METHODOLOGICAL PROPOSAL ON SAFETY IN THE TRANSMISSION OF MEDICAL IMAGES IN TELEHEALTH SYSTEMS

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ABSTRACT

Information and communication technologies are managing to modify certain essential aspects in the lives of forgives, one of the positive impacts on the lives of people and even more so in the communities, is related to the democratization of health, bringing health For most people, it improves the quality of life, thus, the objective of this work is to be able to present a practical methodology, to be able to carry out a remote diagnosis, through the analysis of medical images, whether of any type or modality, the methodology is very practical because it does not require high value infrastructure, on the contrary it is considered as low cost, because we use computational resources that are available. The methodology allows a diagnosis by a doctor specializing in radiology, who being at a distance can help the

diagnosis. The methodology allows the transmission of information, essential, which corresponds to the identification of the affected areas or that are considered with alterations in the image, this process consists of defining a mask for identification, the doctor who performs the diagnosis does not require sending the original image, otherwise it only requires the sending of the marking, with this you can use simple information delivery mechanisms that do not consume much resources, this is one of its strengths of the methodology. As a result, we present a simulation of the methodology, using computerized tomography images of the Brain, where foreign objects are identified in the image, we proceeded to use the methodology, where the DICOM image was converted to PNG; then we proceeded to mark the foreign objects in the image, and finally the image was obtained with all the markings, this image is sent to the health center of origin, for registration. The methodology can be replicated, used and adapted to each of the characteristics and needs of each health center.

Introduction

Telemedicine is one of the computer techniques that is showing the greatest growth in the health area with the use of information and communication technologies, caused by its growth and accelerated by the effect of the pandemic, which makes it possible for most of the activities performed by the person are performed virtually.

TELESALUD systems are being the most used, with the help of telediagnosis systems, allowing interaction between patients, doctors and their respective medical information, in the market there are many commercial applications where sophisticated communications systems are used to perform tele diagnostic. In the academic environment, many solutions are being developed that contribute to the development of these systems, where we can indicate that TELESALUD systems, being used in applications for outpatient hospital care [1], were implemented in most health centers. Many mechanisms that allow doctors to attend to their patients, through various available mechanisms, depending on their technological resources, have developed implementations, protocols dedicated to improving teleconsultation services [2].

Infrastructure is one of the considerations to take into account in the development of these Teleconsultation systems, there are many jobs where it is proposed to use various technologies, their use will depend on access to this infrastructure and the investment that may occur [3]. The response of society is evidenced in the gradual acceptance of these systems caused mainly by the effect of the COVID-19 Pandemic [4].

With the advancement of technologies applied to Health, with an emphasis on Information and Communication Technologies, they are causing a revolution in the health aspect, helping to access many health services in remote and inaccessible places. Achieving Telehealth services, thereby democratizing Healthcare. [5].

Materials and methods

The proposed methodology consists of 3 processes, where it is considered at first, the selection of information to be considered essential in order to

ensure the continuity of a person's life in a medical emergency situation, to have this information It is vital to ensure adequate medical care, after selecting the information it is necessary to have a means that is portable and easy to use for storing this information and that everyone can carry it, that is why the RFID device was selected that ensures a practicality in use and easy handling both for the medical part and for people. Finally, a protocol for reading the information contained in the device is presented, therefore certain necessary steps are defined to ensure the integrity of the information.
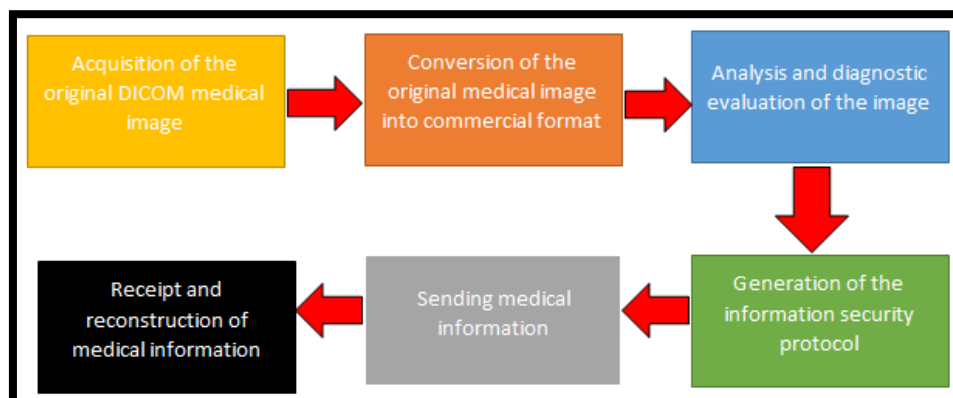

Figure 1. Block diagram of the proposed Methodology

In Figure 1, the methodology to ensure the transmission of medical images in TELESALUD systems is presented, with an added value characterized by sending an initial diagnosis, so that it can be evaluated remotely, by specialist doctors located a long distance.

Acquisition of the medical image: the methodology begins with the acquisition of the image, the result is a medical image in the DICOM format, this format has a particularity that is the file contains information of the image with the information of the patient, and has the disadvantage that it can only be view with special programs that allow you to open the DCM format.

Conversion of the original medical image into commercial format: Due to the problem of the DICOM format, it is necessary that the file can be viewed in a commercial format, the chosen format is PNG, with this conversion, the medical image can be viewed without problems, so a specialist doctor who is at a distance can view the image and perform a diagnosis.

Analysis and diagnostic evaluation of the image: After having the image in PNG format, the image analysis and subsequent diagnosis is carried out.In this process, computer tools can be used to mark the image areas where it presents some alternation that shows some clinical pathology, due to the ease of the format la Image with the marking made can be saved in the same PNG format and sent back for application and integrated into the patient's medical record.

Generation of the information security protocol: the security of the information in the diagnostic imaging of the methodology that is presented, is characterized by the sending of the image and the marking made on the image in PNG format, in this way you can have the coordinates of the markings separately and thus be able to visualize and locate the area marked in the original DICOM image, resulting in the original image in its maximum resolution with the information of the affected area, in order to carry out the corresponding treatments.

Sending medical information: He sent the information is of vital importance, due to the weight of the files, for this reason the marking of the image and the medical image must be sent in PNG format, as well as the patient's data, the information can be sent by different means that may be available.

Receipt and reconstruction of medical information: The reception of the information is of vital importance, because it is essential that the information is not distorted throughout the process, the ideal is to be able to recover in its entirety, so that the diagnosis can be made as precisely as possible in the same way the information that will be stored in the medical record.

Results

The results are presented, they are organized, with the intention of being able to demonstrate the Application of the methodology, where the steps to be taken in the management of the medical image will be indicated, as well as the processes to follow for the transformation, marking, and sending the information, so that the information can be sent with the information that corresponds to a possible pathology present in the medical image.

Figure 2. Original Image of Computed Tomography in DICOM format

In figure 2, a computerized tomography image is presented, in DICOM format, in order to test the proposed methodology. The image shows foreign objects in the cerebral cortex, so it is necessary for a doctor in the radiology specialty to perform a remote diagnosis.

As a mechanism, for the evaluation and diagnosis of the image, the DICOM image is converted into PNG format, so this change of format is carried out and sent to a radiologist, so that the doctor can make a mark of pathologies in order to be able to have the registration in the original image.

Image 3 shows the marking made by the radiology specialty doctor, where it indicates the location of these foreign objects in the image, which is marked in red, indicating the location for further analysis. Image 4 shows an image with the markings made, where the location of foreign objects in the medical image can be seen.

In figure 2, the card that is necessary for both recording and reading the data is presented, this card is connected to the computer application developed to interact with the storage device.
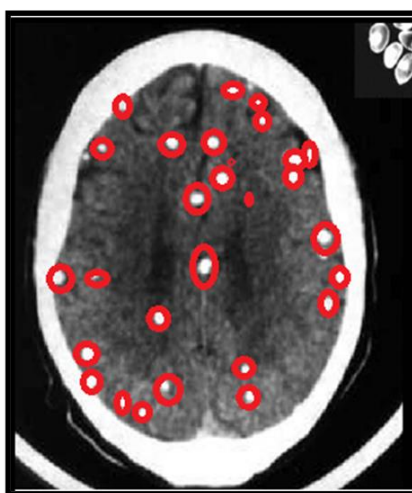

Figure 3. Image marked with the location of foreign objects in the image
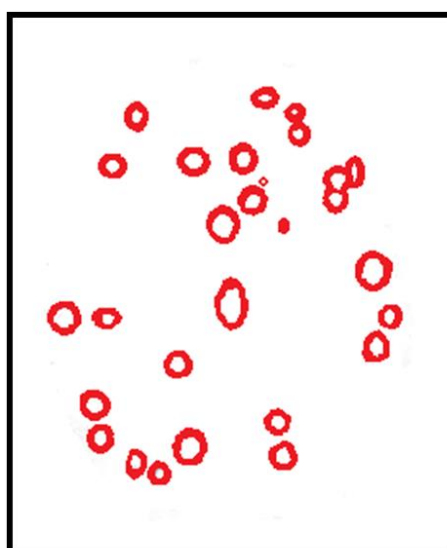

Figure 4. Image with the mask of the markings that correspond to each foreign object present in the image

We can indicate that the proposed methodology helps in the diagnosis of medical images at a distance, which helps a lot, if you do not have a doctor of radiology spatiality, the remote diagnosis helps to a great extent, to be able to make decisions in the field health, which can be useful to safeguard people's lives.
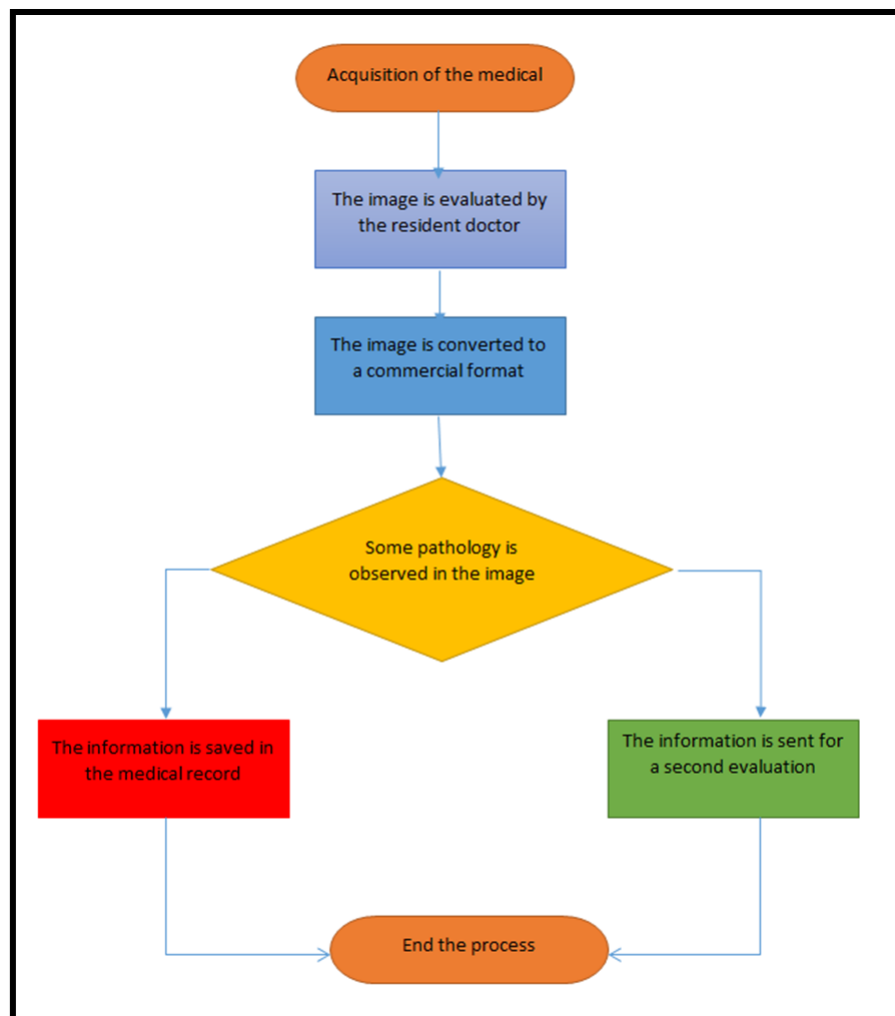

Figure 5. Flow chart of the methodological proposal

In figure 5, the flow diagram of the proposal is presented, where the main factor is to be able to analyze if the medical image presents any pathology, if the answer is positive, the methodology is activated and the image is sent to your TV diagnosis, otherwise the image is recorded and stored in the patient's medical record.

Conclusions

Medical images present today one of the most useful ways where information and communication technologies help to care for people's Health, as their development is evidenced in all aspects, new ways of being able to be exploited, one of these new applications that has been given and that is becoming more and more used, is the issue of remote diagnosis, with

more emphasis in these times of pandemic caused by COVID-19, where most of the attention and Interaction with doctors is carried out in virtual form, that is why the methodology that is presented is of practical use and with great potential, so that it can be implemented and taken into clinical practice.

It is a reality that in many of the countries of South America, there is a deficiency in specialist doctors, due to several factors, which is why the methodology helps a lot in being able to have doctors specializing in radiology, connected in a remote diagnostic system. A few decades ago it was not thought that these remote diagnosis mechanisms could be implemented, but in these times they are being considered and with great potential in the various uses, the essential part of the methodology is to be able to carry out the diagnosis of the image , by converting the DICOM image to a commercial format that is PNG; where the doctor can make all the corresponding observations. Finally, from this image only the markings are extracted in a kind of mask, where only the markings are presented, in order to be able to transmit the image mask, only with what is noted by the specialist doctor.

Finally, it is concluded that the methodology allows a joint evaluation, by several doctors simultaneously, for this task the same image in PNG has to be sent to several doctors, and each of them can make a diagnosis, then a kind of of the medical board, for the final diagnosis, it is necessary to indicate that the methodology can be implemented through a service of sending messages by mail, mail, if there is greater availability, a telemedicine or telediagnosis system can be implemented.

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