

The rehabilitation of the amputee in the developing world: a review of the literature

T.B. STAATS

UCLA Prosthetics Education and Research, Los Angeles, USA

Introduction

For this presentation, 388 references were reviewed including journal articles, progress reports, field assessments, internal documentation, books, newspapers and magazine articles. Many of the amputee-involved organizations very graciously sent additional materials and a collection of articles was provided from RECAL at the University of Strathclyde. A general point about collecting literature on the rehabilitation of the amputee in the developing world is that search parameters should include landmines, recent wars, humanitarian programmes, leprosy, as well as amputation, prosthetics, orthotics and wheelchairs. All these areas will lead to information on the subject.

This paper is organised into seven sections including: cause and incidence of amputation in the developing world; action triggers for amputee rehabilitation; amputee rehabilitation programmes in the developing world; cultural, geographical, and economic impediments to amputee rehabilitation; rehabilitation triage; prosthetics profession culture building; and outcomes in amputee rehabilitation and prosthetics production.

The cause and incidence of amputation in the developing world

Cause of amputation

The cause of amputation in developing countries depends on their stage of development. They may be at war and in

decline, or in post-war development or at peace. In war zones and post-war zones, the greatest number of amputations result from the fighting and landmine explosions. In other countries traffic accidents and work accidents are common causes of amputation.

Landmines leave a deadly legacy that continues for decades after the war. Several publications by *Physicians for Human Rights* offer a good background on this subject as does a recently published book entitled *War of the Mines*. Many magazine and newspaper articles have been written about landmines that include brief discussions of prosthetics projects, particularly in articles about Cambodia, Vietnam and Africa (Angola, Mozambique and Uganda).

Traffic accidents result in amputation in all developing countries. The “motor-cyclification” of the developing world coupled with overloaded buses, trucks and assorted animal drawn carts, crowd inadequately maintained roads. Poor vehicle and driver safety leads to numerous accidents. The resulting injuries confront less than adequate or non-existent medical services and often end in infections and amputation. Train accidents are reported to cause 14,000 amputations per year in India. Accidents in the workplace, especially farming, cause many amputations when occupational safety is ignored.

Other causes of amputation include diseases such as leprosy and tumours and in some areas snakebites are mentioned. Amputation due to vascular disease and diabetes are not reported as important causes of amputation in most parts of the developing world. However, in Micronesia, where modernization and change of diet have increased it has led to a rise in obesity as well as

All correspondence to be addressed to Timothy Staats, UCLA Prosthetics Education and Research, Room 22-48 Rehab., 1000 Veterans Avenue, Los Angeles, CA 920024, USA.

an increase in the number of amputations. Some other tropical diseases contribute to the number of amputations in the developing world. Whereas in the modern world, infections are treated immediately, the villager in a rural developing country may go to a local medicine man who, using small cuts to relieve pain and indigenous cures, may cause infections that lead to amputation by the time the person finally reaches a hospital.

Incidence of amputation in the developing world

The numbers of amputees in the developing world are truly staggering. Vietnam is commonly reported to have 200,000 amputees; Cambodia, 36,000; Angola, 15,000; Uganda, 5,000; Mozambique, 8,000 and so on. The accuracy of these figures may be questioned since most field survey research is incomplete. However, even if one were to divide the estimated number of amputees in half, it would still represent an awesome problem of amputee rehabilitation. Reports of crowded rehabilitation centres in Vietnam, Ethiopia and Angola may confirm that amputee estimates in the developing world are low, since they rarely include comprehensive counts of amputees in rural areas.

The incidence of amputation in populations have an accepted base figure in the modern world of 1-2 amputees per 1000 people in the population for all causes combined. This includes: vascular, traumatic, tumour, disease and congenital causes of amputation. Since the cause of amputation is different and life expectancy is lower for people in developing countries than for people in the modern world, the ratio probably remains similar. However, amputations performed for traumatic injury in the developing world are significantly higher than in the modern world. Estimates of the incidence of traumatic amputation (per capita) have been reported as shown in Table 1.

Table 1. Per capita incidence of amputations from trauma

Cambodia	1 amputee per 256 people
Angola	1 amputee per 470 people
Somalia	1 amputee per 1000 people
Vietnam	1 amputee per 2500 people
USA (for comparison)	1 amputee per 22,000 people

These numbers are only estimates based on partial surveys and assumptions. They are useful for the purpose of discussion.

Action triggers for amputee rehabilitation

There are a number of factors or imperatives that initiate amputee rehabilitation programmes in the developing world. For instance, the famine in Ethiopia went unnoticed by most of the world until a television broadcast forced it in front of the world. A similar set of "action triggers" seems to apply to amputee rehabilitation.

The media and public awareness imperative

Whenever war or landmines cause large numbers of deaths and injury of civilians and soldiers, public awareness from the media attracts attention and brings humanitarian assistance. Some organizations are charter bound to attempt to enter these zones of conflict to assist the injured. As experienced international humanitarian organizations, they are able to focus personnel and resources sooner than smaller organizations. It is often reports to the media by these organizations that bring news of disasters to the rest of the world and triggers action.

The moral imperative

Governments, in war zones or post-war zones, are preoccupied with maintaining civil order and providing essential public services. In these regions medical rehabilitation in any form is a luxury, if it is available at all. It seems to be morally correct to help those who cannot help themselves. We see this in earthquake relief, in refugee assistance, and in helping handicapped people, especially the victims of war. Civilians in war zones are often left without social or medical infrastructures for first aid and primary medical care. In reality, there are many other injuries, more serious than amputation, but the amputee and prosthetic rehabilitation captures the imagination. When problems are overwhelming, it is easier to select one problem to work on than to attempt to correct the entire situation. This makes people feel they are helping and address the moral imperative.

The political imperative

The expertise and manpower required to build an amputee rehabilitation programme and to produce prosthetic devices, in volume, is a

priority that cannot be met in poor developing countries. It is often a concern of government officials responsible for the welfare of their handicapped people. They are pressured by the presence of too many amputees and other disabled people that may represent a destabilizing factor for a government whose war has continued too long. The local markets and streets become crowded with begging amputees and other disabled people. The presence of amputees without prostheses not only demonstrates the cost of war, but also the government's inability to care for its people and its wounded heroes who fought in the war.

During war, borders may be closed or access to regions denied, masking the suffering of citizens and the magnitude of problems. On the other hand, human suffering and evidence of maiming can be used as a propaganda weapon for or against a government, or to request and attract humanitarian assistance. The increased public display of severely handicapped people can trigger a government to do something. When a government's resources are drained, the needs of handicapped people may be impossible to finance. This can open international borders to offers of assistance from international humanitarian relief organizations. To address the needs of the physically handicapped war injured can therefore be a political imperative. Unfortunately, there is commonly no political imperative in low profile developing world countries.

The amputee volume imperative

As war drags on for years, the number of amputees increases and becomes an economic problem since many of these people are unable to work. In some countries the number of amputees is so great it is considered an ecological as well as economic disaster. This is the amputee volume imperative. The economy in the countryside is crippled by the inability of the population to feed and care for themselves and care for their disabled people. This causes incalculable economic disruption. In countries that are already politically unstable, unemployment and underemployment will contribute to the inability of government, a family, and the amputee to survive. When governments realize they are burdened with huge numbers of amputees as well as other disabled people, the volume imperative opens

the closed borders and increases cooperation between governments and international humanitarian relief agencies.

Amputee rehabilitation programmes in the developing world

There are many kinds of programmes for the amputee in the developing world. They may be listed in summary as follows:

1. Government run Programmes (GRP)
2. Government to Government Programmes (GGP)
3. Non-government Organizations (NCO)
4. Private Voluntary Organizations (PVO) and Religious Service Organizations (RSO)

Government run programmes are those started and run by governments usually as part of hospitals or rehabilitation centres. While many of these exist in developing countries, most were initiated with foreign aid assistance. Government to Government programmes are common during wartime. A host country, such as the USA, or the former USSR may have built facilities and trained personnel for rehabilitation projects. For instance during the Vietnam war many prosthetists in the North were trained at East Bloc centres and in the South, facilities and training were provided through the United States Agency for International Development (USAID). Many of the early amputee rehabilitation centres in the South of Vietnam were supervised by the World Rehabilitation Fund with USAID funding. Many of these facilities remain today as do the trained personnel.

In post-war eras non-governmental organizations play an important role in providing amputee rehabilitation in developing countries. These include organizations such as:

1. International Committee of the Red Cross (ICRC)
2. Operation Handicap Internationale (OHI or HI)
3. Vietnam Assistance for the Handicapped (VNAH)
4. Vietnam Veterans of America Foundation (VVAF)
5. World Rehabilitation Fund (WRF)
6. Medical Aid for El Salvador (MAES)
7. Cambodia Trust (CT)
8. Prosthetic Outreach Foundation (POF)

These organizations often receive funding for their amputee rehabilitation programmes from foreign aid sources such as the USAID War Victims Fund, Governments of Germany, Sweden, Norway and of many other countries. The World Health Organization and the United Nations will also provide financial assistance funnelled through this type of agency. Many also receive private donations and grants. Representatives from these organizations can more appropriately describe the goals and purposes of their organizations.

There is a distinction between private voluntary organizations and religious service organizations involved in amputee rehabilitation. The following have been listed for the purpose of discussion, but the distinction as to their classification will not be discussed. Some of these organizations are listed:

- | | |
|--|--------|
| 1. World Vision Relief and Development | (WVRD) |
| 2. American Friends Service Committee | (AFSC) |
| 3. Catholic Relief Services | (CSR) |
| 4. Wings of Calvary | |

There are undoubtedly many other organizations not mentioned here. Those listed were revealed in the literature and are provided as illustrations of these important groups. For instance, many countries have their own Red Cross or Red Crescent organizations that may have amputee rehabilitation programmes separate from or in conjunction with the ICRC. In many developing countries religious organizations operate medical clinics with amputee rehabilitation as one element of the service they provide.

Cultural, geographical, and economic impediments to amputee rehabilitation

Cultural impediments to amputee rehabilitation

The attitude towards the amputee in the developing world relates to the culture and social structure in each country. There may even be differences within different regions of a single country. Some examples of these attitudes include such places as Ethiopia where the concept of "alms for the poor" is part of the culture and tradition. Giving money to disabled people is considered "lending money to God" and will be taken into consideration and help

the donor upon reaching heaven. In other countries, losing a limb is part of Karma. Karma is neither good nor bad, rather fate. In personal relationships the implication for the amputee can be devastating, since they may be considered unfit to marriage due to the inability to support a family or may be considered social outcasts or bringers of bad luck.

When considering very poor rural areas, everyone in the village must work to grow enough food to survive. Anyone who cannot work, is a burden on the family and the community. In the cities, the amputee may have more difficulty finding work, since it may be thought they are taking work away from an able-bodied person. Little consideration or thought is given to what the disabled person can do because the availability of rehabilitation is so unusual. This is especially true in developing countries where unemployment is high and those who are employed make very low wages. Many beliefs and misconceptions about the amputee and other disabled people stem from a lack of knowledge and old traditions.

Some humanitarian relief projects offer community education programmes designed to show the potential of the amputee to work. The former beliefs or social customs and superstitions about disability and amputation are challenged and must be reconsidered. This change of attitudes by both the able-bodied population and the amputee has been quite effective.

Geographical impediments to amputee rehabilitation

Amputees in rural conditions rarely have the luxury of public or private transportation. Infrequently operated rural buses or riding in the back of a truck might be options, but more commonly they must simply walk. In bad weather, travel into or out of many rural areas is often impossible and dangerous.

Travel may also be hindered by the danger of landmines and traffic accidents, which represent a very real impediment to amputee rehabilitation. Without medical care in close proximity and with the nearest village a day or several days walk away, it is understandable that simple injuries can lead to amputation and severe injury and death. It is understandable why amputees in rural areas of the developing world rarely benefit or even know about

rehabilitation. A stick or a crutch or a homemade peg leg is all they may know. Furthermore, many rural people do not like to come to the cities and are afraid of them. It is common for many organizations to locate their first efforts at prosthetics rehabilitation centres in cities, only to find that people in the outer provinces will not come to the centres. Outreach programmes are attempted, either to go to the villages, or to bring the amputee to the rehabilitation centres.

Economics as an impediment to amputee rehabilitation

The rural amputee may be poor and when considering the cost of a prosthesis, which may represent a years earnings, may decide to do without. To feed the family or own a cow may be more important than owning a prosthesis. Even if the amputee finds out that it is possible to have a prosthesis, it may be beyond his comprehension that it could be free of charge. In the literature there is a report of a woman who assumed that she would have to sell her house to afford a prosthesis. In societies where annual income may be less than \$100, it is understandable how this thinking might occur. They also are not used to being served by foreigners and many rarely see a foreigner.

Rehabilitation triage

Rehabilitation triage is the decision to provide the amputee rather than other disabled people with assistance. For the prosthetist, it seems naturally important to provide prosthetic rehabilitation for the amputee in the developing world. When looking closer at the problem of disability in the developing world, other problems such as poliomyelitis, blindness, malaria, or hunger and shelter may be more important. With limited financial resources, humanitarian projects may focus on the amputee. If an organization were to try to help every disabled person who crawled into their limited facilities, they would find themselves short of funds quickly. Since results affect future funding, it is no surprise that highly visible amputee rehabilitation programmes are chosen. It is noted that in most countries orthotics problems outnumber prosthetics problems by a 10 to 1 ratio.

As an adjunct to amputee rehabilitation, many organizations provide crutches and

wheelchairs for amputees who cannot wear prostheses. It is not unusual to see other disabled people benefit from the distribution of wheelchairs. Rehabilitation triage as a concept is receiving more attention as amputee rehabilitation efforts reach maturity and the severe problems of other handicapped people are identified. Whether or not it is right or wrong it is common practice to limit activities. This same argument might be made about those who help the blind or those who work with displaced children. Why don't they make prostheses?

Prosthetics profession culture building

Building a cadre of trained amputee rehabilitation personnel is a goal of many organizations and governments. This will result in sustainable programmes after the departure of the non-governmental agencies. The concept of building a sustainable future is brought up time and again in the literature dealing with amputee rehabilitation in developing countries.

Financial realities and technological choices in amputees rehabilitation

In developing countries limited financial or personnel resources are available for amputee rehabilitation. When a country receives offers of assistance, government officials often have little or no knowledge of amputee rehabilitation or prosthetics technology. The organizations offering amputee rehabilitation may suggest a programme and prosthetics technology in which they have experience. If the organization has already developed an amputee rehabilitation programme in one country, it is likely to attempt to replicate the previous experience and activities in the new country. The government officials are presented with the credentials and prior experience, and barring the logical presentation of competing organizations and without an understanding that there are many choices, it is hard to fault the selection in this manner. The organizations, for their part, offer what they do best. Agreements are reached, programmes are started, and prostheses are manufactured.

It is hard to fault efforts to help physically disabled people in poor or war devastated countries. However, some amputee rehabilitation results have been marginal. The choice or selection of prosthetics technology is

problematic in the post-war developing world. Rather than appropriate technology criteria, it is often the prosthetics technology that is presented or available that is the technology of choice. Any measure of appropriateness in terms of culture, climate or topography are often a secondary consideration and may be based on false premises. The cost of developing these programmes, to learn how to implement the logistical elements, to import manufacturing materials, secure personnel, operate public relations campaigns to finance and maintain programme activities are all factors that cast these projects into a mould that is inherently difficult to break. In other words, choice or selection do not represent the reason that a prosthetics technology is found or used in developing countries.

Building a prosthetics professional culture

Those organizations involved in amputee rehabilitation programmes must always evaluate their efforts and constantly look for ways to improve. There have been cases where the most sophisticated prosthetics technology is introduced into a developing country without regard for the existing culture of the prosthetists. When unemployment or underemployment is a problem, building and maintaining the professional culture of the local prosthetists would seem to be more important than to experiment with new or complex technologies. Any country or agency that authorizes amputee rehabilitation must attempt to evaluate what is being offered and be willing to reject projects that do not fit into their country or to select what it thinks is best to build its rehabilitation culture. However, it is very difficult to refuse free assistance.

In Cambodia some cooperative progress has been made to standardize the amputee rehabilitation and prosthetics service. In the words of Benoit Denise of Operation Handicap International, "the idea to use one technique over another is because you want to create a network that you can develop and hand over to Cambodians when NGO's leave. It's more important to see it from this point of view than to see it in terms of a rivalry between which materials is more appropriate." This statement offered a promising new era of understanding

and cooperation among organizations doing amputee rehabilitation in the developing world.

Outcomes in amputee rehabilitation and prosthetics production

The demands on a prosthesis in the developing world are often more difficult to meet than in the modern world. One measure of success used by many organizations is the number of artificial limbs it has delivered. This reports to funding agencies and contributors that many amputees have been helped and money has been properly spent. In the case of prostheses, this is not necessarily true. What is often overlooked is the evaluation of results for the amputee in the village, far from the workshops where the limbs are manufactured. Prosthesis durability is a critical issue in appropriate technology and is often overlooked, misunderstood, or possibly accepted as a natural limitation. Solving the durability question should be a top priority in future amputee rehabilitation programmes in the developing world. In the developing world, the true measure of good amputee rehabilitation is not only good prosthetic technology and technique, but durability over a period of years. Probably an even stricter measure of durability of five to ten years in rugged outdoor living and working situations, in a variety of climates would address the true needs of the amputee living in rural conditions. This is rarely understood by modern or third world prosthetists until they visit amputees in their living and working situations.

In conclusion, the issues raised in the literature on developing country amputee rehabilitation are complex. The literature reveals a constantly changing environment and evolutionary progression to provide better prosthetics technology. The literature's weakest aspect, taken of the whole, is that it does not provide information in a form the average person would find useful.

REFERENCES

A full list of the literature reviewed in this article is given in Appendix 2 of the Report of the Consensus Conference on Appropriate Prosthetic Technology in Developing Countries.