Annual Review 2015

MAGDI YACOUB
HEART FOUNDATION
ASWAN HEART CENTRE

THIS YEAR WE SAVED

3500

Patients

SUFFERING FROM HEART DISEASE

850

of them recieved life saving open heart operations

THE REMAINING RECIEVED

catheterizations

Table of Contents

Message from our Founder

It gives me great pleasure to present the annual report of the Aswan Heart Centre (AHC) on behalf of my colleagues on the Executive Board. We continue to pursue our Mission Statement with vigour: “Offering state-of-the-art free-of-charge medical service to the Egyptian People, particularly the underprivileged; training a generation of young Egyptian doctors, scientists, nurses and technicians at the highest international standards; advancing basic science and applied research as an integral component of the programme”.

Professor Sir Magdi Yacoub, OM,FRS

Founder
Magdi Yacoub Heart Foundation

Executive Summary on Behalf of the Board of Trustees

At Aswan Heart Centre we continue to pursue the founder's vision and the Board's strategy to develop and enhance sustainable clinical services and enrich research activities. We also continue to create the necessary environment to deliver a first-class service and endeavour to improve on it; such progressive dynamic strategy will require the full commitment of the Board, Clinicians, Management, and Staff.

The year 2015 has witnessed improvement and upgrading of the operating facility, modernization of the Adult Intensive Care Unit, and in our pursue to guard the environment, we have completed a modern and efficient clinical waste disposal unit which meets international standards and environmental safety guidelines.

Our new facility hosting Outpatient Clinics, Research Laboratories, Training and Seminar rooms, and 20-bed Inpatient Unit is being completed. This new building will enable us to review and screen 15,000 patients per annum and increase our inpatient capacity by 40%.

The new building cost for construction, furniture, and equipment was 42 Million Egyptian Pounds.

We continue to strive not only to provide the best clinical services, but also to maintain the dignity, privacy, and respect of all our patients. The Board and Staff spare no effort to achieve this objective.

This year witnessed the expansion of our Research Team across its three integrated departments; Life Sciences, Biomedical Engineering, and Clinical Research. We have been able to attract and recruit high calibre young Egyptian Researchers, Engineers, and Scientists from overseas and within Egypt. The substantial progress achieved in both the clinical and research programs enabled AHC to attract strong partnerships with internationally renowned centres in the USA, UK, and other European countries.

This year, 2808 procedures (both surgical and interventional) have been performed. 13,390 patients have been fully evaluated in the outpatient clinic and imaging suite. A significant percentage of those patients suffer from complex medical conditions that are technically very demanding. We will try to share with you some of these technical details to illustrate the complex nature of the conditions dealt with at AHC. Also in this period we introduced innovative and expensive treatment modalities to meet great unmet demand in Egypt; such services included left ventricular assist devices (artificial heart – LVAD) and transcatheter aortic valve implantation (nonsurgical valve replacement – TAVI). The LVAD program at AHC is unique; as the clinical objective for fitting/implanting an artificial heart in AHC is to be a bridge to recovery of the failing heart rather than a bridge to transplantation as the case usually is in the Western world. We are pleased to announce that the preliminary results of the recovery program are very encouraging indeed. Therefore, it is not an exaggeration to claim that AHC is a leading centre in treatment innovation in specific disease entities.

It is very important at this stage to emphasize that all our services at AHC continue to be completely free of charge at the point of delivery including all drugs and consumables it is. All these free services are funded by the generous donations of the Egyptian People.

15,000

Patients
Per Annum

13,390

Patients have been fully evaluated in the outpatient clinic and imaging suite

Our Employed Staff at AHC reached

425

Having said that, we could treat more patients as the need and demand for the service are overwhelming. Therefore, in an attempt to increase our output and treat more patients, we have launched a renovation and construction program to increase the number of Intensive care unit beds by 9 in the current facility.

These additional beds are expected to increase our surgical output by 14%.

Given that the gap between the demand for service and the existing capacity continues to be in the thousands, we are conscious that the aforementioned expansion will fall short of meeting the overwhelming need for tertiary cardiovascular services in the country. The Board of Trustees have therefore taken the initiative to build the New Aswan Heart Centre located on the West Bank of the Nile in Aswan. This new facility is expected to increase our capacity by three-to-four folds.

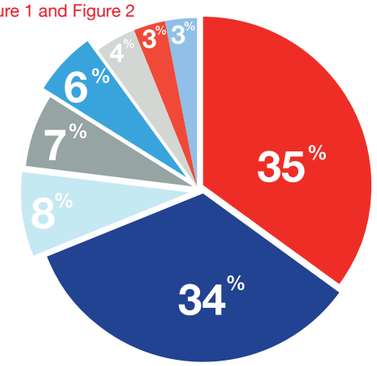
The compliment of the staff employed at AHC have reached 425 by the end of 2015 and that is setup to increase considerably over the next few years.

The total payroll represents 34% of our actual spending, the Board believes that this is an excellent achievement when it is compared nationally or internationally. In applying cost effective analysis to our payroll the Board is fully satisfied that we have the best value for money world-wide, as the high salary paid to skilled consultant is dwarfed by the value of the output and the quality of treatment both in short and medium terms.

We continue to be financially prudent, the pie chart and table below (figure 1 and 2) illustrate how we spend the donors' money. We are very proud to maintain our administrative cost at 3% and to also continue to maintain the contributions and services of expats free of charge. Such in-kind contributions enhance our spending by 18% (added value) without affecting our expenditure.

For every 100 Egyptian Pounds donated, we spend it as follows:

Figure 1 and Figure 2



Consumables	35%
Payroll	34%
Research	8%
Maintenance and Utility	7%
Drugs and Medications	6%
Other Operating Expenses	4%
Admin Costs	3%
Imaging and Diagnostics	3%

The above costs represent the actual annual operating expenses of AHC and our small head office in Cairo and does not include the marketing cost. For every One Egyptian Pound we spend on marketing we raise 5.6 Egyptian Pounds. The Board believes it is good value for money.

Since the year 2011 the Board have decided to build a gradual reserve to cover three times of our annual expenditure, which has been achieved due to the kind support of the Egyptian people. As we continue to grow and expand to meet the increasing demands, your continuous support and trust are very much needed. Aswan Heart Centre belongs to the Egyptian people. On behalf of the Board of Trustees we are very grateful to our donors, and supporters.

Dr Magdy Ishak, FRCS, CCIM, FRSM

Vice Chairman of MYF and Executive Trustee
Magdi Yacoub Heart Foundation

A Word from our Medical Director

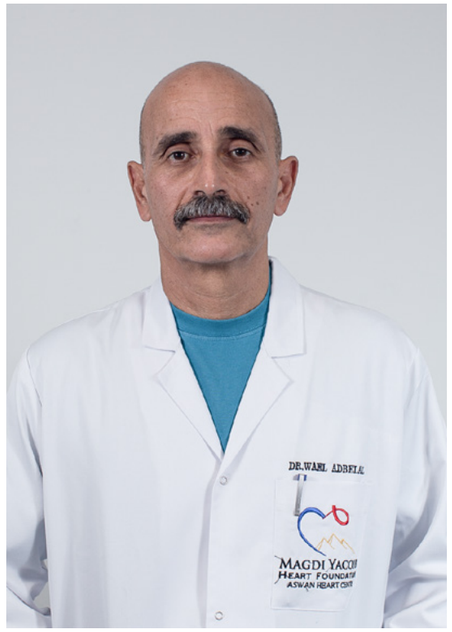
The year 2015 represents an important milestone in the progress of AHC. As we witness the maturing of our second tier of specialists, junior doctors, scientists and nurses who joined AHC a few years back, they are now becoming an integral part of our workforce.

Our Millennial staff was able to grasp the complexity of modern medical practice in a short span of time. They fuelled the development of additional cutting-edge subspecialties and vitalized our research programs. They are now comfortably working as part of our multidisciplinary teams, providing very delicate care and hope to a special cohort of vulnerable patients with complex heart disease.

Our challenge is to retain and further develop our formidable workforce and to attract new comers. AHC strategy is founded on meeting the aspirations of our energetic staff by providing innovative programs to enhance their knowledge and skills, to improve their career and to provide them with a unique opportunity to be part of an outstanding healthcare environment serving the underprivileged.

From our inception, our programs opened a multitude of collaborative international channels exposing our teams to state-of the-art universal medical practice. As the centre matures, our staff are now able to transfer acquired knowledge and expertise to young Egyptian, African doctors, and nurses from other institutions through AHC observership and fellowship programs.

AHC continues to be a vibrant institution that embraces modern medicine and the Yacoub doctrine; hard-work, perseverance and going the "extra-mile" to achieve our Mission Statement and serve our patients with highest degree of medical expertise and respect, as well as to contribute to global knowledge through our translational Life Sciences research programs.



Dr Wael AbdelAal, MD

Medical Director and
Vice Chairman of Executive Board
Aswan Heart Centre

More than

6000

Patients have been reviewed in the Adult Cardiology Outpatient Clinic this year

Aswan Heart Centre
Developments and Achievements

Aswan Heart Centre Clinical Services

Adult Cardiology

The Department of Cardiology continues to work closely with other departments at AHC to achieve our Mission Statement. The Department aspires to ensure and promote excellence through continuous education, advancement of quality standards, audit, and close interaction with other departments. 2015 was a busy and exciting year, with a number of new programs introduced and others undergoing substantial restructuring. Similarly, the overall structure of the department underwent significant changes with the resignation of two senior consultants early in the second half of the year. Presence of a well-trained second line of specialists enabled the department to continue providing its services with minimal disruption.

Clinical Cardiology and Echocardiography

Outpatient Clinics:

More than 6000 patients have been reviewed in the Adult Cardiology Outpatient Clinic this year. Besides thorough history-taking and clinical examination, all patients had a 12-lead electrocardiogram, and the vast majority had transthoracic echocardiography exams performed during the same visit. The Department continues to work closely with other departments and the management to help reduce patient waiting times and improve the overall workflow within the outpatient clinics. In addition, a number of "Specialized Clinics" are being held on weekly basis including Advanced Heart Failure, Electrophysiology, Grown-up Heart Disease, Rheumatic Heart Disease, and Pulmonary Hypertension clinics.

Inpatient Services:

Our Cardiologists continue to be involved in the management of all patients admitted to AHC, including patients after open heart surgery. This strategy has further been emphasized this year by a number of modifications in the team's work pattern to ensure that all cardiologists are directly involved in the surgical intensive care unit and ward.

Echocardiography is a pivotal tool in the diagnosis and management of patients presenting to AHC. Thousands of echocardiograms are performed on annual basis and ensuring the quality of studies as well as accurate interpretation of the findings is one of our priorities.

To this effect, three members of the team have successfully passed the American and European echocardiography board examinations this year. The number of stress echocardiograms and transoesophageal echocardiograms performed (for outpatients) has risen significantly in 2015, averaging 8-10 per month for each.

Special attention was given to training adult intensivists in echocardiography. This is a strategy which we plan to develop further in 2016 with the incorporation of a formal echocardiography course in the ITU's core training program.

Interventional Cardiology

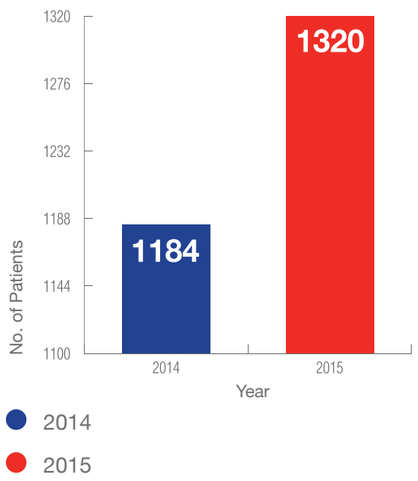
Our Interventional Cardiology Program continued to evolve in 2015 both in terms of number and complexity of procedures performed. The department currently offers advanced treatment to patients with different forms of heart disease including Coronary Artery Disease, Structural Heart Diseases and Heart Rhythm Disturbances.

In total, 1320 procedures were performed in the cath-lab this year compared to 1184 in 2014 with more than 60% of these procedures being interventional (therapeutic). Figure 3 illustrates the number of procedures done in 2015 in comparison to last year.

Important achievements this year include significant strengthening of the Primary PCI program where patients with acute myocardial infarction (heart attack) are promptly taken to the cath-lab to open their blocked vessel(s). This emergency service is proven to reduce mortality significantly, compared to medical treatment. This is the current state-of-the-art therapeutic strategy in these high-risk patients.

This year, 307 primary PCI procedures were performed, more than double the number performed in 2014 (136). Given the crucial importance of minimizing time delays to opening the blocked vessel (door-to-device time), significant operational changes have been introduced to minimize system-related delays reaching an average of 55 minutes in 2015 compared to 67 minutes in 2014.

Figure 3: Cath-Lab Activity



1320

Adults procedures were performed in the cath lab this year

307

Primary PCI procedures were performed this year

In-hospital mortality has also improved substantially during the same period (5.7% in 2015 compared to 8% in 2014). These figures are comparable to those reported in the United States and Europe (table 1).

Table 1. Comparison of PPCI program performance measures in AHC to hospitals in the US National Cardiovascular Data Registry

Outcome Measure	AHC	NCDR* Average	NCDR 75th Percentile
Average door-to-device time	55 minutes	64 minutes	58.1 minutes
Proportion of STEMI patients with door-to-device time within 90 minutes	92%	87.9%	93.2%
In-hospital mortality	5.7%	5.2%	4.8%

* The National Cardiovascular Data Registry (NCDR) is a nationwide online registry that monitors various performance measures of more than 3500 cath-labs across the United States of America.

As mentioned in the previous section, the Trans-Catheter Aortic Valve Implantation (TAVI) program started this year. This relatively novel therapeutic approach offers less invasive means of treating patients with Severe Aortic Stenosis who are judged to have high/prohibitive surgical risk. The program is run by a "Heart Valve Team" that includes two cardiologists, a cardiac surgeon and an anaesthetist to enhance the decision-making process and overall management in this challenging group of patients who frequently suffer from multiple comorbidities and represent a dilemma or a point of clinical equipoise for which no single clinical trial or group of trials is likely to provide the answer. Following an intensive training and proctorship period, AHC is currently one of the few certified TAVI sites in the region, offering the procedure through both the tranfemoral and transapical routes.

The Electrophysiology Program at AHC has also evolved significantly in 2015 where more than 150 procedures have been performed including conventional and advanced ablations and device implantations for a wide range of Heart Rhythm Disturbances. The program has benefited massively from Professor Josep Brugada – the renowned electrophysiologist and channelopathies expert.

An Atrial Fibrillation Ablation Program is scheduled to start in January 2016. With the aid of an online database and a dedicated audit team, outcomes and various quality metrics of the department's programs are currently tightly monitored, reported and benchmarked against those reported in the National Cardiovascular Data Registry in the United States.

> Prof. Joseph Brugada
with Dr. Mohamed ElMeghawry performing an EP study

Career Development and Continuous Medical Education

The Department is establishing a culture of engagement in lifelong learning. Besides the ongoing bed-side teaching, mentorship and focused overseas training sessions, a series of didactic lectures has been introduced in 2015 covering the core topics in Cardiovascular Medicine.
A comprehensive curriculum covering theoretical knowledge and skills is due to be introduced in 2016 to ensure the standard of care in terms of initial evaluation, diagnosis and development of treatment plans for patients at risk for or with cardiovascular disease.
A formal process of self-appraisal and annual assessment has also been introduced this year to ensure clear understanding of the training requirements of every individual within the department as well as fair evaluation.

Research

The department continues to be involved in a number of ongoing research programs within the centre and other places, and strongly emphasis on the staff's involvement in Research. A number of new projects have been introduced this year including the Centre's first randomized controlled study and 4 PhD theses on percutaneous balloon mitral valvuloplasty, pulmonary arterial hypertension, rheolytic thrombectomy and in-vivo plaque characterization in patients with heart attacks. Collectively, members of the Adult Cardiology Department published more than 30 papers in peer-review journals this year.

> AHC medical team reviewing patients in the joint cardiology and Cardiac Surgery meeting

Paediatric Cardiology

For the past 6 years AHC has been at the forefront of caring for children with Congenital Heart Disease. Building a state-of-the Art Paediatric Cardiology service has been one of our biggest challenges. Working together, our team of cardiologists, intensivists, interventionists, surgeons, radiologists, anaesthesiologists and nurses care for hundreds of children from Egypt and beyond.

The year 2015 witnessed a surge in interventional cardiology, PICU and neonatal cardiac surgery. More complex cases are being tackled in the cardiac catheterization suite and tiny neonates now dominate the PICU cots.
Paediatric electrophysiology is now shaping up with the program spearheaded by Professor Josep Brugada. As we continue to grow our commitment continues to grow which is providing exceptional care at the highest quality and safety.

Multidisciplinary Patient Care in Paediatric Cardiology

Outpatient Clinics:

This year more than 8000 patient medical files have been reviewed by our paediatric team. Of those applying, 7296 patients have been seen in our Paediatric Outpatient Clinic. All patients had a thorough evaluation that includes history-taking, clinical examination, ECG, and echocardiography. An important aspect of our outpatient clinic is educating the families about what to expect during hospital stay and to make sure that they understand how to care for the vulnerable babies and children when they are discharged from the hospital. After discharge the team continues to follow-up on the patients, families and communicates with the family physicians.

Multidisciplinary approach for decision making (JCC):

Although "JCC" stands for Joint Cardiology Cardiac Surgery, the meeting actually involves many other disciplines who share in the patients' management and care. Paediatric Cardiologists, Surgeons, Anaesthesiologists, Intensivists and Nurses contribute to the JCC. The JCC forum facilitates the development of a precision personalized management plan to tackle vulnerable neonates and babies with very complex anatomies.

Inpatient Services:

A multidisciplinary inpatient management approach is achieved by continuous round-the-clock collaboration between Paediatric Cardiologists, Intensivists, Surgeons and Nurses. The teams work together to prepare the patients before any intervention and continue to care for them after surgery and/or catheterization.

Paediatric ICU (PICU):

The PICU is the "Pivot of the Scale" in Arabic "Rumanat AlMizan"
"رمانة الميزان"

The final outcome for highly vulnerable babies who undergo complex surgeries and catheter interventions is markedly dependent on a robust PICU. Our highly sophisticated intensive care management is carried by the collaborative effort of our team of exceptionally skilled doctors and nurses who were well nurtured over the past few years and have now matured to be a formidable group. The PICU cared for 414 patients in 2015 by a team of dedicated PICU doctors and Nurses who maintain their cutting edge skills through the AHC continuous medical education (CME) local program and overseas training. The CME program designed for 2015-2016 mainly addresses Neonatal Bronchoscopy, Ultrasonography and Mechanical Ventilation.

Interventional Paediatric Cardiology:

Interventional cardiology has become a huge part of paediatric cardiology. Defects like ASDs, PDAs, and some forms of Coarctation and VSDs are managed by the interventional cardiology team freeing the surgical department for more demanding patients. In 2010 Interventional cardiology was initiated by one paediatric cardiologist, this year we have a team of four interventionists.

We started by performing 89 paediatric intervention procedure in 2010 vs 521 procedures in 2015 of which more than 60% of the patients were challenging complex interventional cases in babies less than 5Kg of weight. Figure 4 shows the paediatric cath – lab activity 2014 vs 2015 .

Total number of patients reviewed in the outpatient department in 2015 was 14,736. Figure 5 illustrates the number of patients reviewed (2013 vs 2014 vs 2015).

Figure 4: Peadiatric Cath-Lab Activity

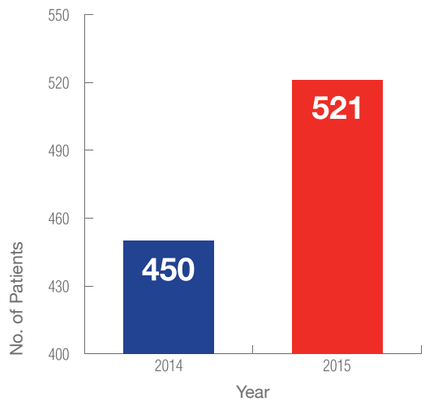
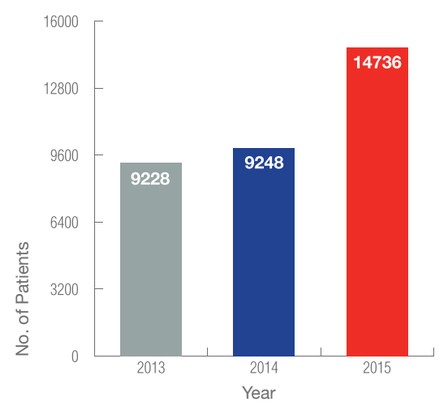


Figure 5: Out Patient Clinics Activity

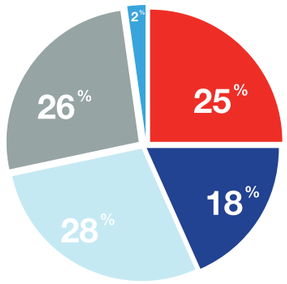


Cardiac Surgery

This year, our surgical department at AHC was strategically focused on 1) service development, 2) quality enhancement, and 3) horizontal expansion; while remaining attentive to the needs of the underserved community. More than half of the patients operated on came from the city of Aswan or Upper Egypt on the whole. While maintaining the total number of procedures performed annually, the number of Congenital Heart surgeries continues to rise. Figure 6 illustrates the demographics and geographical distribution of patients in 2015.

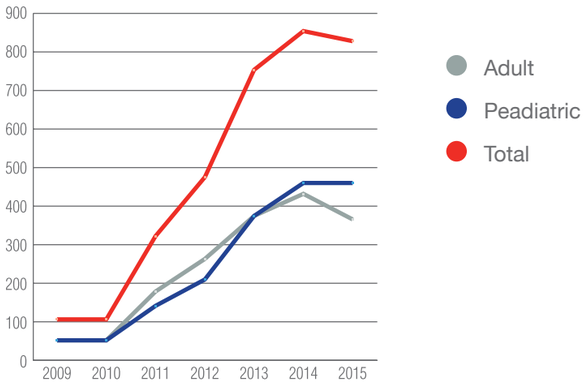
Figure 6: Geographical Distribution in 2015

Aswan	26%
Upper Egypt	25%
Cairo	18%
Other	28%
Non Egyptian	2%



The complexity of heart surgery performed in AHC has risen significantly. More than 20% of the paediatric surgeries are done for babies before the first month of age, many of whom are a few days old. Moreover, more than half of the congenital heart surgeries are performed for children less than one year old. Figure 7 illustrates the surgical activity in 2009-2015 (peadiatric vs. adults).

Figure 7: Surgical Activity per Year



Examples of our Scope of Surgeries and Special Surgical Programs in 2015

The "Arterial Switch Program" AHC is now receiving newborn babies suffering from transposition of the great arteries (TGA) on emergency basis from all over Egypt, with more than a hundred cases performed a year. TGA is a heart condition that is present at birth, and is often called a congenital heart defect. TGA occurs when the two main arteries going out of the heart—the pulmonary artery and the aorta—are switched in position, or "transposed". Older patients diagnosed with TGA that present to us also receive surgery in the form the atrial switch "Mustard Operation" where the team led by Prof Yacoub continue to introduce some novel techincal modifications. Figure 8 illustrates the TGA condition (British Heart Foundation , 2009).

Governed by a comprehensive clinical and imaging research protocol the program, Neonatal Hypoplastic Aortic Arch Repair is rising steadily to provide a much needed service for this difficult patient population. This condition, is described as narrowing of the major artery (the aorta) that carries blood to the body. This narrowing affects blood flow where the arteries branch out to carry blood along separate vessels to the upper and lower parts of the body. This disease can cause high blood pressure or damage to the heart if left untreated. Figure 9 illustrates the condition. (American Heart Association , 2015)

Within a strictly managed "Heart Failure Program" the left ventricular assist device (LVAD)- as a bridge to recovery- is looking after an increasing number of heart failure patients with very close follow up of their heart function, biomarkers and clinical parameters.
AHC continues to have an active interest in valve reconstruction with special focus on Rheumatic Mitral Valve Disease, in addition to surgical intervention for ascending aortic aneurysms utilising the "Yacoub Operation" for remodelling the ascending aorta while preserving the aortic valve.

Figure 8 illustrates the TGA condition

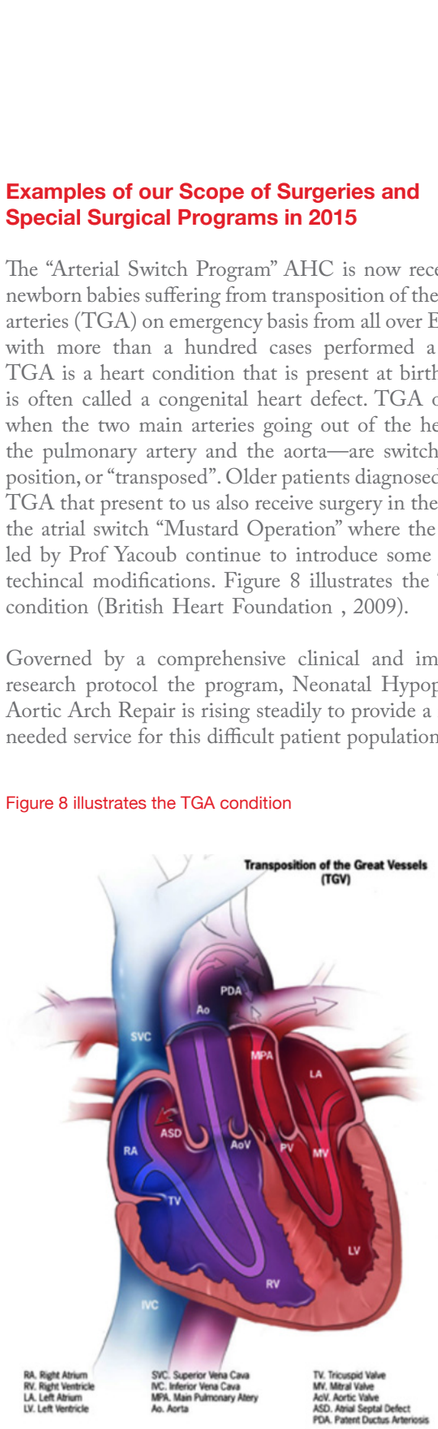
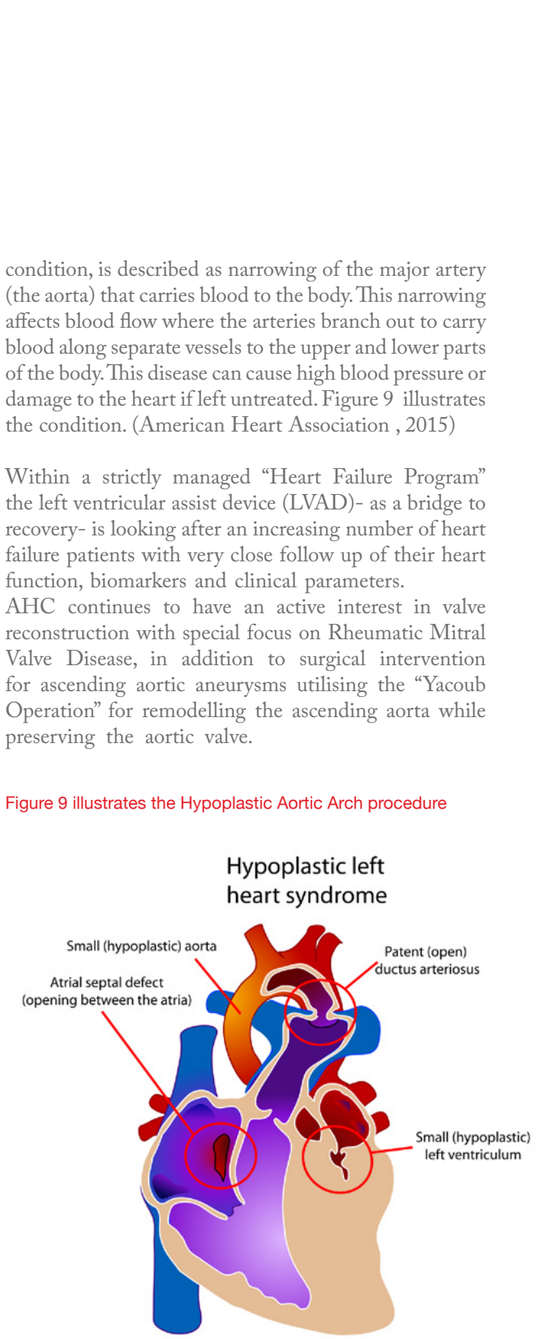


Figure 9 illustrates the Hypoplastic Aortic Arch procedure



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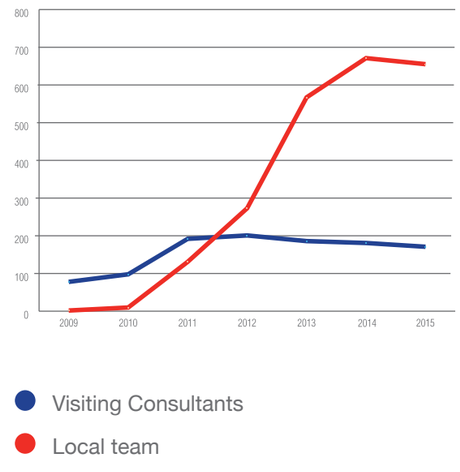
Investment in Human Resources

Inspite of the surge in complex cases, Egyptian trainees and surgeons are currently performing more than 80% of the open heart surgeries offered at AHC; a number that has been progressively increasing along the past 6 years. Figure 10 illustrates the contributions of Local team vs. Visiting Consultants from 2009-2015.

In recognition to the Centre's contributions to surgery in the underserved areas Dr Ahmed Afifi, Consultant of Cardiothoracic Surgery was awarded the "Young Surgeon of the Year Award" from Arab Health 2015 in Dubai, UAE.

The surgical fellowship program continues to be dynamic where every year, four cardiac surgery fellows join the team for a six-months period. The program is a structured cardiac surgical training program. The Anaesthesia department also offers two fellowship opportunities with special focus on managing Neonates with Congenital Heart Disease. We remain commited to recruiting and training local theatre staff from the city of Aswan and Upper Egypt.

Figure 10: Surgical Activity per Year



Aswan Heart Centre
Research and Innovation

This year has seen continued progress, consolidation, expansion and exciting developments in all areas of the integrated programme of clinical, translational and Life Science Research.

Team expansion

The expansion includes the appointment of full time young Researchers and supporting staff. This included the recruitment of biomedical engineers with image processing and numerical simulations skills, biologists with expertise in the fields of cell biology and bioinformatics, a research data base manager and a research secretary.

Department structure

The consolidation is reflected by the establishment of a tight Research Management structure, for the major areas of Research and the appointment of 3 deputy Directors of Research responsible for the scientific advancement, self-administration and management (Figure 11).

Figure 11 Research Department Structure

Director Of Research : Prof Sir Magdi Yacoub → **Operations Zeina Tawakol**

LIFE SCIENCES DEP.DIR. - YASMINE AGUIB, DR. RER. NAT	BIOMEDICAL ENGINEERING & INNOVATION LABORATORY DEP. DIR. - HEBA AGUIB, DR. ING.	CLINICAL RESEARCH DEP. DIR. - AHMED EL GUINDY, MD,MRCP,FACC
Ayman maher, MSc. Research Scientist - Cell Biology Lab	**Nairouz Shehata, BSc.** Research Scientist - Image Processing and Algorithms	Clinical team members involved in AHC research projects
Mona Allouba, MSc. PhD Candidate- Genomics Lab, Next Generation Sequencing and Biomarkers Analysis	**Mazen Abou Gamra, BSc.** Research Scientist - Computational Fluid Dynamics and Modeling	
Alaa Afify, BSc. Research Scientist - Genomics Lab, Bioinformatics (NGS) and Biomarkers Analysis and Date Validation	*BME Lab Interaction with:* **Soha Romeih, MD, phD** Head of Advanced Cardiac Imaging **Amr ElSawy, BSc** Radiology/Segmentation	
Fiesal Mohamed, BSc. Lab Chemist, Diverse Techinques		
Sanger Sequencing Lab, BibAlex-MYF Heba Kassem, phD Remon Azer, MSc. Besra Samy, BSc.		

Data Base Management : S. Anwar
Research Secretary : O. Alameldin

Infrastructure

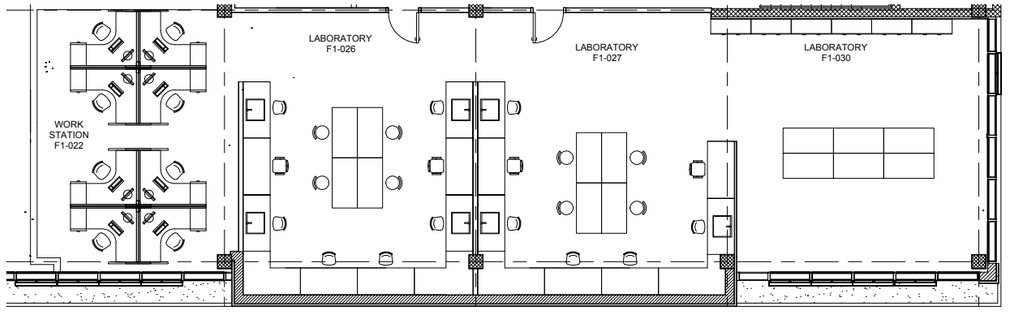
The exciting development is the eminent construction of the purpose built Translational Research Centre for Life Sciences and Biomedical Engineering attached to the Hospital and incorporating a markedly expanded outpatient Clinic which will impact follow up, screening and population science. The Labs are designed to accommodate the state-of-the-art infrastructure needed for the growing research department's technical needs and to ensure a vivid environment for the interdisciplinary team by having open space Labs (Computing, Molecular Biology), focus and meeting areas (Figure 12).

Strategic Research Collaborations (National and International):

The AHC Research Department succeeded in initiating and establishing collaborations with several Universities both in Egypt and abroad as well as with R&D departments of renowned companies in the health care sector:

- AHC Research Departments are coordinating and conducting two projects within the Magdi Yacoub Research Network. We are running joint research collaborations with partners at Imperial College London, University College London, Oxford University and with Qatar Cardiovascular Research Centre. In 2015, Our Research team members hosted and attended interdisciplinary workshops and meetings in the fields of Biomechanical Modelling in Congenital Disease, Population Genomics, Stem Cell Biology, Hypertrophic Cardiomyopathy, and others.
- In February 2015, AHC and American University in Cairo (AUC) signed a Memorandum of Understanding to emphasize and strengthen mutual academic and educational activities. AHC projects are conducted by highly qualified MSc and PhD students and co-supervised by AHC Deputies of Research and AUC professors.
- A research collaboration with Siemens AG was initiated and launched in March 2015. AHC signed a Research Agreement, the 1st of its kind in the Middle East and Africa, to apply, validate and suggest improvement in a Work in Progress Software Package for 4D velocity encoded MRI flow acquisition and analysis.

Figure 12 New AHC Research Labs



> Prof. Sir Magdi Yacoub and Dr. Lisa Anderson (President of AUC) while signing our MOU

Finally, and most importantly, the PhD programme at the Centre is expanded in collaboration with Imperial College London, through a generous Grant from the Alfi Foundation to our young Researchers.

Grants:

• CIB Foundation Research Fund, Proposal: 'Platforms of Integrated Healthcare and Research at the Aswan Heart Centre', 2015: 8M EGP, 2016: 7M EGP for Research Equipment and Consumables.

• BCCI AUC Research Fund: 'Boundary Crossing and Communicative Integrative Research Initiative', Grant Application: "Towards a cardiac electromagnetically modelling tool" (1st round).

• Provision of study drug (Treprostinil/Remodulin) and limited financial support from United Therapeutics Corporation for the "Effects of Treprostinil on Right Ventricular Remodeling in Patients with Pulmonary Arterial Hypertension" Study [30 patients for two years].

• Al Alfi Foundation, 2 PHD scholarships in the field of 'Bioinformatics' and 'Genomic Studies'.

Under Preparation:

• AHC received an initial approval for becoming a collaboration partner in 'The Living Heart Project', a global and interdisciplinary translational research initiative to revolutionize cardiovascular Science through realistic simulation of a whole heart.

• USAID Higher Education Partnership for Innovation and Impact (HEPII), APS No: APS-OAA-15-000048. A concept paper is under preparation by the Biomedical Engineering and Life Sciences department at AHC and our partners at AUC.

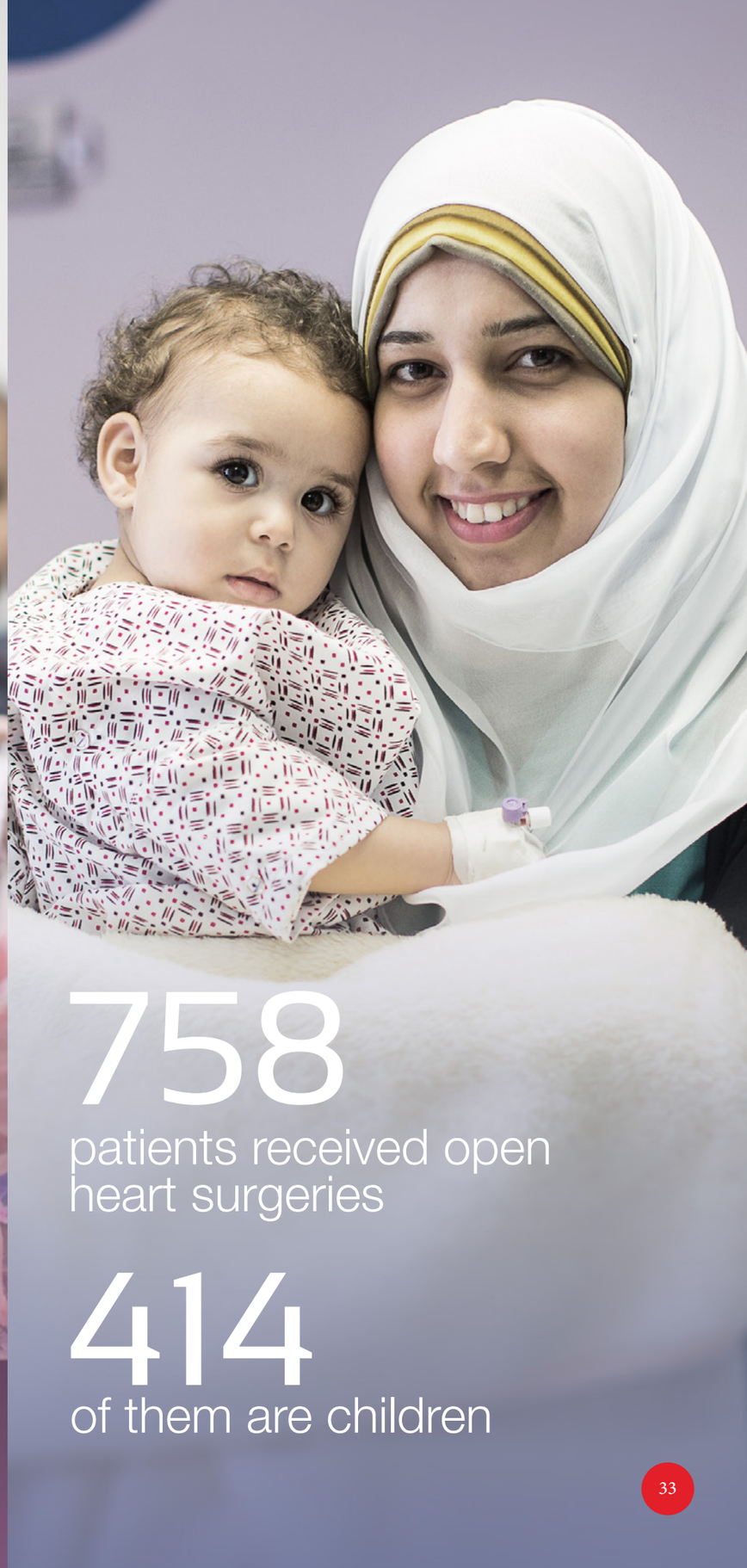
• Leducq Foundation grant application with Prof. Hesham Sadek MD, PhD Division of Cardiology, UT South-western Medical Centre, Title: 'Redox Regulation of Cardiomyocyte Renewal'.

• H2020 Proposal, Work Programme 2016/2017, Health, demographic change and wellbeing – Personalized Medicine. Project Focus: 'Thoracis Aortic Disease', Co-applicants: Prof. C. Nienaber (Imperial College London), Prof. A. Evangelista (Universitari General Vall d'Hebron, Barcelona)

> AHC Research Team

1886
patients received catheterizations in 2015

512
of them are children



758
patients received open heart surgeries

414
of them are children

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Magdi Yacoub Heart Foundation Unit at El Galaa Hospital, Cairo

After about two years of preparation, a soft opening of the Magdi Yacoub Unit in El Galaa Armed Forces Hospital Complex in Almaza took place in August while the unit became functional in December. During this time 74 open heart operations and 18 interventional cardiology procedures (the cath-lab became operational in December) were performed which came hand in hand with the training of El Galaa staff including; doctors, nurses and allied health care professionals, to provide the required expertise in both sites simultaneously.

74

Open Heart Operations in El Galaa Unit

Aswan: The Gateway to Africa

Aswan's location has always lent it unique geographic and historical importance as Egypt's southern gateway to Africa. Stimulated by this fact and by our sense of responsibility towards neighbouring Countries, particularly those within the Nile Basin, AHC was keen to strengthen scientific, academic, and humanitarian collaborations with different African states since the year 2013 and is continuing to do so.

As part of our commitment to global medicine and outreach to the rest of the continent, AHC continues to provide monthly operating slots for African children with heart disease, in collaboration with Chain of Hope, as well as training for african doctors and nurses. This program is fully sponsored by Chain of Hope UK and The Egyptian Agency for Partnership and Development (EAPD).

This year, acardiologist from Jimma in Ethiopia received a one-year fellowship/training in general cardiology with special emphasis on echocardiography. A young perfusionist from Ethiopia was also invited for a six-months training program on heart-lung machine and extra corporeal membrane oxygenation (ECMO) with special emphasis on children and small babies.

With the help of the EAPD of the Egyptian Ministry of Foreign Affairs, we were able to fund the following equipment in Neighnouring countires:

1. Four ICU beds to the Cardiac Centre in Addis Ababa, Ethiopia
2. An Echo Machine to Bujumbura, Burundi
3. An Echo Machine to Uganda Heart Institute
4. An Echo Machine to the Cardiac Centre in Addis Ababa, Ethiopia

Treating patients from Africa: AHC hosted 11 patients from different African countries (Ethiopia, Uganda, Gambia and Senegal) to undergo open heart surgical and catheterization procedures that were too complex to perform at their local hospitals.

Training of Doctors: Two 3-6 months fellowships in echocardiography are currently being offered to doctors and echocardiography technicians from various African countries including Ethiopia, Gambia and Malawi.

Magdi Yacoub Heart Foundation

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