Telemedicine Backpack: Helping rescue teams to send vital sign measurements to healthcare professionals in inaccessible areas

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3 A LURTE centre of natural risks in mountain areas

ABSTRACT: Supported by the Interregional Cooperation Program Spain-France-Andorra POCTEFA INTERREG IV A 2007-2013 as part of STIPP Project and with the aim of improving the prevention of risks in the Pyrenees, the Technical Institute of Aragon (ITA) and the Aragon Regional Healthcare Service (SALUD) have developed and implemented a telemedicine backpack in order to better manage security and health care for people with a health problem by illness or accident until the arrival of the official rescue teams on inaccessible areas.

KEYWORDS: telemedicine, backpack, mountain, healthcare, rescue, accident, vital signs, ECG

1 INTRODUCTION

STIPP Project belongs to the Interregional Co-operation Program Spain – France – Andorra POCTEFA INTERREG IV A 2007-2013. The acronym STIPP stands for “Système Transfrontalier d’Information pour la Prévention dans les Pyrénées en French, and for “Sistema Transfronterizo de Información para la Prevención en los Pirineos” in Spanish or translated in English “Crossborder Information System for Prevention in the Pyrenees”.

STIPP Project consists of several actions. Among them, action number 4 is called "Crossborder Information for medical assistance in mountain areas". The objective of this action number 4 is "Getting a better management of safety and healthcare (people with a health problem due to disease or accident) until the arrival of the official rescue teams in areas with a difficult access.

To achieve this goal, the solution of this project must raise these three commitments:

- Reduce the delay time of the request for help
- Furnish a simple healthcare assistance whether the event must wait the arrival of rescue teams or not.
- Expedite the exchange of information between the protagonists of the rescue chain or rear healthcare, ie among those attending the wounded and those who will later attend.

In this context and to meet these commitments it has been designed a solution based on what is called "telemedicine backpack".

2 PURPOSE

The telemedicine backpack consists of several vital constant signals devices connected to a tablet PC that is equipped with a specific software application capable of collecting and organizing these measures and sending them to a reference center (e.g. hospital).

The scenario for which this solution arises is: Telemedicine's backpack is stored in mountain refuges, called for this occasion "intervention centers": These centers serve to non-medical personnel for providing a first aid assistance to a wounded person. They also act as a linkage between the wounded and the specialist and healthcare professionals located in a hospital, also called "reference centers".

Refuge’s staff, or any person who has received an specific but simple training, collects the injured information and sends it to the emergency specialist. This specialist makes a first evaluation and decides what is most appropriate in each case: managing the rescue, indicate some specific attention or just collect this information to be incorporated into the patient's health record once it arrives to the hospital.
With this information, a crossborder healthcare network is created with a centralized connection between refuges and hospitals. All the refuges that have this equipment can send the information to a common server that can be connected to all the reference centres. The reference centre to which the wounded belongs or where it will be moved attends the corresponding application. Thanks to this proposal, the attention to a wounded can be prepared in a country although the accident happened in a different country.

3 TELEMEDICINE BACKPACK

The STIPP telemedicine backpack is based on two fundamental concepts: the first is its portability due to its low weight and to its ease of transport and the second is the simple of use of its components.

The backpack consists of three main components, placed along different departments in the backpack, with also place to keep the different systems and devices that are needed to monitor the vital signs and also place for other medical supplies such as bandages, gauze, tape or razor blades.

Figure 1: Actors, elements and centres involved in the proposed solution.

Figure 2: Crossborder health network.

3.1 PC tablet

The first component is a robust PC tablet that may get wet (waterproof), can fall to the ground without breaking, and is not affected by sunlight. It can also take pictures. It has an integrated software that collects basic data from the wounded. Some of the medical instruments are managed from this tablet PC.

3.2 Electrocardiogram device

The second device allows to make a twelve-lead electrocardiogram. The ECG recording uses the following components:

- The electrocardiogram recorder that is connected to the tablet PC and weighs no more than 100 g.
- An USB cable to connect the device to the tablet PC.
- An ECG Electrode belt that once placed on the injured’s chest serves to make the twelve-lead electrocardiogram.
- Tweezers or pincers for been placed on extremities (legs and arms).

The main three components of the backpack are:

Figure 3: The complete telemedicine backpack: PC tablet, ECG devices and monitor.
3.3 Monitor

The third component is a monitor with the size of the palm of a hand, weighing less than 1 kg used for collecting basic vital signs. This monitor has a series of connections that will allow to monitor heart rate, breathing rate, blood oxygenation, etc.

4 INTEGRATION OF THE COMPONENTS WITH A SPECIFIC SOFTWARE

This software is the real heart of the telemedicine backpack and it has been designed in an intuitive way to facilitate as far as possible the collection of biomedical signs.

The information contained in this PC software consists of:

- The patient’s personal data
- The location of possible damage, injuries, bruises or burns
- Conducting a Glasgow scale.
- SHORT algorithm realization.
- Capture vital signs and instant monitoring.
- Continuously monitoring of these vital signs
- Registration of the 12 lead electrocardiogram.
- It permits the capture of images with the camera located on the tablet PC and its storage as supplementary information.
- Attachment of any other document considered interesting to report on the assessment of the patient.

The software is operated intuitively through drawings, images and questions so that the information is incorporated step by step for the evaluation of the condition of the victim.

At any point in the program a connection with a reference centre can be made by pressing an icon. When performing this action, all the reference centres that are connected at the time are shown and information is sent automatically. Also at any time photos can be taken and sent to the reference centre or been stored if it may be relevant.

5 CONCLUSION

The main objective of telemedicine backpack is that non-medical personnel can perform a medical data collection of a wounded in a mountain refuge or at a place with a difficult access so that a fast data collection can be done and the attention can be managed more quickly.

These data are sent to a reference centre where skilled healthcare personnel can analyze the information in order to conduct an assessment of the patient.

This collection of data is done through a program installed on a Tablet PC. The specific software has icons so that the data collection can be made easily and also other relevant information can be added.

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