

HPC Telemedicine's Service Improves Access to Pediatric Cardiology in Central Portugal: Leadership, Organization and Training as Critical Success Factors – People really Matter!

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Abstract. HPC Telemedicine Service in the Portuguese context is analysed in terms of impact for public health services. The reasons for its success among many projects failures in Portugal are addressed and the influence of people behaviour is investigated. This study proves how important telemedicine really is to cope with both the geography and the shortage of physicians.

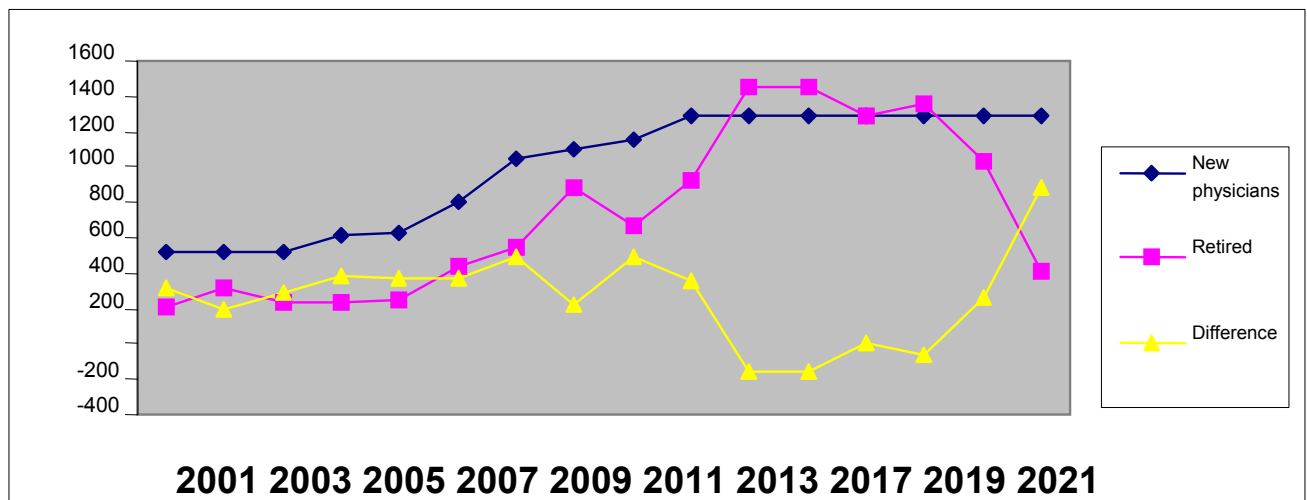
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1. Introduction: Geography and Physicians' Shortage

Portugal is a geographically diverse country. Portugal central part is crossed by several mountains that, despite the availability of new roads, enlarge in many kilometers the distances between places. This creates a difficulty in people reaching health care services, mainly those of special character like neurosurgery and cardiology.

There is also a shortage of professionals as the result of years of poor planning. Only two years ago the problem deserved some attention from the politicians even though physicians' shortage had been identified ten years before. The reason for the problem will not be addressed here but the expected impact will take at least a decade until a partial solution is reached. The minimum of availability of physicians is expected already by the year 2015 as depicted in the figure 1. The figure shows the summation result of new physicians entering the practice and the expected to retire. It seems that the difference will be negative between 2012 and 2019.

Figure 1



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One of the most affected medical specialties is paediatric cardiology. In the 1990's, the SNS Portuguese Health System was already lacking physicians, to this one should consider an additional effect due to the fact that most of the specialists were kept in the major cities (Lisbon, Porto and Coimbra) in the big central hospitals. These cities are located in the coast of Portugal leaving the interior out of specialised physicians. The Table 1 shows the impact on physicians of different specialties.

Table 1 – List of resources needed but not fullfilled (“vacant” are places that should be occupied but there are no specialists to fullfil them)[1].

Specialities	Needed	Effective	Vacant
Anaesthesiology	1202	891	311
Radiology	524	375	149
Psychiatry	670	534	136
Paediatrics	1072	945	127
Pneumology	430	311	119
Imuno-hemotherapy	249	151	98
Pathology	513	423	90
Genecology & Obstetrics	1012	922	90

1.1. In face of such a situation what can people really do? What are the alternatives?

For example, let's imagine a family living in a small city, let's say Guarda. Guarda is a city located 169 Km from Coimbra, 219 from Porto and 305 from Lisbon, right in central Portugal. This family has a child with some indications it needed to be followed by a pediatric cardiologist (PC). This diagnostic was done by a pediatrician in the City small Hospital. What can they actually do? In the case of no other alternative, this family has no other choice than go to one of the big cities looking for a pediatric cardiologist in the emergency (or in consultation), meaning that the parents will need to travel there which will have the following impact:

- The parents will lose at least one day of work (therefore reducing their productivity);
- Children will miss school classes;
- They will spend money in many things like food, hotel and transports; and
- One must also consider the “impact” of travelling in pollution and traffic increase.

In the context of the eHealth paradigm and regarding that every citizen should have access to the same type (and quality) of services one should have to address the telemedicine as an alternative to help solving the problem. The new paradigm of eHealth [2] says “eHealth describes the application of information and communications technologies across the whole range of functions that affect the health sector” and “When combined with organisational changes and the development of new skills, eHealth can help deliver better care for less money within the citizen-centred delivery systems.” This paper is a proof that telemedicine can really happen.

2. Telemedicine Definition and Technology Readiness

2.1. Telemedicine Defined

Telemedicine was first mentioned in the 1950's, although its first utilisations were much earlier in Sweden 1922 [3].

The Telemedicine, as defined, should promote the sharing of (patients') information between Healthcare professionals, allowing for the distance visualization of diagnostic images, audio signals and video in real time with good resolution that help the “tele-physician” to reach a diagnostic. In order to stablish the communication, Telemedicine uses transmitted images, voice and other data to permit consultation, education and integration in medicine over a distance. Telemedicine also reduces the need for special technical and human resources located outside the central hospital, which help most citizens accessing healthcare. These systems can be used with success to deliver radiology, dermatology and eco-cardiology services to patients who are in distant different places [4]. Benefits of telemedicine include immediate access to medical expertise no matter where the patient are, more timely

diagnosis and treatment, and the elimination of the need for patients and clinicians to travel long distances between rural areas and central medical centres. Both benefits can and should be measured.

Today telemedicine is no longer a technical issue [5]. For instance in Portugal, since the 70's there have been invested large amounts of money in technology with almost no success. In Portugal from 1999 to 2002 we could identify 16 projects with a budget of 1 million euros [6]. In most of these cases physicians have leaded the processes, the imaging reports through the web had made several first pages in the newspapers [7] but this is no real telemedicine after all [8]. The imaging examination reports are simply coments made by physicians looking at those exams, that could be done in the room next by. There is no difference in doing it there of elsewhere.

2.2. Telemedicine still has areas of Concern

Areas of concern have been clearly identified [9] and they include the threat of malpractice due to misdiagnosis resulting from the use of telemedicine, which rises questions over the acceptability of image quality, and the reluctance of physicians to become involved in telemedicine.

Field [10] explains that the resistence to change is quite reasonable because telemedicine introduces new aspects in the service process. New technologies and new working methods imply time to learn. This can be overcome by showing the benefits and the real impact on populations. It should also provite more efficiency and a sence of satisfaction captured from both more quality of work and avoiding people coming to the hospital. This means better services to the community at the end of the day. These are real barriers that should be addressed cautiously. Again Field [10] identified human and economic factors. The human factors are related with the *equipment/hardware* (learning, (lack of) requirements and time issues), *difficulties adopting telemedicine* (timetables, suport needed, reports, registration, coordination between sites, standards, etc) and service *optimization/customization* (target population, goals, interaction with other organisations, recording, etc.). The economic factors are *professional image* (impact on social recognition, use of innovation, pacient responce), *written beneficts* (fair relationship between efforth and return, understanding costs, paper reduction, less medical error, better reports), service billing (clear rules for service payment) and Healthcare organisation (impact on the interaction of system actors).

Other factors, which continue to affect the spread of telemedicine, and therefore impact on the timing of evaluations, are the threat of litigation and finacial issues like reimbursement. A still stumbling block to widespread implementation of telemedicine is the lack of reimbursement (and sensibility for the issue) by the Health Care Financing institutions.

2.3. Why is it failing and lacking acceptance

Telemedicine has been evolving and maturing since the 1950s, but Earth pragmatisms failed to achieve physicians and patient's acceptance and cost-effectiveness. When funding was withdrawn the projects ended and interest declined [3]. A cycle of technological development leading to renew activity, followed by a cooling of interest when expectations were not realized, continued every decade. A resurgence of interest occurred in the 1990's due to technological advances combined with reduced costs to respond to the demand by citizens for equal access to healthcare, independent of location. It is understood that the problem is no longer technological [11]. So we looked at the players: physicians and patients. Concerning physicians, [12, 13, 14] identified the following aspects: although physicians show interest they also are afraid of increasing their work load, the patients response, reembiusment and the need of leadership from the top managers. Regarding patients [5, 15, 16, 17] mention that there is a general satisfaction (mostly due to good communication and to avoid commuting)

2.4. The Development of Telemedicine has been Technology Driven

Technology providers have been generating new markets by funding telemedicine research to stimulate both medical and popular interest in such applications. Reports of evaluations of telemedicine systems in the literature have been primarily anecdotal and descriptive. Teledermatology (1st referenced in Medline in 1992) seems to be a much more recent telemedicine application than teleradiology (1st reported use in 1950 - USA).

First project generally served sparsely populated areas, resulting in insufficient patient contacts to provide statistically valid data [3]. Reports in the literature of teleradiology and teledermatology did not explain the timing or the details of why they were undertaken. Factors that influenced the timing of trials of teleradiology and teledermatology were technology-driven as opposed to needs-based. Projects have taken place, mainly focusing on technical feasibility, during periods when commercial providers were injecting funding [11].

3. Paediatric Cardiology HPC Case and Benefits Estimation

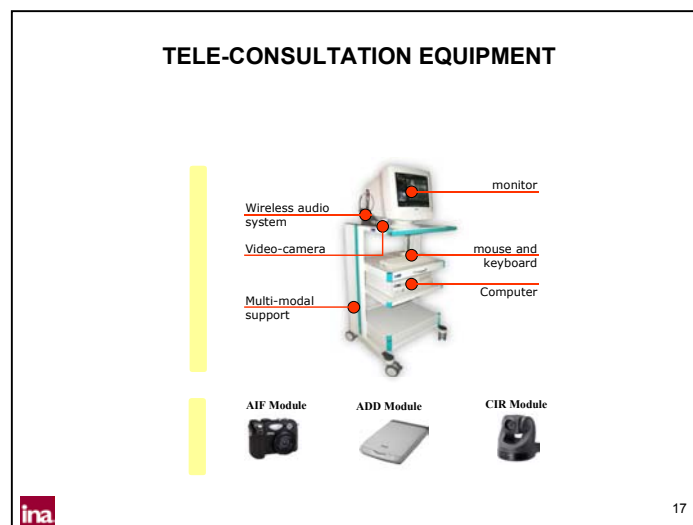
Pediatric cardiology pathology is very constant and broadly spread among the child populations: In statistical terms, in every 1000 born children 8 have cardiopathies of some sort [18]. Therefore, as most parents live outside big cities their children will be born in District Hospitals. An additional factor that enhances the potential of telemedicine is that a quick and correct diagnosis of complex cardiopathies is possible and that healing and adjusted follow-up are possible as well [FF]. Hospital Pediátrico de Coimbra (HPC) is a 95 beds hospital to cover all central Portugal.

3.1. How Does Everything Started: *Fait Divers* really matter

The vision was to replicate the Mayo Clinic experience leveraging the benefits for the all Portuguese population not covered with healthcare services. Dr. Eduardo Castela went to Mayo Clinic in 1995 for a period of training. He was amazed with what they were doing in Telemedicine and more impressed with the quality of the real time image captured. When he came back to Portugal, after a short while he occasionally met a close friend Enga. Lusitânia Fonseca. By the time, she was working at Portugal Telecom (PT), a telecommunication company. Dr. Castela shared the experience with her and she become very interested in the ideas as it could represent an opportunity to PT. PT started few months afterwards working in the project from scratch. The system was named Medigraf (Medi from Médico (physician) and Graf from Gráficos (graphics)). The teleconsultation service started on October 14, 1998.

3.2. MEDIGRAF Tele-Consultation Equipment: *PT's Medigraf will already DICOM certified*

MEDIGRAF is now sophisticated equipment though with simple elements. Basically it enables the distance visualisation of an eco-cardiogram - a dynamical imaging system. It is also possible to communicate with a telephone with the physician on the other side (usually a paediatrician) in order to follow a complete distance examination (helping positioning the children). All the images and sounds can be recorded in the system database (~1 Mb per session). The data can be recorded at both places (distributed application) .The system simply requires a 512 Kb link which can in alternative work with VPN integrated in the RIS (Portuguese Healthcare Network).

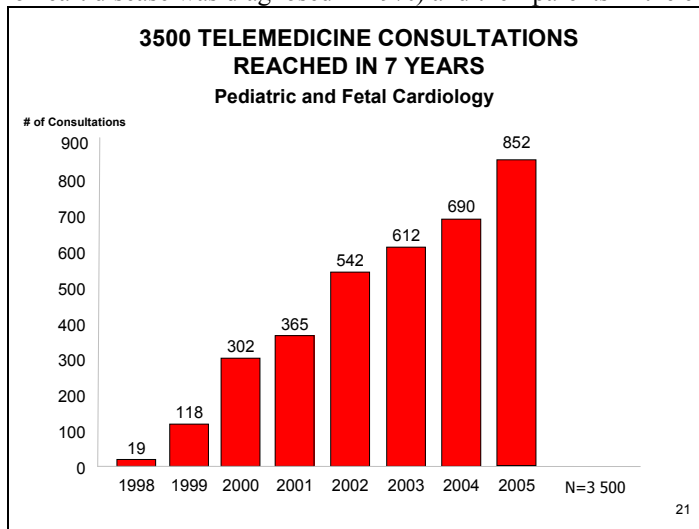


3.3. Estimation Gives a Benefit of approximately € 400 per Telemedicine Consultation

Surely it is not easy to estimate benefits. Others [9] had done so and we followed them. First of all, lets consider some assumptions regarding the benefits mentioned earlier. One working day lost means (8 hours x 20 €/h = 160 €) of work times 2 persons is equivalent to 320 €. One 169 Km Trip costs (2 times the distance between Guarda and Coimbra). Energy consumption for that distance will be (169 Km x 0,4 €/Km = 68 € gasoline plus 20 € tolls = 88 €) 88 € and finally one should also diminish the telecommunications costs (estimate per consultation) = 8 €. In TOTAL BENEFITS = 320 + 88 - 8 = 400 €. So in average (and Guarda represents a city in an average distance from Coimbra) this means that each teleconsultation have an impact of 400 €. If we consider the 3000 done since 1998 the amount obtain reach an impressive value of 1 200 000 €. More then twice the cost of the infrastructure required.

3.4. Seven years of excellent results

Since its beginning, in 1998, approximately 3500 telemedicine consultations were done which represents a huge impact for children (no heart disease was diagnosed in 49%) and their parents in the central part of Portugal [18].



4. Discussion: The importance of Leadership, Organization and Training

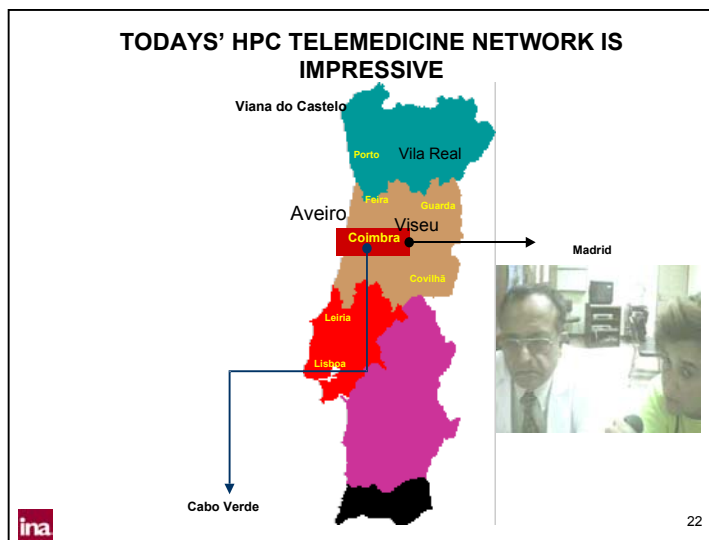
4.1. The patient's behaviour and acceptance are very good

There was a survey done on two main types of patients (Pregnant and Parents). Pregnant ladies have shown some astonishment and indeed cooperate with the telemedicine service. Parents, who accepted well the technology, understanding the impact on costs reduction and added convenience (As mentioned earlier, 49% had no heart disease diagnosed). When necessary the patient will later go for a face-to-face evaluation in the Cardiology Department (HCP) at Coimbra. In some cases children were treated with diuretics and the teleconsultation subsequently repeated.

4.2. Pediatrics eco-cardiology Tele-consultation viability test

A Tele-consultation viability test was performed in the first year (78 cases). Most diagnostics were confirmed in a face-to-face consultation, 10% had surgical indication and only 0,013% of diagnostics (one) were not confirmed.

4.3. Network



The network of hospitals that are linked to HPC reaches Madrid (Spain) and Cabo Verde (Africa). In Portugal it goes from Coimbra to Aveiro, Castelo Branco, Covilhã, Figueira da Foz, Leiria, Viseu, Vila Real, Viana do Castelo.

4.4. Why was this case successful? How did they manage to succeed?

Leadership promoted physicians' participation through the implementation of a telemedicine's pilot trial. To build up momentum they planned to get other regional hospitals into the task force. For instance, Dr. Castela and his team (HPC) joined efforts with Dr. Bilhota Xavier (paediatrician) from Leiria's St. André Hospital in order to "sell the idea" to others. They organised meetings with the objective of developing a prototype - Enga. Lusitânia was the project leader. The engineering pre-requisites were developed with some physicians' help. After a while they started to test the system between Coimbra and Leiria and Porto. There was an intention to share the technology and the service with as many hospitals as possible due to the perception that the service was indeed a must.

Training helped gain the interest of physicians in the project. The participation of the regional hospitals' physicians was critical. It was necessary to grab them unto the idea. To present and explain the idea they organised workshops to catch the attention and train the physicians to increase the probability of success. These training sessions required huge efforts from the telemedicine team but they paid back (HPC team went five times to Cova da Beira and after these meetings they managed to get other paediatricians and obstetricians into the team). The workshops focused basic training and recycling the knowledge with up-dated information.

There were some barriers to tackle before reaching some physicians. The barriers were easy to preview. Two factors were critical: The participation of physicians would require some effort in meetings and training and it was necessary a technological partner. Friendship and the mutual interest actually helped. But, maintenance of technical condition to sustain growing needs is the biggest difficulty. There is now the need of acquiring technical equipment that allows better diagnosis and training other physicians.

5. Conclusions

Telemedicine can be really happen since organisational issues are addressed. There are clear clinical advantages, such as inter-changes between hospitals, better use of equipments and distance teaching and learning. There are also advantages for the patients, such as quick clinical diagnostics, better waiting list control (less time), costs reduction (for both the patient and hospital) and access to pediatric cardiology consultation from remote places. In the case studied, though the service is running with efficiency there are some difficulties for further development of the service because it needs 24-hours/day pediatric cardiologists' availability and quality equipment availability.

Besides the existence of significative barriers it is possible to implement it with success and with the acceptance of physicians and patients. This study proves how important telemedicine really is to cope with both the geography and the shortage of physicians. We expect that further efforts on leadership qualification could improve the success of telemedicine and therefore the improvement of healthcare quality standards.

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