

Children's Heart Link Report

www.childrensheartlink.org

A. Thomas Pezzella MD, Founder/Director International Children's Heart Fund
www.ichfund.org .

Evaluation of Pediatric cardiac surgery program at Kien Giang General Hospital (KGGH) in Rach Gia City, Kien Giang province, Vietnam. In addition, HCM city hospitals visited included Children's Hospital #1, Cho Ray General Hospital, Children's Hospital #2, and University Hospital.

July 14- August 11, 2016

Primary on site resources:

Dr Vu Minh Phuc, Children's Hospital #1, Chief of Cardiology

Dr Huynh Hai Dang, KGGU, Chief of CT Surgery

Hanh Luu, CHL, on site coordinator (husband is CT surgeon at KGGU)

Children's Heart Link coordinator and support: Adriana Dobrzycka

Activities: One day visits (all in HCMC) to Nhi Dong #1; Cho Ray General Hospital; University Hospital; and Nhi Dong #2. In addition, an on-site 3 week visit was made to KGGU in Rach Gia city.

Introduction

Starting in 2015, Children's Heart Link established and developed a project to help develop and sustain the pediatric cardiac surgery program at Kien Giang General Hospital (KGGH) in Rach Gia City, in partnership with Nhi Dong #1 in HCMC, Vietnam, and the pediatric cardiac surgery team from the British of Columbia Children's Hospital in Vancouver, Canada. The Vancouver team made a team visit in 2015 where low risk open-heart operations (ASD, VSD) were performed. During the same time period a pediatric cardiac surgery team from Nhi Dong # 1 has made 1-2 visits per month to assist in the surgery and development of the "in situ" KGGH pediatric cardiac surgery team. Over the past 7 years 360 open-heart operations have been performed at KGGU. 240 pediatric patients have

undergone surgery, as well as 120 adult patients. This report gives an updated overview of the program, as well as recommendations and suggestions for further improvement in the quantity and quality of care. The target goal is to have a sustained “in situ” team capable of performing low risk pediatric congenital heart open-heart surgical operations along with ongoing consultation with Nhi Dong #1 in HCMC.

Background

Presently, 21 centers in Vietnam perform cardiac surgery. The annual national number of operations performed in Vietnam is not known, but is estimated at less than 6,000. Complex and neonatal open-heart congenital heart defects are performed regularly at 6 of the 21 centers in Vietnam (Hanoi National Children's Hospital; Hanoi E Hospital; Hue University Hospital; Children's Hospitals #1 and 2 (Nhi Dong #1, and Nhi Dong #2) in Ho Chi Minh City (HCMC); and the Carpentier Heart Institute in HCMC. A new Children's Hospital #3, scheduled for completion in 2-3 years, in HCMC is designed to increase the yearly caseload, combine the HCMC programs, and be the major referral center for all advanced pediatric cardiac surgery in the southern 32 provinces. Hue and Hanoi serve the middle and northern provinces.

Historically, since the early 1990's, at least 16 foreign countries have been involved in varying degrees with cardiac surgery development in Vietnam (USA, China, Singapore, Ireland, Germany, Switzerland, France, Australia, Japan, South Korea, Malaysia, Thailand, Taiwan, New Zealand, Canada, and India). In 1991, the Carpentier Heart Institute established cardiac surgery in HCM city. In 1994 Viet Duc hospital in Hanoi reestablished it's cardiac surgery program, followed by Cho Ray Hospital in HCM city, and slowly grew to the present level of public and private programs.

At present, there are 8 medical schools in Vietnam. The length is 6 years after primary school. There is no organized national graduate medical education system in Vietnam. The CT surgeon resident pathway includes 6 years medical school, followed by a 5 year residency specialty 2 pathway, or the specialty 1 pathway for the masters and doctor degrees. (See attached publication). The history of cardiac surgery in Vietnam is outlined in table one. The Carpentier Heart Institute and Cho Ray hospital in HCMC, and the Viet Duc hospital in Hanoi have been the major centers for training of the open-heart surgical teams. The majority of senior cardiac surgeons in Vietnam (<50 noted) have had varying degrees of international training, especially in France. The average CT surgeon salary ranges from \$800 to \$1,000/month.

The Vietnam population is 92 million in 63 different provinces. The incidence, prevalence, and waiting list for pediatric cardiac surgery is unknown. Kien Giang province in the Mekong delta has a population of 1.8 million people. The provincial capital is Rach Gia with a population >300,000). The province is primarily rural with a predominant agriculture (rice, fruits, vegetables), and aquaculture industry. The socialized healthcare insurance system in Vietnam continues to evolve. For pediatric cardiac surgery the provincial government insurance covers 80% of the cost, with 20% self-pay (\$500- \$1,200 US).

Partners with CHL for development of pediatric cardiac surgery:

Nhi Dong #1 performs 250-300 pediatric open-heart operations/year. The cardiac team includes 5 CT surgeons, and 13 Cardiologists with mixed duties that includes general care. There are 6 ICU beds x6, 1 dedicated OR, and a new stepdown unit (12-16 beds). They have 2 heart lung machines, and 6 new ICU mechanical ventilators. There are >500 cases on the waiting list, along with an increased incidence of urgent complex high risk neonatal cases. The increase is due to earlier ECHO diagnosis and referral. They conduct a weekly conference to discuss surgical cases. They recently opened a new air conditioned step down unit. The cost of heart surgery is 80% free in children under 6 years of age. Their immediate needs include respiratory therapy training, 2-3 new ICU monitors, and a new heart lung machine. Foreign team help is still needed from the USA and Singapore; along with telemedicine and consult ability, and an improved database system (STS congenital database system has been recommended). Other issues include a high number of preoperative VSD patients with pneumonia, pulmonary hypertension, and failure to thrive (FTT). In addition, the other HCM city hospitals desire a continuing role in CHD care, especially Cho Ray hospital, and the University hospital. Debate remains as to what centers in HCMC wants and should do high risk, and complicated congenital heart defect patients.

Cho Ray General Hospital is the designated graduate education and training hospital in the south. They receive continued NGO support from the Korean Heart

Institute and Hearts Around the World (USA). Cho Ray has partnered with KGGH to help develop the adult cardiac surgery program. Periodic visits are made to assist with adult cases. Members of the KGGH heart team have also trained at Cho Ray for varying periods of time, and make frequent visits to Cho Ray to observe, consult, and update. Difficult adult cases from KGGH are frequently referred to Cho Ray (this includes adult cardiac, thoracic, and vascular cases).

Pediatric Cardiac Surgery at Kien Giang General Hospital (KGGH)

Kien Giang Province has a 1.8 million population. The capital, Rach Gia city, has a 300,000 population. The provincial major hospital is KGGH). There are 13 district hospitals, and 113 medical clinics. Transfers from other provinces, as well as nearby Cambodia (3 hour drive) are not uncommon.

Common diseases include: Dengue fever during the rainy season, 15% incidence of Hep B; increasing diabetes and hypertension; and a decrease in TB and RHD cases. It is the major trauma center with a high volume of motorbike accidents, and penetrating trauma, especially knife wounds.

KGGH stats:

Total beds: 1,500. CT surgery ward beds x 20. Cardiac surgery ICU beds x4. Other ICU's include CCU x9 beds, Surgery ICU x 40 beds, and Medical ICU x 40 beds. Doctors >400. Nurses 1,400 +. 1,800 OPC visits/day. There are 8 surgical operating rooms. The cardiac surgery OR is large, clean and well equipped. The ER has 13 hospital ambulances (115 is the emergency phone #), 13 ER doctors, and 62 non-medical workers. The ER sees 240 cases per day with 140 admitted. There is a separate pediatric ER that sees 10-30 cases/day. The hospital is very old, noisy, and not well organized. Patient meals are not provided. There is an active renal dialysis program. All the major clinical medical disciplines are available. They do not have graduate medical residency programs at KGGH.

Cardiac Surgery

The cardiac surgery team started in 2009. The cardiac team includes: CT surgeons x 4; Anesthesia x2 and 2 anesthesia techs; perfusion x2 and 3 perfusion techs; intensivists x2; Cardiology x3.

Total cardiac open-heart: 2009-2016- 240 pediatric; 120 adult. Adult Cardiology Performs 500 PTCA procedures/ year. Pediatric cardiac interventionalist do about 30 cases/year (PDA, ASD, PS, VSD).

Major concerns:

Continued support from the director of the hospital to develop the adult cardiac surgery program. Presently, the interventional cardiology team has not referred many adult cases for coronary artery bypass surgery. There are no scheduled combined adult cardiology and cardiac surgery conferences. In addition, there are very few adult heart valve surgery referrals. The majority of these cases go to HCMC. A pediatric cardiac surgery service cannot be sustained without an active adult service. The minimum number of open-heart surgery cases desired and warranted is about 150/year. This is necessary to keep the team effective and engaged. The immediate HR concern is a perfusionist. One candidate was sent to Cho Ray hospital for 3 months ECMO training. I stressed to the hospital director that basic HLM training is the priority, not ECMO training.

Recommendations for pediatric cardiac surgery:

Preoperative

- Schedule 6 pediatric cardiac cases (ASD, VSD) with 2 as alternates to cover cancellations (e.g.URI, fever, pneumonia, FTT, rashes, diarrhea)
- Review of ECHO by both Cardiology and Cardiac Surgery to have consensus on correct diagnosis and surgical plan.
- Patient H/P, along with laboratory results reviewed. Fever is frequent problem.
- Blood bank support by patient's family (5 units /case). Blood not used is made available for others in need. Push for fresh blood donors. Do type and xmatch early to avoid delay in OR.

Operating Room

- Check of uninterrupted power supply (UPS) power capability- 4 sources: regular; hospital backup; stand-alone portable unit in OR; and manual hand crank**
- Anesthesia gives antibiotic once IV is in**
- Check list prior to surgery: check electricity, water supply for HLM, wall suction, O2, compressed air, and room temperature control**
- Blood bank and products: Goes to OR on day of surgery in ice bucket, then to ICU with patient transfer, then to Blood Bank after 30 minutes. Malaria screening is done preop.**
- Check defibrillator paddles before case**
- Initiate Time Out Routine**
- Develop transfer protocol from OR to ICU**
- Back up sterilized surgical instruments for emergency**
- Cardiac surgery instruments need update and replacement: presently have 2 sets for cardiac; 2 sets for vascular; 1 set for general thoracic**
- Pericardium preparation formaldehyde (2-6 minutes); rinse with saline**
- Protocols for waste, including sharps, human tissue, HLM tubing.**
- Need for a pediatric TEE prob for OR use. There are 2 Cardiac ECHO machines for the hospital (Hitachi Aloka F37; Hitachi Aloka alpha 6)**
- Need heating blanket for the OR bed**
- Need 2 additional ceiling lights**

ICU

- Dr Chau, from Nhi Dong #1 HCM city, also perfusionist. Need copy of her chapter on pediatric cardiac ICU care
- Need 2 additional O2 ports for each ICU bed
- D/C chest tubes and pacer wires sequence (? 1st or 2nd day)
- Place new ET tube at ICU bedside that is readily available if reintubation needed
- Crash cart for massive bleeding in ICU vs Return to OR
- Temporary Medtronic pacemaker (x2) stored in OR and ICU
- GE Vscan hand held ECHO is available
- ICU needs 1 additional 2 pressor port monitor, and one additional mechanical respiratory ventilator (have only 2)

Other recommendations:

- Ward needs protocols for wound care, nutrition, and activity status
- PALS training-----no certification or courses available; Nhi Dong #1 has courses for PALS. Dr Phuc will schedule courses for medical staff.
- Telemedicine consult capability with Nhi Dong #1 and Cho Ray
- Find financial support for drugs needed, especially Sideline, Prostaglandin, Milrinone
- Coumadin protocol is needed for regulation of dosing and transition from heparin.
- Antibiotic use is very liberal. Need ID to be consulted more often

Inventory in OR: (needs better organization and security)

Valves: St Jude mechanical and bioprosthetic
Medtronic oxygenators
Terumo tubing packs and pediatric oxygenators
IAB shared by surgery and cath lab
Grafts- Maquet
Edwards- valve rings and bands
Chest tubes--- home made
HLM cannulas--- now reused. (Reused perfusion cannulas may be the cause of accentuated post op fever)
Ethicon suture, wires, and pacer wires
iSTAT1 cartridges (Medtronic CG8+)
ACT cartridges (Medtronic)
Temporary pacemaker x2 (Medtronic)
Permanent pacemakers (Cardiology)
Fogarty vascular catheters
Auto TX bags are available
Vascular pulse Doppler (needed)

CTV Surgical Staff x4

Cardiac surgery:

Includes adult and pediatric cardiac surgery

Vascular surgery:

Primarily knife wounds, motor scooter injuries, and PVD with embolectomy RX. Also do many AV fistulas for dialysis) (wait 3 weeks before using).

Thoracic surgery:

Pneumothorax is #1 problem from penetrating trauma, COLD, and spontaneous. Need Heimlich tubes for chronic air leak treatment.

Protocols needed on ward:

Chest tube and pacer wire removal; oral nutrition; antibiotics; home care; home drugs teaching; wound care, and IV site care. F/U in clinic within 2-3 weeks with TTE is indicated or part of routine follow up

Consultants available at hospital: (personal interviews made):

Oncology: Cancer incidence: Liver 11%; Lung 14% male, 5.5% female; Breast 23%. More than 50% of cancer patients are referred to HCM city for definitive care.

Pulmonology: PFTs, Mechanical vent. Weaning issues; R/O TB versus CA problems.

ID: need more consultations re. injudicious use of antibiotics in perioperative cardiac surgery patients.

Hematology: Re. Blood Bank. Screening for Malaria, 3-5 units/case of cardiac surgery by family. If not used then given to others. Blood products are available. Helpful with coagulopathy. Auto TX not routinely done (consider starting). Stress doing Type and Xmatch ASAP to avoid OR delay

Cardiology: CCU 9 beds; MICU 40 beds; arrhythmias. ECHO, Post op RX of Coumadin control. Cardiac cath and PTCA available, as well as peds interventions. Permanent pacers. Active plea was made to Cardiology chief to increase support for adult cardiac surgery program.

Renal:

Hemo vs. peritoneal; Shunts done by Vascular surgery.

Renal dialysis machines x 30. Chronic renal failure patients on outpatient hemodialysis-- 300 RF is primarily 2ndary to Diabetes and Hypertension. Peritoneal dialysis is available (50 chronic outpatients).

Urology:

to be available for urinary foley issues, as well as placement of supra pubic tubes.

Radiology:

CXR, CT, MRI available, portable CXR

Pathology:

Cancer of lung biopsies

Other equipment available in OR area:

C-arm,

Sterilizes x5; Instrument room for washing, packing, storage of instruments in area adjacent to OR

Operating microscopes x 2

VATS tower for thoracic use

No specific designated storage area for CT surgery perfusion, drugs, devices, or disposables

Cardiac OR #8 special equipment: (needs periodic preventive biomedical maintenance).

OR lights x2. One with 1 attached camera (Maquet)

OR table (mechanical) (Maquet)

Mechanical electric sternotomy saw (Aesculap). Oscillating saw also available.

Anesthesia machines with monitor (2 pressor ports) (Datex. Ohmeda)

OR camera screen

Refrigerator for ice, drugs

HLM Teruma/Sarns x2 with 5 DeBakey pump heads. Sechrist blender

DelNido 1to 4 cardioplegia (saline) delivery via bag by Anesthesia. St Thomas cardioplegia also available

Defibrillator (Medtronic Lifepac 20) with ext./int. paddles-- pediatrics internal paddles included

Suction machines, multiple (both wall suction, and electric available)

Headlight with battery pack (Enova Illumination)

Cautery unit (Covidien)

IAB (shared with cath. Lab) (Datascope. Maquet CS 300)

ACT machine with disposable cartridges (Medtronic)

ECG

**Intravenous delivery system: bags and syringe infuser for OR and ICU
(B/Braun company)**

iSTAT1 (Abbott) POC testing with disposable cartridges

(No cell saver capability at present)

Cardiac surgery ICU inventory

-4 beds

-2 monitors (Philips Intellivue with 2 pressor ports)

-2 respiratory ventilators (GE Engstrom; Nell Cor Puritan Bennet 840)

Anesthesia: (areas of responsibility)

-Preoperative evaluation

-Access- peripheral and central lines; give antibiotic once IV in

**`Intubation , including fiberoptic flexible bronchoscopy and single lung
ET tube placement**

-Monitoring---ECG, arterial pressure, CVP, EtCo2, pulse oximetry

-Lab: ACT, blood gases, misc.

-Drugs.

-Postoperative follow-up in ICU

Basic procedures for CT surgeons to know and perform:

- Cutdowns for arterial and venous access**
- Intra-aortic balloon (IAB) insertion and function**
- Supra pubic tube insertion**
- Peritoneal dialysis catheter insertion**
- Emergency endotracheal intubation**
- Tracheotomy**
- IV peripheral and central access.**

Summary

Cardiac surgery at KGGH hospital continues to develop. English language remains a challenge for hospital staff. The adult cardiology service must give more support to the cardiac surgery program, in terms of patient referrals, i.e. primarily low risk coronary artery and valve patients. Without this, the program will not succeed. Cho Ray general hospital in HCM City has agreed to continue their support, as well as Nhi Dong #1 in HCM city (one visit/month for 2 days and 4 operative case procedures).

Children's Heart Link/ and its partner, the British Columbia Children's Hospital pediatric cardiac surgery team should conduct an additional team trip in 2017. Areas that warrant special concern are respiratory therapy training, and biomedical support. Needed equipment include: an additional monitor in the ICU; a mechanical respiratory ventilator; and a pediatric TEE probe. Further training of the team should include a second perfusionist being sent to Nhi Dong #1 in HCM city, and Cho Ray hospital for advanced training and experience in both pediatric and adult cardiac surgery perfusion. The 4 CT surgeons should develop an increased interest and specialized training in adult cardiac, pediatric cardiac, vascular, and general thoracic surgery to include the esophagus. A CTV surgery manual should be developed and frequently updated. It should contain policies, protocols, and guidelines.

Table One

History of Cardiac surgery in Vietnam

1958 The 1st cardiac operation was performed by Professor Ton That Tung on 28 February 1958. Through a left thoracotomy, a closed mitral commissurotomy was performed on a 30-year-old man with rheumatic mitral stenosis. Three months later, a pericardiectomy was performed via a left thoracotomy with transection of the lower sternum.

1960 Using a dilator technique, a team of Soviet surgeons led by a Dr. Libov performed the 1st valvotomy of both the aortic and the mitral valves. The 1st ligation of a patent ductus arteriosus was performed.

1964 The 1st open-heart operation using deep hypothermia was performed on an 18-year-old man who had congenital pulmonic stenosis.

1965 The 1st open-heart operation using cardiopulmonary bypass (with the aid of a Kay-Cross oxygenator) was performed in a 20-year-old woman who underwent direct suture repair of an ostium secundum atrial septal defect.

1972 With the aid of a Sarnes pump and Travenol plastic oxygenators donated by the American Quaker Society, a series of operations (including procedures to correct atrial septal defect, ventricular septal defect, pulmonic stenosis, and tetralogy of Fallot) was performed.

1979 A French medical team, headed by Professor LeCompte from Laennec Hospital in Paris, helped with the 1st mitral valve replacement, in which an Ionescu-Shiley bioprosthesis was used. A series of 9 operations was performed.

1991 Cardiac surgery started at Carpentier Heart Institute in HCMC

1994 Cardiac surgery restarted at Viet Duc hospital in Hanoi.