

The development of orthopaedic appliances and low cost aids in "least developed countries"

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Abstract

The constant reminder of ever-increasing costs and problems in regard to medical care in industrialized countries highlights the need for simplified, low cost, orthopaedic appliances for use in the non-industrialized areas of the world. Those who are engaged in the field of Orthopaedic Technology should withstand the temptation to propagate unreservedly the technologies of industrialized nations. Nowadays the so-called "non-appropriate technologies" have become the target of frequent criticism.

The transfer of technology may offer visible progress in selected areas to a limited number of people but it conceals the danger of ignoring fundamental socio-economic conditions that affect the majority of people.

During the United Nations Year of the Disabled, a group of international experts unanimously came to the conclusion that the current cooperation between industrialized and Third World countries requires revision leading to a new order. The consensus demanded a new emphasis on the development of technical orthopaedic services which would take into account the unique economic, social, cultural and environmental factors of each region.

This paper examines the practices of technical orthopaedics in a "least developed country" and lays down principles and practical applications which could serve as a foundation for a more appropriate approach in this field.

The need for simplified, low cost, appropriate technology

"The simplest solutions are often the hardest to find" states E. F. Schumacher (1983) in his

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book on intermediate technology. "Once they are found it is all the more important that these solutions are passed on".

Frequently, foreign influence has led to the opinion that rehabilitation services are only feasible with the aid of sophisticated appliances. Good appliances, it was believed, ought to be expensive whereas expensive appliances ought to be good. Indigenous, low cost appliances were generally considered to be of inferior quality.

The adverse circumstances in less developed countries should force politicians, doctors, therapists and technicians to adopt programmes that will not drain the limited financial resources of these countries. Before technology and expertise is employed through schemes of technical assistance these schemes should be carefully examined and subjected to the following criteria.

Economic factors

Countries with rudimentary preventative and curative health services should not increase their problems by accepting costly treatment methods of foreign origin. Imported products either burden the local budget or must be dependent on foreign aid. Such products have the added burden of rapidly increasing labour costs, profits, commissions and transport expenditure. Only those aids which lead to indigenisation of orthopaedic technical services will break the dependence on hard-currency investments.

Social factors

The majority of disabled persons who require technical remedies fall into the category of destitute. These people cannot be burdened with costly treatments and/or costly medical appliances since it is unlikely that any government agency will take up the financial responsibility on their behalf.

Cultural factors

Appliances of industrial origin are generally designed for specific living conditions and the high standards of civilized, urban societies. These appliances do not necessarily meet the needs of the people in Asia, Africa or Latin America with their own distinct conditions and living standards.

Pathological factors

In the tropical and subtropical countries of the southern hemisphere we are confronted with diseases and their aftermath which necessitate the development of orthopaedic appliances particularly related to the socio-medical environment and to the high frequency of particular disabilities.

Environmental factors

Up to 90% of patients live in rural areas. Hence the technology must be adapted to poor infrastructures and the availability of local material as well as the manual/technical ability of the people.

Humanitarian factors

Sophisticated, costly remedies cannot contribute effectively to improving the conditions of the widely neglected, untreated disabled population.

Guideline for technical counselling

Technical counselling requires in the first place a clear determination to serve the interests of the host country followed by a high level of flexibility and the ability to adapt to local conditions. Every situation has its own particular advantages and disadvantages and a rigid attitude towards the implementation of programmes is destined to failure.

One of the most common errors in the past has been that industrialized nations tried to introduce their own standards without taking into account the social environment of the target group. Therefore technology should never be viewed in isolation but only in the context of a global approach covering all socio-economic and cultural aspects.

With this basic fact in mind it seems appropriate to design a scheme with the following underlying principles:

- give ample time to study and understand the social environment

- investigate traditional methods and materials
- define the programme's priority areas
- on the basis of these findings, develop indigenous appliances
- test these in conditions which are typical of the country
- specify the appliances by means of illustrations and descriptions
- propagate the philosophy of an appropriate orthopaedic technology

This approach could lead to the replacement of inappropriate, expensive and highly sophisticated technology by systems superior in terms of being well balanced and cost beneficial.

Material resources

In the first place the availability of local material will determine the possibilities for production of orthopaedic appliances. Even if the bulk of the material required has to be imported from neighbouring countries, the production costs can be kept at a comparatively low level. At present, a great number of least developed countries meet their requirements for basic materials, eg prefabricated components, ready made orthopaedic appliances and rehabilitation equipment, by special order from industrialized countries.

A recent in-depth study carried out in Nepal (Vossberg, 1982), has disproved the common opinion that the supposed non-availability of suitable materials in the local market justifies

Table 1. Availability of material in Nepal.

Category	A		B		C	
	raw material	raw material	raw material	raw material	imported by special order	orthopaedic prefabs
steel			×			
aluminium					×	
wood	×					
plastic		×				
leather	×					
rubber		×				
fabric	×					
cork					×	
plaster		×				
rattan	×					
resin					×	
Source	local	neighbour country	neighbour country	neighbour country	industrial country	industrial country

the import of costly "high tech" items. The investigation gives substantial evidence that local resources do in fact exist.

Table 1 indicates clearly that an orthopaedic technical service can to a great extent rely on indigenous raw material (Category A) as well as readily available imported goods from neighbouring countries (Category B). Articles which fall into the third category (C) can be imported by special order, hopefully avoiding those, which are only obtainable through specialized orthopaedic suppliers.

Applied technology

There is a lot of misunderstanding and contradiction when it comes to interpreting correctly the terms "appropriate technology" and "a transfer of technology". While the former term is tainted with the idea of being poor in terms of quality and effectiveness, the latter suggests to many something modern, sophisticated and exorbitantly expensive. However, to hold a more balanced view, it is possible to see that both concepts do not have to stand in sharp contrast to each other. Both of them have enormous potential, provided they are carefully adapted to the local situation. On the one hand, the use of modern technology may demand considerable modification, but on the other hand, more tradition-orientated technology may benefit from fresh technological inputs.

With this willingness to adapt, the two concepts can easily complement each other. Least developed countries can strive to explore their own resources while at the same time absorbing contemporary, scientific ideas. In considering the possibilities in least developed countries, we should be aware that in most countries the local infrastructure may already be sufficient to provide a basic technical service, which can meet the most essential needs.

In developing a project of this nature, the following guidelines should be applied:

- first explore indigenous material and methods
- keep production techniques as simple as possible
- give preference to small/medium sized production units
- keep capital investment low

It should be borne in mind particularly that

technology and construction based on local materials and traditional methods can be maintained with relatively little expense and without the employment of specific, organizational expertise.

A standardized system

The preparation of standardized appliances (Figs. 1 and 2) will avoid frequent bottle necks by accelerating the service to each individual patient. Furthermore, the system will contribute effectively by avoiding the expense of using skilled, paramedical manpower in mechanical routine work.

The evolution of a standardized system can only be accomplished by experienced professionals who are able to conduct extensive data collection. Their morphological and pathomechanical observations in contact with physically disabled patients are essential at every stage of designing an orthopaedic appliance. Any independent research project should observe the following principles.

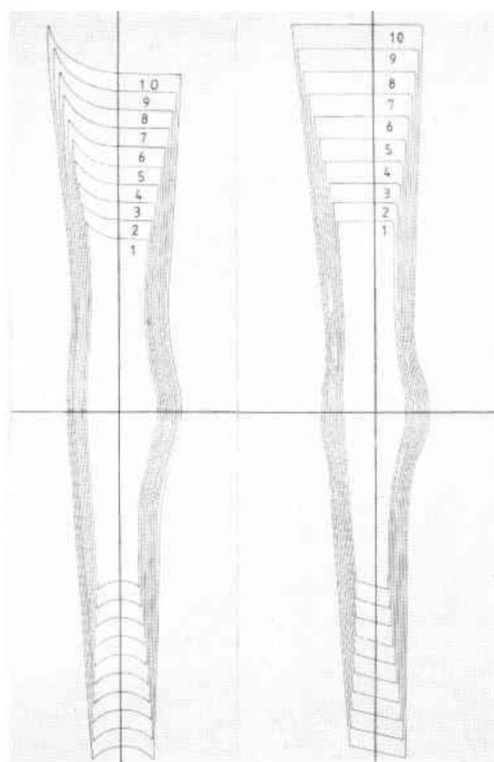


Fig. 1. Anterior and lateral views of standardized orthotics modules.

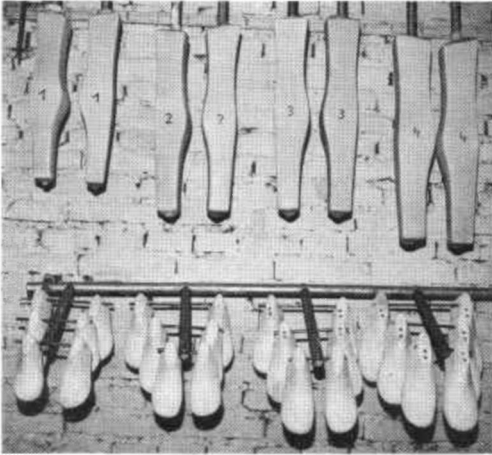


Fig. 2 Range of standardized moulds for lower limb orthoses.

- develop a uniform system for collecting data and taking patient measurements
- follow basic biomechanical principles
- coordinate designs to suit varied anatomical dimensions
- refine appliances by constant checking and evaluation
- classify the range of interchangeable modules by a standardized numbering system
- familiarize doctors, therapists, orthopaedic technicians and other paramedicals with the methods of selecting and assembling modules and especially of adapting standardized appliances to the individual patient.

The use of standardized orthopaedic appliances will make the fitting procedure easier and quicker, thus relieving busy orthopaedic

technicians and paramedicals from heavy workloads. This in turn should have a positive effect in reducing treatment sessions or hospitalization. The ultimate goal is to provide the majority of patients quickly with readily-available, standardized appliances.

The present services in least developed countries must be rated as inadequate. It is not uncommon in certain countries of Asia, Africa or Latin America to find less than 5% of the disabled population receiving any kind of rehabilitation.

While foreign companies have made advances in marketing their components in remote, exotic places, too little attention has been given to exploring the local infrastructures and tapping local resources. While overseas technical assistance has created model institutions run by a cadre of highly skilled technicians, insufficient attention has been given to the potential of readily available, semi-skilled manpower able to manufacture low cost appliances on a larger scale.

The author is confident that these observations and recommendations, which are based on considerable field work in least developed countries, reflect a fair assessment of the situation. It is hoped that the adoption of such a philosophy of technical assistance will help to alleviate the present shortcomings.

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