

Quantifying the impact of equity, diversity, and inclusion in electrophysiology: Training the first female electrophysiologists from Jamaica and Saint Lucia



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BACKGROUND Delivery of electrophysiology (EP) care in developing nations and underserved populations faces many hurdles, including the lack of local expertise and knowledge creation. The West Indies has experienced a paucity of local EP expertise. The University of Toronto has undertaken a unique collaborative educational effort with the University of the West Indies.

OBJECTIVE We describe the effects of equity, diversity, and inclusion (EDI) in EP training at Toronto General Hospital in Canada by quantifying the impact of training the first female electrophysiologists to practice in Jamaica and Saint Lucia.

METHODS Data from the ministries of health in Jamaica and Saint Lucia were reviewed. The number of arrhythmia clinic patients seen, EP studies and ablations performed, pacemaker clinic patients seen, and implantable devices, permanent pacemakers (PPMs), and implantable cardioverter-defibrillators (ICDs) implanted were assessed.

RESULTS One hundred one arrhythmia consults were seen by the new electrophysiologist in Jamaica after her return from training in 2020. She has since performed 19 EP studies/catheter ablations at a newly established ablation laboratory. Three cases of left ventricular (LV) dysfunction due to tachy-cardiomyopathy were treated successfully with catheter ablation with immense improvement in LV ejection fraction. Thirteen PPMs, 1 ICD, and 3 LV leads were im-

planted, after which no early complications were identified. In Saint Lucia, where there is no dedicated electrophysiology laboratory, 2 patients who required catheter ablation for tachycardia-mediated LV dysfunction were identified by the electrophysiologist since her return to the island in 2018. The patients were appropriately referred, resulting in restoration of normal LV function. Six PPMs also were implanted in Saint Lucia. Knowledge translation has been limited by the lack of accessibility to the required devices, catheters, and specialized equipment and accessories, mainly because of their costs.

CONCLUSION Training the first female electrophysiologists from Jamaica and Saint Lucia led to a quantifiable impact on EP care in both of these Caribbean countries. EDI strategies in EP training programs provide much needed benefits to developing nations, but more support is needed to allow new electrophysiologists to fully utilize their EP training to care for underserved populations.

KEYWORDS Electrophysiology training; Equity; diversity; and inclusion; Female electrophysiologists; Gender parity; Underserved populations

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Introduction

The call for equity, diversity, and inclusion (EDI) in cardiovascular (CV) medicine has been prominent in recent policy decisions.¹ Such initiatives have been driven by surveys, trends highlighting deficiencies, sentiments, and position statements.^{2–4} Although this call for change faces practical challenges,⁴ reports

have suggested that the desired progress is being made.⁵ These efforts almost always pertain to North America, but we have yet to address the concept of EDI as it relates to the global community, specifically in terms of electrophysiology (EP).

EP is considered an intellectually and procedurally demanding subspecialty of CV medicine. The impact of

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KEY FINDINGS

- The West Indies is an underserved region where electrophysiology (EP) expertise and EP training opportunities are lacking. Candidates for EP training from these underserved regions often face insurmountable hurdles in their attempts to access competitive programs that require previous experience and achievements during selection.
- Equity, diversity, and inclusion efforts at Toronto General Hospital (TGH) in Canada are underway to train young physicians from the Caribbean to become cardiologists and electrophysiologists.
- The EP fellowship program at TGH has recently trained the first female electrophysiologists in Jamaica and Saint Lucia. Their subsequent return led to a quantifiable positive impact on EP care for patients in both of these Caribbean countries.

sex and/or gender in EP training has been highlighted recently,⁶ with a call for action in the form of inclusion of EDI in EP training.^{7,8} Creating global EP expertise is a considerable challenge, and delivery of care faces many obstacles, one of which is the fellowship training of the global EP fellows. Accessing competitive EP training programs requires global trainees to possess significant merit in the form of advanced CV training and research experience. Although the push for equality is based on the traditional criteria of merit during the selection process, this works against diversity and inclusion in EP. Individuals may be inherently disadvantaged by factors that deprive them of a fair evaluation, such as the lack of basic training in developing countries, underserved communities, and sex- and gender-related disparities that hinder merit development.

Racial/ethnic- or sex-specific disparities are further magnified in developing countries where there is a lack of progress in addressing socioeconomic issues. The collaboration and assistance of the global EP community are needed to dismantle the hurdles that challenge EP trainees who lack the needed resources and available opportunities. The concept of equity must be established to eventually achieve global equality in EP expertise, as it is the basis of the movement toward breaking the vicious cycle of disparity that relies on merit-based access to training. The EP fellowship program at Toronto General Hospital (TGH) of the University Health Network (UHN) in Canada thus adopted a strategy of equity in global EDI while training the first female electrophysiologists from Saint Lucia and Jamaica.⁹ The goal was to have a meaningful impact on Caribbean EP by attempting to remove the barriers to knowledge and expertise. The effects of adoption of EDI in EP have not been previously quantified. In this article, we describe the impact of training the first female

electrophysiologists from Jamaica and Saint Lucia on the local delivery of EP care.

Methods

Focused training of electrophysiologists: University of Toronto's strategic plan

Through the generous funding from the late Dr Raymond Chang, a local philanthropist with connections to the Canadian Caribbean community, and the dedicated work of Dr Herbert Ho Ping Kong, a pioneer in medical education, UHN and the University of the West Indies (UWI) had the opportunity to closely collaborate on a project focused on developing local cardiology expertise in the Caribbean.⁹ Over the years, more than 20 general cardiologists from UWI have been trained through this partnership, most of whom are currently practicing in the Caribbean in both academic and community settings.

The cardiology fellowship program at the University of Toronto (U of T) is administered through a number of teaching hospitals, including TGH and several others that form the UHN. Trainees spend 3 years completing full general cardiology training with rotations in echocardiography, nuclear cardiology, EP, cardiac catheterization, heart failure, adult congenital heart disease, and critical care unit and ward cardiology. The Caribbean cardiology program is unique to TGH. There are currently 4 funded fellowship positions (adult cardiology and subspecialties), all dedicated to trainees from UWI. The funding comes from the Department of Medicine as part of a legacy funding model that originated from an endowment from Dr Raymond Chang. Internal medicine graduates from UWI come to Toronto and enroll in an adult cardiology fellowship program administered through the Division of Cardiology at UHN. Selection is a 2-step process that includes local recommendations from established internal medicine specialists in the Caribbean and the assessment period at U of T during cardiology fellowship training. Applications to the program are reviewed by a committee chaired by the fellowship primary supervisor. Candidates from UWI must have completed residency training in internal medicine and carry an endorsement from their internal medicine program director. Candidates are selected based on the quality of their educational and clinical experience to date, academic performance, strength of reference letters, and level of endorsement by their program director. Candidates are offered an interview and the opportunity to participate in an observership before starting their training. Candidates are selected with attention to equity and diversity. The EDI effort is program-wide. Only in the last few years have funding opportunities been extended to interested graduates of the adult cardiology fellowship program, allowing them to pursue further training in subspecialty cardiology, such as EP. In the past few years, we had the opportunity to expand our training opportunities to include specialized cardiology. Many of the trainees in general cardiology are now able to

extend their fellowships and transition into cardiac subspecialty training in interventional cardiology, congenital cardiology, and EP. These trainees come to the U of T program with the hope of developing specialized knowledge and skills in their area of interest, which they can bring back to their communities to provide enhanced care to their patients.

Quantification of impact

The University Hospital of the West Indies (UHWI) in Kingston, Jamaica, uses the Hospital Information Management System (HIMS) to store and access data on patients once seen in certain clinics at the hospital. Therefore, HIMS was used to retrieve the number of EP patients seen in the newly established arrhythmia clinic at UHWI. The previously established pacemaker clinic within the cardiology unit at UHWI generates a list of patients with appointments at each clinic encounter. The tallies of patients seen in each pacemaker clinic were summated, and a monthly average number of patients seen was calculated. The data for all EP procedures performed at the catheterization laboratory were collected by the electrophysiologist and stored in a Microsoft Excel (Redmond, WA) spreadsheet for a performance audit, not for research purposes. The number of EP studies/ablations performed from the period 2020 to 2021 was tallied. Hurdles to the delivery of care were identified through the firsthand experience of a cardiologist working in the health care system in Jamaica.

Jamaica has a 2-tier health care system whereby all Jamaican citizens and legal residents are provided with free health care at public hospitals and clinics; they also have the option of private care for additional and more advanced services. Free health care covers public health facility visits and admissions as well as some prescribed medications. Some private health care facilities in Jamaica offer more advanced cardiac care that is not provided by the public system; however, patients must pay their own expenses if a cardiac device (eg, pacemaker), EP study, or ablation is needed.

In Saint Lucia, there is no electronic medical record system within the public hospital or in the private sector. Therefore, data on patients with an indication for device implantation, number of implants, as well as patients requiring EP studies or intervention were obtained for a clinical audit based on records from the physicians involved in the care of those patients. The findings reported in this article were derived from clinical audits and physician/hospital clinic records.

Results

Since 2003, the program to train Caribbean cardiologists has trained 19 cardiology fellows (9 women and 10 men) from UWI. Fourteen of these UWI fellows (6 women) came from Jamaica.⁹ The EP subspecialty fellowship is site-centric, and at TGH the EP program is large enough to accommodate at least 1 interested trainee per year. The director of the program made an independent conscious initiative, without formal criteria, to select females and underrepre-

sented minorities for EP training. Two recent female graduates who successfully completed fellowships in adult cardiology were selected for fellowships in cardiac EP. Since their return after training, Dr Nordia Clare-Pascoe (NCP) and Dr Kurlene Cenac (KC) have been working as electrophysiologists in Jamaica and Saint Lucia, respectively. Their training in the EP fellowship program was tailored to include approachable staff, a more supportive working environment, a variety of cases with different complexities, and educational opportunities with multiple educational rounds per week with attending electrophysiologists to provide hands-on teaching. An active buddy system with guidance from co-trainees who were at higher training levels was encouraged, allowing fellows to obtain help without the concern of the perception of being judged for the lack of their previous training opportunities.

EP consultations

The arrhythmia clinic at UHWI in Jamaica was established in 2020 by NCP, the recently trained female electrophysiologist. One hundred one EP consultations/follow-up visits were made in this clinic through February 2022. The UHWI pacemaker clinic is managed by a joint effort between EP and CV surgery and saw an average of 50 patients per month from 2020 to May 2022.

KC, the first female electrophysiologist in Saint Lucia, consults as the only in-house cardiologist at the Owen King European Union Hospital, the main public hospital in Saint Lucia, as well as at Tapion Hospital, a private hospital. At least 40 EP consultations/follow-up visits have been made. There is no EP laboratory in Saint Lucia, so EP studies and catheter ablations are not available on the island. Once identified, patients requiring EP studies and catheter ablation procedures are referred to the nearest available centers, namely, Health City Cayman Islands and Centre Hospitalier Universitaire de Martinique (CHUM). The management of other tachyarrhythmias in children falls under the purview of the lone cardiologist in the public system, who serves the pediatric population because there is no pediatric cardiologist on the island. She is able to liaise with the EP service of the World Pediatric Project to identify neonates/infants who may require radiofrequency ablation (RFA) to address arrhythmias in the setting of complex congenital heart disease.

Catheter ablation laboratory establishment

After NCP returned from EP training to Jamaica in 2020, a catheter ablation laboratory was established within the already existing catheterization suite at UHWI. The main equipment in the laboratory includes a portable recording system with a stimulator, amplifier, and radiofrequency generator; however, it does not have an electroanatomic mapping system. Before this facility opened, no electrophysiologists from Jamaica performed cardiac ablation for treatment of any patients with heart rhythm disorders in the country.

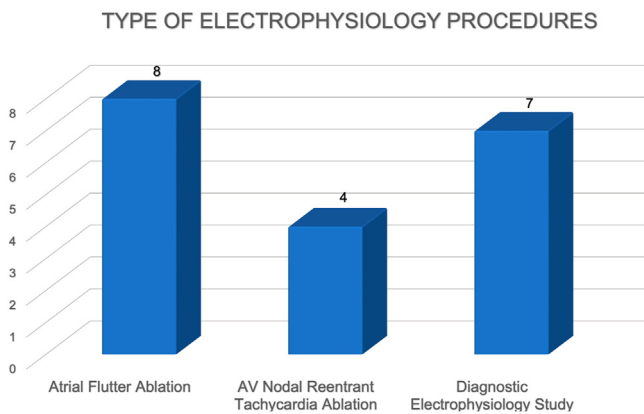


Figure 1 Electrophysiology procedures performed in the electrophysiology laboratory in Jamaica during their first year of operation (2020–2021). AV = atrioventricular.

Catheter ablations

In this EP laboratory established in Jamaica, 19 EP studies/catheter ablations were performed during the period from 2020 to 2021 (Figure 1). These interventions were performed without complications.

Since KC's return to Saint Lucia, 2 patients with severe tachycardia-induced cardiomyopathy (LV ejection fraction [EF] <30%) secondary to atrial flutter/fibrillation and atrial flutter have been identified, cardioverted to sinus rhythm, and appropriately referred for RFA. These treatments were successful, with improved cardiomyopathy and restoration of normal LV function confirmed by repeat echocardiograms 3 months after ablation. Another 3 patients with atrioventricular nodal reentrant tachycardia, all extremely symptomatic with hemodynamic compromise while in rhythm, have been referred for RFA. Two of these patients have been treated successfully, while the third awaits funding.

Permanent pacemaker implants

Thirteen new permanent pacemakers (PPMs) were implanted at UHWI in Jamaica between 2020 and 2021 by NCP and her

EP staff, with CV surgery support (Figure 2). EP also assisted with the implantation of 4 new PPMs and assisted with 5 pacemaker pulse generator replacements. Furthermore, 5 implantable loop recorders have been implanted by NCP. The majority of the PPMs were implanted by CV surgery at UHWI in the period from 2020 to 2021.

In Saint Lucia, device implantation is only available at the private hospital where such procedures have been performed by a male cardiologist since 2007 and by KC since her return to Saint Lucia in 2018. Since then, KC has identified at least 15 patients requiring a pacemaker. Among these patients, only 6 PPMs and 1 implantable loop recorder have been implanted to date. The major challenges continue to be financially based, as most patients cannot afford the devices unless they are insured. Active discussions with industry partners addressing these challenges are underway.

Implantable cardioverter-defibrillator implants

One implantable cardioverter-defibrillator (ICD) was implanted by NCP and her EP staff with CV surgery support at UHWI in Jamaica between 2020 and 2021. The procedure was performed to treat sustained ventricular tachycardia on a background of ischemic cardiomyopathy with LV EF of 17%. EP also assisted in 1 ICD pulse generator replacement. The majority of ICDs were implanted by CV surgery at UHWI during the period from 2020 to 2021.

In Saint Lucia, 3 patients requiring ICDs were identified. One had hypertrophic cardiomyopathy requiring coronary angiography and septal ablation in addition. Because these procedures are not currently available in Saint Lucia, they were performed in Martinique with the ICD implanted at the same time. A second patient needed cardiac positron emission tomography for evaluation of newly diagnosed cardiac amyloid, which was unavailable locally, so it was performed along with implantation in the Cayman Islands. The third patient did not have the necessary funding.

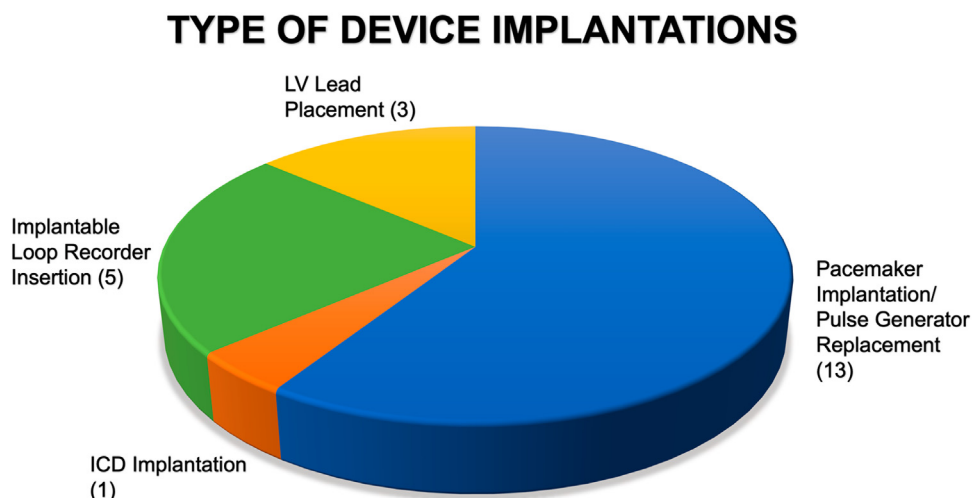


Figure 2 Devices implanted in Jamaica's electrophysiology laboratory during their first year of operation (2020–2021). ICD = implantable cardioverter-defibrillator; LV = left ventricle.

EP congestive heart failure impact

In Jamaica, 3 patients having atrial flutter with severe LV dysfunction were treated successfully with catheter ablation, and immense improvements in EF were seen on repeat echocardiograms 2–3 months post-ablation. In addition, support for 3 successful coronary sinus (CS) lead implants was given to CV surgery during cardiac resynchronization therapy–defibrillator placement in the catheterization laboratory/operating room between 2020 and 2021.

In Saint Lucia, KC has expanded the scope of practice, particularly with regard to identifying patients with an indication for more complex device therapy, such as cardiac resynchronization therapy–defibrillator placement. Since her return in 2018, 3 such patients have been identified and implantations performed at CHUM in Martinique. Two of these patients have shown significant clinical improvement in congestive heart failure symptoms, with increase in New York Heart Association functional class from III–IV to I–II in 1 case.

Local collaborations

In Jamaica, implantation and management of patients with pacemakers and ICDs in the past were performed by CV surgeons. With an electrophysiologist now practicing in Jamaica, CV surgery has been supportive and acted in a collaborative manner, leading to a number of joint procedures. A mutually beneficial relationship has developed. NCP and her EP staff have assisted with CS cannulation and CS lead placement, and CV surgery has assisted with procedural skills development. EP and CV surgery also supervise the pacemaker clinic.

In Saint Lucia, collaboration with the EP department at CHUM is one of the goals of the program, although it was temporarily halted by the COVID-19 pandemic.

Discussion

Quantifiable impact

In recent years, before the training of local electrophysiologists, patients benefited from a visiting electrophysiologist; however, visits were infrequent and did not allow for personal expert follow-ups. The training of NCP and KC to become electrophysiologists in Jamaica and Saint Lucia, respectively, has significantly elevated the level of expertise available in the Caribbean EP field. The first ablation by a Jamaican in Jamaica was performed by NCP at a new facility in September 2020. Successful implementation of the arrhythmia ablation treatment program in the Caribbean not only is an important advancement in improving specialized care in the Caribbean, but it also will have a financial impact on the islands' resources, as fewer patients will need to travel abroad for more specialized medical care. The hope is to diagnose and subsequently treat electrical disturbances/arrhythmias more efficiently and effectively by elevating the overall EP expertise in the whole region.

The trainees who returned to establish EP programs in the Caribbean still face numerous challenges that make

knowledge translation difficult. Input from various stakeholders and persons with material resources is needed to support the advancement of EP care so that the true potential and impact of training these individuals can be translated into benefiting the EP underserved populace in need. In the past, patients in Jamaica and Saint Lucia requiring arrhythmia procedures had to travel overseas, which added costs to an already expensive intervention that made such care unaffordable and inaccessible for most of the population.

Jamaica has a population of 2.97 million people. Because of the paucity of EP expertise on the island, basic device services, such as device implantation and following up on patients with devices, were performed by CV surgeons until recently. These patients were managed without any input from cardiac electrophysiologists. The need to have local content expertise and cardiac electrophysiologists to enhance cardiac rhythm advancements and provide local arrhythmia procedures was obvious. Although the need was clearly established, a significant hurdle to achieving cardiac EP training was accessing both an EP training program and the financial assistance needed for training and knowledge development. The strategic training of NCP and KC has led to the dismantling of this hurdle in Jamaica and Saint Lucia.

Saint Lucia is a much smaller island with a population of just over 184,000. There is no dedicated EP clinic at Owen King European Union Hospital, which is the main public hospital. EP consults are seen via the weekly cardiology clinic and within the private sector. Patients requiring a PPM or ICD often would be forced to travel to Martinique or other countries before device implantation became available in 2007. There is no available EP laboratory for EP studies or interventions, so patients are referred overseas for these procedures. Because of the scarcity of cardiology/EP expertise, patients often are not referred appropriately from general internists or general practitioners, so identification of patients with an obvious indication for EP study or catheter ablation often is delayed.

EDI

Even in the United States, racial minorities often are underrepresented in the EP field. In 2021, as few as 4 applicants for clinical EP fellowships were Black or African American.¹⁰ Extra efforts to attract new trainees, particularly minorities, to EP are needed not only in the United States and Canada but also in the Caribbean. In addition, funding is needed to maintain the quality of EDI in training programs, thereby ensuring that equity can continue to be used as a path to achieve eventual equality in EP for those from underserved communities.

Influence of co-trainees

In addition to supervisors who are understanding of the Caribbean trainees, one of the key features commented on by the trainees is the support provided by co-trainees during their training. By laddering the training program with co-trainees having varying levels of experience, both

supervision and peer support established for the trainees made a significant difference. The senior trainees provided guidance and backup on educational and procedural activities for the trainees.

Philanthropy and university

In 1994, the modern era of Toronto–Caribbean specialized training in subspecialty internal medicine was boosted by the establishment of the endowed Raymond Chang Caribbean medical subspecialty training program at UHN and U of T. Dr Chang was a Jamaican-born Canadian philanthropist. To date, the Chang Fellowship has been instrumental in the training of 13 fellows in subspecialty internal medicine for the Caribbean. These subspecialties include rheumatology, medical oncology, respiratory, general internal medicine, infectious diseases, and nephrology. In addition, more than 30 trainees in cardiology have received special funding from the Division of Cardiology at UHN. Of the trainees who completed the UHN program, all but one returned home to teach and practice in the Caribbean.

EP is not established in various countries in the West Indies. Other than rare visits from foreign electrophysiologists brought in by private clinics, no electrophysiologists were performing ablation in Jamaica before NCP's return from her EP training and the opening of the catheter ablation laboratory at UHWI. The first ablation by a Jamaican in Jamaica was performed at this new facility by NCP in September 2020. Thus, the philanthropy provided by the Jamaican expatriate to the University of Toronto had a significant impact on developing expertise in Jamaica.

Obstacles to extracting benefit

Where knowledge and expertise have been obtained, the lack of physical and human resources required to put that expertise to use on a wide scale poses a significant challenge. In Saint Lucia, well-trained nurses and EP technicians are not readily available and must be flown in from a neighboring island for procedures, thus increasing the costs for patients. Attempts to train local health care workers have been supported by industry, but there is a need for a more structured and dedicated training program with reliably trained personnel. The unit cost for devices is prohibitive and significantly impacts on the patient's decision to seek care on the island. In contrast, the neighboring island of Martinique is able to offer similar procedures at much reduced costs because their health care system is part of a much larger French system, with the obvious favorable implications on cost.

Conclusion

Underserved EP communities in developing nations face many hurdles, including the lack of local expertise and knowledge. EDI in EP training programs will be needed to improve global EP care delivery in developing nations and EP underserved populations. In the past, cardiac care in

the Caribbean was patchy and reliant on visiting consultants. Although the group of cardiologists is growing but still quite small compared to the Canadian or American experience, the provision of cardiac care has stabilized, and subspecialty services now are available in the public and private health care systems. Graduates of training programs from abroad, such as the EP program in Toronto, have returned home and gone on to accomplish a number of firsts in the West Indies. In a short period, the training of the first female electrophysiologists to practice in Jamaica and Saint Lucia has led to quantifiable positive impacts in both countries.

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