International Journal of Clinical Medicine, 2014, 5, 293-296
Published Online March 2014 in SciRes. http://www.scirp.org/journal/ijcm
http://dx.doi.org/10.4236/ijcm.2014.56043

The Unrecognized Value of Bio-Medical Engineers in Healthcare Projects in Developing Countries

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Received 16 December 2013; revised 15 January 2014; accepted 14 February 2014

Abstract

The healthcare needs of developing countries are great and ever increasing as their populations grow. Few assistance programs have recognized the value of the bio-medical engineer as part of the approach to the provision of healthcare in developing countries. An example of a program, the Bach Mai Hospital Project, in Vietnam, utilizing the talents of the bio-medical engineer, attests to the potential value of bio-medical engineers as part of the healthcare team. Their inclusion in such efforts can result in the saving of lives, time and money. Knowledge of their hospital's excess equipment inventory and their ability to restore medical equipment badly needed in a developing country makes them valuable additions to any medical assistance program.

Keywords

Healthcare; Developing Country; Medical Equipment; Volunteerism

1. Introduction

Those of us involved with the provision of medical assistance to developing countries have always centered our efforts on the provision of physicians/educators, nurses, other healthcare workers, medical equipment and medications. For too long, we have overlooked the value of the bio-medical engineer, as recently documented in the book—*The Bach Mai Hospital Project* [1].

2. Background

In October 2012, we (Bach Mai Hospital Project, Catholic Health Initiatives, St. Anthony's Hospital and Foun-

How to cite this paper: Bartecchi, C.E. and Preston, R. (2014) The Unrecognized Value of Bio-Medical Engineers in Healthcare Projects in Developing Countries. *International Journal of Clinical Medicine*, **5**, 293-296.
http://dx.doi.org/10.4236/ijcm.2014.56043

dation) chartered a Boeing 747 - 400 cargo plane to deliver 50 tons of medical equipment from St. Anthony's Hospital in Denver, CO to the Bach Mai University Hospital in Hanoi, Vietnam. Bach Mai is a 2000 bed 3000 patient Government Hospital for the poor of Vietnam, and also the teaching hospital for Hanoi Medical University.

All equipment that we delivered, as required by the Vietnamese government, was at least 85% "good as new". Though many of the items were—190 hospital beds and mattresses, 15 gurneys, an operating room table, 29 treatment chairs, etc., many of the items were of a high-tech nature—3 ventilators, 34 portable patient monitors, 23 large ICU patient monitors, 7 large sophisticated ultrasound machines, IV infusion machines, etc.

Our 17 years of experience with the delivery of equipment to the Bach Mai Hospital told us that with all such deliveries, we needed to be sure that the equipment was not only working when it left the US, but that it had to be working on arrival at the hospital, and was effective when employed in the patient setting. Very early in our experience at the Bach Mai Hospital, we were shown a basement filled with donated equipment that didn't work and merely took up space at the hospital. Aware of this problem at Bach Mai, five years ago we chose a Bach Mai medical technician, Van Nguyen Hoang, and brought him to St. Anthony's Hospital in Denver, and trained him to be a bio-medical technician. He returned to the Bach Mai Hospital and built up a department of young technicians who began working with the medical equipment problems at the Bach Mai Hospital. Following his program in Denver, Mr. Van was in continuous communication with St. Anthony's bio-medical engineering department.

Aware of the problems with delivery of medical equipment, we had Catholic Health Initiative bio-medical engineer, Robert Preston, CBET, check and properly observe the packaging of all technical equipment for the October 2012 equipment delivery. Also, understanding the need for same, we brought Robert Preston to the Bach Mai Hospital to oversee the arrival of the equipment, teach Mr. Van's technicians how to assemble the equipment, calibrate the machines, take them to the patient's bedside and hook them up to the patient. Robert also taught the technicians machine maintenance, how to calibrate the machines, repair them, and trouble-shoot them. He left them manuals for each machine and his e-mail and Skype numbers, should there be any problems.

This experience at the Bach Mai Hospital helped Robert and I appreciate the need for an education program for the technicians at the Bach Mai Hospital and all other medical technicians in Vietnam. A recent survey [2] of Vietnamese hospitals showed that technicians in almost all hospitals were the ones involved with repairs and testing of a machine's quality, and often involved with the operation of medical equipment. Not enough bio-medical engineers are available to accomplish all those important tasks, even though it was reported by Webster [3] almost a decade ago that the policy makers in the central Vietnamese Government were aware of the important contributions of bio-medical engineering in the development of the country. The survey [2] did suggest, according to some incomplete statistics from 2007, regarding medical equipment staff, that those staff members in the provincial and district hospitals, who have a good technical background, are very few: only 6% are engineers, 35% are technicians or technical workers and 59% are doctors, pharmacists or nurses. One problem noted by Webster [3] however was the fact that the Ho Chi Minh City Health Department stopped subsidizing the training of technicians because the well educated ones preferred working in the private sector where they can earn higher salaries than in the public hospitals. That Vietnam and it's engineering community is interested in bio-medical engineering is suggested by the fact that in January, 2012, they presented the 4th International Conference on the Development of Bio-medical Engineering in Vietnam and the 5th such conference is planned for June, 2014. Our review of the presentations at these sessions suggest that they are on a high academic level with sophisticated, often research oriented topics directed at highly trained engineers, and not directed to the technicians doing much of the work in the "trenches."

3. Results

On our return to the US, Robert put together a 4-day program for early November 2013, that he felt would be a beginning to meet the needs of medical technicians at the Bach Mai Hospital and other hospitals in Vietnam. Robert recruited biomedical engineering specialists, Ryan Camire (anesthesia equipment) from Children's Hospital, Colorado, Alex Chee (ventilators) associated with Covidien, Singapore, and Stephen Barredo, associated with Summit Imaging, Woodinville, WA, (ultrasound machines), all volunteers paying their own expenses, or supported by their employers. These four bio-medical engineering specialists provided four full days of lectures, discussions, and hands-on programs for over 100 medical technicians from hospitals in eleven provinces, as far

as 330 kilometers from Hanoi. Forty of the Vietnamese technicians attended all the sessions and were awarded graduate certificates. The objective of all sessions was to update the attendee's knowledge of medical equipment management in their hospital. They were taught the basic principles of the machines, special applications, maintenance, calibration, trouble-shooting and repair of equipment—knowledge of which is sure to benefit each attendee's hospital—saving lives, time and money. The attendees and the Bach Mai Hospital administrators were thrilled with the program and requested future programs. Robert and his team of engineers promised to return, to the delight of the attendees.

4. Teaching Program Evaluation

The value of the program to the attendees and the effectiveness of the course teachers was determined at the end of the four day program by an electronic course evaluation system. Unfortunately, of the 100 course attendees, only the 40 attendees who were present for the entire four day program, and present at the end of the program, participated in the electronic course evaluation effort. This left out attendees, who had gained much from small group, one-on-one instruction and close observation of their ability to take apart and restore their particular machine (anesthesia machines, ventilators, etc.) Those attendees who did respond rated the courses and the presenters with generally high marks, though the evaluation suffered from the low percentage of attendees participating in the evaluation.

5. Discussion

All our bio-medical engineers were impressed with the eagerness and enthusiasm of the attendees to learn more about their machines. They asked plenty of great questions and were most pleased with the packets of information that were given to them. They were also given e-mail and Skype addresses of the bio-medical engineers.

Robert Preston was so impressed with the reception of the program and the degree to which the attendees valued their experience that he is already planning for another program, with even more bio-medical specialists, in November 2014.

A further example of the benefits that can be derived from the inclusion of bio-medical engineers in medical mission programs is the response to a presentation given to bio-medical engineers at an October 2013 national conference of bio-medical engineers held in Denver, Colorado. Catholic Health Initiatives (CHI) is a national nonprofit health system with headquarters in Englewood, Colorado. Its operations in 18 states includes 87 hospitals, most with bio-medical engineering departments. Each year, CHI provides more than $700 million in charity care, including help for programs in developing countries. CHI goes to great lengths to see that its charity care funds are spent wisely. In October 2013, CHI sponsored a two day meeting of department heads from its bio-medical engineering programs from each of its hospitals–over 80 attendees. A presentation to this group by Dr. Bartecchi and Robert Preston, outlining the role played by the bio-medical engineers in the Bach Mai Hospital Project in Hanoi, Vietnam, was well received by the conference attendees. In the days and weeks that followed their presentation, they received numerous offers of equipment as well as interest in being involved in medical assistance programs in developing countries. It turned out that the bio-medical engineers were aware of quality medical equipment items at their hospitals, equipment that was not being used or never employed, for multiple reasons. Some equipment was dated, lacked an inexpensive part or minor adjustments, or calibrations that would make the item useful and valuable to a hospital in a developing country. Some suggested that a few of these items were destined for a waste dump, and were delighted to be a part of a program to resurrect the item and put it to a good use. To date, Bartecchi and Preston have already accepted, received and delivered such items to a grateful Bach Mai Hospital.

6. Conclusion

We feel that few medical mission programs in developing countries have recognized the potential contribution of bio-medical engineers to their programs—training the bio-medical technicians who are probably the main providers of medical equipment management in developing countries. Such training is sure to save lives, time and precious funds that could surely be used in other areas of their hospitals. Our experience with bio-medical engineers has shown them, as a group, to be ready, willing and able to assist and volunteer their expertise for the benefit of a developing country. Their in-depth knowledge of the available, useful, expendable and readily

transportable medical equipment items from their hospitals makes their involvement with medical missions to developing countries even more valuable.

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