Survivor Assistance through Technology Transfer in Tanzania

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Restoring Nature’s Balance

Landmines from a border separating the Chobe region of Botswana from the upper Cuando and Zambezi Rivers. The phlebopathogen Winkworthia Kawango/Zambezi Transfrontier Conservation Area (KtZa TFC) has been reduced to a fraction of its size by the landmine barrier. Surpassing 130,000, the elephant herd is increasing by approximately 5 percent each year, an unsustainable growth rate given the current confinement. The growing herd is disturbing local communities and destroying the surrounding environment by overgrazing the area.

Working with Conservation International, Roots of Peace plans to implement a program to open elephant access corridors, conserve wildlife and stimulate economic development. Roots of Peace will head a demining operation to remove landmines from historic elephant foraging areas, coordinating with the government of Angola, the provincial government of Cuando Cubango, and the U.N. Development Programme—Angola. Conservation International will then work on ecosystem development based on wildlife conservation within the Luriana Reserve. It is expected that the return of the elephants to these historic habitats will stimulate the economy through an increase in tourism in the area.

Harvesting Hope

The landmine situation in Angola has had a severe impact on the socioeconomic state of the country. Landmines and UXO have blocked roads, bridges and access to farmland, resulting in an inability to meet domestic food requirements. Blocked access has also made it hard to provide medical assistance and education on HIV/AIDS and mines, specifically in the war-torn provinces of Huambo, Bie and Benguela. Roots of Peace and World Vision seek to combine demining and redevelopment efforts, stimulating the economy and agricultural development. The project consists of three phases:

1. Cleaning and rebuilding roads, bridges and other priority areas: Roots of Peace will conduct a mine survey including mapping and education efforts. The organization will also demine and reconnect roads and bridges, opening access to regions in need of assistance.

2. Strengthening agri-business development and improving food security: World Vision will focus on its already established Pro-Rural model program, as well as food security through subsistence farming.

3. Producing and exporting high-value crops: Roots of Peace and World Vision will work together on this aspect of the project, executing a plan to grow and market high-value crops.

Bringing Back Security

Each project will raise US$10 million over the next three years. The long-term impact of the projects will be great, helping the people of Angola return to a self-sufficient lifestyle and preserving the environment. Working collaboratively with other organizations, the projects headed by Roots of Peace are expected to enhance security, safety, and stability of these regions.

*See Endnotes, page 109*

Althouth, Tanzania does not have a significant landmine problem, the nation serves as home to the most recognized prosthetic and orthotic training institution in Africa. The Tanzania Training Center for Orthopedic Technologists (TATCOT) trains practitioners from all parts of Africa, who are then able to provide prosthetic and orthotic services to survivors of landmine and other war-related injuries in their home countries. Based in Moshi, Tanzania, TATCOT is currently the only training center in the developing world that has achieved Category 1 certification from the International Society for Prosthetics and Orthotics.

To disseminate innovations in prosthetic technology to landmine-afflicted nations, the Center for International Rehabilitation has been conducting a series of hands-on training workshops in training center and rehabilitation clinics around the world. In collaboration with TATCOT, the CIR organized and implemented a six-week workshop for trainees professionals in the use of the CIR Translimb Prosthetic Casting System in June 2004. The objective of the workshop was to transfer the knowledge developed at the CIR to faculty and students in order to improve the quality of care available to landmine survivors throughout Africa.

The casting system, developed by CIR Research Director Yonglei Wu, M.D., provides an appropriate, resource-effective solution for prosthetic socket fabrication. The system uses local materials to fabricate a prosthesis socket and artificial limb in less than one hour. As a result, a landmine survivor can visit a clinic and leave with a custom-made prosthetic in a matter of hours. The success of prosthetic service provision and training in landmine-affected areas depends largely on the technology used and the degree to which it fits with the local environment.

**Survivor Assistance through Technology Transfer in Tanzania**

This article describes how cutting-edge technology is being developed and disseminated in landmine-affected countries. Focusing particularly on the Tanzania Training Center for Orthopedic Technologists, the authors examine how a process of appropriating, resource-effective casting is being advanced and then shared through training workshops. Improved technology and its successful transfer are vital to better assisting landmine survivors, a goal the Center for International Rehabilitation is working to achieve.

**Appropriate Prosthetic Technology**

It has been well-established that high-tech Western prosthetic technologies are not always suitable for developing countries. The International Society for Prosthetics and Orthotics stressed the use of appropriate technology at its Conference in Cambodai and Tanzania, defining appropriate technology as ‘‘a system providing proper fit and alignment based on sound biomechanical principles [that] suit the needs of the individual and can be maintained by the patient at the most economical and affordable price.’’ There are a significant number of efforts underway to develop appropriate prosthetic technologies for landmine-affected countries; however, many have been designed and produced without accounting for key factors such as the environmental, local resources and culture.

Furthermore, many new technologies continue to rely on older methods and resources that still require a fully operational prosthetic clinic. It is necessary to develop new products and fabrication methods that do
not rely heavily on electricity, which can be unstable in war-torn countries. These products and methods are designed for rural communities in order to provide services to many war-affected populations. The CIR is also working to convert war-affected areas to use a prosthetic socket.

In response to the continued need for appropriate technologies, the CIR operates a Rehabilitation Engineering Research Center (RERC) on Improved Technology Access for Landmine Survivors. Funded by the U.S. Department of Education’s National Institute on Disability and Rehabilitation Research, the RERC carries out research and development, education, and technical assistance. Much of the RERC’s work has focused on the development of assistive technology and prosthetic solutions for landmine survivors. RERC products and methods are designed for global applications; although researchers must work with limited resources, the new technology still adheres to the high biomechanical standards for rehabilitation services.

The RERC has also developed multilingual training modules for use in its technology transfer workshops and the CIR’s distance-education program. Throughout all landmine-affected countries and regions, there are not enough qualified prosthetists to meet the needs of the entire population; greater numbers of technicians must be trained in order to meet the need for prosthetic care. A major goal of the CIR’s training is to help meet this need by providing educational materials and workshops to improve training opportunities for students and professionals in the targeted areas. Development of the CIR

Casting Technology

Along with the need for more training, another barrier to increasing prosthetic service delivery is the time-consuming, labor-intensive process of the prosthetic socket. In many parts of the world, traditional procedures for socket fabrication using plaster of Paris are still being used for the fabrication of prosthetic sockets. In traditional socket casting and socket fabrication methods, the prosthetist must create the patient’s lower body so that a negative mold of the residual limb is made. This mold is then poured into the negative mold to produce a positive model, which is then modified by the prosthetist. Once the socket has been fabricated, the patient must return to the prosthetic center in order to receive the new socket. Finally, the socket is fabricated over the positive model. This process takes up to two days. These techniques require multiple visits between the patient and prosthetist, as well as non-refundable import-related resources that are costly in many developing countries. The CIR Transnational Prosthetic Casting System, which has been the focus of many government grants, includes the provision of amputees for up to 50 amputees each year. The system is modified by the prosthetist and the entire system can be deployed in the field by the CIR. This system must be self-contained, mobile, and capable of providing prosthetic services in remote areas. By traveling directly to TATCOT, CIR’s experts were able to explain the casting technology and gain a better understanding of the needs of TATCOT’s resources and needs. The school’s objective of providing improved training and increasing the number of orthopedic practitioners in Africa is aligned well with the CIR’s goals for distributing its technology throughout the parts of the world affected by landmines.

Twenty-four participants from TATCOT and centers throughout Tanzania attended the training workshop. Handicap International sent one of its field managers, also a trained orthopedist, from Sierra Leone to participate in the workshop. Led by Dr. Wu, the training covered a review of existing technologies, a demonstration of the system and intensive work with participants. Participants were divided into small groups to work on patient evaluation, casting and socket forming. During the second half of the workshop, the participants learned about prosthetic alignment and assembly and evaluated the gait of the patients they had worked with. The workshop concluded with an open discussion about the system and its applications in the clinical setting. Participants had the opportunity to exchange information, share their experiences and gain new methodologies for the treatment of landmine survivors.

Future Progress

Throughout post-workshop reports from TATCOT, the CIR learned that the participants continue to use the system periodically. TATCOT Director and International Society for Artificial Limbs and Orthotics Resident Harold Shangali has been working to further develop the system to accommodate a new design (above-knee) amputee as well. With the technology successfully transferred, follow-up communication between the CIR and TATCOT is ongoing. Researchers at the RERC are developing new guidelines for the system for further testing and distribution worldwide. In addition, the RERC has been working on other research and development related to assistive technology. These projects include a prosthetic socket fabrication system, a wheelchair designed for use in rugged environments, a prosthetic alignment measurement system and development of new prosthetic foot designs. Testing for the projects has been carried out in field locations including Nicaragua, El Salvador, Vietnam and Afghanistan.

TATCOT’s training approach involves direct, hands-on interaction among the workshop leaders and participants in attendance. By traveling directly to TATCOT, CIR’s experts were able to explain the casting technology and gain a better understanding of the needs of TATCOT’s resources and needs. The school’s objective of providing improved training and increasing the number of orthopedic practitioners in Africa is aligned well with the CIR’s goals for distributing its technology throughout the parts of the world affected by landmines.

Earth-friendly Explosives?

Researchers in the United States report they have developed “green” chemicals that can serve as a viable replacement for lead-based materials used as primary explosives to detonate all types of explosives. Primary explosives ignite powerful secondary explosives and are, while relatively weak, very sensitive. More problematic, according to recent studies, are toxic plumes released when lead-based explosives are fired.

Chemists have long struggled with finding safe chemicals to replace primary lead-based explosives because of a need for a proper balance between stability and sensitivity. One of the major obstacles to developing a suitable replacement has been that the new chemicals lose sensitivity when wet.

Currently the chemicals used to make traditional lead-based primary explosives involve high levels of risk; therefore, most manufacturers opt to import those components. The new “green” chemicals, however, are not active until dried, and can be stored indefinitely in their wet form. The use of “green” chemicals could lead to safer and more controlled production, make explosives less sensitive, while also eliminating collateral toxic plumes.

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The CIR is committed to foster communication among rehabilitation centers and create opportunities for new partnerships with organizations serving landmine survivors. The CIR has created a network of 20 centers worldwide to disseminate its technologies and training materials. Through the network, each partner organization serves as an extension of the CIR by way of its work in landmine-affected countries and other developing regions of the world. Potential endeavors in the network include additional collaborations with TATCOT and other rehabilitation centers and organizations in Africa. The CIR continues to make efforts to work with international agencies to find new ways to address the issues of effective survivor assistance in Africa and worldwide.