Cardiology in the Young

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The evolution of cardiac care for children in Washington, DC

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Original Article

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Abstract

Cardiac surgery for CHD was pioneered in Washington, DC by Charles Hufnagel and Edgar Davis working at Georgetown University and Children's Hospital of the District of Columbia. Children's Hospital, now Children's National Hospital, had been established just 5 years after the end of the Civil War. In the 1950s, Davis and Hufnagel undertook many open-heart operations using the technique of surface cooling, hypothermia, and circulatory arrest. Hufnagel and Lewis Scott, who founded the cardiology department at Children's, were trained in Boston by Gross and Nadas. Judson Randolph, also a trainee of Gross, introduced cardiac surgery using cardiopulmonary bypass and established the General Pediatric Surgery department at Children's in the 1960s. The transition of hospital staffing from community-based private physicians to full-time hospital employees was often controversial but was complete by the turn of the millennium. The 21st century has seen continuing growth of the new Children's National Heart Institute and consolidation of several congenital cardiac programmes in Washington, DC.

Founding of a Children's Hospital in the District of Columbia

The "Children's Hospital of the District of Columbia" also known to residents of the District as "DC Children's Hospital", first opened its doors on 2 December, 1870 in a small building at the corner of 13th and F Streets. It had only 12 beds. This was just 5 years after the end of the Civil War and 80 years after George Washington had selected the site for a 10 mile square federal capital city on the banks of the Potomac River not too far from his family home at Mt Vernon Virginia. In the chaotic aftermath of the Civil War, there were many individuals in Washington who recognised that the care of children and particularly orphans suffering from diseases of infancy and childhood was quite inadequate. The original 12-bed hospital soon proved inadequate so that in 1875, plans were developed for a very much larger hospital that eventually grew to occupy an entire city block between V and W streets and 12th and 13th streets. The new hospital began admitting patients on 1 October, 1879 (Fig 1).

In 1968 following the death of the Reverend Martin Luther King, there was widespread rioting and destruction in the District particularly along 14th street relatively close to the hospital which remained completely untouched. Later that year, the board of the hospital developed plans to move the hospital to its current location in northwest Washington. The hospital today overlooks the Mc Millan reservoir with views towards the Capitol building 2 miles south as well as the Washington monument, the National Cathedral and the Basilica of the National Shrine. It stands adjacent to the Washington Hospital Center, an adult general and trauma hospital, the DC Veterans Administration Hospital and the National Rehabilitation Hospital (Fig 2).

By the time the new hospital, now the Children's Hospital Medical Center opened in 1977, the District of Columbia had been granted limited home rule rather than being directly managed by congress. Residents of DC first gained the right to vote in presidential elections in 1961 but even today have no representation in congress. In the 100 years between 1870 when the hospital was first opened and the 1970s when it moved to Michigan Avenue, the population of the District had increased from 132,000 to 760,000. However, this was the peak of the District's population which subsequently declined by almost 25% over the next 20 years. The 1980s and 1990s were a dark time for the District with a high crime rate as seen in many cities across the United States of America. The early 2000s, however, was a time of rebirth for the District. The population decline was reversing and in fact increased by nearly 25% by 2020. Many factors contributed to the spirit of newfound confidence and optimism in the District including expansion of the modern and efficient Washington metro subway system which had been opened in 1976. There was visionary leadership by Mayors Tony Williams, Adrian Fenty, Vincent Gray, and Muriel Bowser. Reflecting similar changes occurring in major cities across the United States of America, there was a sustained decrease in crime and the annual murder rate dropped dramatically. The first two decades of the 2000s were also a period of remarkable growth in size, staffing, and confidence for Children's National Medical Center.

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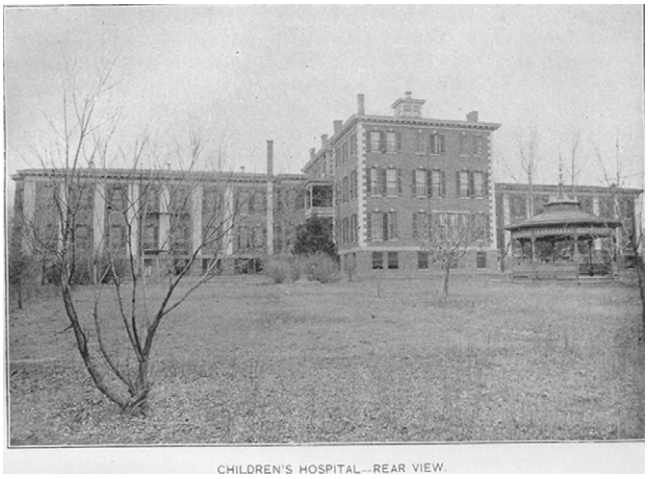

Figure 1. Children's Hospital of the District of Columbia occupied the city block between V and W and 12th and 13th streets from 1879 to 1977.

Administrative changes and advances at Children's National Hospital

Like many hospitals across the United States of America, Children's Hospital was managed initially by a small group of volunteers, particularly the "Board of Lady Visitors". Medical care was provided by community physicians who admitted their own patients as well as caring for orphans and the indigent on a voluntary basis. However, gradually resident and full-time staff physicians were employed by the hospital and established their offices on site. This process was accelerated by the recruitment of Dr Robert Parrot to be Physician in Chief in 1956 (Fig 3).

By 1970 despite Dr Parrot's efforts, only 10% of the medical staff had offices at the hospital. Fewer than half were courtesy staff. Nevertheless the Editorial of the Centennial Issue of the Clinical Proceedings of Children's Hospital of the District of Columbia published in 1970 mentions "I have heard many private physicians comment that their role has been preempted even in the care of their own patients."[1] Despite resistance, Dr Parrot continued to build strong subspecialty departments including neonatology to be led by Dr Gordon B Avery who ultimately took over from Dr Parrot as Physician in Chief. In 1994 during the worst of the difficult days of the District of Columbia when the population was declining precipitously, Edwin "Ned" Zechman was recruited from Children's Hospital of Pittsburgh to become CEO of Children's National.[2] Working in conjunction with a number of visionary board chairs, Zechman recognised that there were major changes underway not just in the District of Columbia but also within the healthcare environment throughout the United States of America. Zechman strengthened the business foundation of the hospital. This was the time of Hillary Clinton's healthcare initiative and consolidation of numerous hospital systems, as well as health insurance companies, was underway. In response to this changing environment the move to full-time medical staff was completed and there would no longer be any courtesy positions for physicians who maintained their own private practices. Going forward all physicians would be employees and staff of the hospital. This model has subsequently been adopted over the last 25 years by many if not the majority of academic medical centres. The transition had continued to be met by considerable resistance by many physician groups including the cardiology practice that was well established by this time. However, as the District of Columbia stabilised in the early 2000s, the model proved to be prescient and was attractive for recruitment of physicians from around the country. In addition, the hospital was experiencing rapid expansion of NIH-supported research under the leadership of Chief Academic Officer Dr Mark Batshaw who further strengthened the academic affiliation with George Washington University Medical School which had been established in 1968. Following Ned Zechman's retirement in 2011 Dr Kurt Newman, previously the Chief of Surgery at Children's National, took over as CEO. With a strong focus on diversity, Newman has continued to strengthen the reputation and fiscal position of the hospital. The hospital took over the management of paediatric care at United Medical Center in south-east DC. Widespread gentrification throughout the District during the rapid growth years of the early 2000's resulted in approximately equal numbers of White and Black residents within the District and approximately 10% Latinos in 2020. Through numerous satellite outreach clinics and recruitment of minority administrators and staff, Newman has extended the reach of Children's National to all members of the greater Washington community.

Cardiac care at Children's National

Surgery for children with CHD was pioneered at Boston Children's Hospital by Dr Robert Gross when he ligated a patent ductus in 1938 and subsequently developed procedures for surgical repair of coarctation in the early 1940s.[3,4] He was assisted in his early studies of coarctation and blood vessel replacement by Dr Charles Hufnagel who was one of the most important innovators in the emerging field of cardiac surgery.[5] Dr Hufnagel moved to Georgetown Medical School from Boston in 1950 where he successfully surgically placed the first artificial aortic valve in 1952.[6] He also continued to develop blood vessel substitutes for replacement of the aorta. Working with Dr Hufnagel at Georgetown was Dr Edgar W Davis who became the first Chief of Thoracic and Cardiovascular Surgery at Children's Hospital. In 1942, he undertook the first patent ductus ligation and in 1950, the first coarctation repair at Children's Hospital and like Hufnagel was an innovator in the early years of congenital cardiac surgery.[7] Dr Davis was a very early adopter of the technique of whole-body hypothermia to allow open-heart surgery. This technique was the result of research efforts of three individuals, Wilfred Bigelow in Toronto, F. John Lewis in Minnesota, and Henry Swan in Colorado.[8] In September, 1952, Lewis performed the world's first open-heart operation when he closed an ASD in a 5-year-old girl. Just 2 years later, Davis used the hypothermia method in Washington to correct a stenotic pulmonary valve followed by numerous procedures to close holes in the heart in children at Children's Hospital[9] (Figs 4 and 5).

In 1963 a young surgeon, Dr Judson Randolph, who had trained under Dr Gross in Boston, was recruited to Children's Hospital where he established paediatric general surgery as a discipline including a surgical training programme.[10] He mentored many fine young paediatric surgeons including Kathryn Anderson who later became President of the American College of Surgeons as well as Kurt Newman who became CEO of Children's Hospital (Fig 6).

Dr Randolph also was able to secure a heart and lung machine for open-heart surgery. The first successful surgery using a heart/lung machine had been undertaken in May, 1953 by Gibbon in Philadelphia. However, early machines were so complex with

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Figure 2. Aerial view of Children's National Hospital adjacent to the McMillan Reservoir (top left), the Washington Hospital Center (centre), the National Rehabilitation Hospital (right), and the DC Veterans Administration Hospital (bottom left, not shown).

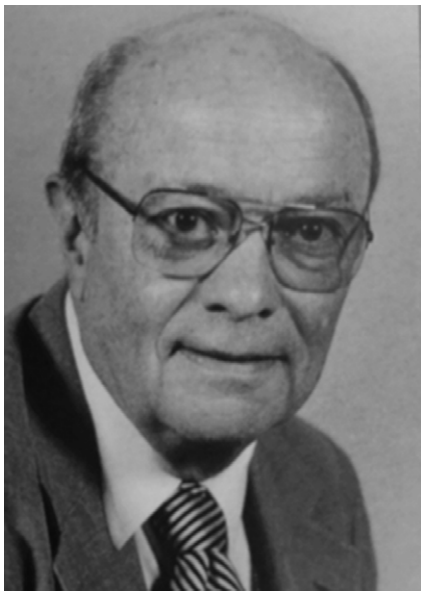

Figure 3. Dr Robert Parrot was recruited to Children's Hospital in 1956 from NIH. He became Physician in Chief and began building the full-time medical staff.

Figure 4. Dr Edgar Davis, the first Chief of Thoracic and Cardiovascular Surgery at Children's Hospital, undertook a number of pioneering operations at Children's Hospital in the 1950s including the first successful surgery ever reported for anomalous left coronary artery from the pulmonary artery in 1957. [6] In addition to being the Chief of Thoracic and Cardiovascular Surgery at Children's Hospital, Davis was Chairman of the Medical Board and President of the Medical Staff at Washington Hospital Center.

many risks for small children that the alternative method of hypothermia was used more commonly during the 1950s. Early machines were also extremely expensive. Following his acquisition of a heart/lung machine in 1965, Dr Randolph recruited Dr James McClenathan to take open-heart surgery at Children's Hospital to the next level. Dr McClenathan had started the cardiac surgery programme at Bethesda Naval Medical Center in the early 1960s. Also recruited from the Bethesda Naval Hospital was Dr Lewis Scott, a cardiologist who joined Children's Hospital in 1964. Dr Scott had trained under the pioneering paediatric cardiologist at Boston Children's Hospital, Dr Alex Nadas. Nadas and Gross had established the first paediatric cardiology and cardiac surgery departments (not divisions) in the United States of America at Boston Children's. Following Nadas' lead, Dr Scott established paediatric cardiology at DC Children's and served as chief of cardiology from 1967 to 1985. He also played an extremely important role at Children's Hospital as senior vice president for academic affairs in the late 1980s (Fig 7).

In 1974, Dr Frank Midgley joined Drs McClenathan and Randolph at DC Children's in the cardiac surgery programme. Midgley had trained at the University of Michigan with specialty training in congenital heart surgery at Great Ormond Street London.[11] He became chief of cardiac surgery in 1975 and soon expanded the programme to more than 100 cases per year including cutting-edge procedures for that time such as the use of deep hypothermia for newborn surgery and the Mustard procedure for transposition of the great arteries. Several other cardiac surgeons worked with Dr Midgley in the 1980s and 1990s including Don Watson, Eric Ceithaml, Marshall Jacobs, Jeff Sell, and Greg DiRusso. The programme grew to a peak of approximately

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Figure 5. Dr Davis undertook pioneering surgery at Children's Hospital in patients under 15 years of age (as shown here) in the 1940s and 50s while older patients were managed at the adjacent Washington Hospital Center.

Figure 6. Dr Judson Randolph established the Department of Pediatric Surgery at Children's Hospital and acquired the first heart/lung machine for the hospital to expand the cardiac surgery program. On his right is Board Chairman C. Richard Beyda.

300 cases per year in the late 1980s. In 1989, Dr Marshall Jacobs performed the first heart transplant at Children's National.[12] Dr. Marshall Jacobs also introduced the neonatal arterial switch operation and the Norwood (Stage 1) operation for hypoplastic left heart syndrome at Children's National (Figs 8 and 9).

Parallel with the expansion of the cardiac surgery programme, Dr Scott was recruiting a large number of paediatric cardiologists to join the cardiology division. Dr Muriel Wolf trained with Helen Taussig at Johns Hopkins and joined the programme in 1966. Other paediatric cardiologists to join the programme in the late 1980s and early 1990s were Lowell Perry, Steven Shapiro, Frank Galioto, Karen Kuehl, and Roger Ruckman. In 1986, Dr Ruckman took over from Dr Scott as Chief of Cardiology. He recruited Dr Gerard Martin from UCSF where he had trained under Drs Norman Silverman and Abraham Rudolph in the new field of paediatric echocardiography. In 1989, Dr Thomas Hougen was recruited from Boston to become the new chief of cardiology.[13] (Fig 10).

An important factor contributing to the successful development of paediatric cardiac surgery and cardiology at Children's National was the outstanding pioneering work being undertaken in paediatric intensive care management by Drs Peter Holbrook and Alan Fields. Holbrook and Fields established one of the first paediatric ICUs in the country just as the hospital was moving to Michigan Avenue in the mid-1970s. They hired Dr. Murray Pollack who later led the Critical Care Medicine programs. They worked closely with Dr Billie Lou Short who rapidly expanded the indications and application of the new modality of ECMO for premature neonates in the neonatal ICU as well as for post-cardiotomy neonates and infants in the multidisciplinary paediatric ICU. In 2004, a separate and dedicated cardiac ICU was established by Dr Richard Jonas and Dr Gerard Martin as a key component of the new Children's National Heart Institute.

Expansion followed by consolidation of cardiac surgery in the District of Columbia

In the early-1990s with the transition from privatepractice visiting physicians to hospital-employed medical staff continuing, a number of paediatric cardiologists left Children's National and moved to Georgetown University Hospital. As noted above, the 1990s was a time of rapid contraction of the population of the District which no doubt contributed to the decision by other cardiologists including Steven Shapiro and Frank Galioto to move out of the District across the Potomac River to establish several new private paediatric cardiology practices in Fairfax Northern Virginia. In conjunction with Dr Seymour Hepner, Drs Shapiro and Galioto worked with a pediatric cardiac surgeon who had been recruited to Inova Fairfax Hospital. Dr Bechara Akl achieved outstanding results at the Inova Children' Hospital in Fairfax Virginia. Thus by the late 1990s, there were four paediatric cardiac surgery programmes within the greater Washington area. In addition to Children's National and Inova Children's, there was a programme at Georgetown

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Figure 7. The first patient to have open-heart surgery at Children's Hospital using the heart and lung machine in 1965. Dr Lewis Scott, Chief of cardiology and Dr Judson Randolph, Chief of Cardiac Surgery, are standing on the right and left sides of the patient's mother.

Figure 8. Dr Marshall Jacobs performed the first heart transplant at Children's Hospital in April 1989 assisted by Dr Frank Midgley. He is pictured with the patient and Dr Gerard Martin.

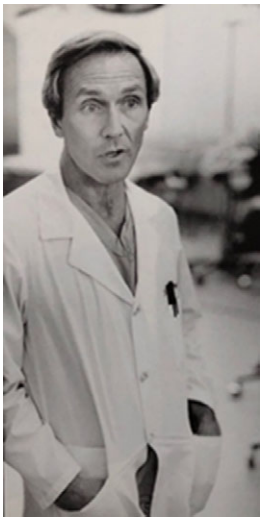

Figure 9. Dr Frank Midgley was the Chief of Cardiac Surgery at Children's Hospital from 1975 to 2004.

University Hospital where Dr Richard Hopkins was the chief of cardiac surgery working under Chief of Surgery Robert Wallace. Also in the District of Columbia was a small military programme at Walter Reed Medical Center.

At Children's National, Dr Gerard Martin took over as chief of paediatric cardiology in 1997. Continuing the healthcare trends that had been noted by Ned Zechman in the early 1990s, there were additional changes underway within the hospital systems in the District of Columbia. Georgetown University sold the Georgetown University Hospital which came under the management of the private MedStar Corporation which was rapidly expanding its control of numerous hospitals in the mid-Atlantic region including the Washington Hospital Center adjacent to Children's National. Georgetown and Children's National agreed to merge their paediatric cardiology programmes under the leadership of Gerard Martin with closure of the Georgetown cardiac surgery programme and all cardiac surgery to be performed at Children's National. The Department of Defense also decided in 2004 to close the paediatric cardiac surgery service at Walter Reed Medical Center. Walter Reed Hospital itself was closed in 2011 with its services and staff merging with Bethesda Naval Medical Center renamed as the Walter Reed National Military Medical Center. Several of the buildings on the Walter Reed campus in the District are being developed by Children's National to allow further expansion of the Children's research programme.

Establishment of the Children' National Heart Institute

In 2004, Dr Gerard Martin together with Dr Peter Holbrook, the Chief Medical Officer at Children's National, recruited Dr Richard

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Figure 10. In 1989, Dr Thomas Hougen was recruited from Boston to become the new chief of cardiology taking over from Dr Roger Ruckman.

Jonas from Children's Hospital Boston to take over as the chief of cardiac surgery upon the retirement of Frank Midgley. Drs Martin and Jonas planned the creation of Children's National Heart Institute reflecting the essential team collaboration needed to achieve excellent outcomes for complex babies undergoing congenital cardiac surgery. A key component of the Heart Institute would be a dedicated cardiac ICU with an adjacent cardiac ward. Plans were drawn up for construction of the CICU and cardiac ward within the new east tower which was already partially built. By placing the CICU adjacent to a general paediatric ICU, it would be possible to expand the number of ICU cardiac beds when necessary from the minimum 13 originally allocated to the Heart Institute. Dr John Berger, doubly board certified in paediatric cardiology and cardiac intensive care, was appointed the first director of the cardiac ICU. Dr Rick Levy was recruited to head the dedicated cardiac anaesthesia team working within the Heart Institute. Cardiac nursing teams were developed for the new ICU and ward as well as for the two dedicated cardiac operating rooms which also were constructed as part of the Heart Institute concept. Several key donors from the Washington community contributed generously to the major expansion of the footprint of the cardiac programme that occurred over the first 8 years of the Heart Institute including Steven and Diana Goldberg, Richard Beyda, Irwin Edlavitch, Richard Rabil, Morton, and NormaLee Funger as well as Melvin and Reyna Cohen. At the same time, the hospital added two floors to the main building as well as constructing the East Wing which would house not only the cardiac in-patient programme, but also a 52-bed neonatal ICU and the general paediatric ICU (Fig 11).

Coincident with the establishment of the Heart Institute and the rationalisation of cardiac care delivery in the District of Columbia to the single cardiac surgical programme at Children's National, there was a rapid rise in case numbers. The 13-bed cardiac ICU which opened in 2005 soon proved to be inadequate in size. Dr David Wessel was recruited from Boston Children's to take over the leadership of all of the hospital's intensive care units including the cardiac ICU, later becoming the hospital's Chief Medical

Figure 11. In 2004, Dr Richard Jonas was recruited to Children's National from Children's Hospital Boston to be the new Chief of Cardiac Surgery following the retirement of Frank Midgley. Drs Jonas and Martin established the Children's National Heart Institute and developed plans for a dedicated cardiac ICU, two cardiac ORs, and a new cardiology clinic and step down ward.

Officer following Peter Holbrook's retirement. He immediately developed plans to construct a 26-bed cardiac ICU in the main building adjacent to the new and greatly expanded cardiology outpatient clinic and on the same level 3 as the cardiac ward in the East Wing. In late 2011, patients were transferred into the new ICU which was soon busy particularly with the caseload generated by a collaborative programme with Batson Children's Hospital in Jackson MS which had been arranged by Gerard Martin. Between 2009 and 2011, teams from Children's National travelled regularly to Mississippi to help with the re-establishment of a cardiac programme there. During the 2–3 years that the programme in Mississippi was in place, approximately 100 complex patients and all neonates travelled to Washington, DC from Jackson Mississippi each year for their cardiac surgical procedures.

On the cardiology side, Dr Charles Berul was recruited from Boston Children's in 2009 to head the division while Gerard Martin handled the administrative responsibilities of the Heart Institute as senior hospital vice president. An additional important role for Dr Martin was to coordinate the rapid expansion of the cardiac international programme. Drs Jonas and Martin made regular visits to the Middle East. Agents representing Children's National were hired in Kuwait and the United Arab Emirates to

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Figure 12. A donation of $150 million allowed expansion of the research program at Children's National and led to further strengthening of the hospital's international program including many patients who came from the Gulf region for complex cardiac surgery. Children's Hospital CEO Kurt Newman (fourth from left) with UAE representatives including Ambassador Yousef Al Otaiba (far left) together with Chief Academic Officer Mark Batshaw and Chief of Surgery Anthony Sandler (third and second from right).

coordinate the transfer of surgical patients from the Gulf region to Children's National working closely with medical staff offices in their Washington embassies. The international programme at Children's National also attracted a large number of oncology, orthopaedic, and neurosurgery patients from the Gulf region in addition to cardiac surgery patients. The Global Services office was restructured and moved into greatly expanded office space on the 2nd floor of the main building. Numerous coordinators and administrative staff as well as interpreters were hired. The international cardiac programme developed into an important contributor to the financial strength of the Children's National Heart Institute and Children's National Hospital.

The strong international profile of the hospital together with the efforts of CEO Kurt Newman and development director Pam King-Sams working with local philanthropist Joe Robert led to a $150 million donation from the United Arab Emirates. The Sheikh Zayed Institute for Pediatric Surgical Innovation was established at Children's National further expanding the research programme which was benefiting from a rapidly expanding portfolio of NIH support (Fig 12).

Within the Heart Institute, the cardiac surgery laboratory was growing as increasing NIH support was added to the RO1 support that had been brought by Richard Jonas when he moved to Children's National. Dr Nobu Ishibashi was appointed laboratory director and soon increased the total number of active federal grants to four including a clinical phase 1 trial designed to optimise neurodevelopmental outcomes of children with heart disease. The Cardiac Surgery laboratory was generously supported by Amy and Brett Baier and their families allowing Nobu Ishibashi to accept the Foglia-Hills endowed professorship (Fig 13).

During the first two decades of the 2000s, there was a shift in the diagnosis of congenital heart problems from the newborn period and infancy to fetal diagnosis. A new fetal cardiology group was established by Dr Mary Donofrio who had joined the Heart Institute in 2004 at the same time as Richard Jonas. She rapidly developed a wide network of relationships with Maternal Fetal Medicine Specialists throughout the greater Washington area. The fetal team built on the solid foundation that had been laid by Dr Craig Sable who had pioneered the use of telemedicine to link with neonatologists in neonatal ICUs throughout the greater Washington area. Increasing sophistication of echocardiography equipment coupled with increasing bandwidth of the Internet allowed rapid remote diagnosis of newborns within minutes of birth. International communication initially by satellite link and subsequently through fibre-optic cable also facilitated outreach programmes established by Craig Sable firstly to Morocco and

Figure 13. The cardiac surgery research programme was generously supported by Amy and Brett Baier (pictured between Gerard Martin [center] and Richard Jonas [far right]) and their families, together with from left, intensivist Dr David Stockwell, Katherine Vernot-Jonas and Chief Medical Officer David Wessel.

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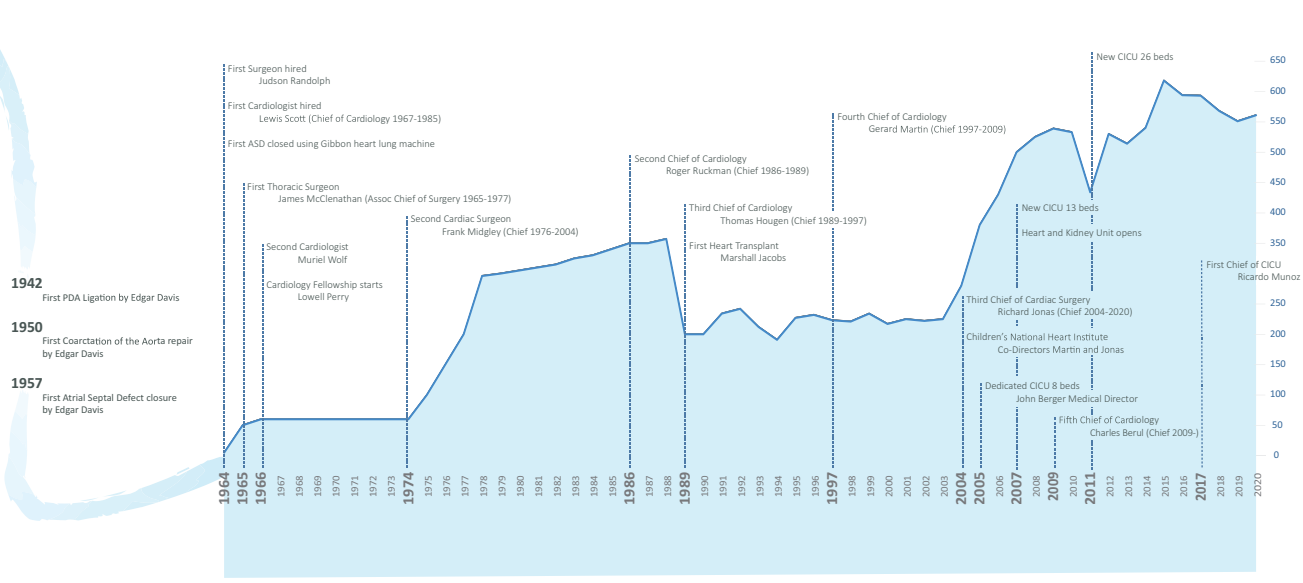

Figure 14. Timeline of the cardiac program at Children's Hospital of the District of Columbia, now Children's National Hospital. (X-axis: year, Y- axis: volume of cardiac surgical cases).

subsequently to Uganda. Team visits to both these countries supplemented the teaching and clinical interchange between the Children's Heart Institute and several programmes in Africa.

In 2017, Dr Ricardo Munoz was recruited from Children's Hospital of Pittsburgh to head up the expanding telemedicine programme at Children's National with the goal of adding new international links particularly in South America. Dr Munoz also took over from John Berger as the head of the cardiac ICU and joined Charlie Berul and Richard Jonas as one of the three co-directors of the Heart Institute assisted by Dr Nina Deutsch chief of cardiac anaesthesia and Lindsey Bradbury chief of cardiac nursing. By this time, a staff of 10 full-time cardiac ICU specialists had been recruited, all of whom were doubly board certified in cardiology and intensive care. In the catheterisation laboratory, Dr Josh Kanter took over as director from Dr Michael Slack in 2015 and working with Drs Kanishka Ratnayaka and Russell Cross pioneered some of the earliest interventional MRI-guided procedures developed in conjunction with the NIH intramural MRI programme. In response to the growing numbers of adults with repaired CHD being managed by the Heart Institute, an Adult Congenital Heart Program was established by Dr. Karen Kuehl with the Washington Hospital Center. Dr Anitha John was recruited from the Mayo Clinic to head up the programme. She rapidly expanded the programme working with Dr Pranav Sinha who undertakes adult congenital surgical procedures both at Children's National as well as at the Hospital Center.

On the surgical side, a number of surgeons worked with Richard Jonas including Michael McMullan, Bassem Mora, Achintya Moulick, Pranava Sinha, Dilip Nath, Can Yerebakan, Murfad Peer, and Karthik Ramakrishnan. The majority of these surgeons had initially come to the Heart Institute as senior cardiac surgery fellows through the international cardiac surgical fellowship programme. These surgeons had already developed extensive operating room skills in general cardiac surgery, but wished to advance their knowledge and expertise in the management of neonates and infants with complex CHD.

In 2020, Richard Jonas stepped down as chief of cardiac surgery following the recruitment of Dr Yves d'Udekem from Royal Children's Hospital in Melbourne Australia.

Conclusion

Children's National Hospital has a long history of caring for the children of the District of Columbia. In the new millennium, it has expanded its role to provide advanced treatment for children throughout the greater Washington area as well as regionally, nationally, and internationally. There is a long history of cardiac care with many links to pioneers in Boston including Lewis Scott who established cardiology and who was trained by Nadas as well as surgeons Judson Randolph and Charles Hufnagel who worked closely with Robert Gross. Since its inception in 2004, the Children's National Heart Institute has experienced rapid growth (see Timeline) which parallels the expansion of Children's National Hospital and the District of Columbia. With a strong group of leaders and an optimal administrative structure, the Heart Institute looks forward to continuing to contribute to the care of neonates, infants, children, and adults with heart disease throughout the greater Washington area and beyond (Fig 14).

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