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Structure and Operating Mode of Multimodal Platform of Télé-medicine

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Abstract

We propose an original concept that aims to demonstrate the feasibility and clinical validation of a multimodal platform for telemedicine and also incorporates the economic and legal aspects. This platform, connected to broadband internet, brings together, in one place, all the basic equipment's necessary for carrying out a consultation and the establishment of a preliminary diagnosis. It ensures, 24H / 24 in compliance with the safety instructions and the requirements of medical ethics, rapid access to care, without limitation of geographic localization. Its implementation on site should enable the validation of the concept, the detection of problems and the establishment of a financial statement. It requires the strong contribution of general practitioners, radiologists and technologists of instrumentation and communication. . The creation of such a platform in a disadvantaged region is justified by the development of medical deserts, which result from the current shortage of general practitioners and specialists, particularly in rural areas and specifically affecting certain disciplines.

Keywords: Tele-medicine; Platform; Multimodality; e-hearth.

I-Introduction

The proposed multi-modal telemedicine platform that we present is not a research project because currently all the scientific, technological or logistic components exist separately but it is essential to assemble them before evaluating the technical, medical, Economic, societal and legal consequences of this association.

The aim of the proposed work is therefore to prove the feasibility and clinical validation of a multimodal platform for consultation and pre-diagnosis in telemedicine, with a practical realization on the ground, not to mention the economic and legal aspects which can often constitute Insurmountable obstacles to any exploitation.

II-Definitions

Telemedicine is one of the components of the tele-hearth.

The e-santé applies ICT (Information and Communication Technology) to all activities related to health (prevention, home care, remote monitoring of a chronic disease, medical records, telemedicine).

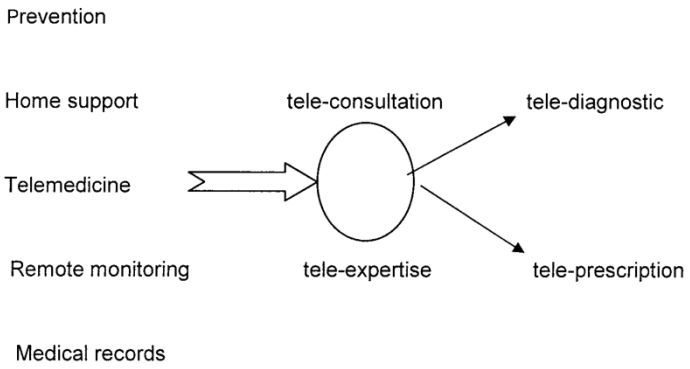

FIG 1: E- Hearth

Telemedicine is a form of remote medical practice using ICT technologies.

<< TRAVELING INFORMATION RATHER THAN PATIENTS >>
The essential goal of telemedicine is to abolish distances!

III-Historic

The evolution of telemedicine has been closely linked to the advancement of technologies. Thus, in 1905, following the emergence of the telephone, Willem Einthoven (Nobel Prize 1924) carried out the transmission by cable telegraph of an ECG (electrocardiogram) over a distance of 1.5 km. The advent of the TSF In 1920, she allowed the medical assistance for people at sea.

The further development of television and the rapid means of transmitting information over long distances became a reality in 2001, Operation Lindbergh, is a first realization of intercontinental tele-surgery between New York and Strasbourg.

IV-The context

There is currently a shortage of general practitioners and specialists in non-urbanized areas. This desertification, which particularly affects rural areas and / or disadvantaged areas in emerging or developing countries, The geographical distance between the patient and hospital or private care facilities, a difficulty in rapid access to care and the need to organize trips (sometimes unnecessary) by ambulance or helicopter, resulting in prohibitive costs. This dysfunction is aggravated by the abandonment of night shifts by general practitioners in the private sector (in France, for example).

V-Telemedicine Platform

The telemedicine platform must combine all the basic equipment needed to conduct a multimodal consultation and establish a preliminary diagnosis in a single location. It must be able to assume 24 h:/24, every day of the week ,respecting the security, connection to networks of generalist and specialist experts, irrespective of geographical location and linguistic constraints. The ultimate goal is rapid access to care, respecting ethics and quality, Integrating current economic, legal and societal constraints.

V-I Classification of different types of platform

---- Class A platform: individual platform allowing the patient to acquire and record a certain number of parameters and to provide a balance sheet to his usual general practitioner. This is therefore a provision of medical equipment's, Pilots only by the patient. This form of platform does not therefore belong to telemedicine.

------ Class B platform: It is a class A platform, but with a nursing staff, facilitating manipulations and adjustments of the materials (same remark as above regarding telemedicine).

------ Class C platform: This is a class B platform, but connected to a generalist physician by some means of telecommunication. C is thus a motivated guidance center and constitutes a simplified primary form of telemedicine .The generalist can establish a preliminary assessment, taking into account, besides the dialogue with the patient, his medical file and all the parameters acquired on the platform. He concludes on the necessity, depending on the urgency, of a transfer to the hospital or a new generalist approach generally known and familiar to the patient.

------ Class D platform. It is a class C platform, with more general access possibilities. Access is not limited to a single generalist, Networking this platform thus benefits from a great number of advantages brought by the connection to this network (globalization, linguistics, access 24/24).

------ Class E platform: It is a class D platform that has access to a wide network of not only generalists, but also specialists covering a wide range of specialties. Under these conditions, the

available generalist guides, if necessary, the file to the specialized expert base concerned with the particular pathology of the patient. Thus the specialist will be able, according to the degree of urgency:

- Or make an appointment with a colleague close to or known to the patient for facilitate the transfer of the patient to the hospital and the most available service available for this pathology

-Or for provide the necessary intensive care before and during the transfer.

V-II The equipment of the platform

The equipment chosen (see list and price in Annex) for the constitution of the platform are of the same nature as those found, scattered in often incomplete forms, in most practices of general practitioners and specialists, used routinely by these practitioners.

This equipment covers several modalities, mainly cardiology, pneumology and hematological analysis.

Two categories are listed:

Lightweight equipment, costing less than 5000 usd.

Mid heavy equipment, costing between 5000 and 25000 usd (eg 3D ultrasound scanners, hematological analyzers etc.).

(Mid heavy equipment is optional and can be loaned or rented with the manufacturer for a long time).

V-III-Creation of two networks of experts

A network of experts results from the inventory of a set of addresses making it possible to establish, in real time, the contact of a patient with an expert (specialist or general practitioner) who has agreed to carry out a pre-diagnosis according to the rules established by Contract with the bodies responsible for this telemedicine action.

Two distinct networks are constituted:

A network of GE (Generalist experts) and a network of SE (Specialist Expert) with at least ten participants;

The existence of these networks is a prerequisite for the functioning of this new approach to remote care and guarantees medical competence, complementarily of diagnoses and respect for ethics.

It is always the general expert, contacted first, who is responsible for establishing the pre-diagnostic and, as the case may be, contact with a generalist outside the network, located closer to the patient and often known by him (doctor of Family, for example).

It is this generalist expert GE, who, if necessary, directs the patient, given the specificity of the pathology, to the competent expert of the network of SE specialists. The specialist, in turn, prepares his pre-diagnosis and, depending on the case, directs the patient to a specialist outside the network, if possible not far from the patient, or to the nearest Regional Hospital Center.

VI-Advantages and innovations of this platform

Staff

The platform manager, who is not a physician, must have a multidisciplinary training in instrumentation, biophysics and communication computing. For example an engineer or a master in biological and medical engineering.

Linguistic aspects

The search for expert on a global level, practicing a given language, makes it possible to be freed of hourly constraints and facilitates the possibilities of exploitation24h / 24. Thus, for example, the francophonie reaches over 274 million people, spread over the five continents (The time differences are with Paris -6h in Quebec, -12h in Polynesia and + 5h in Vietnam!).

Medical validation

The implementation of a prototype on site must allow the validation of the concept, the detection of unforeseen difficulties and the establishment of a balance sheet.

Legal and legislative aspects

The legal and legislative constraints of the different countries concerned must be met (civil liability of the interveners, insurance, patients' rights, etc.)

Remuneration of medical intervenant

The available generalist, automatically retained in base 1 of the call center, will be remunerated for his pre-diagnosis and for the subsequent orientation of the patient (percentage of fees). If he takes care of the entire consultation, his fees will be those of a general practitioner.

Similarly, the specialist retained in the base 2 of the call center will be paid, as the case may be, as a percentage or in full the fees of a specialist in the public domain.

Computer Connections

The platform must have a high-speed Internet connection (> 20Mb / s), means of storage and archiving, as well as faxing of documents and color images

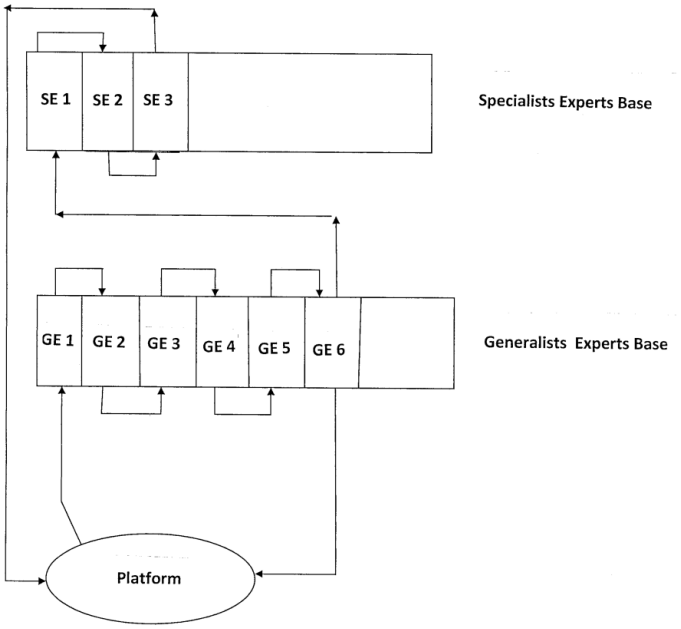

Fig 2: Automatic information Switching

In this example, after communication failure to GE1, GE2 ,GE3 ,GE4,GE5, contact is established between GE6 and the platform. If, after the diagnosis of GE6, it is necessary to contact a specialist, the contact (via failures SE1, SE2,) is established with SE3.

Security

Compression, encryption and tattooing software must be available on the site to ensure the security of online transfer on the internet. Storage and archiving are provided by the cloud

Software support with Artificial Intelligence

The Experts, generalists or specialists ,can benefit from diagnostic assistance by connecting to a large intelligent database, based on global statistical data and the values of the specific parameters extracted from the file (When they are available?) , for to compare them with the results of the measurements obtained during the examination of the patient during his stay at the platform.

Potential sponsoring

Telecom operator

Industrial biological and medical engineering

Computer equipment manufacturers

Insurance

VII-CONCLUSION, Originality of this concept

There are currently no equivalent projects to evaluate logistical efficiency and therapeutic of a real consultation and pre-diagnostic platform. The few achievements mentioned on the web generally relate to single patient / doctor connections or to the patient's provision of equipment without medical supervision. The realization of a telemedicine platform is very realistic and involves no disproportionate costs. However, before generalizing the implementation of such operational structures in different environments, it is essential to test their effectiveness and the quality of their results, in order to resolve possible difficulties arising from their unconventional aspects in their domains, economic, societal and juridical.

References

[1] Craig.J History of telemedicine In :Wootton,J.and Craig,J.,(Eds) Introduction to telemedicine. London : Royal Society of Medical Press 1999.

[2] Shortliff,E.,Medical expert systems knowledge tools for physicians.West.J.Med.145 : 830- 839,1986 .

[3] Zhang XM., Zhang N., An open ,secure and flexible platform , Computer and Management 2011-ieeeexplore,ieee.org.

ANNEX

(Unlimited list of possible equipment's)

Lightweight equipments

Electrocardiography

12 dérivations ECG Schiller (Cardio MS 2010) 3588 euros TTC

Automatic Defibrillator

Lifeline Viero 1749 euros TTC

Electronic Stethoscope

Litmann E 300 300 euros TTC

Pulse digital Oxymetry

Nonin 178 euros TTC

Balance Weitling record

Seca 799 600 euros TTC

Automatic Tensiometeur

Omron 907 Pro à bra 400 euros TTC

Camera video for examen of surfaces

Bundle AM 4115ZT 900 euros TTC

Electronic Spirometreur (Lung capacity)

Spiralo3+logiciels 2800 euros TTC

Glycemical control

One touch Verio Pro 74 euros TTC

TOTAL (excluding options) 10589 euros TTC

Medium-heavy equipments (optional)

Ultrasonic echograph (3D ,Doppler)

MAV 580 15000 euros TTC

Analyser Hématology : Urines, Particles, Chemistry

Siemens,EKSV,Hengda 15000 euros TTC

Total options : 30000 euros TTC

TOTAL GENERAL 40589 euros ttc.

Remark: Equipment prices were introduced solely to assess the real cost of a platform, without any business considerations or technological optimization.