Telemedicine in the Argentine desert of Atacama

Augusto Ittig

Clinical Coordinator Emergency Telemedicine Service, Admiralty (ADY) Resources Limited, Jujuy, Argentina.

Abstract

The implementation of telemedicine in the Atacama Desert to attend a mining town, using channels of image, voice, digital medical, multiparameter monitors and respirators online remote connectivity solves the problem of emergency medical care in places technically impossible be provided by a doctor, saving time care, quality of education, creating learning processes, reducing transportation costs and generating greater medical security in those places.

Keywords: *Remote Consultation; Telemedicine; Ambulatory Care.*

Resumen

Telemedicina en el desierto de Atacama Argentino

La implementación de Telemedicina en el Desierto de Atacama para atender a una población minera, usando canales de imagen, voz, historia clínica digital, monitores multiparametricos y respiradores con conectividad remota on line permite resolver el problema de atención médica de emergencia en lugares técnicamente imposibles de ser provistos por un médico, ahorrando tiempo de atención, calidad de la misma, generando procesos de aprendizaje, disminuyendo los traslados y sus costos, generando mayor seguridad medica en esos lugares.

Palabras-clave: *Consulta Remota; Telemedicina; Atención Ambulatoria.*

Resumo

Telemedicina no deserto do Atacama Argentino

A implementação da telemedicina no Deserto do Atacama para atender a uma população minera usando imagens, voz, história clínica digital, monitores multiparametricos e respiradores com conectividade remota on line permite resolver o problema de atenção médica de emergência em lugares tecnicamente impossíveis de se prover médicos melhorando o tempo de atendimento, o processo de aprendizado, diminuindo o número de deslocamentos e custos com transferências de pacientes e consequentemente gerando maior segurança médica nestes lugares

Palavras-chave: *Consulta Remota; Telemedicina; Assistência Ambulatorial.*

INTRODUCTION

It is defined as telemedicine the provision of services of remote medicine. For its implementation, it is usually used information and communication technologies. The word comes from the Greek (tele) meaning distance and medicine. The telemedicine includes both diagnosis and treatment, as well as medical education. It is a technological resource that enables the optimization of health care services, saving time and money and facilitating access to remote areas to have specialist care. It is the distribution of health services in which the distance is a critical factor. There are experiences like the experience in the Tanzania jungle for the pediatric care, or in rural hospitals of Arizona.[1-3]

So we can name some services that the telemedicine provides:

- complementary and instantaneous services to the specialist care (Obtaining a second opinion);
- immediate diagnoses by a specialist doctor in a determined area;
- remote education of students from nursing and medical schools;
- digital archive services of radiological tests, ecography, computerized axial tomography, nuclear magnetic resonance.

The aim of this paper is to present the results obtained from the use of telemedicine in a mine in the region of Puna in Argentina, where it was developed and implemented a system that provides medical and technical distance support to a health staff which is in unfavorable conditions of intervention and resolution of a wide variety of cases through the telemedicine.

The mine is situated on a salt lake in The Andes, tripartite limit between Salta – Jujuy – Chile, in an arid and rough environment, with wind gusts of 70 km x h, an average height above the sea level of 3800 – 4200 m, winding dirt roads, stone, mud, flagstones, and snow in a great part of the year, with temperatures ranging between 15 ° C and -10 ° C, reaching during winter temperatures of -25 ° C.

The above summarizes the difficulty of finding people who would risk rendering medical services under such conditions, without detailing further the distance between this camp and the nearest hospital of highly complexity is 350 km away approximately, resulting in 4 to 6 hour travel depending on the weather conditions, the routes available in this moment, and of course the risk involved. (Figures 1, 2 and 3).

Figure 1 - Argentine Atacama Desert.

Figure 2 - Mining camp.

Figure 3 - Mining camp.

Taking into account all these things, in early 2011, it began to carry out the development of a telemedicine project that serves as a support for the employees who are there.

METHOD

Infrastructure

By studying a mining camp in which about 150-200 people between 20-60-years old, in turn of 14 x 7 and 7 x 7 average time with strong cultural identity, the work of the clinical team consists of 2 doctors, 4 nurses set up on site and endless consultations with various specialists if required.

It was developed a software that allows to provide remote assistance to people in need through various elements such as: IMAGE – AUDIO – VIDEO x 3, direct anamnesis, online multiparameter values, the implementation of a digital clinical history of each patient also in the online format, as well as management of supplies and drugs in the same way. In a purchasing project, digital RX and ECO, digital lab, and others.

It was installed a physical space called "nursing", which is fully equipped with various medical supplies, such as: multiparameter monitors, respirators / artificial fans, DEA, beds, couches, desks, PC, showcases with drugs, immobilization elements (tables, necklaces), video cameras, utilities and much more (Figure 4).

Figure 4 - Nursing camp.

A multiparameter monitor is a medical product designed for monitoring more than one physiological variable (or vital signs), all these very important to determine the state of a patient, and to alert the professional when the measured values of any vital signs is altered in a programmed range as "normal" for every situation (the maximum and minimum limits are set by user). The multiparameter monitors can be configured with different modules, each one associated with a variable to consider, and sometimes are classified according to the final application obtained with each configuration. Currently, they are configured and offered with five parameters, known as basic parameters, which are: electrocardiogram (ECG), respiration, temperature, non invasive pressure (PNI, or NIBP) and blood oxygen saturation or pulse oximetry ($SatO_2$). In addition to these modules, it is possible to incorporate others as invasive pressure (PI or IBP), capnography (CO_2), cardiac output (GC or CO) and analysis of gases in exhaled air.

As artificial respirator, the medical fan can define any machine designed to move air in and out of the lungs, in order to supply the patient's breathing mechanism who physically can not breathe or breathe insufficiently. In its simplest form, a modern positive pressure respirator consists of: a turbine or a compressible reservoir, a source of air and oxygen, a set of valves and tubes, and a disposable or reusable "patient circuit". The respirators can also be equipped with monitoring and alarm systems for patient parameters (such as: pressure, volume and flow) and the fan function (for example: air leaks, power outages, mechanical failures), backup batteries, oxygen tanks and a remote control.

These two fundamental elements in the care of a patient have a peculiarity in this service, as both can be controlled in the online format from anywhere in the world, as well as the same parameters that visualizes the nurse in the camp can visualize a doctor or anyone else on his PC monitor, notebook, cell phone or other device that has built-in software that we mentioned, with the possibility of having accurate data about the state of any patient and may also do with the respirator and may modify or restore commands or values to improve the situation of each patient.

For the transport, it was especially adapted a 4x4 mobile in order to function as a high complexity ambulance according to the requirements of the place. In this mobile, it also has a multiparameter monitor and a portable fan, with independent and adapted batteries to supply power through the load in the same ambulance. These two devices have remote connectivity, therefore during a transfer, and having connection such as WiFi towers or G4 satellite phone, it is possible to monitor in the online format, the patient's activity throughout the transfer route, being able to modify actions related to the patient's medical situation. (Figures 5, 6 and 7).

The connection takes 5-7 hours using the ambulance specially equipped with oxygen, a monitor and a respirator for critically ill patients.

Training and qualification

The staff was trained entirely in PHTLS – Pre Hospital Trauma Life Support, and various courses of urgencies and emergencies.

Figure 5 - Patient transport.

Figure 6 - Patient transport.

Figure 7 - Ambulance.

Knowing that today, the medicine is fully intricate and therefore each individual highlights in a specific area the various consultations through this system performed by the medical staff and nurses to different specialists are invaluable. It could be solved countless cases submitted that if not for this tool should have been derived or evacuated from the camp.

RESULTS AND DISCUSSION

During these 3 years of activity in the camp, we can say that the results are more favorable, considering that:

If it was offered during 3 years a total of 4152 attentions of various types evacuating from the camp 38 cases, representing only 1% of all care, with all that this implies in terms of economic factor, security, time, and others. Keeping the mortality rate 0 and not registering so far patients with sequelae of pathologies or injuries.

Taking into account this 1%, it could also assume that more than half of these derivations would not have given in case of counting on diagnostic methods such as digital radiology and online laboratory.

For the company, this index of derivations results in a significant reduction in the budget which was previously destined to employees' transfers who suffered from various diseases and / or labor incidents to the various asssitance centers, not only in the economic sphere, but also in working hours, replacement by another employee, utility of vehicles and personnel for this task and especially production (Table 1).

Table 1 - Cost of patient referral

Cost of patient referral	Concept	Value ($)
Distance: S.S. de Jujuy	700 Km	–
Toyota Hilux Van	Performance 10x1: 70 lts	$ 700.00
Patient: x	Monthly salary: $ 6,000	$ 3,000.00
Chauffeur: x	Monthly salary: $ 8,000	$ 500.00
Productive Impact	Reduction in the production	–
Viaticum	Stay and food	$ 300.00
Replacement: x	Monthly Salary: $ 6,000	$ 3,000.00
TOTAL	$ 7.500,00	–

100% of the population participated in on-site and online training courses on first aid, extrication, immobilization, basic RCP, and various prevalent diseases in the area, as well as managing intelligent vehicles in case of patients' transfer

in van or ambulance. Managing to create special brigades of intervention and rescue that can act if necessary.

The mining town accepted the project and today it is a trusted source for the development of their daily activities. The quality of life of the population improved through the years, the incidence of clinical pathologies is less than we had at the beginning of the project, all through talks of education and awareness, annual immunizations such as influenza vaccination, anthropometric controls and meal plans and physical activity. Thus, reducing risk factors for various diseases.

The results are also favorable, taking into account the statistics of derivation, comparing the data regarding the amount of care and derivations that occurred in certain months in the health posts of the surrounding populations.

Comparative of quarterly care between December 2013 and March 2014 of Health Posts with Nursing WITHOUT Telemedicine (in black) and Nursing WITH Telemedicine (in red) in the same area (Puna) (Table 2).

Table 2 - Attended patients and derivatives

Post	Attended patients	Derivatives	%
Jama	219	36	16
Barrancas	376	63	17
San Juan Quillaque	220	18	8
El Toro	279	18	6
Olaroz	247	36	15
Pastos Chicos	186	54	29
Huancar	283	54	19
Salar de Rincón	221	4	2

CONCLUSION

As evidenced by the work, the use of Telemedicine is useful because it allows more people in remote areas to have the best quality health care, so the parties involved are favored in the bio-psycho-social, cultural and economic areas. With successful results, the overview and challenge is to incorporate new technologies and connect all the mines and oil companies from Argentina to the capital Buenos Aires.

REFERENCES

1. Nader KC. Como la distribución de servicios de salud, en el que la distancia es un factor crítico, donde los profesionales de la salud usan información y tecnología de comunicaciones para el intercambio de información válida para el diagnóstico, tratamiento y prevención de enfermedades o daños, investigación y evaluación; y para la educación continuada de los proveedores de salud pública, todo ello en interés del desarrollo de la salud del individuo y su comunidad. Cuba: OMS; 1998.
2. Mitchell M. Initial experiences and outcomes of telepresence in the managementof trauma and emergency surgical patients. Am J Surg. 2009; 198(6):905-10.
3. Hospital de Susques. Departamento de Estadísticas. Jujuy, Argentina.