

Hemodynamic Ultrasound Use: Trauma Program Perspective

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In collaboration with Joe Hage and the LinkedIn Medical Devices Group

Tracy: We're talking about hemodynamic ultrasound. Just a little bit about our Hospital. We're a 535-bed hospital. We're located in the middle of Georgia. We're one of five level one trauma centers in the state. Last year, we saw thirty-six hundred trauma patients. Dr. Ashley talked a little bit about what hemodynamic ultrasound actually is and he gave us a few cases to look at, what its practical application at the bedside is, patient by patient.

Objectives: What I'm going to talk about is a little bit about what I've seen as a program manager with the ultrasound and how it's reduced the number of CRRT days by better management of our fluid status. Also, what we've seen with organ donation and patient management there and also, how it's coming around to help us in PRI in trending on a bigger way with our patients.

Trauma Program Manager: I'm a program manager, so I think trauma program managers and really PI coordinators to a certain extent are hall monitors. We're looking at this population, they're coming and going, and we're really focused on two things, process, and outcomes. We're getting a lot of that from listening to the TQIP talks and finding out about these outcomes, where we should be, where we are.

One of the complications that we all follow is AKI. So, as I'm looking at the data, I've noticed a couple of trends in the last couple years. Number one, our trauma volume has increased. This has happened to a lot of Georgia hospitals. We've seen an 8 to 10 percent increase in our trauma patient volume over the last three years. But also, we have seen the AKI rate trend down since 2012 and the CRRT use. How can that be?

So, I'm thinking, well what's going on? I hear them talking about this hTEE or the hemodynamic ultrasound so I'm thinking how does this affect it? Well, we had a study that was conducted. What they planned to do was say, "CRRT use, how does it affect it"? So they looked at patients and matched them before and after using hTEE... So, the patients were looked at from 2009 to 2015 at our trauma center and they were all admitted to the ICU.

Impact on CRRT Use Findings-Slide #1: In this graph, that we're looking at is eight years represented by a blue bar. The number of patients that did not receive CRRT is in blue and the number is at the bottom of the bar. The number at the top of the bar is a number of trauma patients that received CRRT. That could be anywhere from one day to sometimes as many as 30 days. You've got the orange line that showing you before and after hTEE use.

But what's really impressive to me is this grey line. That's the percentage of patients. So even though the numbers might be going up a little bit in the after group, that was 15 patients, there's 24 before, but it's really a much lower percentage because our volume is higher, our denominator is higher, and also our number has dropped. So as a trauma program manager, I'm excited to see

this kind of trend, because I'm thinking well CRRT to me and my head it goes along with AKI and that means good there are fewer complications of AKI. Our STICU director, our trauma ICU nurse manager likes this because she does not like to see a lot of CRRT use because to her that messes her staffing up because our CRRT patients have to be one-on-one. When you start doing that and you're already tight on your staffing you know you're scrambling to look for more staffing. This is really exciting to her but in a different way.

Impact on CRRT Use Findings-Slide #2: I'm going to skip. Well, I'll show you this slide. Notice 0.5% of our patients were getting CRRT. Afterwards, 0.2% of our patients are getting CRRT, which is a pretty big difference. We've dropped almost 30% in the number. It's a two-fold decrease in the patients that are getting to the point they have to have CRRT, which is a good thing all around because you're looking at the length of stay, ICU length of stay, costs, staffing, it's a lot of stuff. It's a good trend to see.

Trauma Outcomes: Impact. So as the program manager you've got the research study conclusions and, this is the way I look at it, well, our faculty staffing was stable during this time, we really didn't have any population changes, except for the one I mentioned, where our volume has gone up, and with that our ISS force are trending up. But also, the only practice change I could think about, well, we did start MTP and that was about the same time that we started using hTEE.

So is there some influence there on this study? Who knows? But, we didn't know from this study, that there was a very strong association. You can't say cause and effect because there are a lot of variables that can contribute to AKI and CRRT use, but there was a very strong association. We saw a big drop in the CRRT use as we started using hemodynamic ultrasound on a more regular basis. I put the AKI in there because when I think CRRT, I'm thinking AKI, and I'm thinking TQIP. Where am I on the graph?

But, we talked about MTP so did that have some influence on the study? Well, one of them, the ICU director co-director, Dr. Amy Christie, wanted to take a look at this. What she said, "Its patient resuscitation of volume status, how is that influenced by MTP?"

Hemodynamic Ultrasound & MTP: So, she looked at some patients who came in with a hemorrhagic shock from either blunt or penetrating trauma, they received MTP, they're eating, DISPO was to ICU, and she used some metrics that Doctor Ashley was mentioning, as far as, the kissing part, whether it was the Superior Vena Cava or the left ventricle, they named some numbers, and said you're at this or below then you're under resuscitated.

So, what we found, we did not have a lot of patients, but what we found is 10 out of 12 of these patients were under resuscitated, which was really kind of surprising, because you're thinking blood products stay in the intravascular system a lot better, so you're thinking, that's a much better volume resuscitation. But we still were not meeting the grade.

And then also, 5 out of 12 of those patients had a pretty significant secondary volume status change. So as Dr. Ashley had mentioned, in one of his patients, sometimes they're changing

you've got that hTEE probe there then you can say okay what's going on and, then also, do I need to rescan or consider something else that's going on with the patient.

So in conclusion, what we found out is that MTP with the MTP under resuscitation was not uncommon. So, okay, my trauma program hall monitoring says, "I need to look at MTP a little bit closer but that hTEE did help us identify changes quickly or look at what was going on and, also, for me, it kind of settled in my mind that MTP probably did not have a significant influence on our CRRT study, because we were under resuscitating so it's not going to be that significant of an influence.

Optimizing Organ Management: So, another way that we've used hemodynamic ultrasound and looked at it is optimizing organ management. In our patients, in our hospital, when a patient is identified as an organ donor they've consented and most of the ones that we deal with in trauma or from traumatic brain injury, the organ procurement agency, which in Georgia is Life Link of Georgia, they take over management of the patient. So from the time of brain death to procurement, Life Link is managing that patient. Their primary objective is organ optimization, which is a nice word, but in Ashley's language, you've got happy juicy organs.

So, you want happy juicy organs to transplant to the people who need them. So, what we did, we looked at taking hemodynamic ultrasound and thought, well, how is it that the management and the organs as far as the number of organs and the numbers that can be transplanted.

So we looked at patients 18 years old or older that had been declared brain-dead and we got 10 consented donors, that's a pretty small number. But in these donors, what we did is at the time of brain death, we started to do serial hTEE measurements. So with the hemodynamic ultrasound, we're looking at their volume every 5 hours from the time of brain death until the time they went for organ donation or procurement.

Then we took a group of patients and we matched those consented donors that got the hemodynamic ultrasound and we matched them for injury and age to do a comparison to see the outcomes and how they compared. This is what we found. You can see the hTEE group on the left column. The right is the control group. You see the mechanism of entry pretty much matched; age, male/female. What is really impressive in and pretty shocking but, basic pressor use went down 80%. Also, the organ donation, per donor, went up, 4.1 to 3.8, which doesn't sound like a lot but it is 8%. It's trending favorably and that's only in 10 patients.

So, it really gives you some hope in a way of better managing your organ donors. As a trauma program manager, I am interested in the number of organs recovered and also organs transplanted. Part of that is also because I'm on our organ donation team. So when we are surveyed by CMS or DMV I'm part of that work that talks to them and those are two numbers that they're really looking at and they're looking at them hard. That really is a good thing too and so when they ask well what are you doing I can whip out the study, this is what we're doing we're looking at that.

So, we've seen the hemodynamic ultrasound and, as far as volume status, managing, in its affected the AKI, how much we evaluated our MTP, also organ management.

My Take on hTEE Bedside Use: So, what does this mean to me? Okay, so I'm going to put on my hTEE hall monitor trauma program hat, it's a party hat, because we all know being a program manager is a big party. Sometimes we want to shoot ourselves before the party and sometimes it's after, but, you know. So we put on our hat and, really, I'm seeing this as a team effort, it's been pretty effective, and it's influenced a lot of things, as far as, my trauma population.

My API rate has been flat, observed as expected, around 1 to 1.1%, observe to expected, over two years, that's with increased volume and increase ISS, which really is pretty good. This also plays into the fact we've got the Georgia collaborative. We played very well together in the same box.

We are taking a look at a statewide manner at AKI. We run our data - all 15 level one and two centers - pool their data, and it is run as one. So that way we have a state benchmark. We look at, as a state, where we have an opportunity for improvement. And one of the places we've identified, too, that and we're looking at AKI.

So, here this is kind of playing into with the hemodynamic ultrasound. I'm kind of seeing flat but we've got other centers that are seeing positive and negatives. So, this might be something they can play into the treatment or best practice for API, we don't know yet, but we're looking into it.

So, it is an opportunity for recruitment for the trauma hospitals. All 15 level one & two trauma centers have done a deep dive to look at one year of their AKI patients. We looked at a lot of stuff. But also, on the NSQIP side AKI has been identified as an outlier and an opportunity for improvement. So we're trying to work together and because they also are surgery patients and we're looking at this together to see, are there similarities where we can share best practice for things to prevent AKI from happening. So, it really helps in our collaborative efforts.

So keeping my hall monitor party hat on, the other things I'm seeing, is my hospital and ICU length of stay is staying flat. It's right at the median for both reports 2016, 2017 in ICU and the hospital. Is this all from hemodynamic monitoring? No, but I think it surely has helped it, especially with cutting down on my CRRT days.

Also, we've got approved organ donation management. And that is something that column 2 looks at. It's also something that CMS looks at and it's also something that DMV looks at over Joint Commission, whoever surveys you.

So, at the bedside, Dr. Ashley's looking at hemodynamic ultrasound on a patient-by-patient basis. They want to manage it well. They want to get the patient better and get them on their way. I'm looking in a population manner, the hall monitor. I'm looking at outcomes. And I've seen it touch a lot of different things that I have to monitor and I've seen some really positive outcomes.

So, I really feel like we've got a pretty big bang for our buck out of the ultrasound, hemodynamic ultrasound. I'm actually pretty happy because it's done things for me and let me concentrate on other areas or show me other areas where I need to concentrate on. And I thank you very much.