SUCCESSFUL DEPLOYMENT OF DIGITAL DIAGNOSTIC IMAGING IN TANZANIA THROUGH ROTARY GRANTS AND TECHNICAL SUPPORT

The donation of digital diagnostic imaging equipment and training by multiple Rotary clubs and Districts has improved the ability of physicians to greatly improve the quality of health care to young mothers, infants and children. The hope and promise are that this technology will lower the mortality rate for mothers, infants and children and will not only improve survivability but lead to a better quality of life. The processes to assure these outcomes are well understood at Children's Hospital Zinga and in practice as represented in the statistics of performance. Digital technology provides immediate digital images, long term low cost electronic archiving and retrieval and electronic overreads by consulting radiologists and clinicians. This provides for immediate, high quality health care which can precede and prevent complications thereby lowering the mortality and morbidity rates.

A team of 13 Rotary clubs, five Rotary Districts, and an anonymous donor raised over $100,000 to donate digital medical imaging equipment to the first free standing pediatric hospital in Tanzania, Children's Hospital, Zinga

Background

How Rotary became involved is a story that begins over seven decades ago in the Methodist Church and the enduring friendship of two little girls through their adulthood. Dorothy Silver and Paula Lofstrom began their life's journey together as children in the Methodist Church in Kansas City, Mo. and developed a life -long friendship. Dorothy's family moved to Park Ridge, Il. when she was five and they joined the Methodist Church. She has been active in the church these many years. Paula, a nurse administrator, followed the path of becoming a medical missionary. She and her husband, Dr. Denny Lofstrom and the late Mary Ellen Kitundu formed International Health Partners (IHP) to provide better health care in Tanzania. Their vision is to create a 500-bed hospital all on one floor with 33 buildings on 63 acres of donated land. Zinga is located 35 miles from Dar-es-Salaam, the largest city in Tanzania.

To engage in their mission, the Lofstrom's had to raise money on a continuing basis. They began making trips to the U.S. to spread the news of their mission and monetary needs from coast to coast. They presented to churches, service groups, medical centers, philanthropists and whoever might provide support. Of course, one of the stops was her old friend Dorothy and the First United Methodist Church in Park Ridge.

Some members of the church were also Rotarians. The Rotary Club of Park Ridge began exploring the feasibility of donating medical x-ray systems in under resourced countries based on WHO standards and based on the efforts of the late Dr. E.S. Palmer and other discussions with the Lofstrom's led to the development of a Rotary Global grant which included the clubs to whom they had presented.

How We Got Funding

The Rotary funding formula is bases on initiatives set in motion by one or more Rotary clubs. Each club is within a District and each District is supported by The Rotary Foundation (TRF). There are Rotary clubs in 216 countries and there are 1.3 million Rotarians worldwide. TRF has over $1B in funds and most notably, has used these funds combined with countless hours of Rotary volunteerism in the eradication of polio.

Typically, a club or clubs generates a fund for a Global Grant project. This is matched by the District from their District Designated Funds. TRF then matches the District match and 50% of the club(s) funds. example if a club comes up with $10K for a project, the total amount raised is $35K. Global grants are required to have a minimum grant amount of $30K.

In the case of the Zinga project, there were 12 contributing clubs, an anonymous outside donor, and a host club in Dar-es-Salaam. A host club in the recipient country is a mandatory requirement of Rotary Global grants which has a critical role to provide oversight and sustainability of the project

The leverage provided by the Districts and TRF brought the total to $103,500 which was adequate to fund the project. The clubs generated a total of $21,750 plus $7500 from the anonymous donor. These funds leveraged by matches from the Districts and TRF (The Rotary Foundation) made up the rest of the funds.

Technical Support

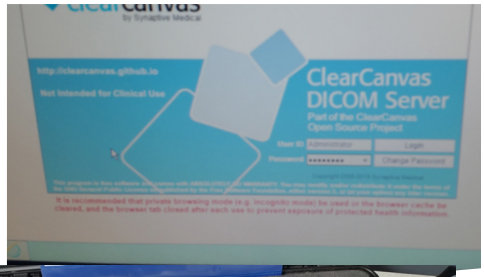
A major challenge is that many NGO's, including particular Rotary clubs who are partnering with a club in the region needing a medical imaging solution, do not have the technical expertise to determine what might work in these regions. Here is where the DIMIST (Diagnostic Imaging and Medical Informatics Support Team) plays a role, a group of Rotarians with expertise to advise on the requirements, evaluate vendor specifications, negotiate preferred pricing with vendors, and even support the actual installation if needed. DIMIST connects in the true sense of the "rotary wheel" the non-profit sector with academia, vendors and professional societies and has supported projects in South Africa, Nepal, Zimbabwe, Tanzania, Guatemala, Uganda and Sierra Leone.

Implementation

As with any project, it is critical to do your homework and make sure that everything is well prepared. The DIMIST team spent quite a bit of time to work with the physicians on-site to make sure the proposed solution met the specific requirements of the pediatric clinic. The result was an X-ray system from Fuji, with a digital detector reader from the same vendor, an open source digital archive and database management system from ClearCanvas installed on a locally purchased server running Windows operating system, a medical grade display, remote computers to view the images, an Ultrasound unit and also digital dental acquisition detectors and software. All of these modalities (X-ray, Ultrasound, dental) create digital images which are centrally archived and viewable. The grant proposal which funded the equipment included a line item for training and support which paid for the travel for a DIMIST team member to support the installation which turned out to be invaluable, if nothing else to create a sense of urgency to meet the installation date as well as address any issues that might come up.

What is different in this installation from a typical deployment in a comparable clinic in let's say a suburb in the US is the following:

- We used a digital solution for the X-ray which is called CR (Computed Radiography) which is mature and cost-effective unlike the more common Direct Digital detector technology (aka DR) which is widely used in the developed world. We saved at least US$25k.
- The digital archiving and viewing of the medical images (aka PACS system) uses an open source solution. The particular viewing for this application, (Clearcanvas) has become more or less the de-facto standard for the developing world but is obviously not pushed by any of the local dealers as it does not create any revenue for them. We saved an estimated US $25k.
- We used two re-furbished dental detectors, provided by a local dealer in the USA. We saved here at least US$2,500.
- While we recommended a WHIS-RAD system for CHZ which Doctor's without borders routinely uses for pediatrics, one of the doctor's requested a Fuji system which was somewhat more expensive. Since service was readily available from nearby Dar and since we had previous successful dealings with the dealer, we agreed to the change and used an Ultrasound directly imported from China instead of using a traditional US or European supplier. We saved an estimated US $15k



Challenges

- People in developing countries have a different sense of urgency and timing. If you make an appointment for someone to show up to install equipment at a certain date, they might or might not show up. If someone from the USA arrives at a certain date with a relatively fixed preplanned schedule, that might conflict with the flexible schedule of the local suppliers and dealers. That makes the implementation challenging and requires a lot of flexibility.
- There is little IT knowledge and expertise in developing countries. Fundamental principles such as virus protection, redundancy and backups are common in the USA but are important to be taught at these sites.
- Clinical training is also a challenge, it took us several months to finally get someone from the nearest large hospital to come to the site and finally teach the physicians the use of the Ultrasound. For the X-ray, this was less of a problem as the clinic hired a certified radiological technologist to do the X-ray procedures.
- Radiation safety is also an area that needs training. The site was inspected by the radiation safety commission, which found some leaks through the door of a restroom connected to the X-ray room and a non-lead glass panel in the radiation screen, but after their approval, the site is left on their own. In the US we have a required radiation safety officer for each location and personnel wear X-ray badges, which is rarely seen in any of the hospitals visited in these countries.
- The software used for viewing images is relatively user friendly, and staff can figure out how to use it relatively easily. There is an extensive training manual included as a "help" feature, therefore, the staff can quickly use it. The overall system configuration, how images are routed, archived and accessed is a little bit harder to explain and grasp and requires more explanation.
- Follow up after a period of 6-12 months is also important to make sure that the system is used as intended. Look for improvements in workflow and quality measures.
- It is often challenging to get "data" from a site, whether it is the number of studies performed, whether the system meets the expectations as set forth in the initial grant proposal and if the impact that the system was supposed to make on the community, indeed was accomplished. This feedback is critical as input for additional grants and new proposals as it can build on the experience we gain from successful projects like these.
- Physical security is a major issue. In one hospital they installed camera's everywhere there was a workstation. In Zinga it was not so much of an issue because of the remote location of the campus, and the always presence of several Masai guards who literally live on the site.

In conclusion, we could provide a digital imaging system for less than 2/3rd of the cost of a similar "commercial" system, which is a significant savings as these funds are provided by grass-roots fund raising and matching by Rotary International, but even more importantly, it is a more sustainable solution.

Results

Since the installation of the systems in the spring of 2018, considerable changes have occurred. Two radiology technologists have been hired and an independent radiology group in Dar-es Salaam is providing oversight. The Ministry of Health recognizes the hospital as part of the Tanzanian health delivery system, and is providing partial operational funding. There are now two shifts to meet the demand and a third shift is under consideration to provide 24/7 service. The hospital has created its own microeconomy.

Additional Results:

- their maternity ward will open soon, which will increase their traffic.
- they do currently about 10 Ultrasounds/week
- they are now open 9-9, they work two shifts, including Saturday, and soon they'll be 24/7.
- they are still able to raise funds to continue construction. Paula and Denny will be coming back to the US next week and be there till March for fundraising.
- Their campus is quite impressive. They have several guest houses where they host quite a few groups and next year is almost totally booked with teams from churches and medical teams. Most groups do a combined safari-mission trip.

Lessons Learned

1. On-site support from a constructionbn expert is important: For example, when looking at the room where the physician would read the X-rays, there was a window that let in outside light, which is a no-no as it impacts the capability for the physician to see small details in the darker regions. It was suggested to paint the window with dark paint to alleviate this.
2. Always have some money in the budget for unforeseen items: We discovered that the site did not have any radiation protective clothing for the patients and staff, we used the remaining budget to purchase this.
3. Local support from a rotary club who has people on-the-ground is critical: the local club (Bahari in Dar-es-Salaam) was instrumental in finding a local computer supplier, following up when there were issues with warranty and training and making sure that payments to local suppliers were paid.
4. Typically, we pay from funds in a bank account in the U.S. with one half on initiation of a purchase and ½ on acceptance by the site. In one case, we did not follow this rule and paid the whole amount up front and subsequently had trouble getting the vendor to provide an acceptable unit for the user.
5. After checking with the stakeholders, we closed the Global Grant. About two weeks afterwards, we received comments from the receiving District that they had questions. We had never heard from this entity before. It delayed the project about 6 months to bring the outside reviewer up to date and re-institute the grant. It could have all been handled simply during the grant development if we had known there was this reviewing authority within the District. More clarity about the receiving districts, their structure and grant process would be helpful.
6. Different Districts have different matching fund approaches. Our District has a one to one match. Another District had a 6x match; another had no match.

With respect to the diagnostic imaging systems which have played a part in this growth, the following reports from January to May 2018 and from January to June 2019 provide insight into how the technology itself is being used.

RADIOLOGY DEPARTMENT JANUARY TO JUNE 2019 REPORT

Radiology department report for January to May 2018 and January to June 2019. Total number of patients up to June was 65 where 96 were for X-ray examinations and 193 were for Ultrasound examinations.

STATICALLY: TOTAL NUMBER OF PATIENTS FOR XRAY EXAMINATION

MONTH	FEMALE	MALE	TOTAL NUMBER
JANUARY	02	02	04
FEBRUARY	08	07	15
MARCH	02	03	05
APRIL	10	10	20
MAY	04	05	09
JUNE	06	06	12
OVERALL	**32**	**33**	**65**

STATISTICALLY THE TOTAL COUNT OF THE PATIENT ATTEND FOR X-RAY EXAMINATIONS IS AS FOLLOWS:

MONTH	FEMALE	MALE	TOTAL NUMBER
JANUARY	18	05	23
FEBRUARY	62	12	74
MARCH	34	03	37
APRIL	13	03	16
MAY	15	02	17
JUNE	24	02	26
OVERALL	**169**	**27**	**193**

STATISTCALLY: TOTAL NUMBER OF PATIENTS FOR ULTRASOUND EXAMINATION

1. BASED ON AGE AND SEX:

BY AGE			BY SEX	
CHILDRENS		ADULTS	FEMALE	MALE
UNDER 5	ABOVE 5			
0	11	51	32	33

Figure 01.

2. BASED ON DIAGNOSIS:

NORMAL	ABNORMAL
34	31

Figure 02.

3. BASED ON TYPE OF EXAMINATION:

TYPE OF EXAMINATION	NUMBER OF THE PATIENTS
SKULL X-RAY	3
CHEST X-RAY	27
SPINE X-RAY	7
UPPER EXTRIMITIES X-RAY	6
LOWER EXTRIMITIES X-RAY	9
PLAIN ABDOMINAL X-RAY	3
PELVIC X-RAY	0

Figure 03.

STATISTICALLY THE TOTAL NUMBER OF PATIENTS FOR ULTRASOUND EXAMINATIONS WAS AS NOTED BELOW:

1. BASED ON AGE AND SEX:

BY AGE			BY SEX	
CHILDRENS		ADULTS	FEMALE	MALE
UNDER 5	ABOVE 5			
3	7	183	169	27

Figure 04.

2. BASED ON DIAGNOSIS:

NORMAL	ABNORMAL	PREGNANCY
105	88	63

Figure 05.

3. BASED ON TYPE OF EXAMINATION:

TYPE OF EXAMINATION	NUMBER OF THE PATIENTS
ABDOMINAL – PELVIC ULTRASOUND	102
OBSTRETIC ULTRASOUND	63
ECHO-CARDIOGRAM	0
THYROID ULTRASOUND	1
DOPPLER ULTRASOUND	0
Scrotal	1

Figure 06.