiotics stewardship kind of changing cultures of antibiotic use. And they actually wrote a really nice paper. I think the primary author was Chris Graber about the kind of relationship between the stewardship teams and the kind of more judicious antibiotic use. So there are data out there. And I’ll actually if I have time with my IRR, I’ll talk a little bit more about how I plan to leverage some of that survey data to understand change in antibiotic use.

Robert: I got another come into the chat if you want to hear it Dr. Jones.

Dr. Barb Jones: Oh, yeah let’s see.

Robert: You won’t see it. Any change you looked at overlap with dysphasia? And then in parentheses, oropharyngeal or so esophageal/reflux. Although, ICD diagnosed codes are often not accurate.

Dr. Barb Jones: Yes. So we do put that into our model of illness severity. I actually think probably the really important place is if we were studying pathogenesis of pneumonia of like, take the whole veteran population and look at who gets pneumonia who doesn’t. That dysphasia, kind of the dysphasia codes, that would be a really interesting risk factor. We do actually have it in our model and hemiplegia, so that’s kind of one. And dysphasia and then we also even use peptic ulcer disease and gastritis. Hemiplegia is definitely associated with worse outcomes in pneumonia as you can imagine. So yeah, that is something that I think…illness severity is one thing, but then actually just setting one up for vulnerability to get pneumonia in the first place is probably the even more important risk for dysphasia but great question.

Okay, so I had an existential crisis about year three and this was kind of like, what am I doing? Though am I really…am I ready to just implement decision support or should we leverage some of this variation to look at some of these areas that are more uncertain than others. And broad-spectrum antibiotic use. So the qualitative part I went to different VA sites and talked to people about their attitudes toward antibiotics and lots of different things. So they really felt pretty strongly that some places really were like, no. To withhold broad-spectrum antibiotics from somebody who has these risk factors is really withholding a life-saving therapy potentially. So there were very strong feelings both ways.

So what we decided to do with the variation in broad-spectrum antibiotic use is we focused our attention on anti-MRSA. So that’s like vancomycin kind of antibiotics. Empiric, just the attention to treat analysis. And we leveraged the variation that we saw and seeing that it was not explained by patient variables, that’s a pretty great space for some of the causal inference comparative effectiveness methods. So we did a propensity weighted analysis to examine whether we could see an effect of anti-MRSA empiric therapy on 30-day mortality.

And one thing that I really liked about this was, we did it for all patients, but that’s not really the clinical question. The clinical question is, what about the patients who have these risk factors? And what about the patients who are really sick? Because one justification that we heard in our qualitative results a lot was, well, this patient was really sick. They are in the ICU. The consequences of failure if you have a patient with a resistant organism are really, really high. But the other side of that sword is that, the consequences of adverse events from broad-spectrum antibiotic use is also very high when you have a patient in the ICU. And so we wanted to look at, at the end of the day, we can do all this predictive modeling to try to find who’s at risk for a resistant organism. But does it have any impact on outcomes? And you can see we looked at different subgroups.

So we started with all patients 88,000 hospitalized patients with pneumonia and saw that if anything, there was a higher risk of mortality for patients receiving broad-spectrum antibiotics. Then among the ICU admitted patients, so you’re kind of sub-grouping those sick patients, then still no benefit. Then patients with these risk factors for MRSA, which the guidelines have promoters as patients with a history of hospitalization. Patients from a nursing home. Patients with hemodialysis. We included all of that to define this subgroup, and still couldn’t find a benefit. Patients with the PCR so that’s a rapid diagnostic molecular diagnostic tests of the nose for MRSA colonization.

That’s another way to kind of rapidly assess whether a patient is at risk for MRSA pneumonia. And that no benefit. And the only group that kind of crossed the line into not sure whether it was benefit or harm was actually patients who ultimately had a culture that was positive for MRSA. And so it is kind of a way to kind of leverage the variation to try to inform this uncertainty. And it did help promote kind of the de-adoption of broad-spectrum antibiotics. So I will move on. Love to talk about kind of, well, what does all that mean? Maybe there’ll be a little time in the Q&A. But to then to the qualitative part. And so meanwhile, we also crafted an interview with physician that included a cognitive test analysis. So basically, just ask the physician to tell you the story of kind of the last pneumonia patient that they saw. And hear kind of the specific details.

It’s important to do this kind of narrative recall because then it’s the specific details where they really get to the critical decisions. So a critical decision method kind of approach to really look at how does the workflow in the cognitive workflow for a physician in the emergency department taking care of pneumonia, how does that work? And this is a diagram of kind of that cognitive workflow. And you can see that the first interaction with the patient is actually before this redline kind of marks the emergency department. Or let’s say, the first interaction of the patient is actually with the triage team which is typically a nurse, but sometimes a physician. And they do also interact with the EHR here. And then after that line, then the patient enters the emergency department and seen by a physician.

And sometimes the physician reviews the computer prior to the patient, but a lot of times the patient…the physician just walks in kind of blinds. But the most important thing that they get from the computer here is the context or kind of the medical history. And I have on the bottom these diamonds, and these diamonds represent the kind of critical decisions. And if the patient is extremely sick, what’s interesting is that there is no diagnosis. It’s not really that important. What’s important is deciding whether the patient needs life support. Do they need to be intubated? Do they need to be resuscitated? Are they in shock? And oftentimes the antibiotic decision also does not require a diagnosis of the patient is really sick and they think there’s any possibility that the patient has infection, the antibiotic decision and where we need to go. So if they need the ICU, you don’t need a diagnosis really for that.

And so all of these really critical decisions happened before a diagnosis of is made. So our first kind of broad theme that we found in these qualitative interviews is that the value of diagnosis doesn’t emerge until later. And it really is kind of influenced by the patient acuity, and it’s also influenced by local social relationships. And what I mean by that is that, diagnosis sometimes is a way to get your patient what they need. Sometimes you have to write down an indication for your antibiotics oftentimes to get a patient hospitalized if you’re worried about a patient you already decided even before he got the labs back that this patient needs a hospital bed. You’re then kind of proceeding to sort of build a story to get that patient what they need.

And so the diagnosis becomes kind of secondary. And this is really important to me because kind of this whole time I’m thinking, oh, pneumonia decision-support. It’s going to help us really help physicians make better kind of triage decisions. But no, all of the triage decisions are made before a diagnosis is even considered. And so the kind of…there’s a mismatch between providing decision-support in pneumonia. It’s really at best going to help the physician kind of reflect and have sort of a deliberative opportunity to interact with some tool that might contradict what they’d already decided. But it’s really not going to help them kind of make their initial decisions unless you have something that’s syndrome based like hypoxemia or sepsis or chest pain. So these kind of syndromic decision-support tools are actually much better place at helping physicians with that initial decision-making. So sort of like, oh. This became kind of obvious, but it was useful to really see it play out in the quality of work.

So a second theme that we…we have four. You hate qualitative research. But I actually love this, and it’s just been a real blast to go through all of these transcripts. We ended up doing 16 interviews. We were supposed to 30, but the pandemic happened about halfway through my CDA. So we did 16, but then we just have analyzed the heck out of them. And the second theme is that oftentimes the flow concerning emergency department is really unpredictable. And this kind of theme made me really start thinking about the ED as the high reliable ability organization kind of model where you’re like an aircraft carrier kind of in the middle of a war zone and you don’t really know when all the planes are coming through. It’s not like the you know system engineered airport. It’s really more like an aircraft carrier.

And so there’s a lot of chaos, but that actually means that the information space requires a lot of heightened awareness from the physician. They all have to have a lot of situational awareness. And they’re constantly sort of having this tug-of-war between wanting to have things that are automatic and just happen. Like nurse-initiated protocols where the nurse can order a whole bunch of labs for them, so that the patient can get through. And then the requirements for having moments where they are able to deliberate really deeply about things about their patient that surprise them, because emergency care is at its core, you really have no idea what’s going to walk in the door.

And so some of the variation that we see in the quantitative results may be related to the variation in different settings in terms of just their capacity to allow the ER providers to slow down and have these deliberate processes. And then there could be variation in just how much automation there is. So how many standard protocols that you have. And this is where for the antibiotic decision for example, the person asked in the Q&A about what kind of stewardship efforts there are. If you have a strong kind of order set culture, this is where those automatic processes, that’s going to be really different from if you have not such a strong order set culture and the physicians are ordering everything on their own.

And then a huge variation in team dynamics. And what I mean by that is, the relationships that people have with who does what when is also quite interesting. So my local VA for example is there wase kind of lots of conversation of, where to put in the order set who should order which labs like the kind of labs that sometimes don’t help the ER physician like blood cultures. But they’re kind of a norm where you should order those before you get the antibiotics. But they don’t really help the ER physician. There are certain things like that, that are really different. And how much do you have the triage team actually do. The huge variation in nurse-initiated orders. So some VA’s have a ton of nurse autonomy and the nurses can actually…they have these protocols where they can start a nurse-initiated protocol and write a whole lot of orders. And then the physician then kind of sees the patient after having all of the stuff done for them. So those are really different in different VAs.

Then the other thing that I was really struck by is, of these ER physicians I talked to, they’re very intrinsically motivated. And they really find areas of satisfaction in their jobs. And it is this concept of flow. So flow is that experience of peace and attention that you have when you have this perfect match kind of between the expertise and the skills that you have with the demand. And so what we saw was that, physicians are kind of constantly looking for this task feedback. That’s that immediate feedback that really informs how they’re doing. And they really get the feedback from interpersonal interactions like their patients or their team including the nurses, the respiratory therapist, the other colleagues, the other physicians.

And then there’s this concept of orderliness where they’re really satisfied if there are clear roles, heir system support and there are really useful protocols that kind of help automate what can be automated and really help to give some consistency and stability and to what to expect from your system. And then there is the satisfaction of actual ED flow, which is this concept of just moving patients through. That’s one of their jobs and they’re highly aware of how busy the ER is, how many people are waiting in the emergency department, what their kind of ER length of stay is. These are social pressures that ER physicians have on them to move patients through the ED for patient safety, but also patient satisfaction.

But that also sometimes kind of comes in tension with some of the other things that they find satisfaction from like getting an accurate diagnosis. And so these kind of are the types of feedback that they receive that they really kind of...that informs whether they’re satisfied. And then there’s lots of variation in that because the different facilities will have actually kind of different value systems about how important is it to have an empty waiting room versus how important is it to package a patient up and have everything tied up in a bow before you send them up to the floor. So those are really different across different VAs.

And I’m scanning Q&A, but I don’t see anything else. So this is our last theme for the quality work is that, everything is social. These are sort of sometimes like the \_\_\_\_\_ [00:50:04]. But what this really means is kind of the social demands really dominate all of the decisions. So the personal relationships that the ER physicians have with other team members, hospital admission teams, and relationships with their patients, they’re constantly bringing these up as kind of sources of how comfortable they feel sending somebody home versus bringing them into the hospital. They often make decisions pretty intuitively and early, but then have to…what they say actually is build a story. So I knew I needed to get this patient in the hospital. I was worried about this patient. As soon as they walked in the door, I started thinking about getting this patient a hospital bed. And so they’re incorporating their information to build that story and it’s particularly important in kind of them handing off that story to the hospital team.

And then information…they use information to inform their diagnosis, but they’re also kind of using it to build these stories. So it has a social role also. The x-ray in particular for pneumonia is kind of the slam dunk. If you see something on an x-ray, then it kind of validates that pneumonia diagnosis and it often validates the admitting decision, and it really often is kind of a ticket. And that diagnosis is also sort of a ticket to entry two the things that you think your patient needs. And then these order sets are another way to really communicate institutional norms and practice norms. And so we have these the social norms that often physicians might be signing out a patient to their colleague or to the admitting hospital service.

And there are often actually quite different about the antibiotic choice. They decide very strongly that a person either needs antibiotics or doesn’t. But which antibiotics? They tend to actually not be able to remember which antibiotics they put the patient on a lot of times. They’ll often defer to either the accepting teams or they’ll defer to an order set, or they’ll defer to their pharmacist if they have an ER pharmacist. And so this is another spot where this kind of helps explain that clustering that’s just so strong that the facility, everyone kind of practices in the same way in this space for the empirically antibiotic decision in pneumonia. Or another facility really drives these social norms.

Oh, and I see a question from Philip. Since the VA is moving to Cerner, what do you see from your work that the implementation in EHRM should focus on? Oh, that’s a great question Philip. So the Cerner, I’ve kind of been a spectator and they do have power plans for pneumonia, so that’s kind of what I’m curious about. It’s really interesting because I think I will touch on this actually maybe on the next slide. Let’s see. No. I’ll kind of jump ahead. But one of the things that’s going to be fascinating that Cerner is that, pre-Cerner, we have had this beloved old system that we sort of love and hate, and it’s been very customizable. So this probably is kind of old truism at this point. But we have customized the heck out of these instances of CPRS.

Everyone has their own little local order set. When you scale to a huge system that’s going to be used by all VAs, the real opportunity is to actually have central control and to have standardization across the entire system. That’s really exciting, but that also means that if you overreach on kind of what those standards are, and there’s actually a lot of uncertainty in that standard, that standard might actually fail in different settings. And if different settings actually have really good reasons for having a customized approach to a disease, then there’s going to be a lot of issues when you lose that ability to customize. And so it’s kind of this central control versus field autonomy is kind of this big standardization versus variation kind of philosophical battle.

So it’ll be really interesting to see how it plays out in kind of these syndrome specific in order sets. I’ve went around and when I did all the site visits for the CDA, I took screenshots in test patient all of the order sets that people use for pneumonia and it’s actually quite interesting. There are definitely some clear evidence-based practice kind of principles that are in every one of them. But then there are also these very interesting nuances. Mostly kind of around the antibiotics. It’s like that’s interestingly. They do that this way here. And people have kind of strong opinions about some of these nuances. And some of them are for good reason.

Some of them aren’t for good reasons. But a lot of them, they just represent uncertainty in the evidence-base. So what to do when you just kind of wipe away all that variation? You kind of lose the opportunity to study it to see well, is there any one of these ways that’s better than the other? But you can also be very disruptive in terms of people having buy-in and all that. So I think it’s going to be really interesting, but I also think that a lot of the variation is just wacky. And so there is this desire to kind of standardize, but I probably say, those order set better be really lean and really evidence based. And as long as they really represent the core consensus of what we all think is the right thing to do for a given disease, then they could actually have a lot of power to improve care.

Robert: Dr. Jones, I have to point out you only have three minutes before the top of the hour.

Dr. Barb Jones: Oh my gosh. Okay. I have rambled on for way too long. Well, I’m almost done with my CDA \_\_\_\_\_ [00:56:15] so that’s good. So the local decision support, this is just kind of…we did this, and this is a great example of kind of how to do user centered design with multiple stakeholders. I used a lot of the TIDER kind of findings here. And that was really fun. And so I’m just going to skip all the way ahead to the end of my thing. I was going to talk a little bit about my IR, but the key thing is, I did have this whole existential crisis through COVID. I was a critical care doctor; I took six months off from my CDA and actually just shifted to help operations. I helped them write a standard operating procedure for acute management of COVID.

I helped kind of codirector this Echo program to disseminate information quickly. It was quite an interesting kind of experiment for all of that. But I did have another existential crisis about where research…what the role was for research in my life and kind of in healthcare. And I ended up deciding, no, research is good. And so my IIR just called it wisdom from the wreckage. And I’m just going to say the general theme of that is to understand there’s a lot of practice change that’s emerging from our experience with the pandemic. And it’s really interesting especially around antibiotic use in viral infections, in viral pneumonia and what do you do with antibiotics. Can we actually de-adopt some of the kind of overused probably of antibiotics or do we not have enough evidence and do we have to study it more. And so that’s kind of what my IIR is about.

And I’m going to scroll all the way to my last line here, which is, what does it mean to become an independent investigator. So I would argue that there is no such thing as an independent investigator. And actually, increasingly, our knowledge is so deep that we actually can’t possibly take…it takes more than a lifetime to actually have mastery of a single field. And so this is where the NSF would say, we have a crisis which requires team science. This depth of knowledge requires that we have teams that have different expertise. And so with a IIR, I have teamed up with some new qualitative researchers, some new people doing mixed methods, and a new expert in causal inference to really kind of understand practice change pneumonia, but really work with methodologist.

And so as much as I am not sure sometimes what my 12 hours a day of SQL programming actually did for me four years ago, now I’m really good at talking to people who do the SQL programming. So I think the key is being able to be that intersector. I think that’s kind of one of my goals. Yes, quality over quantity. And that is, I write very few papers, but I try to write really high-quality work. And that’s been another thing that’s just another way that I keep longevity. And I was a little bit too intense in COVID. Now I’m kind of trying to learn that, if I stay in the game for decades, I think that’s much better than if we just put in ten ridiculous years of work and don’t really have much to inform kind of the next generation. So that’s sort of one of my other goals of being an independent investigator.

And I think that’s my…I’ll end there. And this is my team. So Matt Samore has been my primary mentor for the CDA. He’s been amazing. Charlene Weir is a psychologist and informatics professor who has helped me with my qualitative skills. Tom Green a statistician with kind of the hierarchical regression modeling all that stuff. Nat Dean a pneumonia expert at Intermountain Medical Center. And then Adi Gundlapalli who’s a CDC person now. And then some new folks including Jorie Butler who is a PhD psychologist who’s working with me on my IIR. And I didn’t put in the slide all the operations folks who are amazing. The national program director of Pulmonary Emergency Medicine and Hospital, so Chad Kessler, Mel Anderson, and Claibe Yarborough were super informative to the IIR and our advisors. And that was another benefit of kind of getting to know them through COVID. And that’s pretty much all I have. I know I’m two minutes over.

Robert: Thank you Dr. Jones for preparing and presenting today. And thanks everybody for attending. When I close the webinar momentarily, you’ll be presented with a short survey. Please do take a few moments and fill that out. Good day everybody.