2018 ACCES23-CMBEC41
Joint Conference
Charlottetown PEI
May 8-11, 2018

VOLUNTEERING AT TWO CENTRAL AMERICAN HOSPITALS: A CANADIAN CLINICAL ENGINEER'S PERSPECTIVE

Parisa Bahrami
Children Hospital of Eastern Ontario (CHEO)

Abstract – Inaccessibility of medical equipment in low resource settings is a challenge and an obstacle to providing care. Some of the contributing factors to this problem are discussed in this paper based on the two-months volunteering experience of the author at two hospitals in Central America. This firsthand experience alludes to the shortage of functional equipment, impractical reliance on donated equipment, lack of equipment donation policy, inadequate healthcare technology management policies, and lack of technical resources. In order to have a sustainable impact on improving accessibility of medical equipment, the clinical engineering professionals need to focus their volunteering work on developing local resources in order to increase local ownership and participation.

INTRODUCTION

The author volunteered as a Clinical Engineer at two hospitals in Nicaragua and Guatemala for two months in the summer of 2016. The intent of this paper is twofold: first, to allude into the overall experience, including involvement on the ground, and observed medical technology challenges and opportunities in low resource settings, and secondly, to inspire clinical engineering professionals to get engaged in improving global health.

PREPARATION

The availability of safe and functioning medical equipment that meet the population's healthcare needs remains a great challenge in low resource settings. To gain a firsthand experience and to assist alleviating immediate medical equipment needs at local hospitals in low resource settings, the author applied for a clinical engineering volunteering opportunity in Nicaragua and Guatemala through Engineering World Health (EWH), an organization that empowers engineers to use their engineering skills to improve global health.

Upon acceptance, the author conducted a series of fundraising activities, including pizza sales, advertising through the GoFundMe website, and applying for travel grants to raise the required funds for travel, accommodation, repair tools, etc.

Planning for the trip required personal growth including learning about the history, culture, and the official language of these two countries as well as personal health preparation such as getting the required vaccinations. Also, arrangements had to be made with the employer in Canada to support taking unpaid time off from work.

LOGISTICS

Upon arrival in Nicaragua, orientation and intensive language training was provided to the volunteers through EWH. During the orientation period, the twenty three volunteers were divided into smaller groups of five or six individuals. The groups took language classes in the morning for four weeks. During this period, the groups visited and worked at assigned clinics and hospitals in the afternoon. At the end of the first month, individuals were divided into smaller groups of two or three individuals who complemented each other's language and technical skills. Each group was assigned to the main public hospital in different cities. Each group worked full time, Monday to Friday from 8 a.m. to 4 p.m. Some groups stayed in Nicaragua, while others were

deployed to Guatemala. In both host countries, each group stayed with a local family in their assigned city. This accommodation was arranged through EWH. Staying with the local families facilitated a better cultural immersion and language learning.

ON THE GROUND EXPERIENCE

Guatemala and Nicaragua have a mix of public and private hospitals. The author's team was assigned to public hospitals in both countries. The working relationship between EWH volunteers and the hospitals had been established through previous visiting volunteers and EWH administrators. As a result, the transition to a working space in the hospital and starting the daily work went smoothly for the group. Upon arrival, the team met with the Director of the hospital and the hospital inventory manager was assigned as the main contact with whom any work related issues could be raised and discussed.

At both hospitals, there were no clinical engineering professionals. The facilities team which consisted of three to four individuals had very basic tools and not enough technical skills to maintain the medical equipment. There were no official inventory of medical equipment at the hospital.

The team visited each department at the hospital twice a week to receive the defective equipment and to return the repaired items. The units were often very overcrowded with patients waiting to receive care. The hospital infrastructure such as power receptacles on the walls were outdated and sometimes did not look safe. Throughout the day, various departments brought equipment to the team's working space for repair. As the volunteer team built trust by repairing simple equipment from various units, the units started to bring forward more complex equipment. There was also a large room in the hospital that contained the nonworking donated or hospital-owned equipment. The inventory manager would select equipment from this pool, based on the greatest need at the hospital, and bring them to the team for repair. The staff were often very appreciative of the work of the volunteers and would positively comment on the impact of having equipment available for patient care.

The medical equipment were often old. The equipment included but were not limited to thermometer, blender, vital sign monitor, cast cutter, patient bed, infant incubator and warmer, lab centrifuge, ultrasound, OR lights, phototherapy light, ventilator, defibrillator and the requests varied from repair and inspection to translating user manuals and educating the staff on how to use the equipment.

Sourcing parts was often difficult due to the age of the equipment and they were often unaffordable for the hospital due to their high cost. The providers were often outside of the country and they had a long delivery time. The volunteer group could purchase some of the parts from their fundraised money or reuse parts from other similar equipment. However, some equipment had to be left unrepaired due to unavailability or unaffordability of the parts.

The group had to be creative in sourcing the parts by visiting the local market or visiting the local machining shops to make custom parts. Due to unavailability of test equipment, the group had to devise reliable testing methods, for testing infusion pumps and ventilators for example, that were feasible with basic tools and equipment that were available to them.

CHALLENGES

Shortage of functional affordable medical equipment that the local staff are adequately trained on severely challenges the provision of healthcare at low resource settings. This shortage could be due to many reasons, some of which are briefly mentioned below based on the author's experience.

<u>Lack of Planning to Accept Donated Equipment</u>

Due to lack of funding, the hospitals often rely on donated equipment. However, donation of medical equipment to low resource environments is done with little or no appropriate planning which does not resolve the shortage of medical equipment but ends them up in landfills:

- The donated equipment may not be needed at locations where they are sent to
- The clinical staff may not know how to use them

- The user and service manuals may not exist in the local language which impedes the appropriate use of equipment
- The essential accessories that are required to operate the equipment may not be available or too expensive to purchase
- Local technical expertise may not exist to repair the equipment in case of failure
- Affordable repair parts may not be sold or may be too expensive to acquire
- Donated equipment may be incompatible with local power voltages and frequencies

Lack of Infrastructure to Support Medical Equipment

One of the impediments in having functional medical equipment in low resource settings is the lack of supporting infrastructure. For example, unreliable electricity, including frequent spikes and power failures may cause permanent damage to the equipment. Another instance is lack of a water treatment infrastructure that may impede setting up dialysis equipment in low resource settings.

Lack of a Health Technology Management Plan

Procuring, implementation, and maintenance of medical equipment in hospitals require planning and preparation. In low resource settings the planning is very minimal or non-existent due to a lack of expert resources, inadequate funding, and a heavy reliance on donated equipment or international aid.

Lack of Trained Technical Personnel

Local trained technical resources are very scarce. As a result, maintaining medical equipment or design of medical equipment at the local level is not possible or sustainable at this point in time.

Language Barrier and Building Trust

Building trust and positive professional relationships are crucial in any work environment. Due to language barriers and cultural differences, building these relationships may take longer for a foreign volunteer. However, being sensitive to the cultural differences, having a professional attitude towards the volunteering work, building friendships, and taking steps and initiatives that makes the work of the healthcare providers easier goes a long way in building trust.

LESSONS LEARNED

Drastic Difference between Public and Private Hospitals

Working in a publicly funded hospital and visiting a friend in a private hospital in Nicaragua was an eye-opening experience. It was striking to see up to date equipment in a private hospital in a country that its poor people did not have access to basics of healthcare. It demonstrated the drastic difference in the quality of care provided to the poor and the rich and spoke to the wealth gap between the two groups in the same country.

Sustainability of the Foreign Volunteers' Work

Foreign volunteers usually work in the low resource settings for a short period of time. If there is no continuity between the work of the volunteering groups that come one after the other, the service could feel disjointed to the recipients. In the absence of clinical engineering professionals in the host hospital, it is important for the volunteering groups to take an inventory of the equipment in the hospital and document the work that they perform on the equipment in a database and pass this information to the next volunteering group through the organizing institute. They could also make note of the relationships that are being made, the key staff and stakeholders at the hospital, main local part providers, etc. that could be time-saving for the next group of volunteers. The author and her team started an equipment inventory as well as a resource manual that included the name of the key contacts at the hospital and local parts suppliers that was given to EWH as a reference for future volunteers.

Engaging Local Resources

Purchasing parts from the local market or working with local machining shop to produce parts that were needed to repair a piece of equipment was a very positive experience. It

demonstrated the appreciation of the local people for the work of foreign volunteers and their willingness to assist in any way they could to help. It also showed the potential that exist in developing local resources that could make the support of the medical equipment at low resource settings more sustainable.

OPPORTUNITIES

The challenges that are mentioned above present many opportunities for improving the accessibility of medical technology in low resource settings. The opportunities that are mentioned below came up in conversations with the local staff at the hospitals and the members of the volunteering group.

Lending Expertise in Healthcare Technology Management

Healthcare technology management policies and procedures at the national, regional, and hospital levels are required to assist with planning, procurement, and implementation of appropriate medical technologies in low resource settings. However, developing such policies requires expertise as well as knowledge of the culture and environments where such policies and plans are to be implemented.

Organizations such as World Health Organization work with some governments to develop plans to assist them with addressing healthcare issues in low resource settings [1]. Clinical engineering professionals from developed countries can volunteer with such organizations or governments to lend them expertise in developing such programs and to train local staff in running and sustaining them.

Lending Expertise in Developing Local Technical Resources

Clinical engineering professionals can lend expertise in a variety of ways to develop local resources that are capable of improving the healthcare technology themselves:

- Volunteering with universities, colleges, and higher education organizations in low resource countries to develop up to date curriculum and to train local clinical engineering professionals. Such programs will develop innovative local engineers and designers that can design, develop, repair and maintain medical equipment locally. Local clinical engineers have a better knowledge of the available resources to develop and maintain technologies, as well as the pressing medical technology needs in their communities and healthcare systems [2]. Fostering local participation and ownership will reduce the problems that currently exist with maintenance and accessibility of medical equipment.
- Raising awareness among professionals in developed countries to volunteer their knowledge and resources for developing local capacity in low resource settings that can sustain the development initiatives locally in the long run.

CONCLUSION

Volunteering at a low resource setting was a rich and eye-opening experience that demonstrated the need for a systematic approach to healthcare technology management practices. Clinical engineering professionals can volunteer to assist with developing policies and procedures, increasing local technical resources, and fostering local ownership which are important factors leading to more accessible and sustainable medical technology.

ACKNOWLEDGEMENT

Clinical Engineering Society of Ontario (CESO) is gratefully acknowledged for the provision of a travel grant that funded some part of the author's volunteering trip.

The author acknowledges the support of her manager and coworkers at Mount Sinai Hospital in Canada that allowed her to undertake this initiative.

REFERENCES

[1] World Health Organization (WHO), "Human Resources for Medical Devices, the Role of Biomedical Engineers", WHO Technical Series, 2017.

[2] D. R. Lustick, and M. H. Zaman, "Biomedical Engineering Education and Practice Challenges and Opportunities in Improving Health in Developing Countries", 2011 Atlanta Conference on Science and Innovation Policy, Sept. 2011.