Medical Editor: Vincent J. Spagnuolo, MD, FACC

The Virtua Cardiologist

Fall 2022

What an exciting fall for Virtua Cardiology! I was pleased to see so many of you attend our get-together on Oct. 18 at the HEC. The event gave us all a chance to meet new team members, and reacquaint in person after such a long COVID break.

If you did not have a chance then to meet our newest colleagues, their profiles are featured below. And stay tuned for additional hires coming soon.

In this issue, read on for Dr. Finch's update on our cardiac imaging capabilities. CTA-FFR is now operational at Brace Road and at Virtua Our Lady of Lourdes Hospital, with plans to expand next year to Moorestown. Look for PET next year as well. Further, get a quick reminder on Aortic Clinic referral, a great case study from the EP team, an update on our latest clinical trials, vascular service outreach, and more.

As we prepare for 2023, we are well positioned to continue our growth strategy to become a comprehensive service line and a destination center for cardiac care. I look forward to working together with you to accomplish our goal.

New to Virtua Cardiology

We are pleased and honored to announce the following new providers have joined our team:

Tolulope Adesiyun Agunbiade, MD, FACC

Dr. Tolu Agunbiade is Virtua's new medical director of advanced heart failure. She is an advanced heart failure cardiologist who earned her medical degree from Harvard Medical School. She completed her residency in internal medicine and her fellowships in cardiovascular disease and advanced heart failure and transplant at Johns Hopkins University Hospital.

Prior to joining Virtua, Dr. Agunbiade served as an advanced heart failure and transplant cardiologist at Medstar Heart and Vascular Institute. She also served as the director of the cardio-oncology program in Medstar North. Through the years, she has published papers and reviewed articles in peer-reviewed journals.

Dr. Agunbiade is board certified in internal medicine, cardiovascular disease, echocardiography, and advanced heart failure and transplant cardiology. She is a member of the Heart Failure Society of America, the American College of Cardiology, and the American Heart Association.

Her philosophy of care is centered on treating both the patient and the disease. She seeks to create a sustainable solution with a focus on both disease and symptom control with the goal of returning patients to as normal a life as possible.

Rita Butler, MD
Dr. Rita Butler is our newest interventional cardiologist. Dr. Butler earned her medical degree from Robert Wood Johnson Medical School and completed her residency in internal medicine at Tufts University Medical Center and fellowships in cardiovascular disease and interventional cardiology at Lankenau Heart Institute.

Dr. Butler is board certified in internal medicine, nuclear cardiology, and cardiovascular computed tomography. She served as a hospitalist at the Hospital of the University of Pennsylvania, where she also was as an instructor of internal medicine.

A member of American College of Cardiology, American Heart Association, American Board of Internal Medicine, and the American College of Physicians, Dr. Butler has presented internationally on numerous cardiac topics and has contributed to review articles and publications. She also served as a peer reviewer for *the Journal of Hospital Medicine*.

Among her volunteer activities, she was active in the Jesuit Volunteer Corps, assisting the economically disadvantaged in Chicago. She provided primary medical care as a student doctor in New Brunswick and Camden. As part of the Himalayan Health Exchange, Dr. Butler traveled to remote areas of the Indo-Tibetan borderlands to provide medical care in a multidisciplinary tent clinic.

Chao-Wei Hwang, MD, PhD
Dr. Chao-Wei Hwang is an interventional cardiologist with a history of innovation and dedication to community health. He serves as Virtua's new system-wide administrative director of interventional cardiology, as well as the director of the cardiac cath lab at Virtua Our Lady of Lourdes Hospital.

Dr. Hwang obtained his medical degree at Harvard Medical School and earned a PhD in medical engineering and medical physics at Harvard and MIT. He completed his residency in internal medicine at Brigham and Women's Hospital and his fellowships in cardiology and interventional cardiology at Johns Hopkins Hospital.

Board certified in cardiovascular disease and interventional cardiology, Dr. Hwang was assistant professor of medicine at The Johns Hopkins University School of Medicine prior to joining Virtua, and served as core clinical faculty in interventional cardiology at Johns Hopkins Hospital and Howard County General Hospital. Dr. Hwang was also director of the Johns Hopkins interventional cardiology program at Frederick Health Hospital (FHH). As co-director of the FHH cardiac catheterization lab, he helped build the FHH cath lab into one of the busiest non-tertiary cath labs in Maryland.

Dr. Hwang has expertise in performing complex coronary interventions and in developing and implementing systems to improve efficiency and outcomes in the care of cardiac patients. Dr. Hwang served as PI of several important interventional cardiology trials at FHH, and also has research interest in

engineering cardiac devices. He holds a number of U.S. patents, and co-founded a venture-backed startup to develop catheter-based stem cell implantable bioreactors for the treatment of heart failure and inflammatory diseases. Dr. Hwang is the recipient of many awards, including the American College of Cardiology William H. Keating Endowment Award, the APL Invention of the Year, and the Howard L. Silverman Research Award. He has presented nationally and internationally, and has published extensively.

Dr. Hwang is a member of the Development and Industry Relations Committee of the Society of Cardiovascular Angiography and Interventions (SCAI). He is also the Development Liaison on SCAI's Diversity, Equity, and Inclusion task force.

Christopher J. Mercogliano, DO

Dr. Christopher Mercogliano has joined Virtua Cardiology's clinical cardiology service, with offices in Cherry Hill, Voorhees, Woodbury, and Hammonton. He earned his medical degree from Lake Erie College of Osteopathic Medicine. He completed his residency in internal medicine at Reading Health System and his fellowship in general cardiology at Deborah Heart and Lung Center.

Dr. Mercogliano has presented various lectures on topics such as ischemic cardiomyopathy, acute coronary syndrome, and eosinophilia diagnosis. He has contributed to numerous articles in publications such as *Cardiovascular Revascularization Medicine* and *Emergency Medicine Journal*.

He is a member of the American College of Cardiology, American College of Osteopathic Internists, and the Pennsylvania Osteopathic Medical Association.

Eden C. Payabyab, MD

Dr. Eden C. Payabyab is a cardiothoracic surgeon who earned her medical degree from the University at Buffalo. Prior to joining Virtua, Dr. Payabyab completed an advanced aortic surgery fellowship at Emory University. She completed a cardiothoracic surgery fellowship at New York-Presbyterian/Weill Cornell Medical Center and Memorial Sloan Kettering Cancer Center. Her general surgery residency was at Virginia Commonwealth University during which she also completed fellowships in Surgical Oncology and Immunotherapy at the National Institutes of Health – National Cancer Institute. She is double board certified in thoracic and general surgery.

She has contributed to extensive research while also co-authoring numerous publications as well as presenting on various topics such as aortic dissection and aneurysms, lung cancer therapy, adoptive cell therapy and immunotherapy, thymic malignancies, and more.

Among her many recognitions, she was a recipient of the Humera Surgical Society David M. Hume Resident Research Award, which enabled her to present her research to medical school educators from across the nation.

A former collegiate Division I swimmer, she has fundraised for cancer research and patient care through the Roswell Park Cancer Institute, participated in marathons and triathlons while coaching other participants to reach personal goals.

As a native of New York City she is excited to return to the area and provide patient centered care to South Jersey.

Alex Snyder, DO
Dr. Alex Snyder has joined Virtua Cardiology's clinical cardiology service, with offices in Voorhees, Lindenwold, Medford, and Pennsauken. He earned his medical degree and completed his residency in internal medicine at the Philadelphia College of Osteopathic Medicine. He completed a fellowship in cardiovascular medicine at Deborah Heart and Lung Center. Dr. Snyder has given lectures and presentations on the diagnosis and treatment of atrial fibrillation and TTR cardiac amyloidosis. He participated in heart failure-related projects during his residency at Roxborough Memorial Hospital, and submitted research data which was published by the Heart Failure Society of America.

A member of the American Osteopathic Association, Dr. Snyder previously volunteered as a tutor/mentor with the afterschool program for at-risk youth at the Northern Home for Children in Philadelphia.

The Case for Coronary CTA

By Mark T Finch MD FACC, FASNC, Director, Advanced Cardiac Imaging, Virtua Health

Coronary CTA (CCTA) has been available to cardiologists for at least 20 years. However, until recently, it has not been widely used for the diagnosis of coronary artery disease (CAD) in the United States. This is largely because the technology has been too expensive for cardiologists to own, and the diagnostic accuracy was thought to be inferior to stress testing. This perception changed in 2019, when the European Society of Cardiology made CCTA a level 1A recommendation for the evaluation of stable chest pain—even preferable to "functional" stress testing in some populations. This paradigm shift was fueled by several studies that showed CCTA was more accurate than stress testing and had a far superior "negative predictive value." Even when CCTA did not detect obstructive CAD, the finding of coronary atherosclerosis changed risk factor management and patient behavior with better medication compliance (especially statins), and fewer subsequent acute coronary events. In 2021, the ACC/AHA guideline for the evaluation of stable chest pain syndromes also followed suit and elevated CCTA to a level 1A recommendation. Additionally, this multi-societal consensus document provided guidance regarding which patients benefit from either "anatomic" coronary CTA or "functional/physiologic" stress testing. Both diagnostic modalities have their respective ideal patient attributes, as well as patient-specific contraindications. To understand these differences, it is important to review the current state of the technology of both modalities.

Coronary CTA is truly an anatomic test that utilizes radiation (albeit minimal) and intravenous contrast to reconstruct the lumen of a coronary artery. Under optimal patient conditions, it can "look inside" coronary arteries at atherosclerosis and characterize plaque extent and morphology and identify high-risk features that can be associated with poor short-term outcomes, even in non-obstructive lesions. An adjunctive feature, CT-FFR (fractional flow reserve), is a noninvasive technique, similar to its invasive namesake, that can further predict the physiologic significance of a particular atherosclerotic plaque. This increases the accuracy of CCTA for diagnostic purposes and may aid in future interventional planning, if indicated.

Coronary CTA can also identify a patient who has little or no atherosclerotic plaque and provide excellent negative predictive value and good prognosis. However, CCTA has several important drawbacks. It cannot evaluate the lumen of heavily calcified arteries or the inside of most stents. Therefore, patients with established CAD or who have been revascularized with stents are poor candidates for CCTA. Also, because the heart and arteries are in motion, CCTA requires a low, regular heart rate, a fast camera and a cooperative patient who can hold their breath and not move for up to 10 seconds. Accordingly, patients who have irregular heart rates (atrial fibrillation, frequent PVCs), are also not ideal candidates for CCTA.

Stress testing exploits coronary supply and demand physiology to assess extent and severity of obstructive CAD indirectly through perfusion imaging, left ventricular wall motion and ST segment assessment. It is very versatile for a variety of patient types and is very familiar to most cardiologists. It too provides decent negative predictive value, but has inferior positive predictive value, as compared to CCTA. Patients sent to the cath lab based on an "abnormal stress" test have an almost 60% chance of having no or non-obstructive CAD as compared to 20% of patients who have an abnormal CCTA. Cardiac PET-CT stress is an exception to this comparison, and was highlighted in the chest pain guideline, as preferred stress modality over stress echo and SPECT, for diagnostic accuracy.

So in a perfect world, when all these tests are at our disposal, which one best suits our patient with a chest pain syndrome? The answer… it depends. It depends on three factors: the aforementioned clinical CAD history, the patient's heart rhythm and rate, and of course, the insurance industry. So, having a history of CAD with known disease, stents, or bypass, limits our ability to evaluate disease with CCTA. New CT algorithms using "photon counting" technology will likely overcome this limitation. Until then, it's best to order a stress test on these patients, unless one is interested in graft patency; a subpopulation that CT does well. The second factor is very important with CT. Ideally, patients should have a heart rate between 55-60 BPM, and the rate should be regular, without PVCs, etc. The faster and/or the more irregular the heartbeat, the more likely the coronary arteries will move and cause artifacts. Atrial fibrillation, in particular, poses a significant challenge, though it is not a rigid contraindication. Finally, the insurance industry is becoming more assertive in their ability to dictate which tests can be ordered. For example, we are increasingly seeing physicians order heart catheterization (or even imaging stress testing) only to have the insurer deny the exam and instead recommend cardiac CTA. Remember, a trip to the cath lab is a big expense for them, so a technology that efficiently selects patients that are most likely to need revascularization (i.e., CTA with CT-FFR) is more "cost-effective."

Since we have begun our coronary CTA program (using CT-FFR) in late June, and as of this writing, we have completed 266 coronary CTAs. Fifty-four percent (54%) of these patients were women and 80% were under the age of 65; in all, reflecting a low-to-moderate risk population. Over 98% of the scanned patients had no previously known CAD. After scanning, 19% had significant, obstructive CAD of at least one vessel (>50% luminal stenosis). Forty-one percent (41%) of patients had no atherosclerotic plaque. This leaves 36% of patients with non-obstructive CAD who likely would have had a normal stress test, but who still have atherosclerosis and need more aggressive risk factor modification (i.e., aspirin and statin). Herein lies an important difference between anatomic and functional testing for CAD in that CCTA often gives us an opportunity to provide more appropriate cardiovascular risk stratification.

Our colleagues have enthusiastically supported our program. The table below breaks down are referral sources.

Source	N	%
North	90	34
Central	64	24
South	50	19
West	50	19
Structural	2	1
Non Virtua C	6	2
PCP	4	2
Total	266	100

Our success has largely been driven by the new ACC/AHA chest pain guidelines and to a small degree by the insurance industry. I predict the program will continue to grow, as physicians incorporate CCTA into their practices and they experience the value this technology brings to their patients. Our indications are also expanding, as we hope to support Virtua's structural heart program, our electrophysiology colleagues as well as the emergency room and our inpatients. I recognize that this rate of growth does have its "growing pains" as, at present, it is taking three to four weeks to schedule a patient for a CCTA. In the short term, we hope to close that gap by adding more capacity at Virtua Health & Wellness Center Cherry Hill (Brace Road). My ideal is to have one-to-two-week availability for scheduling. Within the next year, we hope to triple our capacity with new "one beat" cameras at Virtua Our Lady of Lourdes Hospital in Camden and at Marne Highway in Moorestown.

Finally, I would like to thank and acknowledge the support of Virtua in sponsoring four cardiologists this year (Drs. Delcine Sood, Raghu Dudda, and Scott Gabler, as well as myself), who have become board certified by the Certification Board of Cardiac CT. There has been additional support for others, as next year we hope to add at least six more cardiology readers as we expand the program to other sites in Moorestown and beyond. **Privileging pathways for new and existing cardiologists are available, and I encourage those who are interested to contact me at MFinch@virtua.org**.

In closing, we must temper our enthusiasm somewhat, as this type of expansion will require significant capital investment, advanced planning and take some time. I welcome your ideas and feedback as our program grows. Together, I am confident that we will soon provide a state-of-the-art, comprehensive, quality cardiac CT program that will benefit our patients and programs for many years to come.

Convenient Referral for Virtua Aortic Clinic

Referring a patient for aortic disease evaluation has never been easier. Utilizing the "Ambulatory Referral to Cardiothoracic Surgery" option in Epic provides a one-stop-shop for the seamless referral and treatment of your patients in need of aortic disease treatments. Click here [link will go to capabilities sheet] for a full list of procedures offered by Virtua Cardiothoracic Surgery, including aortic disease.

When you select "Ambulatory Referral to Cardiothoracic Surgery" in Epic, this will initiate a request where a member of our team will connect directly with the patient to arrange an appointment for

evaluation and testing. We will follow the patient and provide any needed intervention should the circumstances arise. Throughout the process, the team will remain in close contact with you.

For any questions regarding this process or how the team can best serve your patients, contact Louisa Waszewski (LWaszewski@virtua.org or 856-547-0389) or Stephen Bechtel (SBechtel@virtua.org or 856-325-4290).

Case Study Details Successful Resolution of Atrial Flutter Using Vein of Marshall Ethanol Infusion

Virtua heart rhythm specialists Aatish Garg, MD, Heath Saltzman, MD, and Darius Sholevar, MD, published in the May 2022 issue of *EP Lab Digest* a case study of a patient with long-standing, persistent atrial fibrillation and inducible mitral annual flutter who was successfully treated with vein of Marshall (VOM) ethanol infusion.

The Virtua heart rhythm team began performing VOM ethanol infusion last year. Following endocardial catheter ablation, a secondary catheter is threaded to the coronary sinus and the VOM. Expanding a balloon within the VOM, 5 to 10 cc of ethanol is injected into the vein, destroying the tissue causing the irregular heartbeat.

The 78-year-old male patient presented with a history of symptomatic, persistent AFib for three years despite adequate rate control. Over the years, multiple cardioversions were attempted, but each time he reverted back to AFib, which was accompanied by significant shortness of breath and fatigue. Antiarrhythmic drugs could not be used due to a prior liver transplant.

Catheter ablation was performed for atrial fibrillation. Atrial flutter was reproducibly induced in the lab, which was noted to go around the mitral valve. Despite extensive ablation, the flutter could not be terminated, as it was using the Vein of Marshal on the outer surface of the heart to bypass the ablation that was performed. A 9 cc VOM ethanol infusion restored the patient's normal sinus rhythm and terminated the atrial flutter. The patient remains in normal rhythm at nine-month follow-up.

With the demonstrated effectiveness of VOM ethanol infusion, the team hopes to increase the success rate of catheter-based ablation for persistent AFib and atrial flutter—reducing the need for repeat ablations and improving patients' quality of life. Read the full study here.

Virtua Cardiology Participates in TAVR, CAD Study

People who undergo transcatheter aortic valve replacement (TAVR) to treat aortic stenosis often also have coronary artery disease. As a leader in performing heart valve procedures, Virtua Health is participating in a study to determine whether those individuals should undergo a catheter-based intervention with a balloon and stent, or be treated medically.

"It's not unusual to see concomitant disease in the same patient," said interventional cardiologist Ibrahim Moussa, DO, FACC, FSCAI, RPVI, principal study investigator at Virtua. "However, there is no agreement on how to best treat these individuals. This study may help determine an optimal path."

The COMPLETE TAVR study will determine whether a strategy of completed revascularization involving staged percutaneous coronary intervention (PCI) using drug-eluting stents to treat all suitable coronary artery lesions is superior to a strategy of medical therapy alone in reducing cardiovascular death, new

myocardial infarction, ischemia-driven revascularization or hospitalization for unstable angina or heart failure.

Study Inclusion: Men and women with severe symptomatic aortic valve stenosis prior to TAVR
Exclusion: PCI already performed within 90 days prior to TAVR or at the same time as the index transfemoral TAVR procedure

The study is sponsored by the University of British Columbia, and is expected to conclude in April 2026. It is being conducted at more than 100 sites across the United States and Canada. Virtua is the only study location in South Jersey.

To refer a patient to the study, contact Danielle Connors at DConnors@virtua.org.

Vein & Vascular Service Promoted in Practice Locations

You may notice that many Virtua Cardiology practices have vascular service information posted in their patient exam rooms to educate patients and families about Virtua's unified vein and vascular services.

The posters are meant to prompt a conversation with the clinical cardiologist related to symptoms they may be having, but not necessarily reporting. Ideally, the cardiologist will use Epic to generate a referral to the service. However, the poster also directs to a digital landing page that provides additional information. It provides direction for self-referral through a dedicated phone number or a web form that pings the clinical navigation team. The program hopes to expand into the Virtua Primary Care settings with collateral material appearing in their practices soon. Recently, the team offered two free vascular screenings to the public at events held in Cherry Hill and Moorestown. More than 150 individuals were screened at those events.

With Health Care Marketing, Patient Stories Rule

Some of the most effective ways to promote our outstanding services is through the voice of the patient. There is no better way to communicate our innovation, quality and compassion than through a patient story. Earlier this year, a team Virtua was featured in a front page *New York Times* story of an unvaccinated first responder who survived an extremely serious case of COVID-19 involving a foot-long pulmonary embolism. While the story highlighted vaccine resistance among law enforcement officers, it cast a strong, positive light on the advanced care provided by the team at Virtua Our Lady of Lourdes Hospital that included many members of Virtua Cardiology and the cardiothoracic critical care service. We are so proud of this story, which was repurposed and used in other media outlets. Then we received more positive attention when the patient returned to thank the team and cheer on another patient who he'd bonded with. A good story goes a long way.

Do you have any patient stories to share? The Virtua Marketing team is available to follow up and make all the connections to bring stories to life. If you have a patient who would be willing to be interviewed, let us know. Send your ideas to VirtuaClinician@virtua.org.

Reminder: WomenHeart Support Group

For many years, Virtua Health has offered a monthly support group, WomenHeart, a cardiac support group for women by women. Championed by Virtua cardiologist Maria Duca, MD, and involving all of Virtua's female cardiologists who contribute to its content, the sessions are led by two WomenHeart

Champions who are heart disease survivors, and who trained at WomenHeart Science and Leadership Symposium at Mayo Clinic.

The programs offer education from Virtua experts and peer-to-peer support from women living with heart disease. Since the pandemic, the sessions are now being conducted virtually via Zoom. Click here for more information and dates. Or, to refer a patient to speak with a WomenHeart Champion, call 833-894-3278.