Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist

CATH LAB SPOTLIGHT

The Heart Institute at Huntsville Hospital

Arin Hornsby, RN, BSN
Director of the Heart Institute (Cardiac Pre/Post Recovery, Electrophysiology Lab, Cardiac Catheterization Lab, Cardioversion/TEE Lab)
Huntsville, Alabama.

Tell us about your institution and cath lab.

Huntsville Hospital is a community-based, not-for-profit hospital that is part of a 13-hospital system and is a regional referral center. It is located in one of the fastest-growing metropolitan areas in Alabama, employing over 18,000 employees across northern Alabama. The 881 patient beds at the Huntsville Hospital main campus continue to maintain The Blue Cross Distinction Centers in Cardiac Care. In addition to being accredited by the Joint Commission, the hospital has received numerous recognitions for excellence in patient care for cardiac services.

Since our community is growing at a rapid pace, so must our cardiac service line.

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In This Issue

In Transition: Early-Career Interventional Cardiologists

Morton J. Kern, MD

This editor's page was stimulated by Rymer et al[1], who reported on cath lab procedure volumes and outcomes among early-career interventional cardiologists. In an accompanying editorial, Shah et al[2] help us understand what we can do to assist our younger, less-experienced colleagues navigate their first years without undue problems and risk to patients.

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Talking With the ACC's New President: Cathie Biga, MSN, FACC

"My heart is still in the cath lab, always and forever," says Cathie Biga, MSN, FACC, the 2024-2025 President of the American College of Cardiology. "[Even as] VP of a hospital, I used to go to the cath lab just to get my sanity back."

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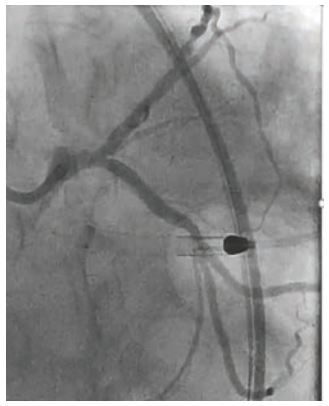
CASE REPORT

Making Complex Simple

Ori Waksman, MD; Hayder Hashim, MD, FSCAI



Revascularization of patients with unprotected left main disease poses a significant challenge due to the heightened risk of mortality and periprocedural hemodynamic collapse. Historically, such patients were managed surgically via coronary artery bypass grafting (CABG); however, randomized controlled trials (RCTs) demonstrating similar mortality and long-term outcomes with percutaneous coronary intervention (PCI) have shifted contemporary practice trends and broadened the use of unprotected left main percutaneous coronary intervention (ULM-PCI).

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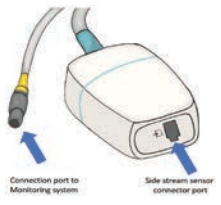
CATH LAB REVIEW

Waveform Capnography: Part of Comprehensive Vital Sign Monitoring

Richard J. Merschen, EdS, RT(R)(CV), RCIS; Madalynne Ruth, RT/ICVT student



Comprehensive vital sign monitoring is an essential patient safety requirement in the cath lab and includes invasive and non-invasive blood pressure, electrocardiogram (ECG), heart rate, and pulse oximetry. Another vital sign, used by anesthesia, respiratory therapy, and other care providers, is waveform capnography. Waveform capnography is a continuous, non-invasive measurement of a patient's ventilation effort and measures the amount of carbon dioxide (CO_2) in exhaled air.[1,2] It consists of two major elements: capnometry and waveform capnography.[1,2] Capnometry is the quantitative numerical value of CO_2 concentration, and focuses on end-tidal CO_2 ($ETCO_2$). $ETCO_2$ ranges from 35-45 mmHg, the same as CO_2 in a blood gas sample. Waveform capnography is a square-shaped graph measurement with slightly rounded corners that measures the entire respiratory cycle[2] (Figure 1). On the vertical axis of the capnography waveform, $ETCO_2$ is captured at the top right side of the square, which represents end expiration (Figure 1). Measuring the $ETCO_2$ on capnography is similar to measuring a hemodynamic pressure that has respiratory variance, with the measurement taken at the same point of end expiration (Figure 2).

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One major challenge, at the forefront of many of our discussions, is creating a vision for the future that centers on improving patient access. On average, the Heart Institute currently preps and recovers between 750 to 800 patients per month in a 46-bed patient recovery area.

We have 55 cardiac specialists who treat patients in our five cath labs, three electrophysiology (EP) labs, and one structural heart lab. Forty-five employees handle cath lab operations and are comprised of a mixture of radiologic technologists (RTs), registered nurses (RNs), and cardiovascular technologists (CVTs). A separate area with 65 employees handles outpatient admissions, patient monitoring, access site management, and discharges.

What procedures are performed in your cath lab?

A variety of procedures are performed on approximately 200 adult patients per week. Each team consists of at least three members: an RT that primarily pans the table, an RN or RT scrubbing with a physician, and an RN monitoring and circulating the case.

Procedures performed may include:

- Angioplasty
- Stenting of coronary, carotid, renal, and peripheral arteries
- Rotational and orbital coronary atherectomy
- Intravascular lithotripsy (IVL)
- Physiologic coronary assessment
- Percutaneous ventricular support
- Intracoronary imaging with intravascular ultrasound (IVUS) and optical coherence tomography (OCT)
- Temporary and permanent pacemakers
- Intra-cardiac defibrillator
- Pericardiocentesis
- Intra-aortic balloon pump insertion
- Patent foramen ovale (PFO) and atrial septal defect (ASD) closure
- Transcatheter aortic valve replacement (TAVR)
- Transcatheter mitral valve replacement
- Transcatheter edge-to-edge repair
- Paravalvular leak closure
- Left atrial appendage occlusion

In recent years, we hit several milestones with our structural heart program. We have celebrated our 1000th TAVR and recently reached our 1000th left atrial appendage occlusion procedure. Our program continues to grow every year.

Who manages your cath lab?

Each area of the Heart Institute (Cath, EP, TEE, and Cardiac Short Stay) has a dedicated manager and educator. Michael Martin, RT(R), is the manager of the Cath Lab, responsible for staffing, safety and daily patient flow. Our educators Terra Jarrell, RN, RCIS, and Janis Branton, RT(R), RCIS, are responsible for the continuing education, certifications, and mentoring of staff.

Can you describe some of the most recently added devices or equipment at your cath lab?

We recently added an integrated IVUS, OCT, and coronary flow reserve system to each cath lab. Additionally, we are participating in the ENCIRCLE research trial for the Sapien M3 mitral valve (Edwards Lifesciences) and have successfully completed over 20 procedures.

Can you describe your lab's use of radial access?

The majority of patients, about 90% will be accessed radially to complete coronary artery imaging.

(L to R, from back to front) Eric Battani; James Vinton RT; Sara Criscoe RN; Michael Ramos; Elizabeth Worsham RN; Julie Vaden RT Tyler Clark RN; Janis Branton RT, RCIS; Leah Boss; Gerald Stanker RN; Brandon Paul RT; Susan Sharp RN; Stephanie Brown RT Terra Jarrell RN, RCIS; Adrienne Lozito; Emily Chatman RN; Brandy Wynn RN; Daniel Hastings RT; Michael Martin RT; Sheila Wood RN; Michael Mitchell; Viktoria Castanos RN; Brooke Loggins RT; Joi Buckley RN; Amber Smith RT; Henry Chen MD. *Photograph by Danielle Treece and James Stovall.*

The team performs a lead-free case using the Rampart ic leadless shield system.

The Rampart M1128 with L148 Table-Mounted Shield (Rampart ic).

Unless complications occur intra-procedure, most of our patients will be discharged home the same day.

How does your lab handle hemostasis?

Hemostasis is physician preference, with several physicians using closure devices such as Angio-Seal (Terumo Interventional Systems) and Perclose (Abbott) for femoral arterial sites, and Vasc Band (Teleflex) occlusion for radial arterial sites. The majority of our groin sheaths without closure devices will be pulled in our designated recovery area. We have a designated area for the prep and recovery of all of our lab patients, Cardiac Short Stay (CSSM). Each year, lab and CSSM staff will complete annual competencies to demonstrate proficiency in the management of radial and femoral access sites. Residual hematomas of greater than 3 cm are reported and data collected for quality assurance purposes.

How does your cath lab handle radiation protection for the physicians and staff?

All lab team members are provided with properly fitted lead. Lead integrity is checked yearly by our lead radiology technologist, Janis Branton RT(R), RCIS. We try to limit case time and exposure, and have recently added the leadless shield system from Rampart ic. In addition, Huntsville Hospital has a dedicated radiation safety team that ensures proper policy is followed and dosimeter badges are monitored. Each staff member is given a dosimeter that is monitored monthly by radiation safety for radiation exposure.

The Heart Institute's hybrid lab can function as an electrophysiology lab, structural lab, and cath lab.
Photograph by Danielle Treece and James Stovall.

Can you tell us more about your use of the Rampart ic leadless shield system?

(***Michael Butler, MD, Cath Lab Medical Director, Huntsville Hospital***)**:** We have just started using the Rampart and have enjoyed it. It has been helpful to use a real-time dosimeter to demonstrate dose reductions to the operator and staff at the table and in the room. There are some nuances to the setup, depending on the table in the dedicated room. I imagine some tables may be more difficult than others, but the device is adjustable to multiple situations. Along with the Rampart shield, there are dedicated table shielding and a large multi-purpose pad that are to be used with the Rampart. We have had no issues doing femoral, left, and right radial cases with the system. Doing diagnostics can be a little cumbersome due to needing to manipulate the catheters at the sheath, which is very near the shield. However, the device really shines during longer interventions. In addition, the shield can be positioned in such a way as to shield most everyone in the room, including the circulating nurse, as long as everyone is on the right side of the patient. Although at first, draping and setting up the device takes some time and practice, as we are getting used to it, our workflow has not really changed. Despite the nuances, doing a full day of cases without wearing lead is hard to beat.

How do you determine contrast dose delivered to the patient during an angiographic procedure?

We use a dual injection system. We currently have both the CVi (ACIST Medical Systems) and Medrad Avanta (Bayer) dual injection systems. Our physicians are conscientious of contrast usage to ensure patients receive the lowest dose possible.

Are you tracking the incidence of contrast-induced acute kidney injury in patients?

Patients are properly hydrated pre and post procedure. Labs are obtained the day of procedure and physicians access kidney function prior to case

(L to R): Janis Branton RT, RCIS; Michael Martin RT; Terra Jarrell RN, RCIS.
Photograph by Danielle Treece and James Stovall.

(L to R): Henry Chen MD; George Soliman MD; Michael Butler MD; Jacqueline Green MD; Mihir Kanitkar MD; Alejandro Vasquez MD. *Photograph by Danielle Treece and James Stovall.*

start. If kidney function is poor, physicians may choose to postpone elective procedures or use methods to reduce contrast use intra-procedure.

How is inventory managed at your cath lab? Who handles the purchasing of equipment and supplies?

Huntsville Hospital uses Cerner Surgical Information Systems (SIS) and Lawson for its in-house communication, patient scheduling, billing and inventory control. We work closely with Huntsville Hospital's supply chain to manage inventory and assess the value of new products, contracts and proposals. We have a dedicated supply chain liaison that is well versed in the daily operations and vendor communications to assist with maintaining current par levels, quality assurance, replacement of expired products, and coordinating all purchase requisitions for daily supplies. Supplies utilized during procedures are entered at point of care for each patient intra-procedure by lab staff via SIS, which interfaces with Lawson to generate an itemized patient bill, deducts from our inventory, and orders supplies according to par levels. When physicians express interest in new products, supply chain and clinical operations leadership collaborate to assess product justification and cost prior to implementation in the labs.

Has your cath lab recently expanded in size and patient volume, or will it be in the near future?

The Huntsville Hospital health system and its affiliates across northern Alabama continue to grow. With the expanding population of the Huntsville community, our cardiology services must also expand. We have been evaluating an increase in the number of procedure labs and pre/post recovery bed space in order to expand our cardiac service line footprint at the Huntsville Hospital main campus. Three cardiology groups currently utilize our cath labs: Alabama Cardiology, Huntsville Cardiovascular Clinic, and HH Heart Center, with the HH Heart Center as our primary utilizing group.

With the expanding population of the Huntsville community, our cardiology services must also expand. We have begun discussions on increasing the number of procedure labs and pre/post recovery bed space in order to expand our cardiac service line footprint at the Huntsville Hospital main campus.

How does your lab communicate information to staff and physicians to stay organized and on top of change?

Each lab/unit within the Heart Institute has a dedicated medical director and leadership team that works to collaborate on lab initiatives and projects. Our medical director of the cath lab is Michael Butler, MD. Every month, a meeting with senior hospital administration, physicians and cath lab leadership will meet to formally discuss improvement initiatives and projects. Heart Institute managers and educators meet bi-weekly to collaborate on education and process improvement goals. In addition, weekly staff meetings and daily leadership rounding are conducted to communicate and address any immediate concerns regarding quality, process improvement, and hospital initiatives.

Can you share some data about your lab's door-to-balloon (D2B) times and some of the ways employees at your facility have worked together in order to lower D2B times?

Our D2B time is set at 90 minutes or less. We work with hospital leadership and EMS services quarterly to discuss improvement of throughput, as hospital bed availability and staffing after COVID has posed many challenges.

Who transports the STEMI patient to the cath lab during regular and off hours?

If the patient is coming from an outside facility, EMS will transport the patient. When a patient arrives to our emergency department (ED), the ED team works diligently to start the process of getting the patient ready for heart catheterization as the on-call STEMI cath lab team travels and prepares to receive the patient. The cath lab STEMI call teams will rotate on and off a four-person team. This four-person call team is on-call after hours on the weekdays and all day on the weekends. Each cath lab staff member will be assigned 4 call slots per month.

What do you do when the call team is already busy doing a procedure and a STEMI comes into the ED?

During normal business hours Monday through Friday, we will have a team available. On weekdays we also have a late shift team that will finish any scheduled cases during the weekdays and field any heart alerts until 9:00 pm. This allows the call team to have a break, as there is a high probability that they will be called in overnight. We average about 50-60 STEMI callbacks per month, with over 500 STEMI patients per year. In addition, we have one physician for the primary interventional group, HH Heart Center, that takes call for the evening and therefore only one team is required.

Is there a particular mix of credentials needed for each call team?

Each team member needs to be advanced cardiac life support (ACLS) certified. Ideally, the STEMI team would be comprised of 2 RNs and 2 RTs. However, we need to have at least one RN and one RT on call at all times. The third and fourth team members can be a mixture of RNs and RTs. If staff is called in all night and staffing for the following day permits, call team members are allowed to leave early, but still must report for the scheduled shift after a night of call.

How are team members scheduled for call?

Each lab team member is responsible for 4 call shifts in a 4-week period, including weekends. We have a dedicated call scheduler that ensures the call is evenly distributed and the teams are comprised of an appropriate combination of staff. After one year of vetted cath lab experience, we allow team members to swap or give away call as needed. We have several who like to pick up extra call for financial reasons.

Do you have flextime or multiple shifts? How do you handle slow periods?

We do allow staff members to leave early if work for the day is complete. We are fortunate to have a productive, busy lab, and slow periods are few and far between.

What measures has your cath lab implemented in order to cut or contain costs?

Our entire staff is very cost-conscious, including our medical director. The cath lab manager, lab director, and medical director work together with the materials manager and purchasing director to ensure the best pricing, favorable contractual agreements, and lean supply costs and inventory.

What quality control measures are practiced in your cath lab?

Each year, the leadership team examines prior years along with rolling quarterly data and metrics to identify areas of improvement. We use Press Ganey, the National Cardiovascular Data Registry (NCDR), unit data, etc., as resources to guide our fiscal year goals for both staff and physicians. This year, hematoma data process collection, handwashing, staff education, and physician documentation are quality assurance items we aim to improve.

How are you populating the NCDR records?

At Huntsville Hospital, we have a separate quality department with individuals assigned to each registry. It is the responsibility of the quality team to input data and keep up with quarterly metrics, and collaboratively communicate methods of accurate data abstraction.

How is coding handled in your lab?

A patient charge sheet is completed by clinical staff at the time of the procedure. The information is communicated with the appropriate personnel in patient accounting and medical records to ensure that coding and billing is accurate. Physician transcription of the procedure at the end of every case is used to verify patient procedure charges.

(L to R): Sheila Wood RN; Janis Branton RN, RCIS; Terra Jarrell RN, RCIS; Gerald Stanker RN; Susan Sharp RN. *Photograph by Danielle Treece and James Stovall.*

(L to R): Tyler Clark RN; Julie Vaden RT; Viktoria Castanos RN; Sara Criscoe RN; Adrienne Lozito.
Photograph by Danielle Treece and James Stovall.

Who documents medication administration during the case?

All medication administration during a procedure is documented by the circulating RN after a verbal order from the procedural physician, and then verified by the procedural /prescribing physician at the end of each case.

Are physicians using a structured reporting tool?

Physician can choose to use a structured report when dictating post procedure. Many will opt for the structured reporting model to ensure all documentation criteria per case are dictated for quality assurance purposes. Our hospital-wide EMR is Cerner.

How do you handle vendor visits to your lab?

Product representatives are welcome to visit by appointment only and verified via check-in at any of our Symplr kiosks. Due to HIPAA guidelines, we require the representatives to follow corporate compliance and hospital policies. Vendors are only allowed in the procedure rooms by physician invitation.

How is staff competency evaluated?

New hires are placed on a 30-, 60-, and 90-day evaluation and probationary period. Thereafter, staff completes yearly competencies via online education and an annual in-person skill fair specifically targeted to each unit's specialty. Evaluations are prepared by each manager and presented to each staff member with the manager and director present to provide an opportunity for staff and leadership feedback.

Spotlight *continued on page 22*

(L to R): Jacquelynn Patton; Michael Martin RT; Barri Dobbs.
Photograph by Danielle Treece and James Stovall.

Spotlight *continued from page 18*

What continuing education opportunities are provided to staff members?

The hospital has a variety of continuing education classes and seminars available to staff hospital-wide both online and in person. Monthly inservices and demonstrations sponsored by vendors and hospital personnel are also provided. HH Heart Center organizes a yearly cardiology conference with special topics and guest speakers. To provide opportunities for advanced certification, we have recently added a review course to help staff prepare to sit for the Registered Cardiovascular Invasive Specialist (RCIS). In addition, all of our cath lab staff is required to be ACLS certified.

What works well for your lab in onboarding new team members?

The leadership team makes careful considerations when pairing each new employee with their trainer. In addition, the educators send out a welcome newsletter to staff to help introduce new staff to the lab. The leadership team works very hard at ensuring the on-boarding process goes smoothly for each candidate, with frequent check-ins and 30-, 60-, and 90-day reviews. We have also added a preceptor training course to ensure all new staff members receive key pieces of information during the training process.

Do you require your clinical staff members to take the RCIS registry exam?

At this time, we do not require RCIS, but highly encourage it and provide opportunities to review material in order to sit for the exam. To increase RCIS credentialing, we have tied exam completion to our incentivized leveling process and will also be hosting our first RCIS review course in June 2024.

Does your lab have any physical (layout) challenges?

We are limited by lab and recovery space as our volumes increase across the cardiovascular service line. However, with collaboration and frequent communication with each area's team leads, we are able to maximize efforts. Currently, the cardiovascular service line is collaborating on a multidisciplinary space plan that will accommodate future growth and solve some of our current physical limitations.

What do you like about the physical space in which you work?

The current Heart Institute layout is patient-friendly and well designed. We have on- and off-stage areas for patient and families with dedicated advocate specialists at the front desk, ensuring all entering the Heart Institute are oriented to their surroundings.

Has your lab recently undergone a national accrediting agency inspection?

We have recently completed a Joint Commission survey with success.

What trends have you seen in your procedures and/or patient population?

We are seeing an increase in our structural case volumes, specifically left atrial appendage device implants.

What is unique or innovative about your cath lab and staff?

Our physicians are always pressing for innovation in technology and methods of care for our patients. As a hospital system, we attempt to help align those innovative goals with resources and funding. To improve lab efficiency and increase productivity, we incorporate some of the following: flip rooms when possible, maintain an area for potential ICU bed holds, a dedicated RT to pan the table, and having CVTs present during cases for quicker response when facilitating patient transports and gathering supplies.

Is there a problem or challenge your lab has faced?

Like many hospitals across the country, we are short of needed staffing resources due to the pandemic. Leadership has worked very hard at recruiting new faces and in encouraging the return of seasoned staff. Our high volumes of scheduled procedures, an increase in STEMI callbacks, and lab capacity issues to accommodate high volumes has a significant effect on staff burnout. We try to manage this by evenly dispersing call volume, advocating for pay incentives when necessary, and promoting a community-oriented environment.

What's special about your city or general regional area in comparison to the rest of the U.S.?

Huntsville, nicknamed the Rocket City, is located in north central Alabama in the foothills of the Appalachian Mountains. It is home to Redstone Arsenal and the Marshall Space Flight Center, which support a large, high-tech, professional population. In 2022 and 2023, *U.S. News and World Report* named Huntsville one of the best places to live in the country. Other area attractions include numerous museums and historical sites, minor league (Trash Pandas) and college sports teams, community music, festivals, and theater, touring Broadway shows, and big-name concerts at the Orion Amphitheater. ■

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Arin Hornsby, RN, BSN, can be contacted at arin.hornsby@hhsys.org