



EPLab Digest

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YEARS

A product, news & clinical update for the electrophysiology professional



EP Lab Spotlight

PeaceHealth St. Joseph Medical Center

John MacGregor, MD, FHRS,
Associate Medical Director for
Cardiac Electrophysiology,
Bellingham, Washington

When was the EP program started at your institution? By whom?
Bellingham is a remarkably beautiful coastal city in extreme northwest Washington State. In the early 1980s it had achieved status as a small city worthy of dedicated cardiology support, and North Cascade Cardiology (NCC) was born at that time. As the practice grew concurrently with advances in cardiovascular technology, the need for cardiology subspecialists grew. In the early 2000s, biventricular pacing systems were implanted by one of our cardiologists who had done a year of EP training during an interventional cardiology fellowship.

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Cover Story

Managing a High-Volume Lead Extraction and Management Program

Interview by Jodie Elrod

In this interview, we speak with Robert C. Canby, MD, and Amin Al-Ahmad, MD, about the lead extraction and management program at St. David's Medical Center in Austin, Texas.

Can you give us an overview of the lead management and extraction program at St. David's Medical Center?

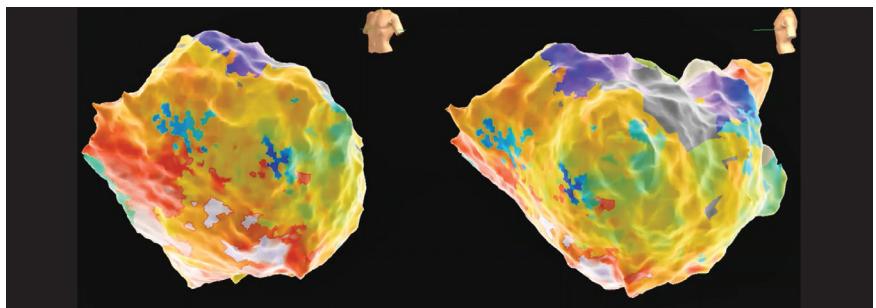
Canby: The lead management program at St. David's was created around 2007. As a high-volume EP practice, lead management issues were becoming an increasing part of the responsibilities of electrophysiologists. With all of the devices that we manage, it became clear that meant chronically implanted leads were going to become a bigger issue for all of us. We made the conscious decision at the time to start a lead extraction and management program, and it took off from there.

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Cover Story

Optimal Ablation Techniques for Ventricular Tachycardia Management: Functional Substrate Mapping With the Sense Protocol

Jason Collinson, BS¹; Joe Shipton, BS¹; Neil T. Srinivasan, MBChB, PhD^{1,2}



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Spotlight Interview: PeaceHealth St. Joseph Medical Center

John F. MacGregor, MD, FHRS, Associate Medical Director for Cardiac Electrophysiology



Figure 1. From left to right: Michel Barakat, MD, FACC, and John F. MacGregor, MD, FHRS. (Photo courtesy of Mark Turner)

In partnership with St. Joseph Hospital, NCC helped to develop a new cardiovascular center, which opened in 2003. Encompassing 4 procedure rooms and 10 recovery beds, it represented a massive leap forward in both technology and capacity for this community at the time.

Simultaneous with the opening of the new cardiovascular center, the cardiac electrophysiology program in Bellingham was born. A recent University of Utah cardiology fellowship graduate who helped spearhead the center recruited 3 more colleagues from Utah to join him, among them Jonathan Lowy, MD, who was finishing his fellowship and moved to Bellingham to establish the EP program. He recruited a nurse practitioner, Christine Anderson, MSN, FNP-BC, and developed the EP service from scratch as a new fellowship graduate.

By 2006, volumes had expanded to the point that a second EP physician was necessary. This is when I entered the scene, and I have remained in Bellingham for the past 15 years. Although Dr. Lowy eventually moved south in 2013, this program has remained a 2-physician program since 2006.

Our practice merged with the hospital in 2011 to become PeaceHealth Cardiology. We are now a group comprised of 17 physicians and 11 advanced practice clinicians (APCs). In EP, we have 2 full-time physicians and 3 APC positions, with

additional per diem help from Christine Anderson, who is now semi-retired. Michel Barakat, MD, FACC, recently joined our team after finishing fellowship training at the University of Utah. Our nurse practitioners are Christine Anderson, MSN, FNP-BC; William Brenton, MSN, ARNP, FNP-BC; Robin Rice, NP; and Mary Schweigert, MSN, RCES, ARNP.

What is the size of your EP lab facility? Is there an expansion planned?

The current EP lab is the original room, which is a biplane system (Philips) in a 750 square foot space. A hybrid OR is currently being built and will be operational by February 2022. The EP team will have regular access to that room for extractions in particular, but also potentially for convergent ablation procedures and as an option for scheduling ablation cases with multiple EP doctors on the same day in the future.

What is the number of staff members? What is the mix of credentials at your lab?

Our current staffing for the EP lab is 7 people; there are 4 RNs and 3 techs, and we typically staff 2 RNs and 2 techs on a given day. Susan Emond, RT(CV), RCES, has been with the program since just after its inception. Our other techs are Owen

Janes, RCIS, and Lauryn Coyle, RCIS. Our nurses are Victor Kuksenko, RN, Sarah Mullavey, RN, BSN, Sarah Wheeler, RN, BSN, and Jen Aune, RN.

What types of procedures are performed at your facility?

Our EP program is quite comprehensive, especially in the context of our community. We implant pacemakers, ICDs, biventricular systems, and leadless (Micra transcatheter pacing system, Medtronic) pacemakers. We have a robust WATCHMAN (Boston Scientific) program that is now just over 4 years old. We perform ablations for every type of SVT, atrial fibrillation (AF) (using a mix of cryo and radiofrequency depending upon circumstances), PVCs, and ventricular tachycardia. We have had a very highly regarded extraction program since our inception in 2003. Every EP physician who has worked in Bellingham has brought training and extraction credentials to the community, allowing us to effectively serve our patient population without the need to refer out those patients for care (Seattle is a 90-minute drive from here, so referring out can be a significant burden for our patients). For a city of 91,000 people, I am quite proud of what we've accomplished and the track record that we have earned.

Approximately how many catheter ablations (for all arrhythmias), device implants, lead extractions, and left atrial appendage occlusions (LAAO) are performed each week?

We perform 19 cases per week on average. This includes 10 CRM devices, 7 catheter ablations, and 2 LAAO/lead extractions.

What types of EP equipment are most commonly used in the lab?

We use the FlexVision Monitor (Philips), a biplane imaging system (Philips), ComboLab EP and Hemodynamic Recording System (GE), the Arctic Front Cardiac Cryoablation System (Medtronic), EnSite Precision (Abbott) and RHYTHMIA (Boston Scientific) Mapping Systems, and Micropace stimulator. We use catheters from Abbott and Boston Scientific, as well as CRM devices from Boston Scientific and Medtronic.

Who manages your EP lab?

The manager of all 4 labs at the cardiovascular center is Julie Maarhuis, BSN, RN. She gets terrific support from her second in command, Kristie D'Angelo, BSN, RN. They both report to Jerry Marschke, who has worked with the cardiovascular center since prior to its completion in 2003.

Tell us about your device clinic, including its staffing model.

We have made every effort to staff our device clinic in such a way that we do not need to rely upon our industry partners for device interrogations, except in rare or unusual circumstances. To that end, we have

staffing for 2 device nurses and 3 device technicians at this time. We have the capacity to complete up to 900 device checks in a typical month. Device checks are routed to the physicians in EPIC for review using the ScottCare (OneView) interface.

In what ways has the COVID-19 pandemic impacted your hospital, EP lab, or practice?

The onset of COVID-19 brought with it some immediate reductions in procedural volume in late March 2020. Much of this was driven by our governor's mandate that most elective procedures be canceled or postponed. The Heart Rhythm Society (HRS) was very proactive in helping to develop guidelines for elective, semi-urgent, and urgent/emergent procedures. We adhered to those guidelines through the remainder of 2020 and into this year, and worked with our administration to schedule cases appropriately in light of local trends of COVID-19 hospitalizations, surge capacity, and PPE supplies. Our governor eased restrictions on elective procedures on May 18, 2020. We have been at or near normal procedural volume since that time. We found initially that there were quite a few patients who had trepidation about scheduling a procedure and presenting to the hospital during the pandemic, but that seemed to ease as the situation evolved last summer.

What new initiatives have recently been added to the EP lab, and how have they changed the way you perform procedures?

Our most impactful recent addition has been the VASCADE MVP (Cardiva Medical) venous closure device. We have been evaluating methods to facilitate same-day discharge for a larger proportion of our patients over the past couple of years. The COVID-19 pandemic accelerated that conversation and resulted in adoption of the VASCADE MVP technology in November 2020. Our hospital administration showed strong interest in adopting the technology when we brought it forward as a proposal. During the pandemic, the goal has been to continue to care for our EP patients to the best of our ability while being mindful of unusually limited resources (in particular, PPE supplies and available hospital beds). We had approval for adopting VASCADE MVP literally days after submitting the proposal. Doing so has dramatically impacted our workflow and now allows us to consider at least 50% of our AF ablation patients for same-day discharge (that number was below 10% historically). Age, comorbidities, living situation, and time of case completion all factor into the decision regarding same-day discharge. Earlier ambulation has also eased the bottleneck in our recovery area, which helps all the cardiovascular providers with case flow efficiency.

Tell us what a typical day might be like in your EP lab.

A typical day starts with huddle at 7 AM, during which we communicate with the post-call cardiologist



Figure 2. From left to right: Will Brenton, ARNP, FNP-BC, MSN; Victor Kuksenko, RN; Michel Barakat, MD, FACC; Mary Schweigert, ANRP-C, MSN; Sarah Wheeler, RN, BSN; Sarah Mullavy, RN, BSN; Sue Emond, RT(CV), RCES; Julie Maarhuis, RN, BSN (Nurse Manager); Kristie D'Angelo, RN, BSN (Assistant Nurse Manager); Jerry Marschke (Cardiovascular Center Director); John F. MacGregor, MD, FHR (Associate Medical Director, Cardiac Electrophysiology). (Photo courtesy of Mark Turner)

to learn of any new consults for today. The hospital APC and EP physician will then see the first patient scheduled for a procedure that day and round on inpatients while the first case is readied. When the doctor scrubs in, the APC continues rounding, doing discharges, and writing notes. Consults get staffed in between cases as necessary. Our most common case mix is two ablations and then either one or two device cases.

How do you ensure timely case starts and patient turnover?

Achieving on-time case starts is a multi-step process that begins in clinic. When a patient agrees to a procedure, consent is obtained in that moment in person and then scanned into the EMR by our schedulers. As our cases can be somewhat challenging to schedule correctly due to variations in the equipment and staffing required, we have focused on having two main schedulers, Lizzy Riley and Megan Simonseth. They work closely with the hospital schedulers to coordinate the timing of our case starts, in particular when anesthesia is involved. COVID testing is carried out ahead of time (48-72 hours pre-procedure), ensuring we have negative test results documented in the EMR when patients first arrive to check in. Room turnover is handled by staff in the cardiovascular center, so we are not reliant upon a separate cleaning staff who may be preoccupied elsewhere.

What are the best features of your EP lab's layout or design?

My favorite feature is our biplane fluoro system. If you haven't tried biplane, you should! Be warned, once you get a taste of it, you'll find it is quite addictive. The benefits are particularly terrific with left-sided ablations and with Micra implants. We have ablation modules loaded onto carts that can be rolled into place near the foot of the bed, allowing for easier switching between our EnSite and RHYTHMIA systems. This will also allow us to move a system to the hybrid room upstairs as needed, once it is operational. Inputs to the FlexVision monitor have been wired into conduits in the ceiling, avoiding cables lying across the floor. Our room can be used as an OR in an emergency, and we do our extractions in the main EP lab due to its excellent fluoro system, but we certainly anticipate that the hybrid room will be the logical location for our extractions in the future.

Does your lab use a third party for reprocessing? How has it impacted your lab?

We have embraced catheter reprocessing for the past few years, and it has certainly generated substantial cost savings. We reprocessed over 600 catheter tips last year alone, and realized over \$275,000 in savings to our system. We utilize Innovative Health's catheter reprocessing service.

What other ways have you cut or contained costs in the lab and device clinic?

We work with industry partners to bulk purchase supplies whenever possible, and to achieve volume-based discounts as well. We strictly adhere to our Premier Purchasing Agreement, which



Figure 3. From left to right: Sue Emond, RT(CV), RCES; Sarah Mullavye, RN, BSN; Victor Kuksenko, RN; Sarah Wheeler, RN, BSN. (Photo courtesy of Mark Turner)

is currently a dual-vendor CRM agreement. We embraced remote monitoring of device patients years ago as the standard of care, and as the most cost-efficient model for longitudinal monitoring of most of our patients.

What types of continuing education opportunities are provided to staff? What options for continuing education are available to your mid-career staff?

We conduct a weekly EP meeting, and we devote about half of that meeting to educational topics. We also sometimes review our inpatients or our recent or upcoming cases of interest. We have also implemented an abbreviated journal club format during some weekly EP meetings. This task falls on the MDs and APCs on a rotating basis. We endeavor to send at least 2 of the lab staff to the annual HRS scientific sessions every year, and plan to reinstate that policy once COVID-19 limitations on in-person CME meetings have been lifted.

Describe a particularly memorable case from your EP lab and how it was addressed.

Although it is a rare occurrence, perforation/tamponade is a real test of how well the lab can rise to the occasion during an emergency. In February 2021, I was extracting a fractured right-sided atrial lead in a 77-year-old woman with a low BMI, and this resulted in right atrial perforation with tamponade when the lead dislodged from the right atrium. My team sprang into action to move our pericardiocentesis equipment to the bedside while our anesthesiologist confirmed a growing effusion adjacent to the right heart. Our cardiac surgery standby team (immediately accessible in our control room, as is our standard protocol)

promptly assessed the situation and we mutually agreed that the most expeditious treatment would be a pericardial window. CT surgeon Dr. Nicole Jackson made short work of that project, the patient subsequently stabilized, and I was then able to complete reimplantation of the new pacemaker lead as required. At the end of that case, we spent about 20 minutes in the EP lab debriefing as a team in real time. I found the experience really valuable, as everyone had an opportunity to express what they had been feeling during the emergency, what they felt went smoothly, and what elements of the case might be improved upon in the future. For example, we determined that the surgical instrument tray will be located in a different and more convenient spot in the future to avoid any potential delays during any similar future scenario.

My patient had some atrial fibrillation and pericarditis pain transiently post procedure, but she was seen in clinic earlier this week and reported that she has been doing tremendously well. In fact, she had just returned from a vacation during which she was walking at least 30 minutes per day without limitations and said she felt great. She had spontaneously reverted back to sinus rhythm.

Does your lab perform His bundle pacing?

We have considered His bundle pacing, but are currently not offering that service. We would like to see some more encouraging progress on the tools and techniques for His bundle pacing so that it could be a more predictable procedure before expanding our efforts in that arena.

Tell us about your primary approach for LAAO.

Our LAAO program was initiated in February 2017. Working mainly with the colleagues in our

cardiology group, we endeavor to have patients appropriately screened prior to meeting with one of the implanting EP physicians. Most of this work has been accomplished by Christine Anderson, our most experienced APC, over the past 4 years. We are now actively engaged in the process of recruiting an arrhythmia program coordinator. This RN level position will encompass many functions vital to our growing EP program, prominent among them the screening and evaluation of potential LAAO candidates to ensure appropriateness of referral and completion of all steps of preprocedural evaluation. Post procedure, the coordinator will maintain regular contact with our LAAO patients to confirm they undergo surveillance imaging and clinical evaluation at the recommended intervals.

We evolved from the WATCHMAN 2.5 to the WATCHMAN FLX device in October 2020, and have been very pleased with the results. The WATCHMAN FLX is unquestionably a safer device to implant than previous generations. This has translated to a more predictable case flow and post-procedural recovery, and in fact, we have been able to release a handful of WATCHMAN patients the same day since making the transition.

Does your program have a dedicated lead extraction program or AF clinic?

We have committed to what I term “comprehensive CIED management” since the inception of our program in 2003. We recognize that lead extraction is often an unsavory pastime, but it is a necessary and sometimes critically important component of the management of arrhythmia patients. I have had the good fortune to work with physicians who trained at renowned extraction centers and came equipped with the knowledge and skills to safely perform extractions. We are competent to do this work, and so we commit to doing it when necessary. In fact, we have earned a regional reputation as a safe and relatively high-volume extraction center; not infrequently, we receive referrals for extraction from colleagues in the greater Seattle area. We work in close collaboration with our cardiac surgeons for our extractions. Patients with any prior history of chest surgery or radiation will typically meet with the surgeon prior to the extraction whenever possible, to review their unique risks and the approaches that might be required in the event of an emergency. Our CT surgical standby team has no competing priorities at the time of an extraction. They are immediately available in the EP control room to assist if needed. Once the hybrid room is completed, we will perform our extractions in that setting.

We do not currently have a dedicated AF clinic, but our volumes have increased to the point that we clearly need one very soon! This is a strong motivator to get an arrhythmia program coordinator up and running. Management of our LAAO patients will be one component of a larger and



Figure 4. John F. MacGregor, MD, FFRS. (Photo courtesy of Mark Turner)

more comprehensive program for the management of AF. We are developing protocols for rapid referral from both the ER and primary care, with certain elements of the workup completed prior to meeting with one of the EP physicians so that the visit has maximal potential benefit.

What approaches has your lab taken to reduce fluoroscopy time? What percentage of cases are done without fluoro?

Our comfort level with intracardiac echo (ICE) imaging has increased dramatically over the past 10 years, and most of our reduction in fluoro can be attributed to embracing the power of ICE imaging, often in conjunction with 3D mapping. Although fluoro times have been greatly reduced, only a handful of cases have been completed without any fluoro thus far. This remains a goal of ours in the future, but we must balance patient safety with the desire to go fluoro free. A couple of minutes of fluoro and no tamponade seems like a reasonable compromise. The physicians have utilized the Zero-Gravity (BIOTRONIK) Suspended Radiation Protection System for over 10 years now, and I cannot overstate how beneficial it has been for longer cases in terms of provider fatigue and musculoskeletal pain.

How do you manage radiation quality checks of the imaging equipment?

There is bi-annual performance monitoring of the equipment, and we conduct an annual radiation physicist inspection to ensure radiation output compliance.

What are some of the dominant trends you see emerging in the practice of electrophysiology?

EP has always been a very technology-heavy subspecialty. In the current era, we are seeing explosive growth in the use of wearable monitoring technology for arrhythmia conditions. This has been true for patch technology such as the Zio patch (iRhythm Technologies) and CAM patch (Bardy Diagnostics),



Figure 5. Michel Barakat, MD, FACC. (Photo courtesy of Mark Turner)

but also in the consumer arena with devices such as the KardiaMobile (AliveCor) devices as well as the Apple Watch. As machine learning continues to evolve, these devices will become even more accurate and valuable as tools for patients and their physicians. One of the challenges we will face is how to separate actionable information from enormous volumes of data. Healthcare systems must understand that time and talent must be allocated to these important functions.

Ablation technology is also advancing at an impressive rate. The cryoballoon ablation system has been our workhorse for index pulmonary vein isolation (PVI) procedures for the past 8 years, but we see competition on the horizon from other manufacturers who are exploring not only cryotechnology, but also laser and ultrasound balloons for PVI. Pulsed field ablation also appears to hold tremendous promise as a safe and effective technology of the near future, and we are excited to see how it evolves.

How do you utilize digital tools or wearable technologies in your treatment strategies?

We migrated from a variety of older, wearable Holter and event monitors to patch technology with the Zio XT and Zio AT (iRhythm Technologies) about 2 years ago. We have been very pleased with that evolution, and the majority of our patients have voiced their favorable reaction to patch monitor use as well. We are currently placing around 400 monitors per month, and we have seen a substantial increase in diagnostic yield with this technology. Implantable loop recorders remain an important tool for us as well, and we are pleased with the latest versions of our Medtronic and Boston Scientific monitors in terms of recording quality.

Describe your city or general regional area. How is it unique from the rest of the U.S.?

Bellingham, Washington is a city of approximately 91,000 in a county of 220,000, situated 90 miles

north of Seattle on the Washington coast. Our geography is unique: we are bordered 25 miles to the north by Canada, to the west by the San Juan Islands and Puget Sound, and to the east by the Cascade Mountains (with Mt. Baker towering in the distance at 10,781 feet). The natural beauty of this place is incredible, and it has drawn a steady influx of new settlers over the past 2 decades. It remains a top place to consider retirement in many national publications, and we have seen significant growth in the elderly population potentially in need of cardiovascular care in that timespan.

Our catchment area includes all of our county (we are the only hospital in the county), as well as the islands to the west of us and a sizeable piece of Southeast Alaska, which is primarily served by another PeaceHealth hospital in Ketchikan.

What specific challenges does your hospital face given its unique geographic service area?

We are one of the few hospitals in the United States with a catchment area that extends beyond the border with Canada. When patients in Southeast Alaska require urgent cardiovascular care, they are flown to us via fixed wing aircraft, as Ketchikan is 598 miles from Bellingham as the crow flies. Similarly, patients from the San Juan Islands often require helicopter transport to Bellingham for urgent treatment, as a ferry ride and a trip up the freeway can be a 4-hour endeavor or more. This very extended catchment area has prompted us to embrace telehealth technology whenever possible. I regularly conduct telehealth consultations with patients in Ketchikan to discuss arrhythmia treatment strategies, and then our scheduling staff work out travel details when procedures in Bellingham are required.

Please tell our readers what you consider special about your EP lab and staff.

My EP lab team considers itself a close-knit “work family,” and we frequently communicate with each other via a group thread on WhatsApp to keep everyone in the loop about interesting EP-related topics, birthday celebrations, or after-work events. We genuinely like one another and there is a lot of mutual respect; as a result, we have historically had very low turnover. I have worked with Sue Emond since I arrived in 2006. Mary Schweigert, NP, was an EP lab nurse for a decade; subsequently, she trained as a nurse practitioner and we were thrilled that she then wanted to join the EP team in that role last year. The importance of skilled and caring colleagues that you trust to give their best to you and your patients during complex procedures cannot be overstated, and we have that in spades. We are lucky in that way, and we know it! ■

John MacGregor, MD, FFRS, Associate Medical Director for Cardiac Electrophysiology

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