



Introduction of therapeutic catheterization for congenital heart diseases in a developing country



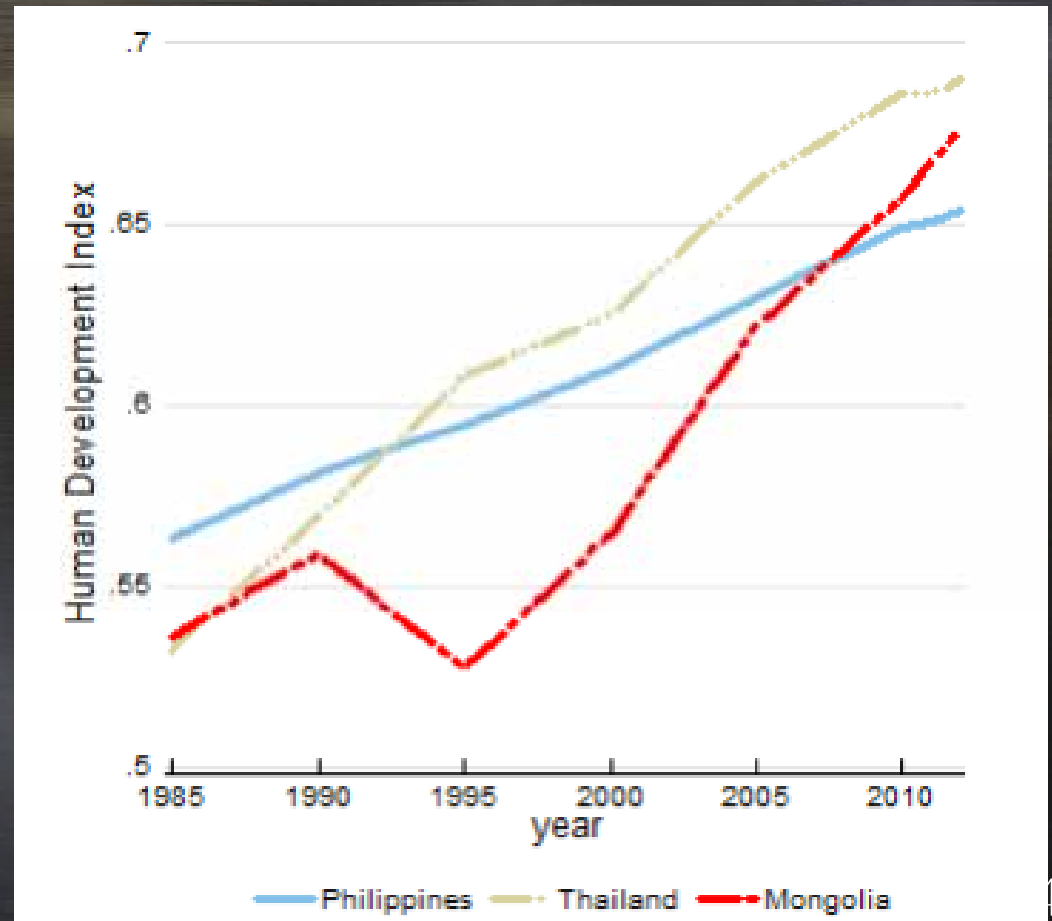
Showa University Northern Yokohama Hospital
Hideshi Tomita
Heart Saving Project
Noriyuki Haneda, Takashi Higaki, Koichi Kataoka

Mongolia

- Population (2013); **2,900,000**
 - Approximately 40% of the population lives in the capital city of Ulaanbaatar
- The number of live births (2012) ; **74,000**
- Estimated significant CHDs; **390/year**
- Children under 14 years old make up about 27% of the total population
- Life expectancy at birth (2012); **68**
- Probability of dying under five (per 1 000 live births, 2012); **28**

Health care

- Gross national income per capita (2012); \$5020
- Total expenditure on health per capita ; \$250
- Total expenditure on health as % of GDP; 5.3% (USA 17.7%, Japan 9.6%, Korea 7.4%)
- Human Developmental Index (2012) ; 0.675 (at 108 out of 187 countries)



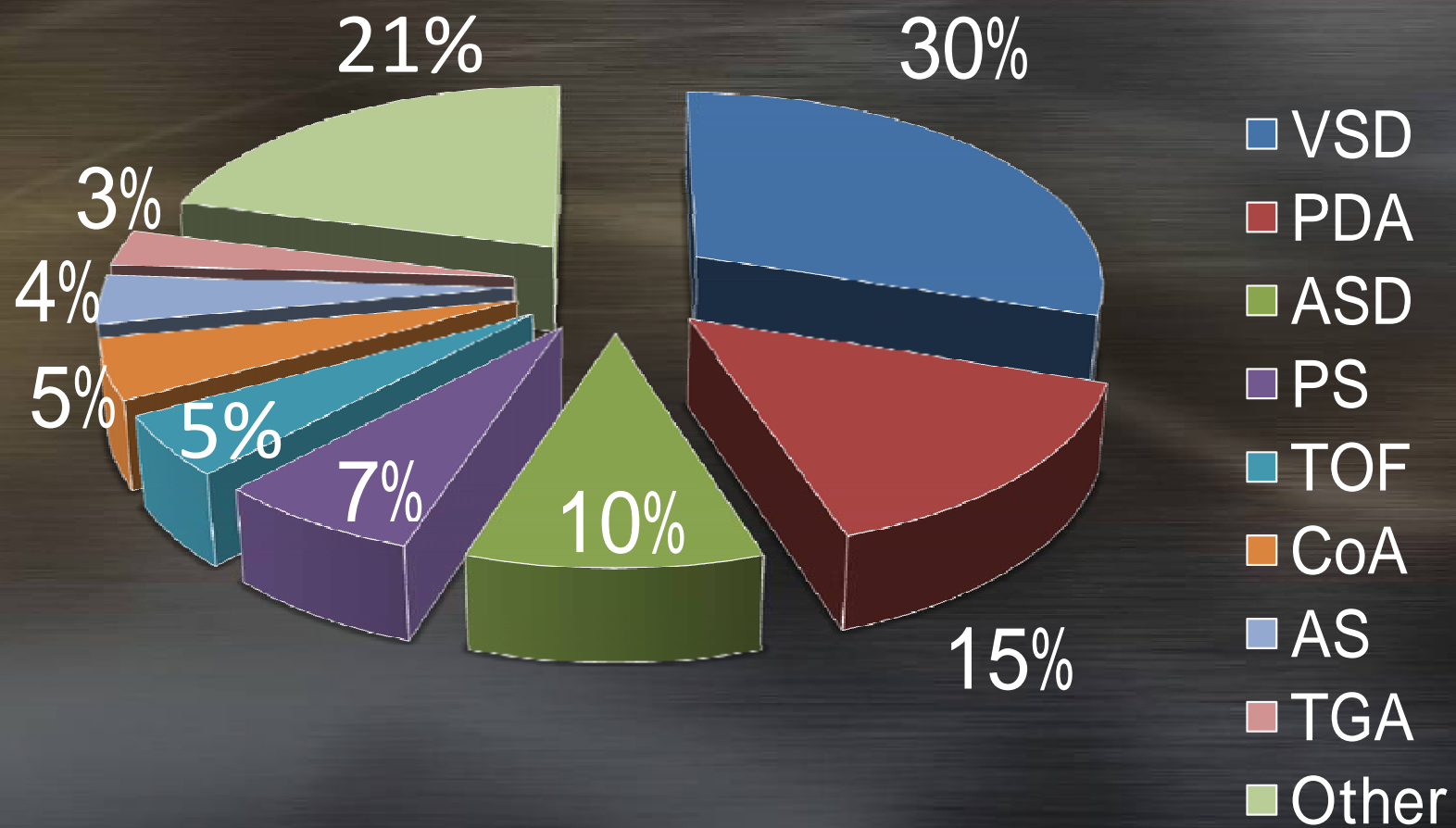
Congenital Heart Diseases (CHD) in Mongolia-1

- The incidence of congenital anomalies in Mongolia is **2.7/1000** live births, while CHDs comprise 39% of all congenital anomalies.
- Patients older than 1 year old of simple CHDs like PDA, and older children with ASD are sent to the adult cardiothoracic hospital for surgery in Mongolia.
- Other children with complex or severe diseases and children under 2 years old are usually referred abroad for treatment.

CHD in Mongolia-2

- Even in the patients of PDA, morbidity like moderate residual leak is quite common.
- Open heart surgery for a small children using cardiopulmonary bypass is still quite challenging, because of limited skill in postoperative management.
- A cardiac surgical team from a foreign country occasionally visits Mongolia to perform cardiac catheterizations or open heart surgery for selected children.

Incidence of Major CHDs

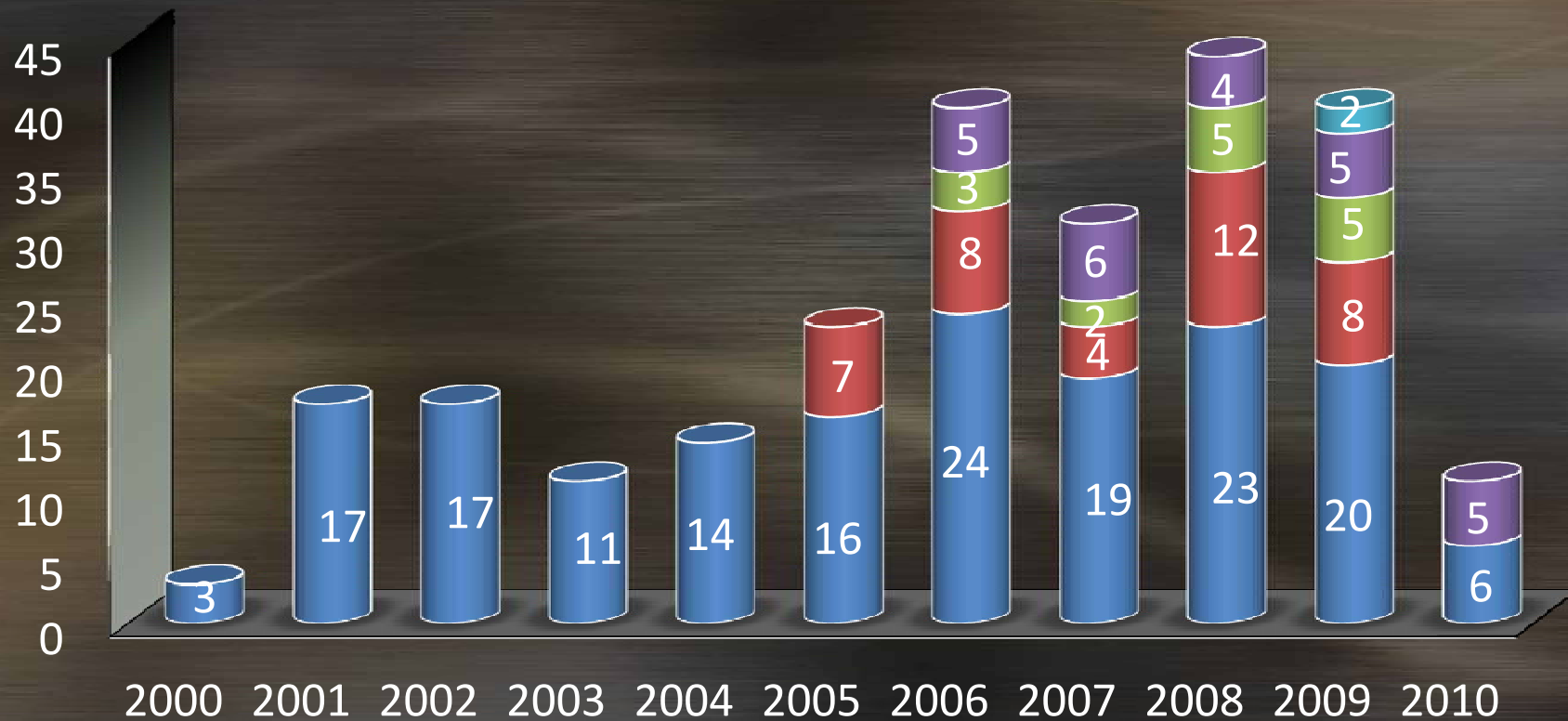


Three Projects for CHD

- This country definitely needs one center for pediatric cardiology and cardiac surgery, however, at this moment, there is no such center.
- Currently, there are 3 large projects for children with CHD in Mongolia
 - Children's Heart Project of Mongolia and Korea Rotary Club
 - Up to 2010, totally **150** children with CHD went to Korea for heart surgery.
 - American Children's Heart Project
 - Heart Saving Project of Japan



American Children's Heart Project



- surgery in US
- surgery in Mongolia
- devise closure cath in Mongolia
- diagnostic caths in Mongolia
- balloon valvuloplasty caths in Mongolia

Heart Saving Project

- Since 2001, a team of Japanese pediatric cardiologists has visited Mongolia to provide children's **heart catheterization**, as well as for **screening of children for heart diseases** at Ulaanbaatar and at some rural areas.
- Before this project began, in Mongolia there had never been interventional catheterizations for CHDs.



First visit in 2001

- We focused our activities on four areas 1) screening by echocardiography, 2) transcatheter closure of PDA, 3) balloon dilation of valvar PS and CoA, and 4) diagnostic catheterization.
- Interventional catheterizations for PDA and PS were performed at the State Research Center on Maternal and Child Health (MCHRC).
- MCHRC is the national referral center serving all Mongolian children with the full complement of sub-specialties in pediatrics.
- Until the age of 18-year, all children with heart disease are evaluated at the MCHRC.

State Research Center on Maternal and Child Health

- 658 beds
- 223 medical doctors, and researchers
- 24 beds for pediatric cardiology
- 5 pediatric cardiologists
- Not equipped for cath lab
- No cardiac surgery



- As the center was not equipped for cath lab, all procedures were done in the OR under monitoring with a portable fluoroscope.
- As this system lacked any recording capability, we judged the size and morphology of the PDA solely on the fluoroscopic image during a rapid hand injection.



The Shastin Central Clinical Hospital

- On the 3rd visit in December 2002, we moved our catheterizations to the Shastin Central Clinical Hospital, which is an adult cardiology and cardiovascular surgery center, equipped with the only one cath lab in Mongolia at that time.
- Although it was an old Hitachi machine, it was renewed to Philips machine which has analysis and recording equipment.



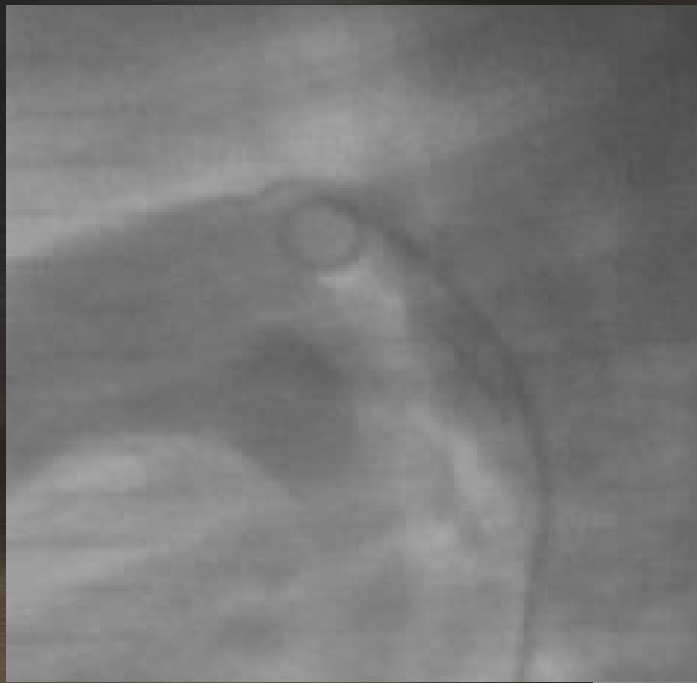
Finance and Medical materials

- Our activity is supported mostly by donation from Japanese people, while we do not have a fund from the government nor any company.
- We bring most of medical materials, excluding duct occluders and some catheters, with us from Japan.



Devices

- PDA was closed mainly with 0.052 inch Gianturco coil and Flipper coil until the 5th visit in 2004.
- We first introduced Amplatzer duct occluder in the 6th visit at 2005.
- Currently, we mainly use Cera duct occluder since 2010.



1 year, 6kg, 7mm, 16/14



Screening for Children's heart diseases in rural area

- We began screening of children's heart diseases at rural area from 2003.
- We have been visited 1-3 prefectures in a year for this screening.



Up to the end of 2013

- We have completed
 - Echocardiography for 1400 patients
 - Diagnostic catheterization for 59 patients
 - Catheter interventions for 306 patients
 - PDA 276
 - Coil 135
 - DO 141
 - Valvar PS 25
 - CoA 6
 - Others 2
- We visited 16 rural areas for Screening of Children's heart diseases.

Annual number of catheter interventions



■ Coil ■ Duct occluder ■ valvar PS ■ Coarctation ■ Others

PDA occlusion

	Total	Coil	DO	p
Age (months)	7-684 (38)	7-684 (48)	7-526 (28)	ns
Weight (kg)	5-74 (14)	5-74 (15)	7-65 (12)	0.04
Diameter (mm)	0.8-13.0 (3.0)	0.8-8.0 (3.0)	1.4-13.0 (4.0)	<0.01
Success	268/273	129/135	139/141	ns

Range (median)

Complications

- Coil occlusion
 - In 2 patients, coils could not be deployed in a stable position.
 - In 1 patient, coils migrated to the main PA, and were successfully retrieved surgically.
- DO
 - Device could not be stably deployed in 1 patients, as an appropriate specification was not available at that time.
 - Device embolized to the left PA 48 hours after being deployed in 1 patient. The patient died after surgical retrieval of the device, and PDA ligation on CPB.

Balloon dilation

- Valvar PS

- 25 patients (male 11/female 12)
- 3-168 (17) months
- 6-41 (10) kg
- All procedure was succeeded.

- CoA

- 6 patients (male 4/female 2)
- 5-228 (131) months
- 9-54 (28) kg
- All procedures were successful and effective, one patient developed re-CoA which was subsequently stented.

Non Profit Organization

- We established a Non Profit Organization at 2009 to reinforce our activity.
- Some Sumo wrestlers from Mongolia support our activities.



Discussions

- Under the limited healthcare environment in a developing country such as Mongolia, i.e. limited facilities, human resources, medications, etc, catheter intervention is an effective means saving the lives of children with simple but critical congenital heart diseases.
- Introduction of DO extended an indication of transcatheter occlusion of PDA in Mongolia, overcoming the limitations of multiple coils.



Challenge for Pediatric Cardiology in Mongolia

- The lowest population density
 - Small economy, poor cost-performance
 - Difficult access to the center facility, particularly in winter
- Limited understanding about Pediatric cardiology
 - Government
 - Leaders of medical facilities
 - Peoples
- Education system
 - Need support from foreign countries
- Limited understanding for team medicine in Pediatric cardiology

Our answer, hopefully

- We repeatedly negotiate with the Mongolian government
 - to establish one center not only for pediatric cardiology but also for pediatric cardiac surgery
 - to establish specialty for therapeutic catheterization and surgery in pediatric cardiology
- We have started to talk with the local medical distributors on devices for pediatric cardiac catheterization
- We repeatedly talk with Mongolian doctors that team medicine is critical in pediatric cardiology
- Through these activities, we aim to promote transfer of skills for using DO to Mongolian doctors