

Pediatric neurosurgery at British Columbia's Children's Hospital

Paul Steinbok^{1,2} · Felix Durity² · John Kestle³ · D. Douglas Cochrane^{1,2}

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Introduction

A formal pediatric neurosurgical service in British Columbia (BC) started with the opening in 1982 of British Columbia's Children's Hospital (BCCH) as a full service pediatric tertiary care center serving the population of BC and the Yukon (Fig. 1).

There had been a Children's Hospital in Vancouver prior to this at a different location. That previous Children's Hospital opened in 1933 on West 59th Avenue as a Crippled Children's Hospital and in 1947 the facility was renamed Children's Hospital. Neurosurgeons participated at this Children's Hospital only in the outpatient Spina Bifida clinic. Prior to the opening of the new BCCH in 1982, inpatient pediatric neurosurgical care, including operations, was provided in a wing of the Vancouver General Hospital (VGA), called the Health Centre for Children. VGH was the major tertiary care center serving adults and children in BC and was affiliated with the University of British Columbia (UBC). In 1964, Children's Hospital and the Health Centre for Children agreed to develop a joint facility and finally, construction began in 1977 at 28th Avenue and Oak Street,

the current site of BCCH. The new BCCH opened to its first patients in June 1982.

In the years preceding the opening of BCCH, there was a well-established neurosurgical service and neurosurgical residency program at VGH, and this was chaired by Dr. Gordon Thompson. Children and infants, including pediatric neurosurgical patients, were operated on in the general operating room facilities of VGH, with anesthesia provided by general anesthesiologists. Intravenous access in the infants was a significant problem and often cutdowns had to perform to obtain adequate intravenous access. The adult patients typically received the highest priority in the neurosurgical operating room and elective pediatric cases tended to be left until late in the day. All neurosurgeons would do the occasional pediatric operation, especially for patients encountered while on call. However, for many years, the majority of the pediatric neurosurgical operations were performed by Dr. Peter Moyes, a technically-gifted, Mayo Clinic-trained neurosurgeon, but pediatric cases still accounted for a minority of his practice. In the late 1970s, Dr. Moyes was forced to slow down and eventually retire because of illness. The pediatric neurosurgical cases at VGH were referred more and more to Dr. Felix Durity, a graduate of the UBC Neurosurgical residency program in Vancouver, who had joined the neurosurgical group at VGH in 1975. In 1979, Paul Steinbok, who had also trained in the neurosurgical program at VGH, returned from a neuro-oncology fellowship with Drs. Steve Mahaley and Darryl Bigner in North Carolina and joined the VGH group. Gradually, the pediatric component of his neurosurgical practice increased. By the time that Peter Moyes retired, most of the pediatric neurosurgical cases at BCCH were being managed by Drs. Felix Durity and Paul Steinbok.

In 1982, with the opening of BCCH, a pediatric neurosurgical service was required at the new hospital, which was located 2 km from VGH. Comprehensive pediatric

✉ Paul Steinbok
psteinbok@cw.bc.ca

¹ Division of Pediatric Neurosurgery, Department of Surgery, University of British Columbia and British Columbia Children's Hospital, Vancouver, BC, Canada

² Division of Neurosurgery, Department of Surgery, University of British Columbia, Vancouver, BC, Canada

³ Division of Pediatric Neurosurgery, University of Utah, Salt Lake City, UT, USA

Fig. 1 The front of BC Children's Hospital as it existed from 1982 to 2014



neurosurgical diagnostic and surgical services were provided entirely at BCCH. Felix Durity (Fig. 2) and Paul Steinbok (Fig. 3) were assigned to work at BCCH. In addition, Dr. Patrick Murray, one of the neurosurgeons at St. Paul's Hospital, the other major UBC teaching hospital in Vancouver, joined the service. Dr. Murray had completed his neurosurgical training at the Montreal Neurologic Institute, a training which included 6 months of pediatric neurosurgery at the Montreal Children's Hospital. Felix Durity was appointed as the Head of the Pediatric Neurosurgery Division at BCCH.

In late 1983, Patrick Murray left BC Children's Hospital leaving Drs. Durity and Steinbok to look after the pediatric service at BCCH. Both Dr. Steinbok and Durity had busy adult neurosurgical practices at VGH, and the only house staff available to assist with the management of the children was general pediatric residents. This made it difficult to provide

high quality care for the neurosurgical patients at BCCH. At this point, Dr Steinbok decided to give up his adult practice and focus only on pediatric neurosurgery. Dr. Durity relinquished his position as head of the Division of Pediatric Neurosurgery, a position that Dr. Steinbok assumed in July 1984. On call coverage for neurosurgery at BCCH was provided by Drs. Durity and Steinbok, with some help on occasional weekends from the adult neurosurgeons at VGH. When pediatric patients had to be treated on the weekend by the adult neurosurgeons, their care would be transferred on Monday morning to Dr. Steinbok. The general neurosurgeons in BC were supportive of the development of pediatric neurosurgery at BCCH and generously started to refer their pediatric patients to BCCH to the care of Dr. Steinbok. Dr. Steinbok had received no formal training in pediatric neurosurgery and repeatedly sought advice and support from other established pediatric neurosurgeons, especially Dr. Harold Hoffman in Toronto.

With the increasing volume of pediatric neurosurgical cases, it became feasible to have two fulltime neurosurgeons practicing only pediatric neurosurgery at BCCH. At the annual meeting of the Pediatric Section of the American Association of Neurological Surgeons in Salt Lake City in December 1984, Dr. Steinbok met Dr. Douglas Cochrane for the first time and chatted about the opportunities for pediatric neurosurgery at BCCH. This resulted in the recruitment of Dr. Cochrane (Fig. 4), who arrived in September 1986, to be the second full time pediatric neurosurgeon at BCCH. Dr. Cochrane had completed 6 months in pediatric neurosurgery at Sick Kids in Toronto and was working as a combined adult and pediatric neurosurgeon at the Calgary General, the Foothills Hospital and the Alberta Children's Hospital in Calgary, but his goal was to be a pediatric neurosurgeon. In order to recruit Dr. Cochrane, Dr. Steinbok created a practice plan, the first of its kind in the Departments of Surgery at



Fig. 2 Dr. Felix Durity (1982)



Fig. 3 Dr. Paul Steinbok (1993)

BCCH and at UBC, wherein all income derived from clinical practice and from the University was pooled and shared between the two neurosurgeons. This recruitment was supported by the then CEO of BCCH, Mr. John Tegenfeldt, who provided additional hospital funding to the Division of Pediatric Neurosurgery, without which such a recruitment would not have been feasible.

With the arrival of Dr. Cochrane, Dr. Durity discontinued his pediatric neurosurgical practice to focus on adult neurosurgery at VGH. Dr. Durity and a few other adult neurosurgeons at

VGH continued to provide on call coverage every third weekend at BCCH, doing whatever was required urgently and handing over the patients to the pediatric neurosurgeons after the weekend.

When BCCH opened in 1982, the general pediatric residents were assigned to cover neurosurgical patients and the pediatric neurosurgeons provided significant teaching to these residents. Indeed, Dr. Steinbok and Cochrane received a special teaching award from the pediatric residents in 1989. After a few years, it was decided by the general pediatric residency training program director that there were higher priorities for their residents than learning neurosurgery. The general pediatric neurosurgery residents were no longer assigned to cover neurosurgical patients, and the formal teaching sessions about neurosurgical conditions were deleted from the curriculum. At approximately the same time, residents in the neurosurgical training program started to rotate through BCCH for 6 months in their fourth or fifth year of residency to obtain their exposure to pediatric neurosurgery, since this was no longer being done at the now adult only VGH. The neurosurgical residents would manage the neurosurgical issues, with input from general pediatric and pediatric subspecialty services only as required. There was only one neurosurgical resident on the service at any time, so that he/she was on call all the time during the days, and 1 out of 3 weekday nights and weekends. For the remainder of the time, Drs. Steinbok and Cochrane were on first call for neurosurgical issues.

Much time was spent in educating emergency room physicians, general pediatricians, and neonatologists to make clinical diagnoses in their respective settings and to do some simple procedures, such as shunt punctures to access CSF for culture or puncture of neonatal reservoirs daily for management of hydrocephalus in premature neonates. As a result, the service has been supported by well-educated pediatricians and general practitioners in the community. The philosophy of

Fig. 4 Dr. D Douglas Cochrane (1993)



educating the pediatric residents has continued so that wherever they practice in BC, pediatric neurosurgery diagnosis and care is known to them. Procedures, such as shunt punctures, continue to be done by these physicians, wherever they practice in BC with no adverse outcomes. In order to continue this practice, neurosurgical residents and fellows teach the other physicians how to do these interventions.

Throughout these early years and with the support of the practice plan, the academic mandate of the University and the Hospital was developed. Dr. Steinbok, already a recognized academic, continued to strengthen the program and mentored Dr. Cochrane in clinical academic pursuits.

The clinical neurosurgical program at BCCH continued to increase and, looking to the future, it was decided to recruit a third full time pediatric neurosurgeon. With the support of the executive of BCCH and the BCCH Research Institute, we were successful in recruiting Dr. John Kestle in 1992. Dr. Kestle (Fig. 5) had trained in Toronto and had also received a Masters in Clinical Epidemiology from McMaster University. He was recruited with the understanding that he would have 50 % of his time protected for research activities, not only within the Division of Neurosurgery but also at the level of the Research Institute. This arrangement was very productive and allowed Dr. Kestle to be the co-leader with Dr. Jim Drake, of the first randomized clinical trial in Pediatric Neurosurgery, the shunt study [1]. Dr. Kestle created the clinical trials infrastructure at BCCH to run this study and

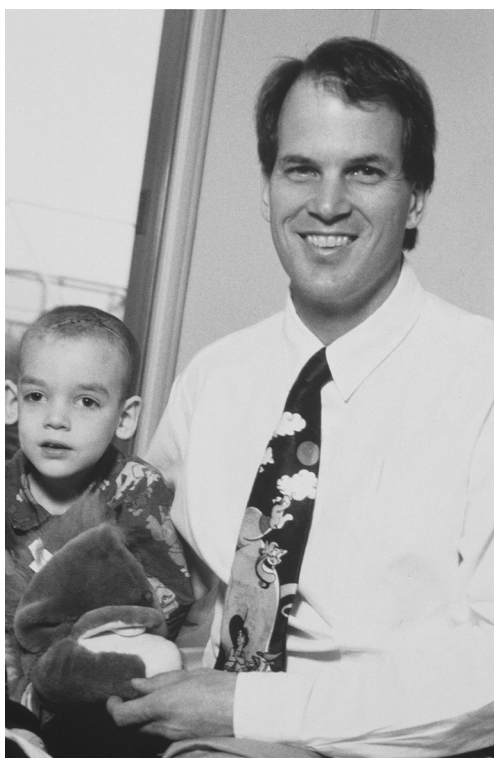


Fig. 5 Dr. John Kestle (1993)

went on to lead the sequel to this, the Endoscopic Shunt Insertion Trial (ESIT) [3]. In 1998, Dr. Kestle moved from Vancouver to work at Primary Children's Medical Center in Salt Lake City and the University of Utah.

In 2001, Dr. Angela Price (Fig. 6) was recruited to BCCH and was the first female neurosurgeon in British Columbia. Dr. Price had done neurosurgical training in Calgary and had completed a Pediatric Neurosurgery fellowship on Dallas, Texas. She moved back to join the neurosurgical group in Dallas in 2003. It was not possible to recruit another trained pediatric neurosurgeon to BCCH immediately at that time. Fortunately, Felix Durity, who had just retired after being the head of Neurosurgery at UBC and VGH agreed to do a locum at BCCH until we could recruit a full time pediatric neurosurgeon. In 2005, Dr. Ashutosh (Ash) Singhal (Fig. 7), who was a graduate of the Toronto neurosurgical program and who then had completed a fellowship at BCCH, joined the neurosurgical group at BCCH.

In April 2013, we welcomed back to Vancouver Dr. John Kestle, who had accepted the role of head of surgery at UBC. Dr. Kestle worked clinically as a pediatric neurosurgeon at BCCH in addition to his administrative responsibilities. In April 2014, Dr. Kestle returned to Primary Children's Hospital as a pediatric neurosurgeon and Vice Chair of Clinical Research, for the University of Utah Department of Neurosurgery.

On December 31, 2012, Dr. Steinbok stepped down as head of Pediatric Neurosurgery, and this role was assumed by Dr. Cochrane. Currently, the neurosurgical attending staff comprises Dr. Cochrane (Head), Dr. Steinbok, and Dr. Singhal (Fig. 8).



Fig. 6 Dr. Angela Price (2002)



Fig. 7 Dr. Ashutosh Singhal (2005)

Specialized programs

When BCCH opened in 1982, the multidisciplinary specialized programs that existed in the Health Centre for Children and the old Children's Hospital were transferred to the new facility. These included the spina bifida and craniofacial programs. Over the years, other specialized multidisciplinary programs were developed, including neuro-oncology, pediatric epilepsy surgery, and spasticity programs.

Spina bifida program

Prior to the opening of BCCH, children with myelomeningoceles were managed as inpatients at the Health Center for Children but out patient management was at a multidisciplinary clinic in the old Children's Hospital, about 5 km away. This clinic had very little neurosurgical



Fig. 8 Drs. Steinbok (*left*), Cochrane (*middle*), and Singhal (*right*) in 2015

input. However, when BCCH opened, the myelomeningocele clinic, which was directed by a pediatrician Dr. William Arnold, was moved to BCCH and expanded to include pediatrics, neurosurgery, orthopedic surgery, urology, general surgery, psychiatry, nursing, social work, physiotherapy, occupational therapy, psychology, and nutrition services.

Over time, children with other forms of spinal dysraphism, such as lipomyelomeningoceles, conus lipomas, diastematomyelia, and the occasional patient with a spinal cord tumor or spinal cord injury, have been managed at this clinic. In recognition of this, the name of the clinic was changed in 2012 to the "Spinal Cord Clinic". As has occurred elsewhere, the number of newborns with myelomeningoceles declined over the years and an important role of the staff of the clinic has been to provide counseling to parents about an in utero diagnosis of spinal dysraphism.

Craniofacial program

The neurosurgical involvement in the craniofacial program has centered around the management of children with craniosynostosis and to a lesser extent, anterior encephaloceles and hyper/hypotelorism. Patients with simple sagittal or lambdoidal synostosis have been managed by the neurosurgeons alone, but for coronal and metopic synostosis and all those with syndromic cranial and facial deformities, the neurosurgeons have worked with Dr. Donald Fitzpatrick and Dr. Douglas Courtemanche, craniofacial plastic surgeons, as a team. Pre- and postoperative follow-up by a multidisciplinary team is provided to syndromic patients.

Since 1982, our group operated on over 350 children with craniosynostosis. There have been no mortalities or serious infections after surgical procedures for craniosynostosis. Except for the most complex craniofacial syndromic cases, children are not admitted to the ICU setting after surgery and generally are discharged within 72 h of surgery.

Over the years, we have reduced the rate of transfusions during these procedures by meticulous attention to limiting intraoperative blood loss and by accepting a lower hemoglobin level in the postoperative period. The rate of blood transfusion in surgery for all types of craniosynostosis at BCCH has been less than 20 %. We have reviewed in detail our series of 118 children having surgery for sagittal synostosis between January 1986 and December 1999, and have documented a reduction in the rate of transfusions from 42 % before 1996 to 11 % from 1997 to 1999 [2]. This low rate of transfusion has continued to the present.

More recently, we have introduced minimally invasive endoscopically assisted surgery and postoperative helmet molding for selected infants with craniosynostosis.

Fig. 9 Neurosurgical fellows at BCCH from 1992 to 2006. (Top row from left) Gustavsson, Walling, McAuley, Oliviera, and Misra. (Bottom row from left) Hicdonmez, Singhal, Agrawal, Kariyattil, Gan, and Vitali



Neuro-oncology

A formal Pediatric Neuro-oncology program started in 1998, when Dr. Juliette Hukin, a pediatric neurologist returned from a fellowship in pediatric neuro-oncology in New York. The program is multidisciplinary, with the representation from neurosurgery, neurology, pathology, radiology, nursing, psychology, radiation oncology, oncology, endocrinology, nursing, physiotherapy, occupational therapy, and social services. BCCH has been involved for over 20 years with the Children's Cancer Group, and more recently with the Children's Oncology Group (COG), which have coordinated multiple disciplines and multiple centers to work together to advance the treatment of childhood cancers.

For some of the complex, but uncommon tumors, individual neurosurgeons have developed special expertise and the patients are directed to the neurosurgeon on the team with the appropriate expertise. For example, Dr. Steinbok offers expertise to patients with craniopharyngioma and Dr. Cochrane for children with pineal region tumors. Radical resections of tumor when appropriate have been facilitated by the use of state of the art image guidance systems and intraoperative electrophysiologic

monitoring, with the latter modalities being used particularly for spinal cord and brainstem tumors.

Comprehensive pediatric epilepsy surgery program

The Comprehensive Epilepsy Surgery Program was established in 1992 and is led by pediatric neurologist Dr. Mary Connolly. There is a multidisciplinary team, including multiple neurologists, neuropsychologists, psychologists, radiologists, nurses, electrophysiologists, and electrophysiology technologists, in addition to neurosurgeons. This team has been complemented by a Brain mapping group, led by a neurologist Bruce Bjornson.

Initially, Dr. Kestle was the only neurosurgeon in the epilepsy surgery program, but after his departure this role was assumed by Dr. Steinbok. Dr. Price and later Dr. Singhal joined Dr. Steinbok, so that there are currently two neurosurgeons in the epilepsy surgery program. From 1992 onwards, we have operated on over 300 children with intractable epilepsy, with the youngest patient being only 3 months old. The majority of patients have been from British Columbia, but we have also

Fig. 10 Neurosurgical fellows at BCCH from 2006 to 2014. (Top row from left) Gupta, Bukhari, Anderson, Foroughi, Ocal, and Pillai. (Bottom row from left) Suryaningtyas, Al Kharazi, Woerdeman, Knerlich-Lukoschus, Chittur Viswanathan, and Bonfield



treated children from Alberta, Manitoba, Saskatchewan, Prince Edward Island and Nunavut.

At the onset of the program, Wada tests (intra-carotid injections of amytal) were used routinely to assess language dominance and in the assessment of memory functions. In the past 10 years, there have been no Wada tests and language dominance and memory have been assessed with functional MRI under the guidance of the Brain mapping group.

Our results compare favorably with those reported from other centers around the world. Following extratemporal cortical resections, 67 % are completely seizure free. Eighty-two percent of patients are seizure free after temporal lobectomy. We have done over 30 hemispheric operations and 84 % of these patients are seizure free, with 60 % off antiepileptic medications.

Spasticity program

BCCH has developed over the years a comprehensive program for the management of children with motor disorders

causing increased tone in the limbs, typically spasticity. This program is recognized internationally as a center of excellence in the management of children with hypertonic cerebral palsy. Dr. Steinbok and, more recently, Dr. Singhal are the neurosurgeons in this program. There is a multidisciplinary team, comprising developmental pediatricians, orthopedic surgeons, a neurophysiologist, neurophysiology technologists, physiotherapists, occupational therapists, orthotists, and nurses, who work together to optimize the management of these children. The program offers a variety of treatment modalities including botulinum toxin, intrathecal baclofen (ITB), selective dorsal rhizotomy (SDR), and orthopedic surgeries.

SDR were first performed at BCCH by Dr. Steinbok in 1987, and we were the first center in Canada to do this procedure. Since then approximately 300 SDR procedures have been done. Most of the children have been from British Columbia, but patients have come from other provinces in Canada and from outside North America for this operation. The program has made a point of assessing outcomes after rhizotomy, and indeed was the first group in the world to assess the outcomes quantitatively after this procedure.

Table 1 Visiting professors to the Division of Neurosurgery at BCCH

1985	Fred Epstein	New York, USA
1987	Warwick Peacock	Los Angeles, USA
1988	Harold Hoffman	Toronto, Canada
1989	Claude Lapras	Lyon, France
1990	Harold ReKate	Phoenix, USA
1991	David McLone	Chicago, USA
1992	Robin Humphreys	Toronto, Canada
1993	Michel Scott	Boston, USA
1994	Arnold Menezes	Iowa City, USA
1995	Marion (Jack) Walker	Salt Lake City, USA
1997	Maurice Choux	Marseilles, France
1998	Anthony Hockley	Birmingham, UK
1999	Derek Bruce	Dallas, USA
2000	Alain Pierre-Kahn	Paris, France
2001	Leland Albright	Pittsburgh, USA
2002	James Rutka	Toronto, Canada
2003	Richard Hayward	London, UK
2004	Jerry Oakes	Birmingham, USA
2005	Concezio Di Rocco	Rome, Italy
2006	Enrique Ventureyra	Ottawa, Canada
2007	Christian Sainte- Rose	Paris, France
2008	Rick Abbott	New York, USA
2009	James Drake	Toronto, Canada
2010	Ann-Christine Duhaime	Dartmouth, USA
2011	John Kestle	Salt Lake City, USA
2012	Michel Zerah	Paris, France
2013	William Harkness	London, UK
2014	Rick Boop	Memphis, USA
2015	Jean- Pierre Farmer	Montreal, Canada

Table 2 Fellows in the Division of Neurosurgery at BCCH (Figs. 9 and 10)

Name	Origin	Years
Bengt Gustavsson	Stockholm, Sweden	1992/1993
Simon Walling	Halifax, Canada	1995/1996
David McAuley	Belfast, UK	2001/2002
Marcelo Oliviera	Belo Horizonte, Brazil	2002
Sanjay Misra	Houston, TX, USA	2002/2003
Tufan Hicdonmez	Istanbul, Turkey	2002/2003
Ash Singhal	Toronto, Canada	2004/2005
Deepak Agrawal	Delhi, India	2004/2005
Rajeev Kariyattil	Cochin, India	2005/2006
Peter Gan	Birmingham, UK	2005/2006
Alex Vitali	Durban, South Africa	2006/2007
Ashok Gupta	Jaipur, India	2006/2007
Shafqat Bukhari	Manchester, UK	2007/2008
David Anderson	Australia	2008/2009
Mansoor Foroughi	Cardiff, UK	2009/2010
Eylem Ocal	New Haven, CT, USA	2010/2011
Shibu Pillai	Bangalore, India	2010/2011
Wihasto Suryaningtyas	Surabaya, Indonesia	2011
Khalid Al Kharazi	Yemen	2011/2012
Peter Woerdeman	Utrecht, Holland	2012/2013
Friederike Knerlich-Lukoschus	Kiel, Germany	2013/2014
Gopalakrishnan Chittur Viswanathan	Trivandrum, India	2013/2014
Christopher Bonfield	Pittsburgh, USA	2014/2015

The ITB program was initiated by Dr. Robert Armstrong, a developmental pediatrician, and over the years, this program has continued to be coordinated by a developmental pediatrician, working at the Children's Rehabilitation Center. Our center was one of the first to report on the use of ITB for the treatment of spasticity secondary to disorders of the brain (spasticity of cerebral origin) in children. Our early results were positive, but there were many complications and the costs associated with this treatment were high. As a result, this modality of treatment has been used infrequently and in highly selected children.

Visiting professors

In 1985, Fred Epstein was invited as the first visiting professor to the Division of Pediatric Neurosurgery. In 1987, Dr. Warwick Peacock was the visiting professor, and it was during this visit that the first selective dorsal rhizotomy at BCCH was performed. Thereafter, there has been an annual visiting professor to the Division of Pediatric Neurosurgery and the Division of Neurosurgery at UBC. The invited guests have

included many of the leaders in Pediatric Neurosurgery in North America and in Europe (Table 1).

Fellowship program

In 1992, the neurosurgical program at BCCH started to accept fellows for training in pediatric neurosurgery. Initially, this was sporadic, but from 2001, there has been at least one fellow in the program annually (Table 2). In 1999, the fellowship program at BCCH was accredited by the Accreditation Council for Pediatric Neurosurgery Fellowships.

The majority of fellows have come from outside North America, reflecting, in part, the interest of Dr. Steinbok in international pediatric neurosurgery. Most of the fellows have returned to work in their countries of origin.

In addition, we have been joined by travelling Fellows: in 2009 by Dr Tanya Leyva—Mastrepa from Cuba supported by an International Traveling Fellowship Award from the joint Pediatric Section of the AANS/CNS

Fig. 11 **a** Construction photo of new the Teck Acute Care Centre March, 2015, provided by the BC Children's and BC Women's Redevelopment Project. **b** Architectural rendering of the new Teck Acute Care Centre by Affinity Partnerships, ZGF Architects LLP and CEI Architecture



and in 2011 by Dr. Suchanda Bhattacharjee from Hyderabad, India supported by an AANS Visiting Surgeon Fellowship Award.

Major accomplishments of neurosurgeons at BCCH

Dr. Steinbok has had a major interest in neurosurgical education and has been recognized for teaching with multiple awards at UBC for teaching of medical students and residents. As a past Chair of the Education Committee of the International Society for Pediatric Neurosurgery, Dr. Steinbok has organized and chaired educational courses in Argentina, Singapore, India, Morocco, Colombia, Costa Rica, and China. He participates regularly in ISPN, European Society for Pediatric Neurosurgery (ESPN) and World Federation of Neurosurgical Societies (WFNS) courses in Pediatric Neurosurgery. He has been on the executive of the Section of Pediatric Neurosurgery of the American Association of Neurological Surgeons/Congress of Neurological Surgery, the American Society for Pediatric Neurosurgeons and the ISPN. He was the president of the ISPN from 2010 to 2011.

Dr. Cochrane has been on the Executive of the ISPN and has served on the adjudication committees for fetal and pediatric neurosurgery studies. Dr. Cochrane has served as the head of the Section of Surgery and Surgeon-in-Chief, BC Children's Hospital and Children's and Women's Health Centre of British Columbia Vice President of Medicine for Children's and Women's Health Centre of British Columbia and the Provincial Health Services Authority in Vancouver. He chaired the Canadian Patient Safety Institute and now chairs the BC Patient Safety and Quality Council.

Dr. Singhal is the Director of the Trauma Program, British Columbia Children's Hospital.

During his time at BCCH, Dr. Kestle led, with Dr. Drake, the first randomized controlled trial in pediatric neurosurgery, which created the foundation for his future successful work in

clinical research in hydrocephalus. In 2006, he co-founded and assumed the Chairmanship of the Hydrocephalus Clinical Research Network. This North American network has 9 centers and 16 investigators and has been awarded funding by the National Institutes of Health (NIH) and the Hydrocephalus Association. The network conducts peer reviewed, grant funded clinical studies in pediatric hydrocephalus.

The future

The Division of Pediatric Neurosurgery at BCCH is at a transition point, with Drs. Cochrane and Steinbok approaching retirement. We expect to have a new, younger Head of the Division in the next year. At the same time, BCCH is in a state of transition. The new eight story Teck Acute Care Centre is under construction onsite and is scheduled to open in late 2017 (Fig. 11). From the neurosurgical perspective, we are anticipating better inpatient space for our patients and families, larger operating room suites to accommodate all the modern equipment and tools and we are expecting to have an intraoperative MRI scanner.

Disclosure Nothing to disclose

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