BBGuy Essentials 100CE:
"Pearls of Wisdom" with Multiple Guests
Released March 29, 2023

Joe: Hi, I'm Joe Chaffin, and this is the Blood Bank Guy Essentials Podcast.

Okay. Okay. Okay. Episode 100, guys! It is crazy. I can't believe episode 100 is finally happening. When I started this podcast way back in 2016, to be honest, I really never dreamed anyone would listen, frankly. Well maybe I had some hopes that maybe people that knew me might listen a little bit, but I have just been blown away by the response.

I am so grateful that over 650,000 downloads later, that people in 130 or more different countries around the world have found some educational value in this podcast. I am just beyond grateful! Thank you so much for listening! But I'm also not naive. I am very aware that the biggest reason that this podcast seems to have struck a little chord among learners is just the amazing quality of the guests that I've been able to interview and talk to over the last…1, 2, 3, 4…7 years? Holy cow, over the last six or seven years, something like that.

So I have convinced a number of those amazing guests to come back for this episode 100 and to share pearls of wisdom with you. And in fact, that's the episode. It's called "Pearls of Wisdom" because I'm talking to a whole bunch of different people about just some quick things, some quick things with high learning value, hopefully, that you guys I hope will really, really enjoy.

The hardest part of this, to be honest, was figuring out how to keep it at right about an hour or so. First, this IS a continuing education episode. The free continuing education credit is provided by TransfusionNews.com, and Transfusion News is brought to you by Bio-Rad, who has no editorial input into the podcast. This podcast offers a continuing education activity where you can earn two different types of credit: One AMA PRA Category 1 Credit™, or one contact hour of ASCLS P.A.C.E.® program credit. This activity also may be used to fulfill Lifelong Learning Continuing Certification requirements for the American Board of Pathology. To receive credit for this activity, to review the accreditation information and related disclosures, you just need to visit www.wileyhealthlearning.com/transfusionnews. Very important, don't forget: The continuing education credit is no longer available for this episode two years after the date it was released. **In other words, if you are listening to this episode later than March 27, 2025, the continuing education credit will have expired.**

OK, back to this episode. As I said, this episode is a real potpourri of information! There's a whole bunch of different people that I've convinced to come back and have conversations with me about things that I find of high learning value. They chose these deliberately, these pearls, specifically for you as a learner, and I hope that you'll really, really benefit from them.

The first guest is Dr. Steve Frank. Steve Frank is a Professor in the Department of Anesthesiology and Critical Care Medicine at the Johns Hopkins, and he specializes

in anesthesia for thoracic, vascular, and transplant cases. Dr. Frank has been on the podcast a couple of times in the past, most recently, actually FAIRLY recently, talking about Acute Normovolemic Hemodilution [Note: See BBGuy.org/097]. In fact, Steve was the one who came up with the idea for this Pearls of Wisdom podcast. He's wise, and he's a lot of fun to talk to, so let me give you my first guest, my first "pearl of wisdom provider," Dr. Steve Frank.

****

Joe: Hey, Steve. Welcome back, man.

Steve: Thank you. I'm privileged to be here. Thanks for having me.

Joe: It's such an honor. So you get to kick us off my friend. , You get to give us the first pearl of wisdom, since you came up with the idea, good job, or at least the title. How about that? So fire away, my friend. Let's hear your pearl of wisdom.

Steve: Sure. I call it the "Why Give Two, When One Will Do?" campaign, and we launched this in 2015 to advocate single unit red cell transfusions. And it was based on the "Choosing Wisely" recommendations from the AABB that came out in 2014. And if you went to med school, when I did you were taught that the dose of blood was two units, and without any questions asked, we always ordered two units of red cells. And then along came the experts in Choosing Wisely and said, "Hey, wait a minute. We now advocate single-unit transfusions and then reassess the patient before giving more blood."

So we launched this campaign and we put the message "Why Give Two, When One Will Do" on screen savers across the institution. So every five minutes or so, you'd see on all the computers in the hospital, this quality improvement message with a Choosing Wisely logo, by the way, that said Why Give Two, When One Will Do single unit red cell transfusions. And what this is all about is the dose of blood. So you can have an evidence based hemoglobin trigger, let's say of seven, right?

But if you're always giving two, two units versus one unit, you could essentially, cut your blood use in half, even though you have the same hemoglobin trigger.

That's the concept behind it and it has to do with the dose of blood. We're not saying that, you know, for massive transfusions or sickle cell patients, you know, who might need more than one unit. Not at all. You know, we recognize that.

I want to add one more caveat to the Why Give Two, When One Will Do campaign because it can also apply to platelets. When we launched Epic, some genius decided to put how many units of platelets do you want to give your patient? And there was a one and a two, one and a two button you could click on Epic. With the click of a mouse, you could give a thousand dollars worth of platelets, you know, which is a double dose of platelets from what we usually give. We quickly took away the option to give two six packs of platelets, which is much more than most patients need.

Joe: That's awesome. So one question that has come up for me when I have talked to people about the Why Give Two, When One Will Do type of process, I totally agree with everything that you've said, Steve. There's the one objection that clinicians have raised

to me. And I wonder if you'd attack this in the couple minutes we have left is, “well, I don't want to wait. I mean, how long do I have to wait before I check that hemoglobin? Cuz doesn't it take like hours for the hemoglobin to equilibrate?” How do you answer that?

Steve: Well, you know, as an anesthesiologist working in the OR, we do everything a lot faster than they do on the floors. So we'll give a unit of red cells in 10 minutes, you know, not two hours and then we'll recheck a hemoglobin right away. And I can tell you that the results are immediate. You can send a lab five minutes after a transfusion and assess the efficacy of the change in hemoglobin.

Joe: Right. We've talked about patient blood management before, you and I, on episode 098CE. Everyone, you should listen to that about acute normovolemic hemodilution. But Steve, just real quick, this is not just about reducing the number of units and reducing the costs of the products that we're giving, right?

Steve: Correct. I mean, doing good blood management, you can save blood, you can save money, but you can also improve outcomes. if you look at the 12 randomized trials on hemoglobin triggers, they all use single dose single unit transfusion strategies, and in four of those 12 trials, they found harmful effects of giving extra blood to the patients. In the other eight trials they found no difference between liberal and restrictive. So if there's no difference or harmful effects of giving extra blood at higher hemoglobins, then giving less , I like to say, less is more in terms of red cell transfusions.

Joe: Absolutely. Thank you, Steve. I really appreciate your time.

Steve: Thank you, Joe. Thanks for having me.

****

Joe: *Okay, moving on. My next guest is someone that you have heard, even if you're a casual listener of this podcast. Sue Johnson is the Director of Clinical Education Adversity Blood Center of Wisconsin. She's also the director of the specialist in Blood Banking Program Adversity and the Transfusion Medicine program at Marquette University.*

Sue has a long background in education and she has been. In fact, the guest on the most popular episode of this podcast, episode 028, “Who DAT?” with Sue Johnson, where she talks about the direct antiglobulin test, one of her favorite tests, which may relate to what she's about to say in just a moment.

So here is my dear friend Sue Johnson.

Joe: Sue, my friend, how you doing?

Sue: I'm doing great.

Joe: I am thrilled to have you here as part of my pearls of wisdom podcast. I can't think of anyone that I would rather have be a part of this. So fire away. Let's hear your pearl.

Sue: All right. So my Pearl is around one of my favorite tests and that's the direct antiglobulin test and…

Joe: Shock!

Sue: Hard to believe!

My Pearl is around that method. And one of the things that a lot of people don't realize, I think, is that it's really important that you, when you're ready to do the direct antiglobulin test, that you get a drop of red cells directly out of the patient sample, preferably the EDTA tube, and then you make your cell suspension and then start your washing or preparing your cell suspension.

So if it's a tube test, then for sure, you're going to get a fresh drop of red cells and you make your cell suspension and wash four times, right? Or manually wash four times. But the key is that you're getting the red cells directly from the patient sample, versus that cell suspension that you might have made for doing an ABO/Rh type, and saying, “Oh, I already made my cell suspension.” You don't want to do that because those red cells have been sitting in saline.

The same would go with doing a column agglutination test. You want to get your red cells directly from the EDTA tube, make your 0.8% cell suspension, and then add those red cells to the column.

The reason: the reason is because if your patient has a weekly positive DAT, while the red cells have been sitting in that saline suspension that has been sitting on your bench top, that antibody, that IgG antibody might actually start to come off the red cells. And if you had a weak, positive, before it was sitting in the saline-suspended red cells or LISS-suspended red cells, it would become negative. So you would end up with a false negative test. So it's important to do that to get those red cells directly from the tube.

Why do I say that? Well, our lab does quite a few DAT-negative immune hemolytic anemia workups. And when we look at the samples that come into the lab, we know that, oh, it's about 12% or so of the samples that come in, have a positive DAT with our standard tube testing methodology.

Joe: So wait, so these are ones that are sent in as DAT-negative hemolytic anemia. And you're saying 12% of are actually *positive* when you do the DAT on a fresh freshly outta the tube.

Sue: Yeah.

Joe: Wow.

Sue: And, and similar. Yeah. And a similar finding's been reported by the LA Red Cross Pomona lab and George Garratty's work from over the years. Similar finding like 14%, I think. So, you know, you can't say for sure it's method, but you know, there's, there's probably something to that. Right?

Joe: Sure. So let me make sure I understand what you're saying. So you're telling us that before you call something DAT negative, you need to make sure that you're actually using an appropriate sample to do that. Is that accurate?

Sue: That's absolutely accurate. And that you get that drop of red cells directly from that, that patient sample to start. Super important.

Joe: That is an incredibly nerdy point, but I love it. That's fantastic! As you know, the nerdy stuff appeals to me, Sue!

Sue: Right. That's right [Laughs]. And it is important.

Joe: That's fantastic. Okay, well, that's, that is an awesome tip. I really, really appreciate it. I could talk to you, as you know, for days, but I won't and we'll stop now. So thank you so much, Sue.

Sue: You're welcome.

****

Joe: *You know, I tease Sue about being a nerd, but I only do that because she knows that I'm just as big of a nerd, and we love, we both like those things. Great. Little Pearl from Sue.*

Let's move on and let's talk to Dr. Cassandra Josephson. Cassandra Josephson is the Hawkins Family Endowed Professor and Director of the Cancer and Blood Disorders Institute and the Clinical Division Director for Hematology/Oncology, Medical Director of Transfusion Medicine, at the Johns Hopkins All Children's Hospital in St. Petersburg, Florida. Cassandra has also been a guest on this podcast multiple times. She is an amazing clinician, an amazing transfusion medicine doc, and I can't wait for you to hear her pearl. Here we go with Cassandra Josephson.

Joe: Cassandra, this is getting to be a habit, you and I talking. What's the deal?

Cassandra: I don't know! I don't know, Joe, but I love talking to you. So, uh, this, this works out very well.

Joe: Well, thank you. I don't don't want us to take any time away from your shot here to give us a pearl, which I'm taking a wild guess might have something to do with pediatric transfusion medicine. I don't know, it's going out on a limb, but…

Cassandra: That's the whole reason I love being on your podcast. You're super insightful. You know exactly where things are. Got your hand on the pulse.

Joe: Rock and roll. All right, let's hear it. What do you have for us?

Cassandra: So, yeah. Well, well in all sincerity, I just want to say this is a tremendous honor to be here on this centennial podcast. I really want to bring across to the audience, the biggest pearl at this moment in time in pediatric transfusion medicine, as far as I'm concerned, has to do with patient blood management. And I know that sounds kind of

strange, but it is where we are at in transfusion medicine. And what I'm finding is, is that some of those same tenets that we talk about, it's not just transfusing little adults. Children are different, and evidence-based medicine is what should be driving patient blood management.

And we know as pediatric transfusion medicine people or people who take care of Peds within the context of transfusion, know we are still needing lots of evidence to drive things. I don't want to negate patient blood management, but I also want us to be mindful that there are certain strides we've made in pediatric transfusion over the last, even a couple of years, in neonatal transfusion medicine with randomized control trials in red cell transfusion or restrictive versus liberal or preterm infants. And we've done that with platelets as well.

But with those trials come the subtlety of "sometimes less isn't better." It might be giving you less transfusions, such as in the TOPS trial, which is the "Transfusion Of Preterm infants" done in the US where the lower hemoglobin value of around seven or eight is safe. But giving more isn't going to harm the patient. And that's an important aspect of this and getting lower and lower just because you can doesn't mean it's better.

With the platelet transfusion, the PlaNeT-2 trial, there really was a difference between the 25,000 and the 50,000 threshold. And actually it was worse to have a more liberal threshold, both for death and for the development of bronchopulmonary dysplasia.

When you put those two together, you can see where giving less sometimes is evidence-based better. And giving more, isn't always bad in the red cell case. And I bring that to you because if we just take what we do in adults, which we've found that giving one is better than giving two.

Joe: Right.

Cassandra: You know, reduce your red cell units, that would suggest that we should be cutting everything back. But we shouldn't be doing that. We should be letting the evidence within the subpopulations of children and neonates drive the decision making.

And I just want to encourage people who are interested in pediatric transfusion medicine to keep and understand that all the questions are not answered, that there are many, many more to go and keep that mindfulness of pushing the envelope and asking the questions rather than falling back into, which is where we were 20 years ago. "This is what they have. This is what we have to do. They told us these are the only kind of units we can get. These are the only kind of platelets we can get." I mean, there's still a load of questions out there and I just want the audience to know, to keep asking them.

Joe: For someone listening to this right now, that's going okay, well, it sounds like things are up in the air. How do I make the choices now? Is there any place I can go to, to get practical advice on what's current, right now?

Cassandra: Well, I think there are plenty of places. I think that there's going to be more articles written and that are coming out where there are gaps in the research. I think that the ISBT, I think that AABB are very, very central in trying to point that out. The NHLBI is trying to point out those gaps and those gaps are questions that you can go and do

research on. I just want to implore the people who are here to not just practice clinical medicine, but push the envelope.

And I do want to say that from a patient blood management standpoint, there are things that have worked with the normal tenets, like of not doing phlebotomy, iatrogenic blood loss and phlebotomy-induced anemia in pre-term infants. Trying to draw less blood, trying to use delayed cord clamping, trying to use erythropoietin. I mean, so it's not like the tenets of patient blood management aren't there, but we just need to make sure we tailor them to the patient.

Joe: Awesome.

Cassandra: And to the patient population.

Joe: That's fantastic. My friend, what a great pearl to close out this episode 100 for my guests. So Cassandra, you're the best. Thank you so much for hanging out with me.

Cassandra: Oh, you're so sweet. You're the best. Thank you.

****

Joe: *You know, I've always thought that Cassandra's issue is that she just doesn't get excited enough about transfusion medicine, especially pediatric transfusion medicine. She's the best. She's so contagious. I'm so grateful to Cassandra for being on this episode.*

My next guest is another frequent guest on this podcast. Dr. Mark Fung is Professor of Pathology and Laboratory Medicine at the University of Vermont. Mark likewise has been a guest multiple times, including one of my favorite episodes, the Halloween episode from several years ago, "Scary Stories from the Transfusion Service." Mark has a super practical, really, really helpful Pearl for you today. I hope you listen to this one really closely. It's going to seem simple, but man, there's so much that you can benefit from in here, especially if you are a budding transfusion medicine physician. This one's especially for you guys, but it's absolutely true for others as well.

So this is Dr. Mark Fung.

Joe: Hey, Mark. Welcome back, man. It's great to see you.

Mark F: Well, Joe, congratulations on your hundredth podcast and happy and honored to be part of this episode.

Joe: And you dressed up those that are watching the video. I can't believe it. You dressed up what's up with that, man?

Mark F: It's, you know, with the pandemic I've been going the "cas" route and, you know, working from home a lot, have not been putting on the bow tie, but I said, you know, for Joe, for the hundredth, I am going to put my, my shiniest bow tie possible…

Joe: That's fantastic. I'm honored

Mark F: My pearl floor your podcast audience is, uh, **being present**. How to garner better relationships with the floors, the ORs, and the EDs. And my first one in that theme of the pearl being present is **be in person** when your telephone communications don't work. When you're trying to call about massive bleeders and they can't come to the phone, it is time for you to show up. And just go into the OR and, dare I say it, put on some scrubs, find some scrubs somewhere. You know where to find them.

Go into the OR, be very kind. Don't announce yourself like you're the king, but sneak in very quietly and go up quietly to the anesthesia folks on that side of the curtain and say, "Hey, I'm from blood bank. I know you've never seen me, but I'm here. What can I do to help you out?" Take a look at the scene. Because when you're trying to get through on the phone call, whether they're in the ICU or the OR, they can't get to you, it means they're busy. They're up to their elbows in blood. You know, to pull out to answer your one question, no, it's time for you to go up and, and say hi to them. And it generates a lot of points doing so, and plus, you'll see what is going on.

You know, the second thing is certainly in terms of being present, the other one is, dare I say it, occasionally join the primary team for part of the rounding. You know, choose maybe one day a week, one day a month, where you just say, "Hey, I'm going to show up. And just round with you and just hear what kind of stuff." You know, usually it's going to be your heavy bleeder blood user, you know, surgical ICU or MICU teams and show up for that. Certainly we've all had our difficult transfusion support in these patients or reaction. Again, offer to say, "Hey, can I, can I join you on one of your rounds to talk about it?"

Even offer, dare I say it, talk to the patient. Sometimes the team could use the extra time. Cause they're busy rounding for you to say, you know, “why am I explaining you a secondhand when I can have you the expert tell them firsthand.” And sometimes I'll even, if there's time allowed, I'll even grab one of my blood bank staff, particularly one who's been very heavily involved in the workup, just so they get a chance, you know, to see the patient as well. You know, remind ourselves that we are physicians,

Then, you know, the usual stuff, just in case you don't know, to offer to do inservice education for whether it's the residents, the fellows, or the nursing staff. Always appreciate. They can always use an extra person on the roster.

And it's just that face time. You know, I always tell my trainees that you know, you should introduce yourself anytime you have a new chair of surgery, new chair of anesthesia. So that, you know, the first time you talk to them about stuff, it's not over a difficult case or something that went bad, but you've actually had a chance to talk to them and establish that relationship where they often will offer, “let me know if I can help you.”

So, you know, first impressions are very important. So I recommend that.

And of course, be present for your blood bank team. You know, do call in or show up when things going bad, so they know that you care about them. Have their back.

It's as simple as that. No scientific or clinical knowledge around being present except to do it. Hopefully that helps your audience out. It's certainly helped my career over the years.

Joe: It's such a great tip, Mark. It's such a wonderful pearl and I couldn't agree more. I mean, I think that when you do things like that, from my perspective, anyway, it eventually leads to what a transfusion medicine doc really wants to have happen, which is they start to get in trouble, or even before they start to get in trouble, they're calling you. And, it's like a perfect world for us in the blood bank when we are actually able to be proactive. So that it's such a wonderful tip, Mark. Thank you so much.

Mark F: Yeah. And if people forget why, what to do when they're in the OR, dare I say it, offer to grab some of those coag samples that you needed anyway, and the CBCs to bring back down and you can do the patient ID verification right there cause you can vouch for the specimen. Every once in a while I'll even put in the orders. I know some of our colleagues around the country will actually actively manage the transfusion support. I don't say you necessarily have to do it everywhere, but you know, there have been a great instance where patients with bleeding out, coags is not clotting. You need another sample. I'm like, "no, there's a reason why the sample's not clotting. The patients bleeding out. It's a real sample. Please release results."

Joe: Well, as always, you are the man, my friend. Thank you so much, Mark. Appreciate your time.

Mark F: Thank you.

****

Joe: *Man, love that from Mark. That's fantastic advice. Fantastic advice. "Be present." It's awesome.*

I have to tell you guys a little bit about my next guest, who is Dr. Yulia Lin. Yulia is the Division Head of Transfusion Medicine and the Tissue Bank at Sunnybrook Health Sciences Center, and an associate professor in the Department of Laboratory Medicine and Pathobiology at the University of Toronto.

Yulia is an amazing educator. She is the only guest on this Pearls of Wisdom episode who has never been on the podcast before, and there's a reason for that. I have tried to get Yulia to join me, I can't even tell you how many times over the years, and there's always been just something that got in the way.

She's remarkable. She's a wonderful speaker. If you ever get the chance to hear her at an AABB or other session, please do so, and I twisted her arm, gently, and managed to convince her to be an a guest on this particular episode. So I'm so excited for you to hear. This is Dr. Yulia Lin.

Joe: Yulia, I feel like this is like a magical moment for me. Thank you so much for joining me.

Yulia: I'm so excited to be here, Joe. It's amazing that you have reached your hundredth podcast. So a huge congratulations to you. I know all your listeners are excited that

you've continued this educational series this long and you know, looking forward to what else you put out.

Joe: Thank you so much. Well, I'm excited to hear what you have to share with us for your pearl of wisdom today, Yulia. So rock on, let's go.

Yulia: So I thought about this quite a lot, and I thought the most important clinical pearl that I could impart to those who are listening and I assume that would be mostly trainees and clinicians who transfuse, is really to take a pause and think about what the problem is when you see that abnormal lab value. I think we often get caught up in this whole idea that there's an abnormal number and we have to fix it right away. But sometimes, you know, we sort of lose track of why that might be.

So let me give you an example. So in the blood bank, you might very well receive an order for a patient with a hemoglobin of 68 for one red cell unit. And on the surface, that seems perfectly fine. It meets the guidelines. But if you're at the bedside, there may be very different patients that are behind that order.

So on one hand you might have a 70-year-old man who comes in, who's just had chemotherapy and is at the nadir of his counts and is fatigued and short of breath. And in that case you would say, “yeah, it makes sense. He needs a transfusion, he's symptomatic, and he's not going to make more red blood cells anytime soon.”

And the second scenario you could imagine, it's a 45 year old woman who's got heavy menstrual bleeding, she's working full time. And she got a call, interrupted one of her meetings at work to come in from her family doctor to rush to the emergency department because her hemoglobin is 68. And you know, in that case, you know, she's maybe of course fatigued, but doesn't really have any other symptoms and giving her a transfusion doesn't really fix the underlying problem, you know, which is iron deficiency.

And so, you know, I think those are sort of key things that when we see these numbers, we really have to think about the patients and take a close look at them and really understand what that problem is behind the number. So I think that's the most important thing.

And, and the second issue is really to think about how the transfusion's going to benefit them. Sometimes it will benefit and sometimes it may have no benefit. So again, in that second patient, you know, she may get better with just, for example, iron supplementation alone and giving her a unit, you know, puts her at risk, unnecessary risk for things like transfusion reactions, um, development of antibodies for future procedures or plans. These are, you know, some of the important things to think about when you're ordering a transfusion.

Joe: So maybe more than just not benefit, potentially even harm could come. As, as I always say to residents, chronic anemia doesn't mean hypovolemia and you're throwing red cells in, on top of a full blood volume. If someone is at risk, I mean, TACO is a real possibility in cases like that.

Yulia: Yeah, absolutely. So in an older patient who might already have cardiac issues or kidney problems, you might be throwing TACO on top of that. You know, in a younger

patient, you might be throwing alloimmunization on top of that. And yes, you know, you worry about patient developing antibodies and affecting, you know, not only future pregnancies, but you know, down the line, maybe they need a transplant and all of a sudden they have HLA antibodies that they really didn't need to have.

Getting to the heart of what is the underlying problem and does that patient really need transfusion? I think those are sort of those key things that we need to think about when we're ordering transfusion.

Joe: Do you have another quick example with another blood product, maybe?

Yulia: I guess the other example I was thinking about was would be, you know, the abnormal INR. In the blood bank, we got an order. The INR is 1.7, the patient's going for procedure. And there's a request for two units of plasma. Any of us who work in the blood bank, that's a really common scenario. And it's interesting because you really do need to dig a little deeper in terms of that.

So the first question again is, why is the INR elevated? And that can be in a range of hospitalized patients anywhere from warfarin, medication, liver disease, or even just vitamin K deficiency.

So, the way you'd manage a patient who had a totally normal INR when they came to hospital and it's two to three days later after not eating, they're on antibiotics and they're vitamin K deficient, is very different from a patient who may have liver disease. You know, in that first patient, you may just give them vitamin K to replace their stores and get their INR back to normal. In the second patient with liver disease, you might actually not give them anything depending on what the procedure is, right? Because they're in a state of balanced hemostasis.

So I think just sort of getting back at, you know, what is that underlying problem? And do you really need that transfusion?

Joe: That's fantastic. Yulia, what great tips! I am so grateful for you being here with me today. Thank you so much.

Yulia: Thanks so much, Joe. It's such an honor to be here and I'm looking forward to the next 100 podcasts. Thanks.

****

Joe: *Yep. I told you she was great. That's fantastic. Thank you so much Yulia, and I'm sorry for teasing you about, you know, having a hard time getting you on the podcast. Hopefully we'll see you again for another episode.*

My next guest is… Man, when I think back to April, 2016, when I first put out episode 1, episode 001, as I called it 99 episodes ago, my first guest was Dr. Mark Yazer. Dr. Mark Yazer is a Professor of Pathology at the University of Pittsburgh and an Associate Medical Director of the Centralized Transfusion Service in Pittsburgh.

If you know Mark, you know that he has a passion for a couple of things. One is the Montreal Canadiens hockey team, if you're not familiar with that. And the other is for looking at things in transfusion medicine in ways that aren't necessarily traditional.

Mark has advanced science in so many ways and advanced what we're doing in transfusion medicine in so many ways, and he has something to share with you that might at first strike you in a way that concerns you, and frankly, it hit me the same way. So I'll talk to you after this pearl. So, take a listen to this, take a listen to what Dr. Yazer has to say, and I'll be back with you in just a sec.

Joe: Mark, my friend. It is so good to have you back on the podcast.

Mark Y: Hello, Joe. It's feels like it's been forever since I've been on, I think we've gone through three coronavirus variants since then.

Joe: I think you might be right. Rather than, you know, sit here and talk hockey, which you and I could do for a while, why don't we get right to it? Let's hear your pearl. What are you wanting to bring to us today?

Mark Y: I think my pearl, Joe, is that physicians cannot be pedantic about transfusion reactions, in particular when they happen in the pre-hospital setting. So for example, if the nurse observes a one-degree Celsius rise in temperature, it's true that they have to stop the transfusion, but that doesn't mean that they necessarily have to take the unit down, fill out the paperwork and, and basically terminate the unit. What they have to do is call the physician and the physician can then come and evaluate the patient and decide, is this the patient's underlying disease? Or even if it's a febrile reaction, does the patient need that transfusion enough to just get some medications on board and continue on with it?

So for example, if it's an antigen-negative unit for somebody who is highly alloimmunized, or if it has other attributes, like it's a very fresh unit with CMV-safe or hemoglobin S negative, you know, we don't have a lot of these. You know, can we play on through the febrile reaction, in particular, if this is happening in the pre-hospital setting.

So if you have a patient with a low systolic pressure in trauma, in the ambulance or the helicopter and, you know, needs a transfusion to save their life. If that patient breaks out in a rash. You know, yeah. In the hospital you probably would stop the transfusion and evaluate and give antihistamines. But if that's an essential transfusion, then you need to play on with it. You need to carry on with it, keeping a closer eye on the patient's vital signs and making sure it doesn't turn into something more serious. And if it does, at that point, you want to stop the transfusion.

But again, just because we're called about a so-called reaction from the nurse doesn't mean that we have to stop it, end the transfusion right there. We need to evaluate it, understand what the benefits to this patient are of carrying on with it, what the likelihood of finding replacement unit might be. And of course, how serious the patient's signs and symptoms are.

You know, one thing that often happens with neutropenic patients is they come in with febrile neutropenia, and the thrombocytopenic. And so, you know, they come in and the, the temperature's 39 degrees suddenly it's 38 or 37. So quick get the platelets in. And 15 minutes later, it's always 15 minutes later, into the second unit it's 39 or 40 degrees again. And you have to understand, is this really a febrile reaction? Does it really matter if it's a febrile reaction if, if the patient's platelet count is 2, and they're at risk of having an intra-cerebral bleed?

You know, what we want to be careful of is missing a septic reaction. We don't want to miss a septic reaction. That's a serious problem that we want to identify and terminate that transfusion right away. No question about that. But it's uncommon, right? Certainly with whole blood, red cell stored in the refrigerator. And now with all of the machinations of bacterial testing that we have for platelets, septic reaction should be very uncommon.

So you don't want to miss a septic reaction that's for sure. But if that patient needs those platelets because they're HLA matched, right. And then, and the next donor is five days away because they have to come from the other side of the country, you really want to be careful about stopping and ending that transfusion, if it's possible to actually carry on with it.

Joe: So one question for you on that, Mark, and maybe just a tiny bit of pushback. I mean, I've made the point for years that when you look at the early data on how acute hemolytic transfusion reactions present, that in the very early stages, they can be indistinguishable from a febrile nonhemolytic reaction. Granted, once the patient crashes, you can bring the janitor and they can make the diagnosis, something's wrong with this blood, but in the early stages, they can look similar. So how do you fit that in with what you're saying?

Mark Y: Well, as I'm not saying that you shouldn't stop the transfusion. That's right, the nurse is required to stop the transfusion. And that of course is part of the treatment of a febrile reaction is…part of a hemolytic reaction is not giving the patient more red cells to hemolyze. You know, but when you come to the bedside, you can see what is the ABO type of the, of, of the unit, does the patient identification match that of the bag. Or if it's a platelet is it an ABO compatible unit?

You know, from the time you spike the unit until the time it has to be finished, administering is four hours. And so you have plenty of time to do some bedside checking, some clerical checking to make sure that you're not missing, as you say, a hemolytic reaction, which is bad, or septic reaction, which is bad as well.

But luckily both, very uncommon and much less common than febrile reaction. And that's even less common. And just seeing the patient's underlying disease kick off again, especially in a patient who has febrile neutropenia.

You know, I had the great honor of attending a special forces medic training session where the, the medics were put through their paces with simulated patients and they had a limited number of whole blood bags they could collect. And once they exhausted those bags, there weren't any other bags, or Coke bottles or milk bottles or anything

else that they could use. So you had to be really careful about when did you collect the unit and when did you start administering it?

And that got me to thinking that, you know, if this patient here is crashing in front of us, starts to develop a rash all over or some, some rigors that are not attributable to the underlying disease, if you could even tell that, why would you stop the transfusion? You need to carry on. If that patient's going to die in front of you, that's the key. You know, if they start to have throat closure and, and hypoxia and hypotension, okay. But if it looks like a mild reaction and that patient would be in real trouble without the transfusion, then that's our medical decision to carry on with it.

Joe: Got it. That's, I think that's an excellent point and I appreciate you making it, my friend. Thank you so much for hanging out with me, Mark. Good to have you back.

Mark Y: Joe. Congratulations again on this milestone episode. You're doing a great service to the transfusion community.

Joe: Thank you, sir.

****

Joe: *So I have to confess, when I first heard Mark talking about that, my first thought was, "um, gee, is Mark telling us to have people not stop transfusions at all?" And then I listened back to it and I was like, "oh, no, he's not saying that." So, so again, I think what Mark is saying is that clinical judgment can be used by people that are qualified to use that clinical judgment in the settings of evaluating fever during transfusion.*

I stand by what I said, that early in acute hemolytic transfusion reactions that they can be indistinguishable from benign febrile nonhemolytic reactions. So if you're going to do something like this, you have to be careful with it. But I understand his point that it is better to have someone survive due to the need, urgent need for the transfusion as opposed to withhold the transfusion in a scenario where, where the patient's at low risk. Again, that, that, there's a lot more we could talk about with that, but let's move on to another one of my favorite people in the whole world.

This next pearl is very special to me because this was recorded just a very short time before Dr. Connie Westhoff retired, excuse me, as the Executive Scientific Director of the Laboratory for Immunohematology and Genomics at the New York Blood Center and the National Center of Blood Group Genomics in Kansas City.

Connie is, boy, she's remarkable. She and I have developed a great friendship over the years and, well, I think the world of her and. I'm sure you'll be able to see that or hear that from this particular interview. So here's Dr. Connie Westhoff with her Pearl of Wisdom on Anti D.

Joe: Connie welcome back to Blood Bank Guy Essentials.

Connie: It's great to be here, Joe. I've missed talking to you.

Joe: It's been too long. In the interest of time, I want to give you all the time you can to talk about what you told me you were going to mention today, which is just crazy. I can't even believe what I've heard. So you have roughly five minutes to convince me, Connie, that all anti-D is not bad. Come on. Seriously? Let's hear it.

Connie: That's right. D has gotten a bad rap. Okay. Not all anti-D are clinically significant. Okay. So I want to say, not all anti-D are clinically significant, but all anti-D make us worry. Right? So it's all about the worry.

And the reason we avoid this many times is because of concern that it *could* be bad. Anti big K for example, no, we should be more worried potentially about anti big K or just as worried about big K, especially in pregnancy, you know, OB woman, because that causes severe, severe anemia. And oftentimes the D-titers don't get high enough to cross a placenta. So not all anti-D are bad in all situations.

And the other thing is not all D negative folks will make anti-D. I was certainly never taught that over 50 years ago that all D negative people won't make anti D. And in fact, the estimates were 75% or greater, but we've now realized that it may be less than 50% of folks.

Right? We've seen with giving platelets, D-positive platelets, less than 2% of folks given D-positive platelets who are D-negative actually make anti-D. So, I'm just trying to focus on the fact, anti-D is not necessarily the bad guy we think it is. But of course it's not something we want to encounter every day either.

So that's my pearl for your audience, is that everybody will make anti-D and not all of them are clinically significant

Joe: So, so let's dive into that a little bit, Connie, because we have a little bit of time left and I know there's something that's so near and dear to your heart that you and I have talked about before on this podcast. In fact, on one of the first episodes of this podcast, with D variants and the type of the type of D variant that's been called “partial D” and that we worry about, and I know that you, you and your lab have been responsible for really helping to define partial D and all the bazillions of different types.

So how does that fit in? Is the, is anti-D, because we know people with partial D are kind of partially characterized by the fact that they appear D-positive, but they make anti-D. Does that fit in with what you're talking about?

Connie: That's part of it, part of the picture also. So those antibodies that people who are partial D make; partial D just means you're missing some of the D epitopes. Okay. So you have some D epitopes and you don't have others. And so the ones you don't have, you could be immunized against. Some of the partial D folks have had hemolytic disease of the newborn, especially DVI, but many, you know, may not be clinically significant. But, but again, if a partial-D individual makes an anti-D, we're concerned about it.

And especially in pregnancy, we follow that pregnancy. It's expensive to follow that pregnancy. And most importantly, it's the concern of mom and her family that they may need an intervention. So I guess the idea to avoid any anti-D in pregnancy is to mainly

to avoid concern and expense of following that pregnancy. More so than being worried about having an affected child or a fatality or a morbidity or mortality.

Joe: Wow.

Connie: The problem with partial D is that, you know, serologically, we can't tell if it's just a weak D, in other words, you're not likely to have an immune response versus you're actually missing epitopes. So serology detects low levels as a weak, and also missing epitopes as a weak. So it looks the same in phenotyping.

So I always taught my students “the four D's of D.” It's “Dominant.” I mean, it's inherited as a dominant trait. It's “Diverse” at the genetic level. So it's all this genetic variation that makes typing for D the problem because there's so many variants in different populations. So we can't detect serologically exactly what genetic variant is there.

The third D is “Difficult.” So this makes it difficult, you know, of all blood types. Is it positive? Is it negative? Is it weak? Is it partial? You know. So that makes it D, difficult. And maybe D for “Dangerous.” Sometimes, but not always. So the last D is sometimes not always.

Joe: Yeah. I'm so glad you made that last point because that's, and it kind of comes back to what I think you were saying at the beginning. I've had a lot of conversations with residents over the years and with clinicians extraordinarily concerned about people making anti-D and again, we emphasize it so much. That's understandable. But what I have said, and you please correct me if you feel like I'm overstating this case, Connie, is that if someone forms an anti-D, it's not necessarily the end of the world.

I mean, even if they made an anti-D, and they came in in a trauma situation and they happened to get Rh-positive blood, the hemolysis that occurs when someone has anti-D is not typically, it's not like ABO-related hemolysis, right? It tends to be extravascular. It tends to be certainly milder than ABO. And while we would rather not have it, it's not necessarily a catastrophe when outside of the OB setting. Is that a fair way to put it Connie? Or am I being too aggressive?

Connie: That is absolutely the correct way to talk about it. And so this kind of brings me to this genotyping world we're in now. I have a lot of requests to genotype males, and I don't mean to disparage men, but we're not so concerned about the *RH* genotype of the guys as we are of childbearing women, et cetera. And there we should put our RH negative resources there, but not maybe, maybe the 70, 80, 90 year old male or even female should we be too concerned about giving D-positive blood. We need to conserve our D-negative resources. I want to conserve genotyping for OB situations. And anytime there's any question, and anytime anyone's going to be on long-term transfusion support, let's know their genotypes so we know what we're dealing with.

Joe: Right. I love that. That's awesome.

Connie: That's my pearl.

Joe: Connie, you are a giant, you're not just a friend, but you're a giant in our world of transfusion medicine. You have contributed so much and we will miss you. Thank you for everything you've done.

Connie: Well, that's so kind of you and I hope to still see all my transfusion medicine friends, even though I'm stepping away from the profession. Thank you, Joe, for having me.

Joe: That's awesome. My pleasure, Connie.

****

Joe: *She's just the best. I'm so honored to have had Connie on this episode.*

My next guest is Dr. Chris Tormey. He is another one of my favorites. Dr. Tormey is an associate professor in the Department of Laboratory Medicine at Yale University in New Haven, Connecticut. Chris has been on the podcast several times as well. Most recently, one of my favorite episodes, um, was, uh, came out in July, 2019. It's episode 074CE, called "Radioactive!" with Chris Tormey, where Chris talks about many of the indications for irradiation. And he takes that and translates it into a compact pearl for you today, so you can get a taste of what he talked about in the irradiation episode.

Again, if you'd like to hear it in more detail, go to BBGuy.org/074. So here's Dr. Chris Tormey.

Joe: Chris. Thanks so much for doing this buddy.

Chris: Oh, it's my pleasure. I'm happy to be back on the podcast with you, Joe. Always a pleasure. Excellent. So, some may remember that you and I had talked about ir radiation blood components on one of our, our previous chats and that's going to be my five minute pearl for today.

And I thought I'd lead off by asking the question, "**Why do we irradiate?**" And as listeners may be aware, we do that to really prevent transfusion-associated graft versus host disease. This is a uniformly or nearly uniformly fatal transfusion interaction in general, from a simplified perspective, donor T lymphocytes, generally CD4 and CD8 cells will in graft and wreak havoc on a recipient's tissues.

And one unique feature of this is that does impact the bone marrow in this setting. And then we don't have treatment for it. So of course the most reliable treatment is to prevent it from occurring.

So that really does raise the question as why we irradiate. And the radiation dose we give generally is going to inactivate the ability for those lymphocytes to proliferate and engraft.

Often people ask, "**how do we irradiate?**"

I think a lot of clinicians are shocked that we irradiate products. Um, so for listeners, they may be aware that, or hopefully they're learning today, that in the US there are actually several FDA-approved devices for this, but if you had to boil it down to one or

two platforms, generally, you're talking about either a gamma source, which is generally a cesium-137 source or an x-ray source.

And the ultimate goal, whether you're using gamma or x-ray is to get, at least in the US, a dose of 25 Gray to the center of the unit and a dose of 15 Gray to the peripheral aspects of the corners of the bag.

I think the last part I'll wrap up with is to really talk about **what do we irradiate?** What components, and maybe the most important question, the $50,000 question, who do we irradiate for?

So, uh, as a reminders to the listeners, we generally tend to irradiate cellular components that are going to contain those potentially dangerous T cells. That would include, and, and the most common, certainly product we irradiate here is red blood cells, but certainly platelets would be a product you'd want to irradiate if appropriate. Granulocytes, those are rarely given at my institution, but we would irradiate if necessary. And one thing that's always important to remember is that some institutions do use liquid, never frozen plasma, and there may be viable lymphocytes in that product. And it is generally recommended to irradiate that.

So those are the practical details, but I guess I mentioned earlier, the complexity and frankly, still the controversy is, **who should we be irradiating for?** And I think again, there are some really nice guidelines out there. There's a British Journal of Hematology guidance that I continually fall back on. It's just updated within the last year or so.

But again, to just make this a pearl, anybody who has a congenital severe T-cell immunodeficiency disorder, like SCID, severe combined immunodeficiency, or very young patients who do not have immune systems. And this would include those getting intrauterine transfusions. Some institutions irradiate even up to four months of age because of that delayed immune function.

Anytime you're getting a donation from a directed… what we call “directed donation” from a relative, where it could be HLA homogeneity, which puts you at risk for this, even if you're not immunosuppressed, we've come to learn in the field, we're going to be irradiating those products. Anytime we give an HLA or crossmatched platelet here because of the potential HLA overlap in homogeneity, we're going to be irradiating those products.

Anybody who's getting a stem cell transplant or a CAR-T therapy. That was one of the more up to date guidances that came out of that British Journal guidance that I talk about. Controversially, when you start, most institutions would say, when you're actually starting the myeloablative chemotherapy and then continuing that… sort of question mark! We irradiate for the rest of the patient's time with us. Some institutions don't do that.

And certainly there are certain medication classes, purine analogs, alemtuzumab used for hematology purposes, that you are almost always going to irradiate for those folks.

The generally not recommended categories tend to be things like solid organ transplant. There's really no data those folks are at risk because they're immunosuppression for

graft versus host disease. HIV. A lot of people think, "oh, that's a T-cell disease. Shouldn't we irradiate for it?" Well, CD8 component remains intact and we don't generally irradiate for those folks. And immunosuppressive therapies that are either mild or don't affect the T-cell lineage, so rituximab, corticosteroids do not require irradiation.

I think if you're on the fence about it, probably the best policy is to irradiate, if in doubt.

But that does lead into kind of the, just the final bullet point of my pearl today, which is, there are some downsides. Otherwise I think most blood banks would just irradiate their entire inventory.

And the biggest, uh, downside tends to be increased potassium leak into the unit, opposed to radiation. This can be very, very deleterious for small children, for infants, of course intrauterine transfusions, or folks with renal failure who are, who are potassium sensitive. So at my institution and this why we love our x-ray irradiator.

We try to irradiate right up to the point at the time we're going to issue the product rather than pre-irradiating units that could accumulate. Also from practical standpoint, as soon as you irradiate a red cell, it's fresh. That unit now adopts a 28 day expiration. So again, that's a practical limitation for many US-based blood banks.

I will say internationally, Joe, there are a lot of facilities that do irradiate their entire inventory, where there's a lot of HLA homogeneity in their recipient population. The last thing I'll say is there's some evidence that there is some damage, some oxidative damage that occurs to red cells in particular, but no one really think that's of clinical significance at this point in time.

So it was a bit of a whirlwind Joe, but hopefully that was a useful, you know, just about five minute pearl on why we irradiate, who we should be irradiating for, and some of the potential pitfalls of irradiation

Joe: Well at, at risk of keeping you for just a couple more seconds, Chris, I think there's a couple questions that popped up in my head as you were talking.

So let, let's put these to bed really fast. I've heard a lot of people say in the midst of the pandemic, is that dose of irradiation enough to sterilize the unit to prevent COVID transmission or further I've had people ask, Hey, is the irradiator you use, can we use that to sterilize our, our PPE? How many times have I heard that?

What's your answer to that?

Chris: Yeah, that's a great question, Joe. It comes up all the time here at my institution as well. Where people think we're doing irradiation to kill organisms. We just don't, don't simply use a high enough dose for that.

Joe: Yeah.

Chris: Um, again, this is a fairly delicate dose. That's really meant to damage DNA, but it's really not going to be enough to kill COVID or kill anything that might be an end. We don't think COVID is spread by transfusion anyway. In reality, it really is to, to inhibit lymphocyte proliferation.

Joe: And the last one is how and people confuse this all the time. And you mentioned granulocytes are not used that often anymore. How come you can irradiate granulocytes? Doesn't that kill their function?

Chris: It, you know, Joe, it's a great question. It's really about proliferation, not so much about function. And those, those little guys only live for about 24 hours anyway. So we don't think it affects the oxidative burst or the phagocytic capacities of those units. And again, like the goal there is to irradiate the lymphocytes, which are going to be potentially long lived and mediate that awful graft versus host disease.

Joe: You are the man, Chris. Awesome pearl. Thanks so much, buddy.

Chris: My pleasure. Always again, always a pleasure to talk to you about the, any blood bank subject.

****

Joe: *All right. Last but not least is my friend Dr. Nancy Dunbar. Nancy is the Medical Director of the Blood Bank at Dartmouth-Hitchcock Medical Center in Lebanon, NH. She is also an Associate Professor of Pathology and Laboratory Medicine at Dartmouth.*

*Wow, you talk about somebody who has made a very great name for herself in transfusion medicine, that is Nancy. She has done so many different things in so many different areas, in research with the BEST collaborative, in terms of helping to edit the American Society for Apheresis guidelines for therapeutic apheresis***.**

Just an enormous array of things that Nancy has done. And she also has a very practical approach to dealing with things in transfusion medicine, so I'm very excited for you to hear this pearl from Dr. Nancy Dunbar.

Joe: Nancy, you're back. It's so good to have you.

Nancy: It's so great to be here. Thank you for inviting me.

Joe: There's just a million things that we could have you give your pearl on, but I'm just super-excited to hear what you're going to give us today. So fire away, Nancy, what's your pearl?

Nancy: Yeah, so my pearl is really very high level. It's something I've learned over my experience in transfusion medicine. That really, what we do is very nuanced. And I think when you start in transfusion medicine, it's easy to think about things in a very black and white way, but over time, as you learn more, you begin to appreciate that it's not black and white.

A case in point is thinking about transfusion reactions. And, you know, when you might want to culture a transfusion reaction to detect a septic transfusion reaction. When I was coming up, you thought about like, you know, we really want to culture, you know, transfusion reactions. We don't want to miss one.

And there's a lot of variability in practice. A couple years ago, we studied centers, practices, and some places culture every transfusion reaction and some places culture none. And how do you decide and what criteria do you apply? Even during the time we've been setting this things have changed a lot, right?

The risk of a contaminated product was never high. And as we've introduced pathogen reduction and now the large volume delayed sampling where we're holding platelets for 48 hours, the cultures, before we dispense the units. The risk is really, really negligible. Right? So you're looking for a needle in a haystack.

And how does that inform how you think about when you might want to pull the trigger around culturing? It's a much more nuanced, I think, than it might seem at first blush.

Joe: What's the strategy that you guys have done and how has that changed maybe recently?

Nancy: So initially when I first started work in this area, I wanted to figure out like, what would be good criteria to teach a resident, like this is when you really need to think about, you know, when you should culture and looking at centers that had detected contamination and what were the symptoms, the signs and symptoms that the patient experienced, and how did those compare to, you know, what is recommended? Numerous entities have provided recommendations. AABB has recommendations, other centers, but, you know, how does that compare with actually getting a positive culture?

We did put together some criteria that seems to correlate with getting a positive result. And those were the BEST criteria that we published a few years ago now.

But what I learned and having a microbiologist on the project was really helpful that just because it's positive doesn't mean it's real, right? Especially when you're dealing with something that's low prevalence, right? And we know, when we think back to distantly rotating through micro, that we can introduce bacteria ourselves in the culturing process. That's a false positive, right?

And so when you're looking at reactions that are quote unquote positive in something that's low prevalence, the odds of actually getting a false positive by introducing bacteria are actually pretty high. So you need to think about not just getting a positive result, but getting one that's real, right? One that actually is real. And, and not just real in the sense that there are bugs in the bag, but real in the sense that it was clinically significant to the patient.

That's what you don't want to miss- something that, that kills someone where you can interdict if there's another product out there, or something that's bad and might have implications for the donor. We're all transiently bacteremic at times, we know that when we brush our teeth, for example, is that harmful to recipients?

I would hazard, I guess, mostly not, in hospitalized patients. So finding that sweet spot where you're using the tools that you have to make a meaningful difference in the care of the patient or the donor is the holy grail. And that's what I've really been seeking.

Joe: So what practically do you do?

Nancy: Yeah. So it gets back to this like black and white versus nuance, right? Like if you publish criteria and you say, you know, culture, every time a fever of 39 is achieved, 39 Celsius, right, that's very black and white thinking but it's more nuanced than that, right? It's what happens after that 39. Do they check it again 15 minutes later and it's back to baseline? Was that even real?

So understanding sort of how the patient evolves and how sick they are versus whether, you know, this is something that they've been doing even before the transfusion started.

They have neutropenic fevers. They've been spiking fevers every 12 hours consistently. This isn't new for them. Checking in with the clinical team. How worried are they about sepsis? Do they want to culture the patient? Because I can tell you if they're not going to culture the patient, what's the point of culturing the bag, right?

How does that information really inform whether that was truly from the unit or something you introduced in the process? So it gets a little bit more complicated and I've really come to thinking about it, more like an art than a science, right? You have to talk to people. You have to think about how the patient's doing.

You can't just sample a moment in time and make a decision, but you have to kind of see how a situation evolve evolves and engage your clinical colleagues. And there are situations where I do culture, but there, there are very few and far between now that we're taking a more nuanced approach.

So we find now that people are calling us much more frequently when they encounter fevers during transfusion to just be sure whether we want to stop or not. I really appreciate that dialogue. I think it's, it's nice, that nurses feel they can contact us when they say things like, "Well, the patient's been having fevers all along. Do I really want to stop this, because I know this resource is precious…" And I think that's where you get back to the nuance, right? Not black and white, although we've always trained nurses: If you have a fever, stop the transfusion.

I think that's, you know, if you have a fever, think about stopping the transfusion and reach out to people like us, who might be able to make a decision that both thinks about the patient, but also thinks about the larger sort of inventory, which has been very strange during the pandemic.

Joe: Well, that's awesome. Nancy, thank you so much for that. I really appreciate you hanging out with me for a little bit.

Nancy: Yeah. So great to be here and congratulations on your hundredth episode.

****

Joe: Hey everybody, it's Joe. You wouldn't think I had a whole lot more to say after a long episode like that with all those guests, and I don't have a whole lot other than just to remind you first that if you're a physician or laboratorian, don't forget to go to wileyhealthlearning.com/transfusionnews to get your hour of completely and totally free continuing education. You can also get there by clicking the link at BBGuy.org/100. As

always, thank you for the continuing education sponsorship to Transfusion News, to Bio-Rad who brings you Transfusion News, as well as of course, to Wiley Health Learning.

One last thing: Go to Apple Podcasts, give this podcast a rating, give it a review and subscribe. All that gets it in front of more people so that more people can learn. And that's really what all I'm trying to do. Just to remind you of that fact.

We are in 2023. My hope is that you're going to continue to hear from me regularly, if life allows it. That is absolutely the plan. So I hope you'll join me for multiple future episodes. I've got some great interviews coming up. I've already done a few for this year and I'm looking forward to doing even more and sharing all the learning with you.

So I can't wait for you to be with me for that, but, until we get together again, my friends, I hope that you smile, have fun, tell the ones that you love just how much you do, and above all, never, ever stop learning. Thank you so much for listening. I will catch you next time on the Blood Bank Guy Essentials Podcast.