

## **The choice of prosthetic and orthotic technique for less developed countries: analysis and perspectives in Colombia**

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### **Abstract**

In their efforts to set up orthopaedic technical services, less developed countries such as Colombia have often relied on so called "turn key" technology transfers depending on the know-how and the infrastructures in industrial countries. The sophisticated industrial product stands thus in sharp contrast to the "single item" product which relies on traditional crafts and local materials.

Both extreme forms of technology are currently employed in most less developed countries including Colombia.

While the high-technology product is costly and requires a specialized base to produce and to service it, the "single item" product lacks generally the minimum requirements in terms of uniform quality, biomechanical function and cosmetic acceptability. Although the remarkably high standard of industrial products explain their worldwide demand and distribution, it should not be concluded that countries such as Colombia have no other choice than to adopt these technologies.

In search of an intermediate alternative, the potential of a yet undervalued, appropriate technology is explored and an accurate account of its advantages is given.

### **Developing strategy**

The first and foremost consideration in establishing orthopaedic technical services is the variety of extremely different conditions that exist in each region of Latin America which inhibit the application of any uniform scheme. Consequently one scheme is never readily transferable from one distinct region to another without its careful adaptation.

The second aspect explores the necessity to shift attention from the usually highly developed central services toward sub-regional and community-based levels. Established institutions must play an active role in functioning as resource and reference centres. The third point demands the unconditional, consequent exploration of local resources. The drive for more centralization, more sophistication, and more foreign dependency must be curtailed in favour of a more appropriate technology.

### **The situation in Colombia**

The determining factors for establishing a national orthopaedic technical structure are the legislative provision by the government authorities, the formal training of prosthetists and orthotists, the restriction of services to qualified practitioners and the enforcement of quality and price control.

Viewing the situation in Colombia, no constructive steps have been undertaken to develop a national policy. Consequently, any law or regulations which are necessary to control any para-medical profession, are virtually non-existent.

However, when examining other allied professions, it can be seen that there is a large number of orthopaedic surgeons and a number of well established schools with a regular output of occupational and physiotherapists. The orthopaedic-orientated manpower resources have led to steady growth and a countrywide spread of medical rehabilitation services.

To the detriment of a multi-disciplinary approach to the treatment of the physically disabled, prosthetics and orthotics have been denied recognition and been unable to develop into an organized structure. In the absence of any noteworthy initiative from the government side, the prospects of raising the educational

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and technical standard in Colombia, must be regarded as remote. Instead of taking the lead as one of the most resourceful countries in the continent, Colombia shares the sad state of backwardness evident in other less developed countries.

On the basis of the foregoing assessment, it is no wonder, that most existing orthopaedic-technical facilities are grossly inadequate to meet the demands and to keep pace with contemporary standards.

What has become a matter of concern to the professional, is to observe how the shortcomings are increasingly met by the activities of semi-or pseudo-professionals, who know little about the psycho-medico-social nature of the profession. This profiteering at the expense of innocent, traumatized human beings, can be considered to be the biggest threat the profession is confronted with.

It is necessary, to distinguish between three different levels of services available in Colombia, namely:

The government controlled workshop

The workshop supported by non-government organizations

The private workshop

#### *The government controlled workshop*

Although these utilities can take the credit for having pioneered prosthetics and orthotics in the country and integrated this entity into the mainstream of medical rehabilitation activities, their share of public services remains a fraction of those generated by the private sector.

The usual problems of limited budgets, lack of trained personnel, logistic insufficiencies and bureaucratic obstructions have caused a stagnant situation, hampering the service to a large number of patients.

#### *The workshop supported by non-governmental organizations*

Taking into account the limited capacity of state controlled services, the private foundations have gradually taken over the leading role in providing services. They can be truly regarded as the pacesetters in advocating a balanced pattern of treatment. In spite of unfavourable conditions, these Foundations have succeeded in organizing training programmes which will lead to the first cadre of orthopaedic technicians in the country.

Another important aspect to mention is their commitment to develop more appropriate technologies, which should be affordable to patients from all walks of life.

These projects aim to countermeasure the continual exploitation of the patient by the commercial sector.

#### *The private workshop*

This sector is dominated by some individuals whose drive for quick profiteering seems to ignore all ethical considerations. Fabrication of orthopaedic appliances is usually done in a garage-type workshop using basic manufacturing facilities with the aid of semi-skilled technicians or on-the-job trained artisans.

Needless to say, this "mechanical approach" is the least likely environment to serve a patient appropriately and has little possibility of enhancing the reputation of a distinct paramedical profession.

The multi-faceted picture of Colombia's orthopaedic technical services resembles a disorganized structure, which seems to be typical for other countries in Latin America. Foreign aid, assistance and influence has seldom led to uniformity. Instead they have had their impact on further diversification, concerning developing philosophies and technologies.

The example of Colombia gives evidence of that unfavourable situation, where a primitive technology stands in sharp contrast to the high-technology transfer.

#### **High-technology**

It is a generally accepted fact, that science and high-technology are not neutral; they do not benefit everybody equally. What has been widely unnoticed however, is that persistent propagation of high-technology products has caused a decline of stimulating new ideas, in creating indigenous designs, and in developing appropriate manufacturing techniques.

It is erroneous to believe that prosthetic and orthotic standards existing in industrial countries can serve as a pattern for less developed countries. Such a belief has a deep and detrimental impact on the local orthopaedic technical scene which is difficult to reverse.

An appropriate prosthetic and orthotic supply system must be based on a careful analysis and bring into balance the different technical, medical and socio-economical components.

In this context, the adoption of high-technology with its extremely high cost-benefit effect would ignore the distinct socio-economical conditions represented by the majority of the disabled population.

Any system that is developed must be designed to benefit the community at large. It should be oriented on a target group which is made up by the large poor sector of the population and not by a small group of affluent individuals.

The continual use of high-technology in a country like Colombia is thus tainted with social injustice, that one person benefits at the expense of many others.

The introduction of imported components has led to extremely high pricing, making the orthopaedic appliance a novelty item available only for those who can afford it.

It can also be said that exploitation of patients, who are desperately in need but can ill-afford to pay for high-technology bills, has become a common practice. On the basis of this assessment it must be stressed again, that a prosthesis or orthosis should not cost more than the common people and the community can afford.

#### Artisan and primitive technology

In the past, the artisan had a pioneering role in orthopaedic technology. The individual, innovative achievements created by skilled, experienced craftsmanship cannot be questioned. Without the constant exploration and application of the artisan's knowledge and skills the extraordinary performances of orthopaedic practitioners today, would be unthinkable.

With the advent of scientific research and industrial technologies however, the artisan's performance lost its competitiveness in terms of labour-cost effectiveness and because of its inconsistent quality (Table 1).

However what is going to bring the artisan's technology into discredit is neither the craftsmanship approach nor its lack of competitiveness, but rather the primitive approach by pseudo-professionals.

Table 1. Technology overview

	High Technology ⇓ mass scale industrial production	Appropriate Technology ⇓ small/medium scale serial production	Primitive Technology ⇓ single item production
Criteria	⇓	⇓	⇓
Manufacturing rationality	Positive		Negative
Quality/durability	Positive		Negative**
Standardization interchangeability	Positive		Negative
Cost benefit effectiveness	Negative		Positive
Utilization of local materials	Negative		Positive
Application of local technology	Negative*		Positive
Service/spare parts	Negative*		Positive
Cosmetic appearance/weight	Positive		Negative**

\*no network

\*\*inconsistent

The "inappropriateness" of such an approach can be seen in the widespread anachronism which allows a considerable number of self-proclaimed or short-term trained technicians to practice a highly specialized profession.

The "inappropriateness" becomes manifest in the poor quality of orthopaedic appliances produced, which falls short of contemporary standards with regard to comfort, alignment, cosmesis and workmanship (Fig. 1).

These malpractices, which obviously violate the professional code of conduct of preventing physical and psychological damage to the patient, are the cause and target of growing criticism. Returning to the days of primitive trial and error practices cannot be regarded as an appropriate answer to the challenges in less developed countries.

Whatever technology is introduced to a country like Colombia, its standards must meet the minimum requirements in terms of professional proficiency, biomechanical functional and cosmetic acceptability.

#### Appropriate technology

After analysing high-technology and artisan-related technology it is easy to conclude that

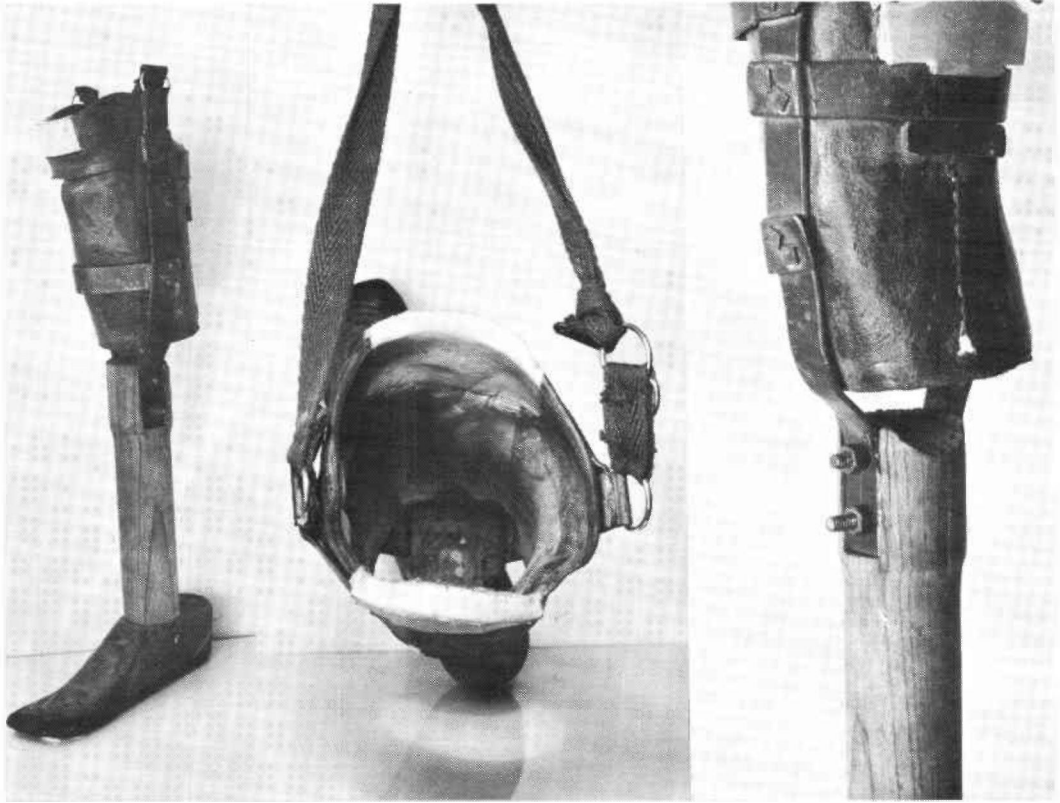


Fig. 1. Examples of primitive technology.

both forms are inappropriate to cope with the demand now and in the future. The concept of appropriate technology with its simplified low-cost approach has drawn considerable attention during the last years. However in spite of this attention, its definition and the scope of application has never been pointed precisely. Up to now the potential benefit of appropriate technology is undervalued, occasionally misinterpreted or even misused.

Essentially, it is a technology which ranges on an intermediate level between a stagnant, inconsistent, labour-intensive technology and an imported, capital-intensive industrial mass-scale technology.

The wide range of application implies that the product itself might provide little information because it can make use of any manual, semi-industrial, and even industrial manufacturing process and any kind of material.

What appropriate technology really means is the maximum exploration of local expertise,

labour and materials to generate an important multiplier effect on the local economy.

It focuses on an appropriate technical solution to a specific socio-economic situation. This requires a simple but scientifically sound basis which can be set by blending contemporary technologies with the traditional ones.

By no means does it employ the pseudo-artisan, primitive and ineffective techniques, which cannot meet the basic qualitative and quantitative requirements.

Consequently, the "single item" production of prosthetics and orthotics, which is propagated by some organizations as appropriate technology, does not comply with the criteria set for an intermediate technology (Table 1).

To develop a complete, efficient network of orthopaedic technical services on a national basis, a centralized small/medium serial production represents the only appropriate solution to counter the very acute shortage of

components and ready-made appliances in countries such as Colombia.

### Conclusion

The recognition of the discrepancy which exists between "appropriate" and "inappropriate" technologies must be regarded as a conflicting situation in Colombia and elsewhere, which needs clarification.

Viewing the scene in Latin America it is seen that most countries lack the manufacturing facilities to meet the orthotic and prosthetic requirements on an appropriate scale.

In the absence of any local appropriate technology, orthopaedic technical services will continue for the most part to be a privilege for a limited number of wealthy patients who can afford to buy foreign technology.

The attempt by some organizations to introduce a primitive, low-cost technology must be regarded as an evolutionary set-back.

The professional community and national authorities in lesser developed countries must realize that incompetence and ignorance of basic technical, biomechanical, psychological and cosmetic principles can only lead to malpractice, risking further damage to the patient.

To redirect the course of development the following policy guidelines should be taken into consideration:

- formulate new ideas and examine approaches, methods and techniques in the

field of prosthetics and orthotics, which could best be applied in a distinct environment

- create a new type of orthopaedic technician who is able to initiate ideas for indigenous designs and detail their construction criteria to the production engineer
- replace a technology, which is characterized by high costs and over-sophistication by one which is acceptable in terms of cost-benefit effectiveness, technical appropriateness and environmental adaptability.
- exchange the feasibility studies and research in the area of appropriate technology to intensify communication and cooperation among the concerned institutions.

It is only after these principles have been adopted that the basis for implementation of appropriate solutions can be envisaged. This would permit orthopaedic technical services in uniform quality, in sufficient quantity and at reasonable cost to be brought to a larger number of patients in need.

### FURTHER READING

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