

# Fifteen years of telemedicine in Maniapure

## Lessons learned from a rural experience starting from the most basic level of care

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## Abstract

The term telemedicine refers to the use of Information and Communication Technologies (ICTs) and their application on health. There are many definitions ranging from phone calls made by a mother to her baby's pediatrician to the robotic surgery where the surgeon in charge is miles away from the place where the patient is being operated. In our case the great change was produced by the mass use of the Internet, and it is on this tool, accessible to most people, that we have based our experience. Most current telemedicine programs had been originated on the highest levels of government health administration entities, such as ministries, departments or any other body dealing with these functions. Usually these programs are taken from these high levels of administration down to the lowest levels of care, generally with extremely costly learning processes which are seldom cost-effective. We have seen too many programs, plans and projects in many countries with excellent publications, reflected in well prepared documents by the planners. However, they are never translated into a concrete experience and this effort never benefits those who need it the most. Our experience has a different origin since it starts at the basis of the healthcare pyramid. It begins in the most remote and isolated places of the country going up to the highest levels of care going through the second and third level of care and to medical sub-specialties and health in general. In this paper we want to tell the origins of our experience, the different stages of its growth and maturation process and we analyze the main obstacles we found at the level of civil society, official sectors and professionals involved (specially in Latin America where problems seem to be similar in many countries). We are sure that the way to speed up the natural process of incorporating Information and Communication Technology is based on training, follow up and encouraging healthcare professionals. This must begin at the university and later on with the continuous professional education (whether it is medical or any other type of education).

**Key-Words:** Telemedicine; Telecommunication Network; Medical Informatics; Information Technology; Primary Health Care; Rural Health.

## Resumen

### Quince años de Telemedicina de Maniapure – Lecciones aprendidas con una experiencia rural partiendo del nivel más básico de atención

El término telemedicina se refiere al uso de las Tecnologías de la Informática y Telecomunicación (TICs) y su aplicación en la salud en general. Las definiciones son muchas y van desde llamadas telefónicas de una madre al pediatra que ve a su hijo hasta la cirugía robótica en la cual el cirujano responsable está a miles de kilómetros de distancia del sitio donde el paciente está siendo intervenido. En nuestro caso el gran cambio lo generó la masificación de una herramienta como el Internet, y es sobre esta herramienta, accesible a la enorme mayoría de las personas que basamos nuestra experiencia. La mayoría de los programas de telemedicina actuales han sido originados partiendo de los más altos estratos de los gobiernos y sus entes responsables de administrar salud, llámense ministerios, departamentos o cualquier otro nombre que cumpla con esas funciones. De esos altos niveles suelen posteriormente ser llevados a los niveles más bajos de atención, usualmente con aprendizaje enormemente costoso y frecuentemente poco costo-efectivo. Hemos visto enorme cantidad de programas, planes y proyectos en muchos países que tienen excelentes publicaciones, plasmadas en bien elaborados documentos de planificadores y que nunca llegan a concretarse y este esfuerzo nunca llega a beneficiar a los más necesitados. Nuestra experiencia parte de un origen diferente, se inicia en la base de la pirámide de atención. Comienza en sitios de lo más remoto y aislado del país, luego sube a los niveles más altos de atención pasando por segundo, tercer nivel, sub-especialidades médicas y salud en general. En el documento que continúa revelamos los orígenes de nuestra experiencia, las fases en su crecimiento y maduración y analizamos los principales obstáculos que encontramos a nivel de las sociedades civiles, sectores oficiales y profesionales involucrados (particularmente en Latinoamérica donde los problemas parecen ser muy similares en muchos países). Estamos convencidos de que la forma de acelerar el natural proceso de incorporación de la Tecnología de Información y Comunicación se basa en el entrenamiento, seguimiento y motivación del personal de salud que debe iniciarse desde el ambiente universitario y posteriormente como educación profesional (médica u otra) continua.

**Palabras-clave:** Telemedicina; Telesalud; Tecnología de la Información; Sistemas de Información; Colombia.

### Quinze anos de Telemedicina de Maniapure – Lições aprendidas de uma experiência rural partindo do nível mais básico de atenção

*O termo telemedicina faz referência ao uso das Tecnologias da Informação e Comunicação (TICs) e a sua aplicação à saúde em geral. As definições são muitas e vão das ligações telefônicas de uma mãe ao pediatra do seu filho até a cirurgia robótica onde o cirurgião responsável está a quilômetros de distância do lugar onde o paciente está sendo operado. Em nosso caso a grande mudança foi gerada pela massificação de uma ferramenta como a internet, e é sobre esta ferramenta, acessível à grande maioria das pessoas, que baseamos a nossa experiência. A maioria dos programas de telemedicina da atualidade foi originada partindo dos mais altos níveis dos governos e seus organismos responsáveis pela administração da saúde, sejam ministérios, departamentos ou qualquer outro nome que cumpra essas funções. Destes altos níveis costumam mais tarde ser levados aos níveis mais baixos de atenção, normalmente com aprendizado muito caro e freqüentemente com baixa eficiência de custo. Temos visto uma enorme quantidade de programas, planos e projetos em muitos países que têm excelentes publicações, refletidas em documentos bem elaborados de planejadores e que nunca conseguem se concretizar. Assim, este esforço nunca beneficia os mais necessitados. A nossa experiência parte de uma origem diferente, começa na base da pirâmide da atenção nos lugares mais remotos e isolados do país, para depois ir subindo aos níveis mais altos de atenção passando pelo segundo, terceiro nível, sub-especialidades médicas e saúde em geral. Neste documento revelamos as origens da nossa experiência, as fases do seu crescimento e maturidade e analisamos os principais obstáculos que encontramos a nível das sociedades civis, setores oficiais e profissionais envolvidos (especificamente na América Latina, onde os problemas parecem ser muito semelhantes em muitos países). Estamos convencidos de que a forma de acelerar o processo natural de incorporação da Tecnologia da Informação e Comunicação está baseada no treinamento, acompanhamento e motivação do pessoal da saúde que deve começar no ambiente universitário e posteriormente como educação profissional (seja médica ou de outro tipo) continuada.*

**Palavras-chave:** Telemedicina; Rede de Telecomunicações; Comunicação em Saúde; Informática Médica; Tecnologia da Informação; Atenção Primária à Saúde; Saúde da População Rural.

## HISTORY AND EXPERIENCE OF MORE THAN 15 YEARS IN MANIAPURE

The history of this project starts with touristic, family and “adventure” trips to remote regions of extraordinary beauty back in the 60’s, when the first visitors established a close relationship with the local inhabitants (indigenous people and mixed race people) supporting them with education and basic needs.<sup>1</sup> This was followed by regular visits made by healthcare professionals that throughout the decades prepared regular consultation plans during those vacations. Together with the NGO Association of Salesian Ladies (ADS in Spanish) since 1990 some facilities were available and finally a physician was hired in 1985, marking the formal beginning of the systemic healthcare program known as Maniapure Program, later identified as Maniapure Project Foundation.

One of the key and innovative features of the project was the importance given to telecommunication. Several stages were used to give support to the physician and provide him with remote assistance:

- Two way radio between 1995 and 1997;
- Since 1997 satellite telephone communication was included with the possibility of sending images by fax: graphs, electrocardiograms, etc.;
- The most important change took place in 1999 with the introduction of Satellite Internet.

The possibility of Internet connection removed the feeling of isolation from healthcare professionals. The chance of having access to their peers and sub-specialists and the

fact of having a hired physician who lived in the region attracted final year medical students from different healthcare degrees, such as medicine, dentistry, nutrition and bioanalysis who normally go for a 10- 12 week internship. By the end of 2010 around one thousand young people had already lived this professional experience. (Figure 1 and Figure 2).

## REPRODUCIBILITY

The news of this type of service spread quickly and the following situations happened almost simultaneously:

1. Our partner telecommunication company (CANTV) requested to put forward our experience to the International Telecommunication Union in Geneva, Switzerland and since our program was considered a successful project, they enthusiastically donated two additional satellite antennas for our connection to be used with the same purpose in nearby communities in the region of Maniapure. (Figure 3).
2. Also, leaders of remote indigenous communities from the National Park of Canaima (Kamarata), very far away from the Maniapure region, asked us to give them information and later to support them to establish a telemedicine system locally. This requested meetings with chiefs of 11 indigenous communities.

In both cases we learned that the work methodology, already with an experience of ten years, could be replicated in only three months since we had the knowledge

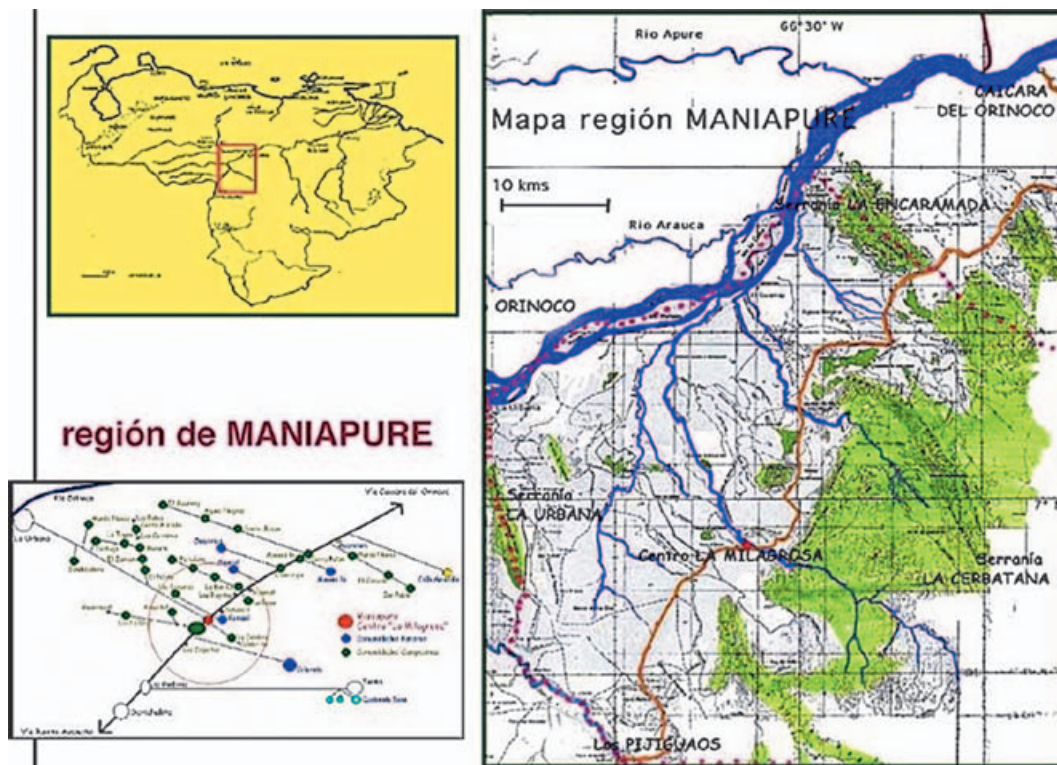


Figure 1 - Geographical region of Maniapure and its influence area

and the adequate networks to reproduce the experience in little time. Thus, we expanded our experience to four new places: in La Urbana village, in El Guarray in the Maniapure region and in the Kamarata and Wonken communities in the Venezuelan Guayana. Later this experience was taken to a total of 17 rural centers with telemedicine services. Everything was done in agreement with regional and national healthcare authorities (Figure 4).

## THE OPERATIONAL MODEL

The Maniapure experience became a very successful solution in two key aspects:

- Improving medical care provided to patients, with the support given by experienced physicians and specialists, that in the past were never available for these communities;
- Making easier to hire healthcare professionals, because without Internet access they would have been completely isolated.

The operational model is concentrated on three levels of care:



Figure 2 - La Milagrosa Center

- At rural health centers or health clinics, places frequently remote and isolated where the consultation request is originated;
- At the Virtual Triage Center (CTV in Spanish), a kind of Call Center for internet consultations. At this center internists or graduated nurses receive consultations and make the first evaluation of the case, trying to get the adequate answer. When they are not able to reach an adequate solution for the case, the consultation is automatically sent to the specialists also via Internet;

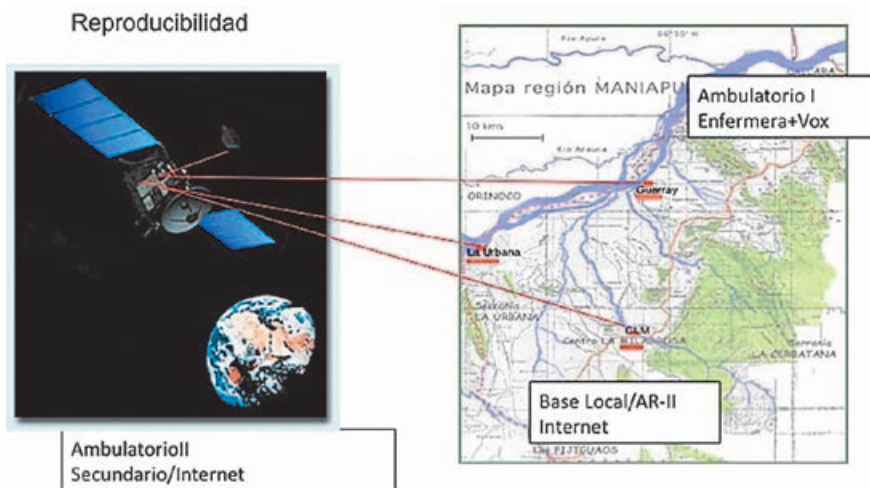


Figure 3 - Local reproducibility

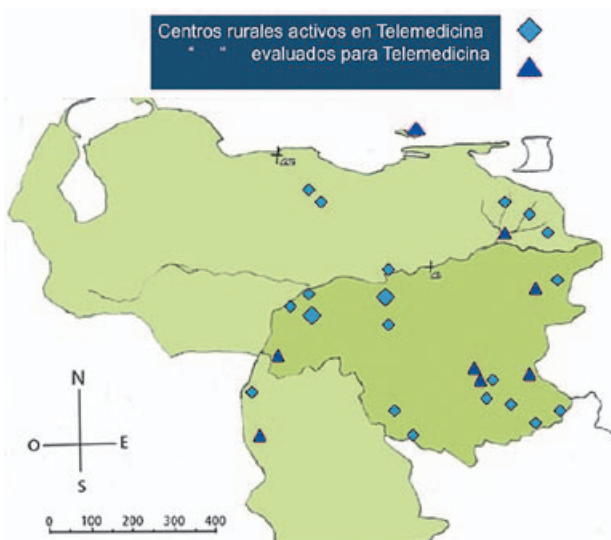


Figure 4 - Operational Model

- Specialists who are available on the internet anywhere they have access to this tool receive the consultation from the Virtual Triage Center and send the answer back. Then the staff at the Virtual Triage Center sends the answer to the “remote” consulting people of the first level. (Figure 5, Figure 6 and Figure 7).

A web application was developed in order to reach this communication in a reliable, safe and friendly way. The aim of this application was also to be able to record the process. The development of this application took almost two years of on line work with rural physicians who were already doing their conventional rural medicine and the group of programmers led by our enthusiastic partner and leader in technology Morel Orta, our engineer. (Figure 8).

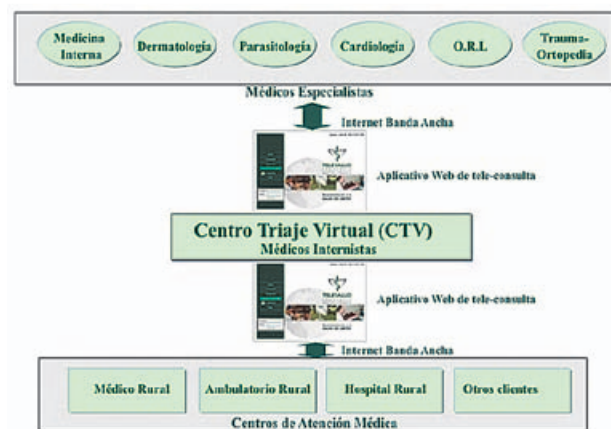


Figure 5 - Operational Model

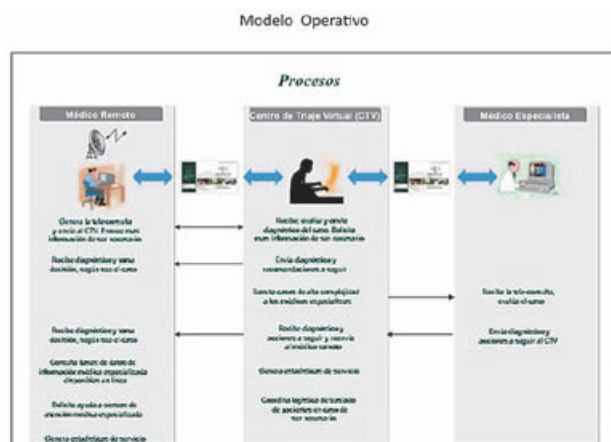


Figure 6 - Operational Model – Processes

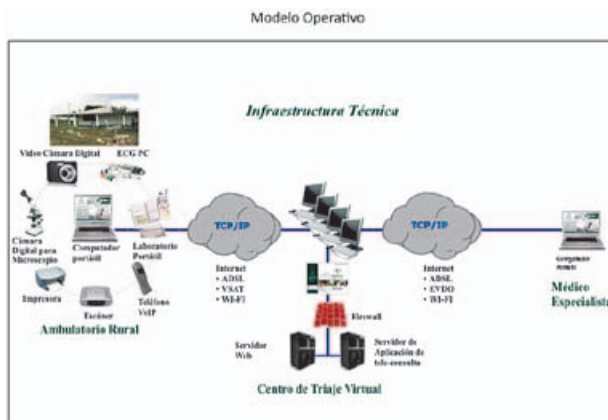


Figure 7 - Operational Model – Technical infrastructure



Figure 8 - WEB application

## IN SEARCH OF SUSTAINABILITY

After ten years of telemedicine activity at La Milagrosa / Maniapure Center and one year of reproduced experience in another four communities, we realized that the Maniapure Project Foundation did not even have enough resources to serve the region which was its main reason to exist.

The only way of extending this experience and being able to benefit other communities was through some sustainable organization that could generate their own funds for the operation, which was increasingly complex and required more staff.

### TELEHEALTH OF VENEZUELA

This is how the company Telehealth of Venezuela was created, the mission of this organization is to reproduce a similar experience to that of Maniapure with funds obtained from companies and public or private institutions with social responsibility among their goals. The participating elements are based on four aspects: 1) Technology; 2)

Patients/Communities; 3) Human Resources; 4) Financial Resources.

#### 1. TECHNOLOGY

Its development is extremely fast, it “embraces” us with its speed both in telecommunications, medical technology and computing in general. It is bought with money and it is increasingly more available and cheaper.

#### 2. PATIENTS OR PEOPLE IN NEED (communities)

Present everywhere, easily seen in our Latin American societies and in many other places in the world.

#### 3. HUMAN RESOURCES

Available in our country, in our excellent universities with a very high quality and education, present both in the healthcare and technology areas. They have to be trained and encouraged until they can “own” this methodology.

#### 4. FINANCIAL RESOURCES

It is certainly one of the limiting factors for the easy application of the methods. However, it is an “existing” resource that is available when the right information is known. Social responsibility in this XXI century is present at all levels and when transparency and credibility are revealed, these resources appear.

In order to have the interaction of these four elements and its coordination, education, follow up and continuity of the services, it is necessary to have an organization that provides services, management and education which is the role played in this case by the Maniapure Project Foundation in its limited sphere of activity, and Telesalud® (Telehealth) as the service provider in any other geographical region.

## SOME CONCEPTS LEARNED

**The community or end user is the most important element for the operation of the program and also to keep using equipments and methodology**

If there is not an organization or group of people that own the system of local telemedicine, supporting its functioning and watching over the technical equipments ( energy supply, internet connection, computers with their peripherals, etc..) and at the same time looking after the adequate use of the consultation systems, it is very likely that the program fails.

### Only a minority of “patients” seen at a Health Center requires telemedicine consultations

95% of patients can get adequate answers from primary healthcare staff (physician, nurse, paramedic, etc.) Approximately 5% of the cases are not solved or they generate doubts that must be consulted to third parties (specialists) or to whoever has access to updated information. Of this 5%, 80% can be solved locally with the opinion of these specialists or center to which the consultation is sent (Virtual Triage Center). Only 20% of “teleconsultations” really needs to be referred to higher care level (Hospitals with specialists, etc.) If these numbers are correct, around 1% or 2% of consultants (patients) would really need to leave their community, and the others who go to the health center can be solved locally, saving huge amount of money on transportation and unnecessary trips.

### Underuse of telemedicine service is frequent

Resistance to change, specially among healthcare professionals is common and mainly among us, physicians. Very often we are convinced that “we are good at what we do” and these technologies do not bring much help. Motivation and time to be “re-trained” on the teleconsultation tool is important and must be included from the beginning in the training of “paramedic” healthcare professionals who must be good motivating the physicians on the application of this methodology. After seeing the first results, they tend to become the most enthusiastic supporters of the system.

### Rooms that facilitate the work of healthcare professionals must be provided

Computers, scanner and cameras for telemedicine must be on the same consulting room. If they are in a distant place, teleconsultation becomes less frequent and there is the risk of not using it at all. A close Infocenter (or something equivalent) is not the adequate place for running a telemedicine system.

### Carrying on a teleconsultation may double the time needed to see a patient.

A frequent comment by those who do not know the operation of a telemedicine system is: “*since it is with a computer this should be quick, so you can do it on your free time*”.

The doubt generated by the patient in the physician or in any other healthcare professional requires time-consuming activities such as “organizing” ideas, re-examining the patient to be sure that the first impression was right and getting relevant and good quality photographic images. Finally, these impressions have to be written in the format in which they are going to be sent. The important thing to understand is that this additional time invested in this case can mean an important advantage in hours saved to move the patient to another place. Also all this additional time is translated into a better medical care and therefore greater effectiveness for the healthcare system in general.

### This must be an allocated job and paid as such

Both at the Health Center/Rural Clinic, and at the Virtual Triage Center as with the specialist who receives a consultation, the time dedicated to telemedicine must be acknowledged as effective work time and therefore must be remunerated. In the past before Magnetic Resonance Scanner, Hybrid Operational Theaters or Hemodynamic Units existed, time and space to provide that type of service did not exist. Nowadays those spaces exist and also the staff to make them work.

Telemedicine is not an exception and must be seen as another tool in hospital healthcare systems. It is not possible to imagine a hospital or a Health Center in the near future that does not use the advantages of information and communication technology to optimize the handling of patients and the cost-effectiveness of the already extremely expensive healthcare system of a country.

## SHORTAGE OF HEALTHCARE PROFESSIONALS – CHANGES IN GLOBAL MEDICAL CARE

Back in the 70’s the shortage of physicians was already noticed and nowadays there is global shortage of around 3 million physicians worldwide. Furthermore, these physicians are not evenly distributed and many countries suffer emigration waves due to economic, technical or political reasons, reducing the capacity of their health systems. Recent reports from the United States of America show projections estimating that there will be a shortage of approximately 130.000 physicians by the year 2025 in that country. This is due to different factors:

- More people who were previously excluded from the health system are now entering the system, and there is an increasingly aging population with longer life expectancy;
- Fewer physicians per patient, fewer specialists: This means that it is necessary to make the most out of the knowledge and expertise obtained by the specialists in areas they know in great depth and that should reach as many patients with a given disease as possible. The use of information and telecommunication technology is the most appropriate way to disseminate the knowledge of specialists and sub-specialists, ensuring they can reach the patient regardless of where those patients are located. The use of the “Virtual Triage Center” concept or any other name given to this type of center to receive consultations, similar to the concept of call centers has given us access to the “Network” of existing specialists.

Starting with the rural experience we have also worked with Urban Rural medicine over the last years in partnerships with pharmaceutical companies, granting low income overpopulated neighborhoods, which are often isolated from the general health system, access to updated medicine. These neighborhoods are very common in the outskirts of our Latin American cities. More recently and with the same name of Triage Center as the “heart” of the system, we are entering into Home Care, both individually and/or at hospitals for chronically ill patients that can be nursing homes or similar institutions.

## APPLYING THIS CONCEPT TO A REGIONAL LEVEL

The best and quicker benefit obtained after implementing a telemedicine system like the one proposed here is in the regions, states or countries with large land extensions with low population density and in those areas where large distances or peculiar geographical features make health care difficult. These aspects are very common in Latin American countries. Added to this there is also poverty that makes even more difficult to travel to specialized health centers, increasing the number of excluded people from national health systems. Exactly the same issues are present in richer and industrialized countries where the benefits and cost-effectiveness of using such tools had been well recorded.

We have seen with concern that in many regions and countries there had been attempts to implement extremely expensive telemedicine systems with beautiful venues using the most advanced communication systems that are hardly used (only once or twice a year) for some distance conferences with universities or multilateral bodies, and this is basically the concept of telemedicine for them. These projects are normally widely advertised by those responsible for them without giving any real benefit to those who are so much in need of medical care.

Similarly, we have seen national telemedicine programs with high speed connections and bandwidth or with very modern equipments and exorbitant costs that once again are under used. It is a fact that current technology allows us to handle information of medical images such as CAT, MRI and very high resolution images and even to carry out robotic surgery. Unfortunately this happens without taking into account the cost-effectiveness of care, pathologies which are much more frequent and simple to solve such as tropical diseases, parasitosis and malaria in which 20 patients could be saved with the investment needed to treat one patient with much complex diseases. Both groups of patients deserve care and treatment, however the state must help to raise awareness on the use of technology to treat the less protected population.

## OBSTACLES AND HOW TO SOLVE THEM

Health systems are normally the responsibility of the state and in most cases, the state “on its own” and isolated faces difficulties to offer universal and high scientific, technical and human quality healthcare. Therefore the joint work with the private sector helps to unload costs of care on the most in need. Thus, private sector must report and follow the rules of the official sector. The success of our model is partially due to the fact that from the first moment the work was done together with regional and national health authorities, integrating our objectives with their goals in topics like healthcare, vaccination, nutrition, reporting systems and so forth. Thus, supporting the rural population and the official health system. Our experience has been possible thanks to the huge contribution given by many private institutions, national and international NGOs, volunteers, individual employees and managers from the public and private sectors with awareness and social responsibility making possible to have equipments, education/training and care for the local staff to use technology with the official approval.

Those who believe that buying or installing the equipments of the Health Center (clinics) is the way to solve the problem are completely wrong, since it is down to us, human beings, to use or not all this technological paraphernalia. The main change resides in education, follow up and motivation and we are convinced that this must start at the university setting and develop simultaneously. The key for success is building partnerships.

## CONCLUDING REMARKS

Telemedicine is a very attractive term: it is modern and makes reference to health, which covers everything. It easily attracts people with motivation and responsibility on this topic. We have heard proposals for “its quick mass use installing hundred centers at the same time”. This is the “easiest way to lead a telemedicine project into failure” and finish with it. But why?

The reason is that the “bottleneck” is not technology or medical informatics, not even a working plan nor the acquisition of telecommunication systems (connectivity is the axis of the system but commercially accessible). The key issue here is human resources and more specifically health-care human resources (physicians, nurses, etc..), since this aspect has been the most difficult one to include. In addition, there is basic training in computing, the use of tools such as internet, web, basic scientific digital photograph which are part of this training focused on making the most out of telemedicine.

The managerial aspects of this education, training, motivation and regular maintenance of technological equipments and human resource is what it will make this change possible for healthcare, without having to wait for years and maybe decades, having already the solution at hand

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