Podcast Transcript

# Artificial Intelligence in Nursing

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## Guests

**Susan McBride, PhD, RN-BC, CPHIMS, FAAN**

- **Registered Nurse**
  - **PhD in Nursing**
  - **Fellow of the American Academy of Nursing (FAAN)**
  - **Clinical background in surgical services as a clinical nurse specialist (CNS)**
- **Nursing Informatics expert and educator**
  - **Assistant Dean of Research, University of Texas**
  - **Healthcare Information Management Systems Society (HIMSS) Certified Professional in Healthcare Information and Management Systems (CPHIMS)**
  - **Over 20 years of experience in informatics**
  - **Well-published and experienced speaker**

**Kirk Ornstein, MSN, RN, CNL**

- **Registered Nurse**
  - **Master of Science in Nursing**
  - **Clinical Nurse Leader (CNL)**
  - **Clinical background includes pediatric and school nursing**
- **Science writer/business executive**
  - **Generator of information for healthcare professionals**
  - **Presenter/disseminator of healthcare information**
  - **Account executive for healthcare-related companies**

## Host and Content Reviewer

**Maria Morales, MSN, RN, CLNC**

- **Maria Morales is a nurse planner for Colibri Healthcare and a certified legal nurse consultant. She is a quality-focused, results-driven nursing education professional. As a continuing education leader with nurse executive experience in developing interprofessional educational programs, she supports healthcare workers with educational activities to help increase communication within the healthcare team.**

## Transcript

## Episode 1 – Intersections Between Artificial Intelligence and Healthcare

**SOUNDBITE OF MUSIC**

**MARIA MORALES, HOST: Hello. Good day to you and thank you for joining us today for this podcast. I am Maria Morales with Colibri Healthcare. Our goal for this podcast is to discuss something high tech today, at least it's high tech for me. (Laughter) We want to be educated by an expert on the intersection of nursing and artificial intelligence. How does and will artificial intelligence influence nursing and healthcare in general?**

**During the podcast episodes, we will discuss terms used when talking about AI, a little history related to the evolving of AI in healthcare, algorithms, and some clinical applications of AI technology. I am joined by two nurses today.**

**The first is an informatics nursing expert, Dr. Susan McBride. She is Associate Dean of Research at the University of Texas at Tyler. She was previously a professor and program director of informatics at Texas Tech University Health Sciences Center. Let me tell you some more about Dr. McBride. She has her PhD in nursing with a clinical background as a clinical nurse specialist. She is certified as a Healthcare Information and Management Systems Society (HIMSS) Certified Professional in Healthcare Information and Management Systems (CPHIMS). Those credentials which she holds, which you will see in various published material, are the HIMSS (that's usually called HIMSS, right?, Dr. McBride?)**

**SUSAN MCBRIDE, HOST: That's correct!**

**MORALES: All right. And CPHIMS. And she is a fellow of the American Academy of Nursing. She is well published and an experienced speaker with over 20 years of experience in informatics and as an educator for statistics and epidemiology. We can learn a lot from her ability to describe complex material in understandable language.**

**And, we have the privilege of having a second presenter here today, Kirk Ornstein! He is a master's prepared registered nurse and clinical nurse leader. He has some varied and interesting nursing experience from private duty, medical ICU step down, to pediatric nursing, even including camp nursing and school nursing! He has even been doing some contract tracer work within the specialty of pediatrics during the pandemic. He has some experience with AI and insulin pumps that he wants to tell us about today, to give us a clinical picture of things to consider as we keep in mind the benefits and concerns for AI and other technologies in healthcare today.**

**Okay, so let's see if our experts today have any other information to add about themselves. So, Dr. McBride, are there any other interests that you would like to tell us about yourself related to this topic**

**or nursing in general or even education? I know uh that you do have a motivation to improve patient safety, increase quality in healthcare, and help both urban and rural populations with regard to health policy. So, a lot going on there for you!**

**MCBRIDE: It is! My passion is all about the data, the data and the information, and what it can do to help us with patient safety, quality, and the health of populations. It's all about that for me, and that's really what led me into the field of informatics. I was a perioperative nurse by clinical background many years ago, and what I see about technology in the data and information is that when we mature it in a certain way, it helps us do our jobs better as clinicians.**

**And that is what it's all about for me. So regardless of what technology or analytic methods we have in place, if the technology and the information don't help us improve things, then we should reconsider its use. And um that's also led me down the road of a lot of the research that I'm doing now. We have implemented electronic health records within the last decade uh very rapidly, and so electronic health records has created lots of opportunities for improvement and better research to inform what we're doing with these electronic health records.**

**So now that is my focus, is how do we mature the data out of the back ends of these systems so that we can use it for patient safety, quality, and population health as well as how do we prepare clinicians to use these systems effectively. And, advanced analytics is a passion of mine. The more data we get, the more these methods that we're going to be talking about today are so important to us. So, that's a little bit more about me.**

**MORALES: Okay, great! And back to Kirk. Is there anything you would like to tell us about yourself in addition to what was said before? Something interesting: It seems your life has moved you from an interest in political science early on to an emergency slash pediatric nursing kind of focus. But, it seems you've also done a bit of content writing in healthcare. So, tell us some more about how you pursued your nursing track and the things you've done.**

**KIRK ORNSTEIN, GUEST: Um, yes, I've done a lot of things. One of the things I think that I've enjoyed most has been in my previous life, a science writer, really doing a lot of generating information for the physicians, doctors, people ... bring in the data that Susan is generating and presenting it to just sort of the the, the community at large. My patients: ... try and help them understand all the information that's, that is out there now.**

**ORNSTEIN: I think that sort of caring for others is sort of what's driven me towards nursing to, to the place I am now.**

**MORALES: And how did you move initially from kind of a political science track to, over to medicine and healthcare?**

**ORNSTEIN: Well, the politics took me to Washington. And Washington was a um, there are words that I can't use! Washington was a mess. (Laughter) Um, you know, the ideal that generating information or generating action to help people wasn't that ... that wasn't the place where I was going to do that. And so, it became much more of a, a change towards sort of local environment, local community, you know, helping your neighbor.**

**And, nursing is ... that's what nursing is about. Lot of different ways you can go in nursing. And for me, it was very much about the community and that's sort of why I've drifted toward the school nurse, camp**

**nurse. It's all about, you know, helping those communities in a way that has that local approach. And so that's sort of where I was heading, and I think that's where I'm feeling good about right now.**

**MORALES: Okay. Well, that sounds great! Thank you again to both of you for taking the time to educate us today as we talk about some techie topics. So, let's talk technology and look at how it helps while being mindful of how we need to be careful with the technology, too. So, here's a fundamental question for our chat today. What is a basic description of artificial intelligence?**

**MCBRIDE: So artificial intelligence, in simple terms, is the ability of computers to learn humanlike functions or tasks. So they attempt to replicate human cognition, hence the term "artificial" meaning computer-based and "intelligence" related to human cognition or cognitive ability of the computers.**

**MORALES: Okay, I follow that. That makes a lot of sense! Is there any history behind artificial intelligence that will help us better understand this evolving science?**

**MCBRIDE: Artificial intelligence dates back to the 1950s, so it's really not new. It's only recently that it has gotten sophisticated enough, and the tools have gotten sufficiently applicable to healthcare to where we've really begun to see it in healthcare. It started, honestly, with a series of "if this, then this" type statements. And so, rules and algorithm type approaches is what we saw early on.**

**And so, I can give you an example of some work that I did back in the nineties with work that was similar to AI, and it helps to explain how it works. So I worked with a project back in the early nineties where we utilized fuzzy logic. And so what fuzzy logic is ... (and it's essentially in simple terms "a sounds like" engine), and so we had a problem we were trying to solve. And, that problem was that people would be billed massive amounts of information out of hospitals with a detailed line item bill. And so, payers and our insurance companies would get that information and really not know, along with the healthcare consumer, whether or not they'd been accurately billed for services provided. So, that was the problem we were trying to solve. And what we did is we actually hired a bunch of smart nurses, and we started looking at patterns and inconsistencies in the detailed level bills and essentially built a standardized chargemaster using fuzzy logic. And so, the nurses would say, this looks like a catheter in the cath lab. This looks like IV solution of a thousand cc's of saline.**

**And after a period of about four years, we had a "sounds like" engine that automated the chargemaster match to up to 90%! And so the combination of this "sounds like" engine and nurses matching these things: Yes, this looks like it matches; no, this doesn't. The machine got smarter and smarter with those matches to where over time it would automate the match with any line item bill that it had seen. And so that's an explanation a little bit of how AI machine learning looks in a very simplistic form.**

**MORALES: Okay. And when you're talking about charges, let me ask a simple question to make sure we understand this. Are you talking about keeping track of items that we would charge patients for ... um syringes, dressings supplies, etc., even if they're not individual charges (they might be a group)? Or are you talking also things like consultations, room rates, surgery charges, interpreter charges?**

**MCBRIDE: Well, that's interesting. So at the time that we did this work in the nineties, a lot of those types of procedural things like surgical charges and all, there were already some standardized ways of looking at that, because there was more standardized code sets around it (so data standards, in other words). And it was much simpler if you're doing a procedure in the operating room, for example, and your surgeons bill for those services provided. That's like a several line items versus thousands of line items that are those syringes and gauze and everything at a line item level that comprises your total hospital bill at any given length of stay. And so, I'll give you an example. We literally saw errors of entire**

**cases of cardiac caths used. So one catheter would be, you know, $1,000. It was for a whole case of catheters, and it was a mistake! It was an error.**

**But when you have something that is automated like that, it can detect error like that. And so just like AI machine learning, when it detects a pattern of what it should see and sees something that's aberrant, like a case of catheters rather than one single catheter that should have been used, it will flag it. And so yes, absolutely. Line items at the syringe or catheter level, it was that, that level, and you can see why automation of it running through thousands and thousands and thousands of charges are really important to do rather than having expensive nurses looking at a bill and saying, "Whoa, that looks like a case of catheters instead of one single catheter."**

**MORALES: Okay. All right. I'm glad you said all that. So, in this case, it sounds like the technology was very helpful on both sides. It kind of makes me think like if I'm thinking about my smartphone or a tablet or something, I think about all the cool things it can do ... make my life easier! But in real life, it's not always so seamless, or there's glitches, or even very simplistically, the battery dies. So, (laughter) you know, what are some things on the other side to think about of how technology can help, but it can also, uh, you still have to have humans involved, too, to guarantee quality control.**

**MCBRIDE: Well, that's certainly true. And we are using mobile phones and in a lot of the same types of technology that our best friends with our mobile devices now are being used in the clinical setting (as I'm sure Kirk's going to tell us a little bit about that). But from an AI standpoint, it's being used in many ways, and we encounter it in our personal lives.**

**Even we see Tesla and the, you know, the smart cars that are out there that are self-driving cars, which are kind of scary to contemplate. Well, it's scary to contemplate in healthcare, too, right, Kirk? (Laughter)**

**ORNSTEIN: Mm hmm.**

**MCBRIDE: Uh, but let's talk a little bit about how they actually work. Algorithms are derived from artificial intelligence and often are combined with machine learning capabilities, and that puts additional knowledge and expertise into the system. So, some of the common encounters that nurses are seeing now are within our electronic health records. We have what we call clinical decision support tools or CDS tools that essentially fire a trigger to say, "Ooh, you may not want to do this with this patient at this time." So, they, they are rules or algorithms, but sometimes those can be driven by AI and machine learning.**

**And so, we don't always know what's triggering that algorithm. And then sometimes it's fairly clear for us. So, for example, we had a, um a nurse that was working on her a doctoral degree and took on a project of "What does a case manager know when the patient admits to the front door of a hospital that might predict a 30-day readmission after discharge?"**

**So when the patient hits that door, what might we know as a nurse case manager that might predict the future? So algorithms can be used (either statistical algorithms can be used to predict whether that patient would readmit); AI and machine learning can be used in order to predict that kind of thing. And, then can give her that, give that nurse a trigger of high alert: "This patient's going to need much more case management type services to prevent that readmission!" So that's one simple example of how algorithms have been used, and that was by a very smart nurse by the name of Dr. Adonica Dugger that I actually had the opportunity to work with that created that algorithm.**

**MORALES: Okay. And I think you were going, you were planning, to give us a case scenario about some of this.**

**MCBRIDE: So another scenario that actually is a true story of a nurse that reported having worked in the emergency room. And so, names are replaced here to protect the innocent and institutions. But ...**

**MORALES: Oh sure, yes.**

**MCBRIDE: Nancy Nurse is an experienced nurse, well-respected in her institution and a patient with, say, around 74, 75 years of age presents. And it, this patient has all the symptomatology of an infection that we often see with sepsis. So, a very severe infection that can be life-threatening. And you develop what's called sepsis. So you often see what we call hypoxemia with oxygen saturations of 88 where you'd like to see it well above the nineties, in the high nineties, and the patient's put on oxygen. The patient has tachycardia and respiratory rate increases.**

**And so, all of the symptoms that that patient is experiencing trigger a sepsis alert like I was describing before. So that clinical decision support alert. And we immediately, one of the things that we do is give fluids. And so, if what, what Nancy nurse sees is that the history of the electronic medical record actually says, "Well, this patient has also had heart failure." And so, with heart failure, we often see a lot of fluid in the chest also and a lot of the same symptoms that we may see.**

**MORALES: Yes, mm hmm.**

**MCBRIDE: And so, what, uh ... long and short of this whole thing is, this patient did not have sepsis. They had heart failure. And so had that clinician and the physicians that were attending at the time gone down the road of that sepsis protocol, like the electronic health record algorithms were telling him to do or her to do, it would have been the wrong thing to do. And so, it's important that we stop and question these types of alerts. Particularly, this one was fairly straightforward where we, we could see fairly clearly why these alerts were being triggered. But, many times we don't know, and it's more of a black box type phenomenon ... where we don't know what's behind that box and what's triggering that algorithm.**

**MORALES: Yes, I'm glad you mentioned that. I wanted to talk more about that black box phenomenon ... sounds really interesting. I was trying to look online to figure out why it's called that. So, you can let me know if I'm in the right neighborhood. So, it seems the term black box is used, because it's like looking at a black box. You don't know what's in the box, as you mentioned.**

**So, like a computer, we can enter data, but sometimes we don't understand how it's coming up ... or the technology is coming up ... with the information that it's giving us back. So especially with complicated AI technologies, I guess we can input data, but the average person doesn't understand how ... the reasoning why it's coming up with the info it gives us. How's that sound?**

**MCBRIDE: That is exactly correct.**

**MORALES: Ooh, thumbs up! (Laughter)**

**MCBRIDE: And so, yes, absolutely. And one of the things that we're seeing is there is a big push for ethical, ethical and unbiased use of AI and machine learning. And so ...**

**MORALES: Oh.**

**MCBRIDE: ... this is one of the rules around ethical use of algorithms, is that there is transparency, and that we should be able to understand the, this, uh what's behind that black box. And many times, the patterns that, when it's really truly big data, large volumes of data, you don't always know what some of these AI networks, one of them particularly is called a neural network where it, it is trying to replicate the way the brain actually thinks. And it's very complex in terms of how it detects patterns within ... in the data. And so those are the ones that are the types of algorithms that are generated that are sometimes most difficult to know what's going on behind those types of algorithms.**

**MORALES: Okay, well said.**

**MCBRIDE: When we actually put AI and machine learning together, we often call it deep learning networks. They get very, very powerful. And what we're seeing now is not only these deep learning networks.... And, an example of that is, is like we discussed earlier, those cars, those automatic cars that .... Tesla is run with deep learning type networks. Their development ... that type of technology ... is part of the development of that type of smart car.**

**So, nurses are beginning to see service robots in all kinds of robotics coupled with AI and machine learning. So not only do we have these deep learning networks, but we also are beginning to see robotics put on top of, of these types of technologies. And so, it gets particularly interesting when some of these robots can even detect emotion, smiling, crying, anger ... facial recognition methods that can predict emotion and respond accordingly. So, some of these robots are getting kind of almost creepy real in appearance and even their responses.**

**MORALES: Hmm hmm.**

**MCBRIDE: And so we see funny commercials that you hear where you, you can't really tell if you're talking to a chat bot or a real person.**

**MORALES: Oh my. Right?!**

**MCBRIDE: They get funny sometimes. (Laughter) So, technologies in clinical life, though, get a little more serious. And so, we've seen some really interesting things.**

**The American Nursing Association commissioned a white paper, because we're beginning to see these service robots, and we need to think in terms of how are they going to impact nursing? And, what does it mean to nursing practice? And so, my colleague, Dr. Mari Tietze and myself had the opportunity to go into several hospitals that were piloting a service robot by the name of Moxi created by some very smart young academician scientists.**

**Part of what we discovered was that, first of all, nurses were ... liked, Moxi. They liked ... it made them happy. They were ... it was fun to have Moxi on the unit. And Moxi had these blinking heart eyes that would respond to the nurses as they're going down the hall. So, a little de-stressor there ...**

**MORALES: Oh my!**

**MCBRIDE: ... and on the other hand, Moxi, they would turn a corner, and they'd be running into Moxi, you know, rushing around, doing their clinical activity. So, you have to think in terms of clinical workflow around service robotics like that, this. But they also told really interesting stories about patients connecting with the robots and it de-stressing those patients prior to surgery, for example. And one of the nurses told a story about a patient that asked if Moxi could come into the room, and we have to think about infection control and things like that. So, it was special circumstances that they allowed**

**Moxi to come into the room, and the patient literally put her forehead on Moxi's, the robot's, forehead and just sat there for several seconds. And, it calmed her down before surgery!**

**MORALES: Wow.**

**MCBRIDE: ... which was a very unexpected thing! Yeah, so really interesting things. But how does Moxi run? Well, AI, machine learning, and Moxi is getting ... they were in pilot stages then. So, they were learning a lot. And the, the actual um company technicians would be behind Moxi and actually helping to drive Moxi, because Moxi was learning. And so, the machine's getting smarter and smarter. And now if you see Moxi out in the field, you're not seeing the human being behind them, because the machine learning has helped Moxi get that much smarter ... and in what Moxi is doing to support nurses on the unit.**

**MORALES: That's fascinating! Wow, (laughter) that's really interesting. So it's really cool. I mean, that, that sounds like we have a lot of advantages there to be able to continue to use technologies like that. I wanted to ask you a fun question, because there's always the other side, particularly in, let's say, movies and the media, where they make it look like artificial intelligence is going to take over the world and overpower humans! So, do you think that's all sensationalized nonsense, or are there certain concepts that are worth thinking about that, you know, we should take a little more seriously?**

**MCBRIDE: Well, I think some of them are fun to think about. You know, what comes to mind is the American sci fi romantic drama of Her, where you know, that's a funny one and fun to watch. And you know, where he falls in love with this uh, his uh artificially intelligent virtual assistant. So that one's kind of fun if you haven't seen that movie, I'd strongly recommend it, because it's, it's a fun one!**

**But, you know, I have a colleague that is actually quoted in the American Nursing Association white paper on, on robotics and nursing. And Dr. Richard Booth, a Canadian colleague who's done quite a bit of work/research with robotics and nursing, and how we need to begin to think about how we're going to prepare our young nurses to respond to robotics and AI and machine learning, perhaps better than we're doing now. Because it is not just on the horizon, it is here in the clinical setting now.**

**And so, he gets very provocative and kind of fun with the way he teaches students many, many times. But he talks about a scenario where in a home health situation, you have a patient with dementia or not quite the cognitive ability. And, he is challenged, because he fails to take his medication, and the robot dispenses the medication. And so, the robot knows whether or not that medication has been dispensed and taken, and clearly it has not! And so, your scenario, nursing student, is that the patient says, "Well that robot's lying!" (laughter) ... and so, you know, it is kind of funny to contemplate, and then, but seriously, that's a scenario that could really happen.**

**MORALES: Right!**

**MCBRIDE: And so how do you respond to a patient in that scenario where your robot is actually an actor within the patient care? And so, Dr. Booth uses a theory called actor network theory where machines can actually be an actor in the clinical process.**

**MORALES: Hmm.**

**MCBRIDE: So, when I first heard Richard talk about that, because it was underlying his dissertation when he got his PhD, I had a hard time wrapping my head around the idea that technology could be an actor. But when you consider an actor is a robot, it's not hard to contemplate at all.**

**That is what that white paper is all about, the American Nursing Association saying we need to figure out how to begin to deal with this, because there are also serious considerations, such as delegation. When should a nurse delegate, under his or her license, to a robot some thing that we do for patients … is it okay to give medications? Is it okay to dispense medications as this scenario in home health, or would we not want to delegate that responsibility to a machine?**

**MORALES: Good points, good concepts. "Technology is an actor" is a statement I'm going to be thinking about. That sticks with you. Wow! Already, it is time to almost conclude episode one. So, let me just check in with Kirk and see if there's anything he'd like to say from the things you've been talking about.**

**SOUNDBITE OF MUSIC**

**ORNSTEIN: Well, I think that your, your comment about the technology as an actor, I think I hadn't thought about it that way.**

**MORALES: Hmm.**

**ORNSTEIN: … but that's what we're seeing in just my limited bit of when it comes to diabetes and insulin pumps. … is that it is playing a significant role in the decision-making process that we're not really aware of. And on top of it, we have a role to play as well, which we're not really embracing.**

**MORALES: Ah ha.**

**ORNSTEIN: … mostly because we don't really understand how the AI is, is coming into the medical field. And so, so just thinking about that's, you know, very important to me that, that we have to be more than just looking at some data and thinking, "Oh, that's great data." But rather, there's an active player behind that data that we need to be aware of or interact with which, which from my experience, well, I haven't been doing it, because it's so new. You're just really not aware of that interaction or technology as an actor.**

**MORALES: Nicely put. Well, there you go. That's our conclusion! (Laughter) So, thank you both. We have a lot more to talk about. So, let's definitely continue this conversation in episode two. Please return for episode two as we continue discussing the role of artificial intelligence and informatics and healthcare. Kirk is going to tell us about some clinical experiences with AI and algorithm-involved technology around insulin pumps, as you just noted. A sincere thank you to our subject matter experts for joining today, Dr. McBride and Kirk Ornstein. This is Maria Morales for Colibri Healthcare.**

**SOUNDBITE OF MUSIC**

## Episode 2 – Garbage In, Garbage Out: Transparency and the Integrity of Data

**SOUNDBITE OF MUSIC**

**MORALES: Welcome back to episode two of this Artificial Intelligence in Nursing podcast. Let's get right back to it. In the previous episode, we were discussing various concepts related to artificial intelligence, machine learning, technology as an actor, and thinking about what's going on behind the scenes or what's going on in the box, so to speak, that we don't, that we kind of take for granted or don't always understand. Let's see, we were going to jump to another term for Dr. McBride, what is augmented intelligence?**

**MCBRIDE: So augmented intelligence, you could go down a couple of different roads with that. Augmented intelligence is a subset of AI and machine learning. And it's designed to do exactly what it sounds like, augment or help support human intelligence. So, augmented reality is a little different where you actually are looking at three-dimensional space using digital technology integrated with real world environments.**

**So, where we're seeing a lot of augmented reality is within training of physicians and nurses where we can use some of these tools with special glasses, and the student may wear those glasses, but you're interacting with an environment that is um … could be um like a human body. That … but you can actually go within that human body with dissection and anatomy and physiology.**

**MORALES: Oh, okay.**

**MCBRIDE: And that's part of the augmented reality components of it.**

**MORALES: Interesting! Okay. So, there could be quite a bit of cost savings with that kind of tech.**

**MCBRIDE: Absolutely, yes. More and more we're seeing those, these types of tools used in simulated environments and for that very reason. But it's also not only is there cost savings, but you can do things in augmented reality that you couldn't do with a cadaver, for example. So, you know, to take someone within the flow of the bloodstream and actually show how, how things are flowing within, within a body rather than dissection.**

**MORALES: Oh, so cost savings, better learning, better training, all kinds of things.**

**MCBRIDE: Hmm hmm.**

**MORALES: Okay. I read something interesting from an article in the Nursing Management Journal. It said that in 2019, the United States had an executive order called Maintaining American Leadership in Artificial Intelligence, which influenced the government to create objectives for speeding up AI research in progress. So how does something like that filter down to healthcare?**

**MCBRIDE: Well, first of all, health information technology is driven quite a bit by policy. And so more and more, we are seeing that technology policy. If we're going to compete with global powers in the world, we in the US have got to be on top of things in terms of how we're using things like AI and machine learning and technologies. And so, there has been a lot of focus in Washington, D.C., and I'm sure Kirk can probably speak …**

**MORALES: Hmm hmmm.**

**MCBRIDE: … to this as well with his policy work. But it's interesting. I think there, there was an executive order under the Trump administration as well, very focused on this. And then prior to that, the Obama administration passed the 21st Century Cures Act … was significant content addressing digital technologies and a focus on ethical considerations that always emerge when we start looking at these types of technologies.**

**And so, the Obama administration was largely a Consumer Privacy Bill of Rights also that was a comprehensive approach to protecting privacy, because as we use massive amounts of data, we have to consider all kinds of things. And so, the focus now is actually on civil rights in the algorithmic age. And so, under the current administration, they're, they're focused on an AI Bill of Rights.**

**But we also have the Food and Drug Administration, from a device management standpoint, stepping in to say, do we need to actually have these FDA approved AI algorithms and machine learning type technologies to where they're approved for safety? So, all kinds of focus have, has been on these new and emerging technologies and how they will be introduced in our daily lives from a civil rights standpoint, but also, you know, safety from uh clinical safety.**

**MORALES: I'd love to hear more. You mentioned the ethics and civil rights. I'd love to hear more about that. Uh, what do you see as concepts related to the ethical discussion? Like off the top of my head, I'm thinking maybe consent-related matters, privacy issues, I guess what data people or organizations have access to and can they share it? So, tell us, tell us more about that, the ethics.**

**MCBRIDE: Transparency, but we also have ... whether we're biasing the algorithms.**

**MORALES: Okay.**

**MCBRIDE: So, it takes data to actually, big data, to feed these algorithms. For example, a lot of our genetic research historically has been White, Caucasian, European descent individuals. So, we biased a lot of the science. And now, what we're trying to do is balance some of that with National Institutes of Health initiatives like the All of Us program. And, the All of Us program is all about getting data from individuals who are minorities and other, you know, not White, Caucasian, European descent. So that our algorithms from a genetics and genomics standpoint are truly working for everyone. And historically they've been biased! And so that's an example of a very significant ethical issue.**

**And in fact, as we, as researchers, approach the All of Us data or we encourage individuals to contribute their data to this, we are bound by all kinds of ethical principles that are way above and beyond. Normally, what we would do with typical research, that I like to call it the institutional review board on steroids, because in fact that is paramount that we protect individual's privacy, security, but at the same time, we have unbiased data that will feed these algorithms. So those are some examples of some of the significant issues that are, that we're confronting now.**

**MORALES: Okay. Let's talk more about that. You already told us about some algorithms in episode one, but tell us more about this and what you were just talking about with uh, "Can there be bias there and what we can do about it?"**

**MCBRIDE: Well, if you think in terms of how these algorithms work, and they're triggering clinicians to do the right thing at the right time for the right patient, and you biased an algorithm. And oh, by the way, it's a black box phenomenon, so it's not transparent, and you don't know what's behind the algorithm.**

**MORALES: Okay.**

**MCBRIDE: It may not work for you at all! And so clinicians may, like Kirk, may see how that just doesn't seem like it's right. The scenario that we gave in episode one where we were talking about the patient that actually had heart failure, and it was triggering like it was sepsis or a bad infection.**

**MORALES: Right.**

**MCBRIDE: So, it was confused or it didn't, you know, it could have gone down either path. And it and those algorithms will make a decision for you. And then you as a clinician have got to say, "Hmm, well, I don't think that's right." Or, perhaps it's not. And so, in some scenarios where it could be gray with even making a diagnosis of the patient, and then you get the computer telling you go this direction. It, it**

**becomes, you get all kinds of ethical considerations there too and legal issues, because what if I make the wrong decision? And, the computer told me to go down that, that path. But I thought it was, you know, I didn't think it was heart failure. I thought it was sepsis. So, and then you have the, the computer also with the algorithm that's fired. So, there are just all kinds of considerations that we have to consider with these algorithms such as that. And I'm sure Kirk may have some things to add to that as well.**

**MORALES: Oh, for sure. Yes. This sounds like something Kirk's going to be able to talk about a lot. Before, before we get there. Okay. I'm just thinking, we have the data that we enter into the computer or the software. What about unintentional errors? Like, let's say we accidentally type the wrong thing or we click the wrong thing, but yet that's, that's input that we're giving, right? So are there any ... I don't know? Are there ways, are there things built into the system to kind of compensate for when we're inputting data? (But, we are humans, and we accidentally enter the wrong data, but yet it's having an effect.)**

**MCBRIDE: Well, I think you're getting to the whole, the integrity of data is critical for these algorithms, because that's the other way we may unintentionally bias the algorithm is with erroneous data.**

**MORALES: Okay.**

**MCBRIDE: And, so we have an old adage, "Garbage in, garbage out," with analytics that many, many times the data especially that we get out of the electronic health record where we're capturing it, and it may not be captured in a standardized way, is or as structured as we want it to be, or we have an open-ended text box and we're typing in. And so, or we may omit information or data. There may be a lot of missing data.**

**So, these algorithms are going to do the best they have with what they've got. And if there is dirty data in the system, it could very well take us down a path that we might not want to go down. So it's one thing that I think is critical for clinicians to understand is the importance of the clinical documentation and how it is being used to actually detect things that feed a lot of these AI and machine learning and even our retrospective analyses that we do from our electronic health records, where we use the retrospective data to build the algorithms.**

**And that is, that is how they're developed many times is we'll have something called a training dataset where we build the algorithm with the, with the one dataset, and then we test it with another dataset. So, they're built retrospectively. And if you have omitted, dirty, or missing data, you really can't go back and correct that. You use what you have.**

**MORALES: Okay. And one more thing before we turn the mic over to Kirk. There was an example you had where there was some research involving COVID-19 or something, and you said some nursing informatics professionals were able to interpret or analyze the data and find out what was really going on. I think that's good to talk about that example here.**

**MCBRIDE: We've had a lot of use of AI and machine learning with COVID-19 globally. And so, there are volumes and volumes of data globally of what's happening with COVID-19. And then right down to the block level, we have used AI and machine learning to determine where is it that we are seeing patients that are hotspots of infection, and how would we prioritize getting those patients into the hospital or clinic first? Because we know the likelihood or the odds and probability that they are going to be infected is higher than other areas of a geographic region.**

**So that is one example of how we could use these algorithms to detect what's happening in public health. And so, we're doing a lot in public health informatics with these types of algorithms. And so an epidemiologist will tell you, done right, we have the ability to identify earlier, inform earlier, isolate earlier, and perform functions that we need to do at a local level, especially with something like the COVID-19 pandemic.**

**MORALES: So let's say there's, you know, a majority of females in the nursing profession, not all areas of nursing, but overall. Um like if you were doing research, you could mistakenly attribute some of the findings to a certain reason. But it really has to do with the sum total. Your set had to do with the fact that there were a majority of women employed.**

**MCBRIDE: Yeah, so that's an example that I often give. We worked with a healthcare system with massive amounts of data, and we were, this was actually early on when we were working with the neural net, and we were trying to actually determine whether or not this neural net would work for our healthcare system. And we tested it with a large dataset, and the data scientists came back, this wonderful "Aha" moment that they had one particular hospital who was seeing a large majority of females. Well, it took us 2 seconds to realize that that was a women's and children's hospital where they delivered babies.**

**MORALES: Okay.**

**MCBRIDE: And so, it was a large proportion of women. Yes, but I think it's kind of a silly example, but the important thing is that knowledge workers and people that understand the data and where it's coming from, and a lot of detail about the clinical scenario from a subject matter expert ... that the data scientists must work with clinicians and people that understand the data.**

**Or, you're going to get wrong answers. And so, there are several scenarios where we have data scientist teams that have created algorithms and they're off. And, our nursing informatics specialists often play roles to say, "Yes, but did you think about using these data or adding this variable into your equation here?" This whole area of perioperative data, for example, on an O.R. patient that you neglected to include, might help you predict what you're trying to predict? So, those are the types of things that knowledge workers or subject matter experts and clinicians can help um teams of scientists with creating algorithms that work more effectively in healthcare.**

**MORALES: Okay. Well, let's turn the mic over to Kirk Ornstein here to tell us about information to consider around clinical scenarios with AI and insulin pumps, insulin administration, blood glucose monitoring overall. So, we know AI has enabled some technological advances in modern monitoring and medication delivery. So, for example, insulin pumps for patients with type one diabetes have begun using AI and algorithms to dose insulin.**

**However, in my communicating with Kirk, (laughter) we've learned it's not as easy a concept as "program it and forget it." Patients and healthcare personnel still need to monitor themselves and their patients, and there's a learning curve. So, Kirk, please tell us about the convenience, but also some of the dangers of some of this technology with regard to AI and this concept of "the technology is managing the patient's condition."**

**ORNSTEIN: Exactly. That's sort of what we're dealing with, with the technology managing the, the condition. So my experience where the AI is sort of a brand new thing, my experience has come through insulin pumps and dealing with type one diabetics, mostly pediatrics. And the introduction to AI into the insulin pumps really started this year with the roll out of some new insulin pumps that were infused**

**with AI, which (and I say it that way because) as the nurses managing it, we weren't really aware of what that meant. The idea that, uh, that the insulin pump was going to help you make decisions, sounded great. The idea that we were going to be able to manage blood sugar better, more incrementally, more microdosing, you know, sounds like a fantastic idea. But, what we found was that I think two things. One like you said, the black box. We couldn't see what was actually going on.**

**And the other was that we didn't really know how to interact with the AI itself. So for us, we're used to a heart rate to heart rate, an O2 sat's an O2 sat, you know, respiration rates, respiration rate, straight data. And what we sort of found that we were getting was more of a summary like, "everything's good here," blood sugar trends "okay," you're good to go kind of thing.**

**MORALES: Okay.**

**ORNSTEIN: And, and because we didn't have that training of how to interact with the AI, it was, it put us in a position where we weren't seeing the, the real data. And so, we started trusting without even knowing it. So, to trust in the information we were getting without any real critical thinking.**

**MORALES: I like, I like what you said! I want to point out, highlight what you said. You didn't have the training to know how to interact with the AI. That's very good. What do you think about that, Dr. McBride? That's, that's a good way to put it, right?**

**MCBRIDE: Absolutely. I think it is. And it's what we as nursing educators are up against. You know, we have so much that we're training these young professional entry level graduate nurses with clinical, and then we complicated it with electronic health records, and now we're adding in ... just an infusion pump, you know, is, is a tough piece of equipment to really ... and of course, there's different infusion pumps.**

**So, one infusion pump isn't the next infusion pump. And now we couple AI and machine learning with a lot of all of it, and it ... we are accountable and responsible for a lot.**

**MORALES: Yeah.**

**MCBRIDE: And so, I think "buyer beware" is maybe the biggest you know, if it doesn't, what I always tell clinicians, if data and information or technology doesn't look right, suspect that it's not right and act accordingly. Because so often, especially the more expert we get on a novice to expert level of training, we just intuitively know it's not right, something's not right.**

**And just like we can look at a patient, and Kirk, I think that you are likely in agreement with me that you're looking at a patient and just know, ooh, that patient is about to go south (laughter) ... and same thing. We can, we need to get to the point where we can look at that technology and go, "Ooh, something's not right!" And I don't know. Kirk, has that ever been your experience with any of these technologies that your intuition is telling you, "Ooh, something's not right?"**

**ORNSTEIN: Oh, absolutely! There are times, and it, it came a little bit later as we're dealing with the AI that, you know, that critical thinking that all of a sudden ... needs to come back into it, that all of a sudden we were getting notifications that didn't make sense. And so, I found myself going back to some very basic stuff about how to manage blood sugar. I'm going back to the orders and the, the ratios and things like that and trying to figure out what, what the bolus should really be and not what the AI is telling me it should be ...**

**MCBRIDE: Hmm hmm.**

**ORNSTEIN: ... because, because the numbers didn't look right, even if, even as the AI is telling me something else, I have to step back and look at the bigger picture and really what's going on. And then dig into the AI and see what, what is it really doing? We would have to go in, not we, I would go in and go into the background information and see what it was really dosing. And then from that dose plus what it was reading, plus what I knew as the clinical orders, we pieced together the, the right thing to do.**

**MCBRIDE: You're making a really good point! And so coupled with all of this technology is the ability to evaluate it and validate it. Because once we plug these algorithms in, a whole other ethical consideration is maintenance of them. And so, because they worked one day doesn't mean a year from now these algorithms are still going to work for us, especially if your patient population has shifted and changed, even at a population level, much less individual patients like Kirk is describing. ... but he's also pointing to something that's really important when these algorithms are out there and they've been triggered, you can back in to looking at whether or not they're doing the right thing at the right time for the right patient. But it's very complicated data analyses to actually look at. "Okay, the algorithm said to do this, but we should have given the, given all the characteristics and all the details of the patient at that point in time, blood sugars at this point, we should have done this!" And so, I've seen this done with things like sepsis, where you, you're getting these sepsis triggers like we've talked about in this series and you can back in to it. Sepsis. Was it sepsis or was it not sepsis? And then, so you can determine on a population level. But when Kirk's pointing to an individual level of a patient at any given moment in time, when you've got all of these different factors that are influencing that dosage, that that analyses is a big data science challenge in and of itself to know whether these algorithms are working right.**

**ORNSTEIN: The other part is that there's an expectation that we're going to feed some of that information in as well.**

**MORALES: Hmm.**

**ORNSTEIN: And I can say that there were times based on how in this case of, say, hypoglycemic patient, you're supposed to give a 15 grams carbs over 15 minutes, that kind of thing. But because it doesn't involve any insulin, potentially doesn't get fed back into the insulin pump where the AI is.**

**So now it will view the blood sugar change as some sort of baseline change and not as a result of a carbohydrate infusion.**

**MORALES: Hmm.**

**ORNSTEIN: And so now what we've done isn't really calculated or evaluated by the AI as something other than baseline based on who knows, I don't know, because it's the algorithm. And so, so the information it's getting is no longer right, because one, we don't really know that we need to do that and two, there's kind of not, there's really not a placeholder for us or for it to do it.**

**ORNSTEIN: So, it gets a little messy when we're trying to feed back information in that it might need to make those future decisions.**

**MCBRIDE: Interesting.**

**ORNSTEIN: We found that out later when we're like, "Wait, we're missing ... there's a piece missing here." And then we realized that might be going on. But again, we didn't really ... there's nowhere to go or to say this is the right thing to do. It just becomes part of that critical thinking. Well, if it's spitting out information based on this, and we're doing something, and the AI doesn't know we're doing it. Well, there's clearly a disconnect there that's going to have an effect.**

**MCBRIDE: Mmm, hmm.**

**ORNSTEIN: What effect it might have, we don't really know ...**

**MORALES: Right.**

**ORNSTEIN: ... other than it's data it should have. And, we're not giving it to it ... to the AI.**

**SOUNDBITE OF MUSIC**

**ORNSTEIN: You fall back on the critical thinking, because it's all about patient safety. And so, you see something that doesn't make sense. You know, you respond and act. Um but again, you're, you're you want to think you're working with the AI, but a lot of times it feels like you're working against it or definitely not in cooperation or any other way. And it sort of becomes this bumpy ride trying to figure out how to get to where you need to be.**

**MORALES: Right. So, I guess we'd want, you'd want perfect or ideal collaboration, but sometimes it can be working in spite of it. (Laughter) Or there's two, there's, there's two parties involved, you know, you know, one doesn't always know what the other one's doing.**

**ORNSTEIN: Well, I think one of the things that that we were seeing with, say, the parents of the patients, there's an expectation of, of being perfect. That now that we have this technology and we can make these for, for my case, the blood sugar is much more narrow. Then there's an expectation that we should be able to do it. And it's, a, that further complicates things when you have so much information and the expectations start to rise. You know, getting there can be, can be difficult.**

**MORALES: Okay. well, let's go ahead and wrap up episode two, and we will come right back and continue. And I think Kirk's going to tell us about some more of the impact of AI and then some patient experiences. So, stay tuned.**

**SOUNDBITE OF MUSIC**

## Episode 3 – Artificial Intelligence: It's Here to Stay! How Do We Work With It Effectively?

**SOUNDBITE OF MUSIC**

**MORALES: And, welcome back to episode three. Let's continue with Kirk giving us some very real practical, clinical insight about artificial intelligence and insulin pumps and the critical thinking concerned with all of that.**

**ORNSTEIN: So I think for, for us in sort of that, that clinical setting where you're dealing with real life sort of environments, you know, integrating the AI is, is there, is great sort of hope to it that it will help bring out, bring along better outcomes, better care, you know ease of, of care planning, you know, but, but as it generates more and more information to make better, better decision-making, it also generates from, from my end more opportunities for manipulating parameters.**

**And when I say that, it's that as, as we have this AI and all these inputs, for me, all of a sudden you have sort of that, that, the people around the patient trying to influence care, because they now have an opportunity to have this real time data. This information is flowing to them minute by minute. In our**

**case, it's really every five minutes that they can chime in with their own comments, information, recommendations.**

**And as we look at it, trying to simplify and create better care, the nurse gets stuck in the situation where it's a little bit of a information overload, plus outside pressures that start to, start to affect your ability to make decisions about care. And so, that, that tends to be ... that's a new problem like we haven't seen.**

**And again, this technology is very new in this world, and the parents are embracing it, and it's great. We want them to embrace it. We want parental involvement; we want family involvement. But it really does give them an opportunity to be hyper-involved, because there's so much information, because there's so much more control over it that they get involved in it, and it becomes a little bit problematic for us.**

**So that's sort of where, where we are right now ... sort of on implementing all the AI. We're not even implementing it. I feel like AI's implementing us! (Laughter) You know, we're more responding to it and trying to understand it better. So that's where we are right now.**

**MCBRIDE: Well, I just had a question for Kirk. You know, it, it reminds me of the early days of the self-driving cars, where you hear all of a sudden the car would like, "Errr!," stop in the middle of the road and do strange things. But now, it's getting more sophisticated where people are really liking those self-driving cars. So, do you think that that's where we are with some of this technology like you're describing that, that after we are ... fine tune it and it's going to, it's going to work for us, or, or what do you think?**

**ORNSTEIN: I do. I think, I think your analogy is correct. I think that right now ... we didn't know we were sort of fighting the AI. We didn't know what the AI was doing. And, we were managing the patients, as we always did with the information that we were given. And we respond to that information without knowing what's going on in the background. I know that as we, as we started to really look deeper and understand what the AI was doing, all of a sudden we were managing better. Now we were micromanaging. So, we're spending more time managing. But I can say that those blood sugar values and those ranges were much better! So, we got to that better point for blood sugars, but we were spending more time than we should have, because it was being sort micromanaged, microdosed.**

**We were going out instead of giving a big bolus, there were numerous little boluses that obviously would keep that that range more narrow. So I do, I think we're going in that direction. And I think for, for the nurses, it's how do we, how do we educate the nurses so that they know what their job is interacting with the AI. As we don't know what we're really supposed to do other than follow it.**

**And then that sort of falls apart when the critical thinking kicks in and you're like, "This doesn't make sense." And like I said before, like we're, we may not be feeding the AI the information it's supposed to have, because we never had to do it before. But I do, I think it's going in that direction. I mean, I think the idea that, that we could have an insulin pump that really managed, manages the patients on a, on a regular basis with less intervention from healthcare workers and nurses, that's great! And I think that's definitely where it's going. Right now, it's like I said, that it's like you said, the black box ... it's a little bit of a black box. You know, information is coming out; information is going in, and you can't see anything else.**

**MORALES: Do you have any experience to share regarding how this might work in, say, a school environment?**

**ORNSTEIN: Well, you know, a school environment is actually a good place for this to work, because there are minimal interruptions. There are, they're sitting, they're moving, they're walking. It's, they don't encounter these significant changes that would cause spikes or drops in blood sugar. So, I think it works really well in the more controlled environment, which makes sense, because the algorithm is going to work better with fewer sort of variations.**

**ORNSTEIN: It's when you take them out and say, in a camp, where they're running around from activity to activity, and they're different every day or different times, it got, it got a little wonky. We would see kind of big changes when you didn't expect it. So the more varied or it's really not of like physical intensive/physical activity, the more varied it becomes, the, the harder we had, the, the more difficult it became managing the AI and the blood sugar. But, the school setting a great place. I mean, we wouldn't have to do anything really.**

**MORALES: So as far as parents being open to this kind of technology, it sounded like you were saying earlier that parents are quite receptive ... or maybe too trusting (laughter) of the technology?**

**ORNSTEIN: I think it's, it's two separate questions.**

**MORALES: Okay.**

**ORNSTEIN: I think they're very accepting of it ... that, anything that's going to help them manage their child's blood sugars better. I think the question of trust is a really interesting one.**

**MORALES: Okay.**

**ORNSTEIN: And I've talked to other nurses about that, that how do you give up that sense of sort of control that I'm taking care of my kid to AI that says, now I can do it.**

**MORALES: Hmm.**

**ORNSTEIN: I don't really know where we fall on that right now. It's still sort of early and new, but it's, it's something you talk about that how do you? Because some parents buy into it right away. They love it, and they're ready to do it. But it does, it does require at some point accepting the fact that you're going to trust the AI to do this sort of the heavy lifting.**

**And some parents have, and some parents haven't. They're nervous. A lot of parents will call you every time they see a change in their blood sugar, because it's real time data. I mean, it's a five-minute delay, which is important when you get into that sort of critical situation. But they're getting that information quick, and they're calling you up, and they see something. So, it's a mixed bag right now. But, but yeah. Okay. So, they're accepting it.**

**MORALES: A couple more questions. And I then have a question for Dr. McBride about the education component. So, do you think the technology has led to a decreased amount of nursing management?**

**ORNSTEIN: Right now, it's, it's my feeling. Again, we're talking about very small data sets.**

**MORALES: Okay.**

**ORNSTEIN: But it's increased.**

**MORALES: Okay.**

**ORNSTEIN: Like when you do this micro sort of managing thing, we are ... I'm looking, I'm looking at those blood sugars ... because we're monitoring them remotely. I'm looking at their blood sugars all day long.**

**MORALES: Okay.**

**ORNSTEIN: And honestly, I was an early adopter with this, that I could track them real time all day long so I could get involved in early intervention as needed, and initially when I was doing it, the other nurses looked at me like, "Why do you want to be so involved?"**

**ORNSTEIN: They wanted to do it more old school that lunchtime, we come in and get checked, each morning, get checked on your first time, and things like that. Where with the AI, it was again so much more control over it, that you really could see these trends earlier, that you could head off an issue before it became one. Because you could see the trend in real time data, but it, but it resulted in much more time being spent on tracking intervention um and things of that nature.**

**ORNSTEIN: Where you're calling them in to do a blood sugar check more than you would, or you're running out to give them, to give them two Starbursts or (laughter) Skittles or whatever the parent wanted, you know, to be the rescue carb.**

**MORALES: Okay. And along that note, that was the other question, you know, and these things change over time, the more we learn, the more the technology improves, you know, things can change. But what have you seen in terms of risk involved or emergency interventions needed?**

**ORNSTEIN: I think the risk is higher.**

**MORALES: Okay.**

**ORNSTEIN: But again, I think it's because we're not working with the AI together. Sometimes it's in opposition, because we see something going on, but the AI has already taken action on it, so then we take action on it. So, it's like twice as much action on that. And, all of a sudden you're in a, you know, a tough hypoglycemic situation.**

**And so, you know, so there has been, there were, I think, more concerns early on. But again, as we sort of learn to work with it, that became less and less of an issue. And then it turned away from the emergency situation to how much more narrow can we make this range? You know, don't go above 110, don't go below 90.**

**And these ranges got tighter and tighter as we got better at it. But again, it ended up with more, more individualized care to do that. So yeah, I think we're on the right direction, but it's definitely a learning process. For me, it doesn't feel like I'm on the same team. I want to be on the same team. And as AI is progressing, I want to know about how it's progressing and how I should be interacting with it.**

**MCBRIDE: What's interesting is it sounds like nurses monitoring this are a component of the machine learning. In other words, you're training it to do the right thing at the right time, given the parameters that you're seeing and, you know, there's been some interesting scenarios with that around big companies who are going into healthcare systems, and they're generating lots of this type of capability.**

**And part of the challenge is who owns the technology? Is it the vendor who has the AI or the machine learning, or is it the data that feeds the algorithm that makes it smarter and smarter and smarter? And**

**I just heard Kirk adding another element, because nurses and their decisions are, are training it. And, you know, that's interesting!**

**Some of these things have been used for things like selecting the right oncology protocol for patients, given the genomics, the epigenetics and all, you know, what's the right pharmaceutical protocol or treatment protocol? And in that case, the oncologist was the one that was training the algorithms with the data that, all of the data they had, and the oncology expertise. And so, it was a partnership in the development of product. So, in this scenario, we got nurses training the algorithms, which is really, really interesting.**

**MORALES: This is very fascinating and very practical information. Thank you all so much! I wanted to, based on something Kirk said, I wanted to ask you, Dr. McBride. So, have you noticed anything in the research? Have you seen anything recently about the need for education for, let's, I was going to ask you about nurses, but, you know, even patients, parents, etc. for how to, how, how to know about the AI? I mean we can, we can offer a technology, but it seems very apparent that we need to know how to interact with it.**

**MCBRIDE: Well, it is almost part of that civil rights in terms of patients' right to know what's behind the technology that they're ... and how does it really work. But it is up to the nurses often to educate. We are, we, one of our major roles is to educate patients on things like this very thing that Kirk described. And so, we often prepare families to go home with these devices and make sure that they can care for their children or their loved ones.**

**And so, it does get down to preparing, you know, you back it all the way up to how do we prepare nurses to meet these roles that we are being called upon. And so, with our new AACN Essentials, we see a large focus on technology and you can see why. We're ... a fundamental essential of nursing now is ... technology. It has become a major actor in what we do, and so we have to take into consideration how are we going to build knowledge and competencies in nurses in the current practice setting for those that are currently practicing and beginning to onboard with new technology?**

**But also, how do we prepare young nurses so that they can be receptive to this, to this day and age in technology and what's coming in the future? Because, we, it's only going to get bigger and more complex.**

**MORALES: Well, before we go, I wanted to give the opportunity for you to share with us how you've been a principal investigator for electronic health record research and optimization. So, if you just want to tell us a little bit about how you've been involved in trying to optimize our electronic health records?**

**MCBRIDE: Well, from a number of avenues. My colleague, Dr. Mari Tietze, and myself a number of years ago, we had been called in by educators to say, how do we even begin to think about informatics and nursing education? And this was well over a decade ago, almost pushing two decades. And so, we actually came at it from a conceptual model standpoint, because we were very applied at that point.**

**We were in the practice setting as practicing doctorally-prepared nursing informatics. So, what we saw in the field is there were essentially three important domains that nurses need to know about. There are those technologies like Kirk was describing that is point of care technology. It's at the bedside, whether it be electronic health record or a pump or device or whatever.**

**And then from those, all of that, we have data and information that comes out of it that we need to be able to analyze effectively and use it to improve patient safety, quality, and population health, which is**

**the third domain. And so, if we can educate nurses with all of that, in my point of care technology, data management, analytics, and patient safety and quality, and add to that the fact it is all in a complex environment within healthcare that is very policy driven.**

**So, we need to prepare professional nurses with all of that in mind. And likewise, it drives the research that we do in order ... because then you back up and say, how do we know they're competent? How do we measure and evaluate competencies with things like the electronic health record?**

**MORALES: For sure.**

**MCBRIDE: And so that is part of our research is actually to develop an instrument for evaluating whether or not nurses are practicing with domains of best practice.**

**We also have done some work around clinical workflow redesign from a very applied standpoint, particularly advanced nurses in ... that are at advanced practice and doctoral level. We begin to look at how do we redesign clinical workflows so that we optimize technology and it works with us rather than against us. And so you can hear Kirk as a, an advanced practice prepared-masters prepared nurse speaking to how he is trying to optimize the technology within his clinical workflow to work so that it is safe and effective.**

**You also heard in his speaking that he used data management analytics to figure out how this point of care device wasn't working for him. So, I think it's really a great example of ... and I'll add to that the fact that FDA is going to make sure these devices are safe for us with these algorithms. So, it adds to that whole policy environment piece. ... so really great example that he shared.**

**MORALES: Kirk, anything you'd like to add?**

**SOUNDBITE OF MUSIC**

**ORNSTEIN: I think that there's ... obviously this is where it's going to go. There's no stopping AI. It's, it's here. It's, it's going to grow. I think my, my biggest concern is that from the sort of the medical device side of it, how willing are they going to be to share sort of insights to their algorithms? Because the algorithms are their intellectual property.**

**MORALES: Ahh, good point!**

**ORNSTEIN: They're not going to share.... That's their, you know, that's theirs.**

**And so, when I think about the nurses trying to understand what they need to do to make it better or to make it useful, will those, those companies give that information to us? I mean, it's one thing to, to educate, you know, the families on how to use it. It's another thing to educate the healthcare providers who need to have much more of an intimate understanding of what's going on.**

**MORALES: I saw you shaking your head, Dr. McBride.**

**MCBRIDE: Yes.**

**MORALES: All right. Well, I wish we could just keep talking more, but we have reached the end of the podcast. So, I liked how you two explained some of these complex terms and topics with regard to artificial intelligence and machine learning and, and so on and so forth. Technology overall. You brought it very close to home.**

**This was a nice conversation, and you made it easy to grasp the info and how it practically applies to nursing and healthcare today. Thank you for taking the time out of your busy schedules. I would like to thank Dr. Susan McBride and Kirk Ornstein for joining us today. This is Maria Morales with Colibri Healthcare.**

**SOUNDBITE OF MUSIC**