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### Pearls & Pitfalls of Algorithm-Based Vascular Access Care Protocols

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. Matt Birnholz.

Dr. Birnholz:

Every healthcare provider involved in vascular access care wants to feel reassured that patient safety remains at the center of all clinical decisions. For this reason, algorithm-based care has become a standard for vascular access teams, providing evidence-based protocols for matching device selections with appropriate clinical settings. But understanding where these algorithms originated, how they compare, and what clinicians need to know to put patients at the front of them all is going to be our focus today.

This is *Vascular Viewpoints*, and I'm Dr. Matt Birnholz. Joining me to explore care algorithms in vascular access is Dr. Marcia Ryder, Research Scientist, Consultant, and Biofilm Related Infections and Vascular Access Technology, and Clinical Nurse Specialist. Dr. Ryder is past President of the Association for Vascular Access, where she was the recipient of the Suzanne LaVerre Herbst Award for Excellence in Vascular Access, which is the highest honor bestowed by that organization. Dr. Ryder, welcome to the program.

Dr. Ryder:

Thank you, Dr. Matt. It's my pleasure to be here with you.

Dr. Birnholz:

Great to have you with us. So, before we dive into the various protocols out there and how they influence approaches to vascular access, can you just give us some background on how these algorithms came into the limelight and what they're aimed at doing?

Dr. Ryder:

To answer that, Dr. Matt, we've got to go back into history a little bit into the late 1980s when our only choices for vascular access were a short PIV or a central catheter. As I was in my practice as a nutrition support nurse, I was a specialist, I was approached by a sales rep who showed me a catheter that was used in neonates and pediatrics that was a 45-cm silicone catheter placed peripherally through a breakaway needle. He wanted to know if I thought this would be applicable in the adult population. So after I got thinking about it and thought that this was worth a go, and I got permissions to do so, I began placing these catheters in adults for TPN. But being only 45 cm long, that placed the tip in the subclavian vein, and we thought the blood flow was okay, but unfortunately, we did see a lot of thrombosis of the subclavian vein as a result. So, about that same time, and as word traveled with the use of this type of catheter, the midline and midclavicular catheters came into popular use. Unfortunately, there was not a lot of evidence to support the safe indications for use of these catheters. And pretty soon, other clinicians were seeing similar results, so they became very confused about how to properly use these devices, including myself. To address the problem, I consulted with my pharmacy colleagues and physicians to try to understand how certain drug properties might increase the risk of thrombosis. After that, I then constructed the first algorithmic approach to device selection, and I published that in 1993 in the *Nursing Clinics of North America*. The aim was to give parameters to make the best choice for the best outcomes at the least cost.

Dr. Birnholz:

Well, that's a great background, Dr. Ryder. And what I love about it is that not only do you have a lot of information on the background to what brought algorithms to the limelight, you actually are solely responsible alongside your colleagues for doing so. So, on behalf of everyone out there in vascular access care, I think we owe you a debt of gratitude. But just looking forward to the current algorithms that

are being utilized in algorithm-based protocols today, can you just walk us through how they compare, how they overlap with one another?

Dr. Ryder:

Well, to understand the current algorithms, we kind of need to talk a little bit about the conceptual framework of the original algorithm and how those developed into modified versions. The first algorithm was based on two core parameters. First, what are you going to give? And second, how long are you going to give it? And then you do a thorough assessment of the patient in regard to their vascular integrity and their device history. Then, determine the patient setting, either hospital or home. And then you are left with a number of choices. And to make the choices appropriate for the drug solution and the duration of therapy, you do a thorough assessment of the patient. For example, their risk for infection. So that was 1993. The algorithm has stood for the next 25 years, but the dramatic increase in the use of PICCs was paralleled by increased upper extremity DVT. So, in an effort to try to reduce the risk, a different methodology was used to examine the problem, and then expanded into recommendations for device selection. The first of these, and probably the most popular one today is the Michigan Appropriateness Guide for Intravenous Catheters. And it's commonly called MAGIC. And this was the result of a multispecialty panel using the RAND/UCLA Appropriateness Method. They separated their recommendation into four separate tables, and they were constructed on the same two core elements as the original vascular access algorithm. The four tables included, one to be used when peripherally compatible infusates were given. The second, a nonperipherally compatible infusate. The third, patients with difficult venous access. And the fourth, patients requiring frequent phlebotomy. The biggest problem was with number one and number two, because they did not define what are peripherally, compatible infusates. So there was a lot of controversy and a lot of disagreement with these recommendations, primarily based around those two issues. So, soon after that, Dr. Mauro Pittiruti and the GAVeCeLT group went on to develop another algorithmic approach. And these were based on the original concepts of the first algorithm. First, is it peripheral or is it central? But in determining the peripheral and central drugs and solutions to be infused, it reverted back to the very same parameters of the original algorithm in relation to pH and osmolarity and vesicant drugs. And then, secondly, the peripheral criteria were broken down for the various types of catheters we have now; short PIV, long PIV, midlines, and then of course taking into consideration the setting. So that has become a very popular algorithmic approach, and again is more well defined and more parallel with the original algorithms.

Dr. Birnholz:

And it sounds like in both cases, there are some fundamental limitations from your vantage point that vascular access teams should keep in mind. You've run us through a few of them. Any other limitations that those particular algorithms and/or any others should be put in top of mind for our audience?

Dr. Ryder:

Yeah, well these are really intended to be guidelines. And they should never supersede thorough patient assessment and critical thinking. And they're also more designed for the use of a vascular access team.

Dr. Birnholz:

Excellent. Well, for those just tuning in, you're listening to Vascular Viewpoints on ReachMD. I'm Dr. Matt Birnholz, and today I'm speaking with Research Scientist and Clinical Nurse Specialist Dr. Marcia Ryder about algorithm-based vascular access care protocols. So, Dr. Ryder, ideally, what do you think would be the best role for these protocols to provide on the hospital floors, specifically? Are they tools? Are they doctrines? What are your thoughts?

Dr. Ryder:

Well, I think that they indeed are only tools because they are guidelines and they give the clinician parameters to follow and to begin a pathway of thinking about what the patient's needs are and how to get the best outcomes. I honestly believe that it may be a bit of a dangerous thing for these to be used by the general clinician, because vascular access has become so specialized and so sophisticated we have so many devices, and to be able to make that proper choice, it requires the specialization of vascular access. So, I believe these are probably better used in the hands of a vascular access team. And in regards to the different algorithms, I still believe that the core elements to making this choice is the drug property and the duration of use, and that these are critical to making the decisions between the use of a peripheral vascular catheter and a central venous catheter.

Dr. Birnholz:

Those are great thoughts to keep in mind there, Dr. Ryder. Before we close though, I want to open the floor up to you and see if there are any additional thoughts or considerations we should keep in mind, given everything we just spoke about.

Dr. Ryder:

Yes. I again want to come back and kind of emphasize this point that vascular access technology and patient safety risks associated with vascular access has advanced to a level that requires a specialized vascular access team to provide the best outcome, the best

choice for the best outcome, at the least cost for the patient.

Dr. Birnholz:

So, in other words, it really does take a village in order to be able to make the best choice, and not simply rely on a protocol in and of itself without getting a broader picture of the patient's needs and what the team's expertise can weigh in on that best selection. Is that correct?

Dr. Ryder:

That's correct.

Dr. Birnholz:

Well, if I've captured it even remotely correctly, then with those closing thoughts, I very much want to thank my guest, Dr. Ryder, for joining me to review algorithm-based vascular access care. Dr. Ryder, it was great having you on the program.

Dr. Ryder:

Thank you so much.

Announcer:

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