

# BETWEEN TWO VENTRICLES: The Power of Nutrition in Heart Failure Management

## Featuring:

Phil Adamson, MD, MSc, FACC

Peter McCullough, MD, MPH

## TRANSCRIPT

**Maura Bowen:** Hello, listeners, and welcome to Abbott Nutrition Health Institute's Power of Nutrition Podcast. I'm Maura Bowen, and I'm here today mostly to make an important introduction. That's because the episode you're about to enjoy was created by our Heart Failure colleagues in Abbott's Cardiovascular division. That team has created a fantastic series on topics related to heart failure and heart health, and today, they'd like to talk about nutrition.

In this episode, hosted by Abbott's own Dr Phil Adamson, and featuring Dr Peter McCullough, Vice Chief of Medicine at Baylor University Medical Center in Dallas, Texas, these two heart experts discuss the critical role nutrition interventions can play in improving outcomes for individuals with heart failure. It's a great conversation. We think you'll find it to be helpful. And we hope you'll stick around when the discussion has ended so we can tell you where to find more information related to this important topic.

Without further ado, we're pleased to present this episode of BETWEEN TWO VENTRICLES, called "The Power of Nutrition in Heart Failure Management." Enjoy!

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**Dr. Adamson:** Welcome to Between Two Ventricles. I'm your host, Dr. Phil Adamson and our guest today is Dr. Peter McCullough, who is professor of medicine at the Dallas campus of the Texas A&M College of Medicine. Dr. McCullough is the founder and current president of the Cardio Renal Society of America. And this organization brings cardiologists and nephrologists together to work on the emerging problem of co-morbid cardiac and renal disease. He's the editor in chief of *Cardiorenal Medicine*, *Reviews in Cardiovascular Medicine*, and a senior associate editor of the *American Journal of Cardiology*. He served as a member or chair of data safety monitoring boards for 24 randomized clinical trials. In addition, Dr. McCullough is a leader in the medical response to severe COVID-19 syndromes having produced 35 peer reviewed publications concerning COVID since the pandemic began. Additionally, Dr. McCullough testified to the U.S. Senate committee on Homeland Security and governmental affairs concerning early ambulatory treatment of high-risk patients with COVID-19. Dr. McCullough has a special interest in the intersection between heart and kidney disease and the role nutrition has in comprehensive care of patients with multiple comorbidities. Today we'll visit specifically about how nutrition, malnutrition, and heart failure interact. Dr. McCullough, welcome and thank you for joining me on Between Two Ventricles.

**Dr. McCullough:** Well, thanks for having me on the program.

**Dr. Adamson:** I want to admit that it turns out that my medical education did not spend a lot of time, honestly, in the nutritional aspects of medical care. And maybe that week in CoreSite took vacation on because it just was not much of my curriculum. How did you become interested in the nutritional aspects of medical care?

**Dr. McCullough:** It became obvious to me that we were really reaching the limits of what we can do with medical therapy in so many conditions, particularly patients with heart failure. And I was struck by some of the emerging sources of data to suggest simple indicators like serum albumin were so tightly related to mortality.

**Dr. Adamson:** So, you look at serum albumin, but what are some of the other diagnostic techniques of identifying malnutrition in a clinical scenario?

**Dr. McCullough:** Well, one of the things I had learned by working with patients who have had bariatric surgery, where they're in a sense they're nutritionally starved of calories and in a catabolic state is to really focus on the prealbumin otherwise known as transthyretin. And so what I learned is that the prealbumin is a leading indicator ahead of albumin in terms of patients who are tipping from anabolic to catabolic in terms of their metabolism. In heart failure, we have all kinds of counterregulatory hormones that are increased and these are maladaptive changes. Ultimately they work against the patient in terms of specifically losing muscle mass and losing muscle mass to the expense of preserving fat mass in patients.

So it's quite deceptive. We can have an overweight or obese patient who's losing muscle mass. And if this effect is catabolic and developing what we call cardiac cachexia right in front of us. So diagnostic techniques that use whole body densitometry or could use forms of bioimpedance to give us an idea of lean mass, which is really the indicator that we're after, and understand changes in lean mass over time. Additionally, some have attempted to use CT or other radiographic forms of imaging. So the biomarkers and imaging can be used together to give the clinician and the nutrition specialist an idea. Is a patient going in the right direction? Are they holding their own? Or are they getting worse?

**Dr. Adamson:** Well, weight changes in patients with heart failure can be quite problematic given the constant battle of congestion and excess volume retention. How do you integrate the historical fact that a patient may have lost a significant amount of body weight in the last say six months and in your nutritional assessment?

**Dr. McCullough:** You're right. Body weight's deceptive because it integrates everything including body water, excesses of sodium and free water, as well as lean in fat mass. And so a day to day indicator of a two or three pounds is probably above the variation in normal. So we always instruct patients to weigh themselves. And in fact, if they've had a rapid change in weight up, it usually means water weight, but over the long-term, over the long-term, we look for changes in body weight. That's really a percent of the total over the long-term. And what we need to know there is about a 5% change in body weight over the long-term. Let's say 200 pound person losing 10 pounds is an indicator, a fundamental indicator, that it's more than just edema that's going on. And then progressively greater amounts of weight, in general, indicate in a patient with heart

failure, who's not intentionally doing this, in generally indicate losses of lean mass. So as a general rule, if the patients lose weight, they're losing about 75% of its muscle and 25% of its fat.

**Dr. Adamson:** Wow. In terms of your practice, are there somewhat easy screening tools to integrate into an evaluation of nutrition, sort of on a regular basis?

**Dr. McCullough:** We're very lab based. And of course we're busy in practice and moving quickly. So I like to see the albumin, the prealbumin, BUN and creatinine, and electrolytes. In heart failure, I'm very clued into the FDA cleared biomarkers for heart failure prognosis, and they include galectin-3, blood B type metric peptide, or N-terminal-proBNP SD 2 or suppressor of tumor Genesee 2. It's really a cardiac biomarker, not a cancer biomarker. And then high sensitivity [inaudible 00:05:30]. And we can integrate all of these and really get a sense of where a patient is prognostically and probably the leading one. They indicate different things. The BNP is largely indicating left ventricular wall tension and minute to minute volume status. Although it's possible to normalize the BNP with good management, in about 25% of cases the galectin-3 is the leading measure of what we consider fibrosis or pathogenic fibrosis. If that's [inaudible 00:05:56] in the heart and elsewhere. And that doesn't change very much, it's not very dynamic.

SD 2 is an indicator of biomechanical strain. Patients seem to respond better to certain drugs, including beta blockers. And then the cardiac high sensitivity [inaudible 00:06:08] is really in a sense, an indicator of cardiomyocyte turnover. We know that the body is additionally sensitive to certain micronutrients. So in heart failure, we measure iron studies, total serum, iron ferritin, and the total iron binding capacity, iron saturation. We know there that patients can benefit if they're iron deficient, even if they're not anemic, with supplemental iron. We also take a careful look at folate and B12 because in the exaggerated circumstances, those patients can have a worsened myocardial function as well as a musculoskeletal function. And then beyond that, it really has to do with the specific inferences. You know, we have exciting data with, in a sense, medical nutrition or nutrition supplemental therapy, including beta-hydroxymethylbutyrate that in fact patients can improve, skeletal muscle mass can improve.

And we have a belief that if nutrition is optimized, if the patient's muscle mass and state of their overall metabolism is optimized, they're less likely to succumb to a complication. So it may not change the natural history of disease, but these complications are big. For example, a heart failure patient who has an aborted cardiac arrest, let's say they have ventricular tachycardia and they collapse, and their ICD goes off. Who's going to live or die after that event and potentially an aspiration is really going to depend on their cardiopulmonary fitness and their metabolic status. But superimposed influenza, pneumococcal pneumonia, urogenital infections, abdominal issues like acute cold cystitis. So the term we've used is called survival of the fittest. That in any chronic disease, the real issue is to survive and to survive one has to have the greatest degree of fitness. And the two major determinants of fitness are the exercise or the musculoskeletal cardiopulmonary and strength element to it and nutrition.

**Dr. Adamson:** Well we've talked about cardiomyocytes and cardiac metabolism a little bit, but I'd like to go a little more into that. I think we all know that the heart has the ability to change its preferred metabolic substrate under stress or under other certain circumstances. What are your thoughts about ketones as a substrate for energetics in the myocardium and how does that play in a clinical management of patients with heart failure?

**Dr. McCullough:** It's an emerging science, that's for sure. The three fuels to the heart are fatty acids, glucose, and ketones, really in that order. So the heart muscle, we know, relies in general in the normal state. About 80% of the fuel mix is fatty acids, probably about 18% is glucose, and 2% is ketones. Those are just rough numbers. It's just the opposite by the way, for skeletal muscles, which is a much greater reliance on glucose as a fuel source.

But as the heart becomes diseased, it preferentially has a greater reliance on glucose. We know this from studies of hibernating myocardium, using nuclear techniques that use FDG PET or measuring fluorodeoxyglucose or tagged glucose. And that in the setting of heart failure, there may be an opportunity to, instead of have glucose be the fuel source to actually rely on ketones. And we know this from studies of SGLT2 inhibitors, new diabetes drugs, that tip the body a bit towards the ketotic state and from a very low level, they triple circulating levels of ketones. And of interest, these drugs are related to overall reductions in body weight, but improvement in heart failure outcomes.

So, I'm not ready to say that we want to intentionally create a ketotic state, but these points are made to have the listeners understand that the metabolic substrates that the heart is relying on in some way are related to outcomes.

**Dr. Adamson:** I think it's a pretty fascinating area, quite frankly. And you know, we've seen or heard of anecdotes at least of patients with pretty significant left ventricular dysfunction improving with a ketogenic diet. So I think it'll be fascinating to see what we learn in the next few years as measurement techniques improve and we're able to sort of see what longer term trends are with ketones, both circulating in the interstitium.

So malnutrition in patients with heart failure leads to bad outcomes, obviously. Increased risk of mortality and complications. How prevalent do you think malnutrition is in patients with heart failure?

**Dr. McCullough:** I'd say easily 30% of those are hospitalized. It could be closer to 50%. And again, these patients are intensively examined. They have lots of laboratory panels and that's where the data on albumin and prealbumin has come forward. I think it's much trickier in the office. And I think that's where the deceptive patient is, where it's difficult to assess their home environment, food frequency questionnaires, dietary assessments, all of these can round out the understanding. But I think there is a fraction of patients who really are nutritionally deplete at home, and they could really be improved with, in a sense, nutrition as a therapy

**Dr. Adamson:** And, you know, given the dramatic effect on outcomes, I think this is an area that I think we all should be much more aware of and sensitive to in normal practice of medicine. Is, do you agree with that?

**Dr. McCullough:** I agree. And I think we have to start by making some measurements. So, I have, I'm very laboratory based because that's what I have available to me, but I've been interested in some technologies. One we featured at the Cardio Renal Society of American meetings for several years now is in a sense of complex bioimpedance measure. We can get fat mass, we can assess the water mass, muscle mass, and we can get relationships. For instance, intracellular body water to extracellular body water. And there are some nomographic outputs to give an idea if a patient is within ranges.

And there's been some recent data from Zoccali in Italy, in patients on hemodialysis showing if you use this type of technology and some type of algorithmic approach, patients can be more optimally managed and improve mortality. Some of the management is along the lines of fluid and water balance. In the case of Zoccali it's with dialysis and heart failures with the use of diuretics. But when there really are signs and signals that the patient is nutritionally deplete, they're catabolic, they're losing muscle mass, We have very good data that in fact, supplementing there, intentionally supplementing to not only preserve muscle mass but to improve muscle mass, is associated with improved mortality.

**Dr. Adamson:** Well that's a very important area. I mean, it's great to know about the diagnosis and how to get there, but then what do you do about it? And you mentioned supplements. How do you deal with an individual at home, ambulatory heart failure patient, who is clearly malnourished and catabolic? How do you approach that patient therapeutically?

**Dr. McCullough:** One of the greatest challenges. As patients get sicker, their tolerance or their inclination to eat high quality sources of protein really drops. And they really gravitate towards comfort foods, which are largely sugars and starches. And so the prioritization in my view is always high quality sources of protein and then fresh fruits and vegetables, and really trying to minimize the three S's, sugars, starches and saturated fats, as a general rule. And that type of approach is good for coronary heart disease. It's good for diabetes. It's good for weight reduction. But in the setting of heart failure, it's just the opposite. Patients tend to gravitate to the sugars and starches, and they just don't have an appetite for sources of protein.

So here is where protein supplementation in the form of medical nutrition. ~~Ensure Enlive is considered the top of the line product on the market. There are others that are utilized, but~~ Here patients can get a balanced source of protein, add relatively little GI expenditure, if you will. Usually these are small volumes. They're not terribly filling. They're nutritious enough or attractive enough where patients can work them into their intake per day. If anything, these supplements help a little bit with diuresis and that's a clinical observation. Many have worried [inaudible 00:14:08] you have a patient drinks a nutritional supplement that that's going to fluid overload them. It's just the opposite. When patients take these supplements, they become easier to manage with respect to diuretics.

**Dr. Adamson:** And tell me about micronutrients.

**Dr. McCullough:** Well, micronutrients are things that are not protein, fat, or carbohydrate. And the micronutrients are in a sense everything else. So, they include essential minerals. They include essential vitamins and there may be familiar to the audience. They go along these different lines of vitamins are water-soluble and the fat soluble vitamins, but let's kind of break it down, the minerals.

The most abundant mineral in the body is iron. So iron is number one, the biggest source of iron in the bodies of circulating red blood cells. Number two is the heart. Myoglobin is an iron containing protein and our body needs it. And we have a requirement for iron cause we're always shedding iron through the GI tract. But other ones related to heart function include a selenium, zinc. All of these are necessary and copper and any of these engross deficiencies can be related to heart failure. Additionally, there are some patients who just genetically don't handle these as well. And so they're prone to heart failure. So, there are clearly those individuals who are responsive to selenium, as an example.

So, in my heart failure package to patients in terms of drugs, I always have a package of micronutrients that, where there's some evidence-base behind this, the vitamins C, water-soluble vitamins, would include vitamin C the B vitamins. As an example, fat-soluble vitamins would be vitamins A, E, D, and K. And those we want to make sure patients are replete on.

We know an exaggerated case, for instance, B12 deficiency can precipitate heart failure. In the exaggerated case, we know that a folate deficiency works to impair what's called remethylation of proteins, and that can tend the body towards oxidative stress and forms of anemia. It's interesting that many of these deficiencies are also related to anemia itself. It worsens heart failure. So, there's really quite a complex relationship between micronutrients and myocardial function and skeletal muscle in a sense between the ventricles.

**Dr. Adamson:** Absolutely. We'll shift just a second here to the obesity paradox. What's your interpretation, what's your view of the obesity paradox in patients with heart failure?

**Dr. McCullough:** The obesity paradox, and this has been shown in other conditions besides heart failure, it's been shown in cancer and end-stage renal disease, is interesting. So, the body mass index, is the weight in kilogram divided by the height in metered square, has a U shaped relationship to outcomes. So, at the very low end, at a body mass index below 18 in almost every disease state is related to a high, higher mortality. It really means someone is cachectic that they're underweight and they're weak, and they have relatively little resilience. This has been shown in multiple studies.

There's a sweet spot where let's say a body mass index of 25 or so declared normal that would have an optimum mortality.

And then at the higher levels of body mass index, again, mortality goes up, but goes up for different reasons. It goes up because obesity predisposes to all these complications such as diabetes, sleep apnea syndrome, neurohormonal activation, venous thromboembolism, myocardial infarction, stroke, atrial fibrillation. So, the U shape relationship between obesity and outcomes, it's true. Both ends of the U there's higher mortality, but the way the patient gets to the higher mortality is different.

**Dr. Adamson:** Well that's a fascinating area and certainly I've learned a lot in our time here. I have a segment of the podcast called The Squeeze, which is, I think kind of fun. You know, it's kind of like when we're in the unit or running a code, you know, there's questions being asked that have to be answered quickly and succinctly. So, I'm going to give you a series of questions that I'd like your just top of the head first answer in a very short period of time. So, you ready?

**Dr. McCullough:** I'm ready.

**Dr. Adamson:** All right, here we go. So, number one. So how often do you evaluate nutritional status in patients with cardiovascular disease?

**Dr. McCullough:** Inpatient at least every other day. Outpatient serious cases once a month, stable cases once every three months.

**Dr. Adamson:** What's your first nutritional intervention for malnourished patients?

**Dr. McCullough:** Protein supplementation.

**Dr. Adamson:** And how often do you find patients with morbid obesity to be malnourished?

**Dr. McCullough:** 30%.

**Dr. Adamson:** 30%. Wow. So, what's the most important underlying pathophysiologic mechanism of malnutrition?

**Dr. McCullough:** It's maladaptive elevation of cytokines and cell signaling factors that cause skeletal myocytes and adipocytes to behave in a abnormal fashion.

**Dr. Adamson:** That's awesome. Because it goes into the next one. To what extent does inflammation play a role in the badness of malnutrition?

**Dr. McCullough:** Inflammation, as a broad term indicating maladaptive cell signaling cytokines and other factors, what we call metabolomic factors, is overwhelmingly a very large player. More so than hemodynamics and more so than neurohormonal factors. What we're talking about here is that's probably the major player that is driving this malnutrition. It's malnutrition in patients where there's enough calories in the environment. There's enough food in the pantry, but it's an internal malnutrition.

**Dr. Adamson:** What's your favorite restaurant in the Dallas Fort Worth area?

**Dr. McCullough:** Truluck's.

**Dr. Adamson:** Truluck's. Absolutely. I agree. And finally, what's your favorite test, and I think you've said it two or three times, to evaluate nutritional status?

**Dr. McCullough:** Prealbumin.

**Dr. Adamson:** Prealbumin. Okay. I think we've learned that first of all, nutrition is an area of gap knowledge, I think. And certainly our awareness of the ill effects of malnutrition and nutritional status in patients with chronic diseases, especially heart failure, is very important. And re-evaluating our knowledge base and our ability to assess these things is going to be important too. So, Dr. McCullough, thank you so much for joining us today on the podcast. I'm very excited to hear feedback from our audience about what they've learned and how they can change their practice to help patients get better. Thank you again for joining us.

**Dr. McCullough:** Thank you for having me.

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**Maura Bowen:** Listeners, thanks for joining us today. We hope you found this discussion between Dr Adamson and Dr McCullough to be useful. If you're looking for more podcasts, Abbott Nutrition Health Institute has dozens across a variety of different nutrition science topics, and you can find them on ANHI.org by clicking RESOURCES at the top of the page, then PODCASTS & VIDEOS. We and our Cardiovascular colleagues are also on Spotify now. If you're so inclined, look for ANHI's THE POWER OF NUTRITION PODCAST as well as BETWEEN TWO VENTRICLES so you can subscribe and tell your colleagues about us.

Thanks everyone. Until next time.