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Comparing Complications: Centrally vs. Peripherally Inserted Central Catheters

Announcer:
This is ReachMD, and you're listening to *Vascular Viewpoints*, sponsored by Becton Dickinson, advancing the world of health.

Here's your host, Dr. Jennifer Caudle.

Dr. Caudle:
Centrally inserted central catheters, or CICCs for short, and peripherally inserted central catheters, also known as PICCs, are common devices used to administer intravenous therapy. And although they come with several benefits, serious complications such as deep vein thrombosis and central line associated bloodstream infections can occur. But how do PICCs and CICCs compare on catheter-related complications? And do insertion methods have a part to play in those outcomes? A deep dive into what the latest research is telling us, straight from the investigators themselves, will be coming up on today's program.

This is *Vascular Viewpoints* on Reach MD, and I'm your host, Dr. Jennifer Caudle. Joining me to share insights from two recent meta-analyses for the *Journal of Vascular Access* are study authors Dr. Gregory Schears and Dr. Paolo Balsorano. Dr. Schears is an anesthesiologist and critical care specialist at the Mayo Clinic in Rochester, Minnesota, and he was lead author of a systemic review comparing DVT and CLABSI risks in patients receiving peripheral versus centrally inserted central catheters. Dr. Schears, thank you so much for being here today.

Dr. Schears:
It's my pleasure, Dr. Caudle. Thanks for inviting me.

Dr. Caudle:
Of course, we're happy you're here. And Dr. Balsorano is an anesthesiologist as well, and critical care specialist who practices at Careggi University Hospital, in Florence, Italy. He served as lead author of a meta-analysis examining PICC-related thrombosis rates, based on modern insertion techniques. Dr. Balsorano, it's great to have you with us.

Dr. Balsorano:
Oh, the honor is mine. Thanks for the invitation.

Dr. Caudle:
Of course. Now, before we dive into these two studies respectively, Dr. Schears, let me throw a basic prefacing question your way first. Why is there an ongoing need for additional reviews of complication rates between central catheter devices? You know, what's the clinical practice gap at stake here?

Dr. Schears:
Sure. It's actually a – a complicated answer, that I'll try to, um, give to you, uh, succinctly. Um, so vascular access is at the core of anything we do as an inpatient and much of what we do as an outpatient. And there are many potential choices in vascular access devices that one can make. There have been attempts in recent years to try to help individuals with selection, by creating guidelines and – and other sort of things, and, um, one thing that has come up since a recent meta-analysis, uh, done several years ago, is that there was some, uh, unfortunate misinformation that was provided, that I think may have helped to misdirect one of the guidelines, uh, in some ways. So, um, it was important – um, it is always important that we look carefully at the data and also at the results. Do they make sense? Are they aligned with current practice? And, um, uh – and that's really what the nidus was that inspired me to, um, do an additional meta-analysis, uh, comparing, uh, peripherally inserted central venous catheters and centrally inserted venous catheters, in

order to understand their contemporary, uh, complication rates.

Dr. Caudle:
And Dr. Balsorano, I'll pose the same question to you, through your vantage point in Italy. What ongoing issue or issues in vascular access care led you to conduct your systemic review?

Dr. Balsorano:
So, essentially, our main aim was to investigate PICC related thrombotic complications and, uh, we tried to, uh, do something which could overcome not only patient that I talked about the, uh, previous question. Uh, so we used three criteria for study selection, which is something weird for a systematic review, because – which is meant to gather all available evidences around the topic, and we all included, uh, prospective studies, uh, where catheters had been inserted according to extremely important technical aspects, such as catheter size choice according to the vein size, and tip location control. Uh, and in addition, we limited our systematic search to studies published in the last eight years, uh, which was a kind of effort to be representative of, uh, contemporary – of modern vascular access era.

Dr. Caudle:
Understood. So, let's dive into each of your studies, uh, in turn. Dr. Balsorano, let's stay with you for a moment. You know, can you talk about your study's overall objective and how you pursued the investigation?

Dr. Balsorano:
So, essentially, our aim was to investigate PICC related thrombotic complications, and we tried to write something which could overcome, uh, the aforementioned limitations. Uh, so we used criteria for study selection, uh, which might sound unfamiliar for a systematic regimen analysis which are meant to gather all available evidence surrounding the topic, and as a matter of fact, we all included the studies which had contemplated two technical aspects, such as catheter size choice according to the vein size, and tip location control during the insertion. And, in addition, we limited our systematic search to studies published in the last eight years, and it was an effort to be representative of modern vascular access era.

Dr. Caudle:
Now Dr. Schears, coming back to your study, can you walk us through its overall goal and design?

Dr. Schears:
Sure. Um, the overall goal of my study was to provide a contemporary look at, uh, the, uh, the PICC and CICC literature, with regard to two main outcome variables. Uh, they were CLABSI rate and, uh, uh, DVT – deep venous thrombosis – rates. Um, the prior meta-analysis from, uh, 2013 incorporated, um, studies going all the way back to 1926, which, um, uh, because of the number of studies over that period of time and the fact that they didn't reflect current best practice, biased toward potentially incorrect information. So I wanted to take a more modern look at, um, uh, the, um, those two main outcome variables. And so, I chose 2006 as my starting point, because it was far enough after the beginning of the insertion bundle for central venous catheters – six, and, um, uh, the PICC nurses had been practicing, um, uh, uh, the current best practice already. They were ahead of the, um, IHI bundle. So, um, and then, I used exactly the same research methodology beyond that – the PRISMA, PICO approach to looking at those, um, studies. And, um, and from that, uh, developed, uh, very interesting data.

Dr. Caudle:
Okay. For those of you who are just tuning in, you're listening to Vascular Viewpoints on ReachMD. I'm your host, Dr. Jennifer Caudle, and joining me today are Dr. Gregory Schears and Dr. Paolo Balsorano, to discuss their respective meta-analyses examining DVT and CLABSI outcomes associated with the use of centrally versus peripherally inserted central catheters. So, coming back to these two studies – let's review their respective findings and what each of you took away from them, to inform your own practices. Dr. Schears, what can you tell us about the outcomes of your study?

Dr. Schears:
Sure. Um, so it was consistent with what I thought, uh, was going to happen, which is always reassuring. And that is, um, that the, um, the CLABSI rate was very low. A – Actually, it ended up being 48% lower, um, than with CICCs. Now, I think that reflects – you know, a – as anybody that knows this area realizes that PICC catheters and CICC catheters are very similar – similar materials, you can get triple lumens, you know, there aren't that many things that are different other than, uh, PICCs tend to be a little bit, um, longer, inserted in a different place. But, um, as I mentioned, the – the nurses were ahead of the game with performing the bundle. Uh, they've been doing, um, maximum sterile barrier, washing hands, uh, chlor – two percent chlorhexidine, all of that way before the, um, uh, the physician-dominant CICC insertion, uh, was happening. So, uh, there was, um, a, um – the – the PICCs clearly were doing a better job within this meta-analysis, looking at data from 2006 to, um, 2018, um, with regard to a much lower rate of CLABSI. So I think if, um, we have a shorter sample time, maybe that would be closer, but clearly PICCs are not a disadvantage, and within this, it was demonstrating

they're either equal or a real advantage. And then with regard to DVT, uh, since 2006 or so, people were paying more and more attention to this issue – catheter to vein ratio. So we know that as we crowd the veins more, with larger size catheters, we're going to bias towards thrombosis. So, um, uh, within the vascular access community, uh, people have been talking about this issue now for quite a while – actually, it's been a hot topic at many of the meetings. So people are onboard with this, and they're inserting, uh, PICC catheters, uh, of the smallest possible diameter. Um, so – and, uh, the companies have totally gotten on top of this as well. There's been advancements in material science, so before, what one could do with a five French double lumen, you can now do with a four French double lumen. So people are inserting smaller catheters, and so when we looked at the actual rate of, uh, DVT, it was low. It was actually lower than six, if you used a smaller, uh, PICC catheter, like a four French catheter. If you used a larger PICC catheter, like a five French or a six French, then of course, the likelihood of thrombosis was higher.

Dr. Caudle:
Okay. And Dr. Balsorano, given the special focus on insertion technique guiding your team's meta-analysis, what were the results and main takeaways of your investigation?

Dr. Balsorano:
Uh, so we observed the rate of 2.4% of, uh, symptomatic thrombosis related to PICC line which is essentially lower than previously reported in other meta-analyses on the same topic, which were not contemplating the impact of technical aspects on this occurrence. Uh, so rates were slightly higher in some kind of population, such as hematologic patients, uh, highlighting, uh, how, in the middle of susceptibility, uh, plays a dominant role for this, uh, occurrence. And that's what it is, uh, so what we showed is that a proper insertion technique, paying attention to catheter size choice, and tip location control, uh, leads to a lower rate of PICC related deep vein thrombosis, and so this is something extremely contemporary – extremely modern. So, we need to pay attention to evidence-based technical factors, when we insert, uh, a PICC line.

Dr. Caudle:
Well, before we wrap up, I'd like to get each of your perspectives on what lines of research you think are needed next in the vascular access field – maybe stemming from your own, or each other's findings. So Dr. Balsorano, I'll start with you on this.

Dr. Balsorano:
So, uh, first of all, I – I think that research surrounding catheter related complications should be based on prospective studies – well-designed studies, uh, or randomized clinical trials. Over the last years, I read a lot of retrospective – retrospective studies, uh, uh, which are essentially based on data retrieval from huge databases, and this kind of methodology, uh, might be incredibly misleading br – because there are two component factors – too many biases, uh, which might alter the – the quality of, uh, results. Uh, as for my research field, uh, such as catheter related thrombosis, uh, a key aspect would be to evaluate the impact of asymptomatic, uh, thrombotic events, uh, which are – uh, which happens to be often incidental findings, but once found, uh, as physicians, we are very reluctant not to treat this kind of thrombosis, even if they rarely lead to serious consequences, and we start, uh, very long and very demanding treatments. So, this might be a good, uh – a good point, a good aspect to – to investigate farther.

Dr. Caudle:
Okay. And how about you, Dr. Schears? What lines of research and discovery are you looking forward to here?

Dr. Schears:
With regard to where research needs to go with regard to vascular access, um, if – if you want to talk in general categories, we have to focus on the relationship of the device and the vessel. Um, we have, um – I think, if you follow best practice – if you're meticulous with your insertion, and you use good insertion technique, we have demonstrated that we can have relatively low complication, low insertional based CLABSI risk. Our remaining problems have to do with catheters remaining in the vessel, and our care and maintenance subsequently, which can, um, uh, cause adherence of bacteria and subsequent biofilm development. So we have to look to ways to either engineer out the human factor of noncompliance or figure out a way to get better compliance with regard to best practices for care and maintenance. That is a huge problem, at least in the CLABSI realm. We have to really continue to emphasize the importance of catheter-to-vein ratio, and also look to additional materials that are not going to be less thrombogenic, but still strong and small, to reduce, uh, the probability of – of, of, uh, DVT over the long term. Those are areas that are actively being pursued right now, and, uh, I'm hoping in the next five years, will actually have – will take another step forward with regard to improvements in this area.

Dr. Caudle:
Well, with those developments on the horizon, I'd like to thank my guests, Dr. Gregory Schears and Dr. Paolo Balsorano for joining me today. Doctors, it was wonderful speaking with you.

Dr. Schears:
Thank you very much for the opportunity.

Dr. Balsorano:
Thank you, thank you to you all.

Announcer:
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