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Conflicts d'intérêts : aucun.

ABSTRACT:

Epilepsy is a real health care problem in Morocco, it is certainly the most common incapacitating neurological condition. The WHO estimates that 50 million of people are victims of epilepsy. It is the second reason for neurological consultation. This represents a failure of conventional face-to-face medicine in Morocco as in many developing countries. It is estimated that 80% of the global health burden represented by epilepsy is borne by the developing world, where 80% of people with epilepsy reside and do not receive modern treatment, or are not even identified. Poor infrastructure, insufficient availability of drugs and scarcity of trained medical personnel are all relevant factors for this situation. Might a telemedicine approach do better? To answer this question, we aimed to highlight the importance of the use of mobile phones for all aspects of epilepsy. The telephone and smartphone applications should give considerable medical support to diagnose and manage epilepsy. Smartphones might contribute to two steps - diagnosis and review. A tool that enables non-doctors to diagnose episodes as epileptic has been developed as a mobile phone app and has good applicability, sensitivity, and specificity for the diagnosis. There are a number of ways in which the use of phone review or short messaging service can improve management.

INTRODUCTION:

Epilepsy is one of the most common serious brain conditions, affecting over 70 million people worldwide. Its incidence has a bimodal distribution with the highest risk in infants and older age groups [1].

It is one of the commonest neurological diseases. Epilepsy is the second most common reason for consultations in neurology after headaches. Its prevalence from a door-to-door study was estimated to be 1.1%. Based on the prevalence, it is projected that there are about 370 000 PWE in Morocco, and a reported death rate of 0.2% [2].

Lack of neurologists and their unequal distribution. Considerable progress has been made in medical training in Morocco. The current number of neurologists in Morocco is 180; however, most of them remain at Casablanca and Rabat and other major urban centers. The authorities have shown a keen interest in community-based medicine, yet this seems inadequate to reach a population dispersed over vast territories. In April 2006, the Neurology Department of Marrakech and the Moroccan Association Against Epilepsy (MAAE) initiated a program of itinerant clinics to fill the gap in neurology consultations in South Morocco. The program started at the town of Ouarzazate and its environs. This important region had remained without neurologists until 2010. The program has helped with the management of PWE, train general practitioners in the region to treat epilepsy, and to start an electroencephalography unit [3]. It is due to intermittent paroxysms of disordered electrical ac-

tivity in the brain causing loss or alteration of consciousness and usually a convulsion (these are called epileptic seizures). Although epilepsy can be associated with other structural brain disease most people with it have only epilepsy [3].

The majority of people with epilepsy (PWE) in the world live in low- or middle-income countries (LMICs). These countries have high treatment gaps – the percentage of people with epilepsy not on treatment. These range from 50 to 90% and are larger in rural areas than in cities. One of the reasons for large treatment gaps is an absence of doctors to treat and manage epilepsy. This is much worse in rural areas where the great majority of these people live and where doctors generally neither live nor visit. For the same reasons those patients with epilepsy already on treatment often receive a sub-optimal service. So other methods of care are needed if both the epilepsy treatment gap is to be reduced and epilepsy care improved. [4]

Of all telemedicine techniques the telephone is perhaps the most potent especially with the advent of the mobile phone which make it both ubiquitous and portable. Its commonest use in epilepsy in both high- and low-income countries is to obtain an eye-witness account of an episode where the patient is in the clinic, but the eyewitness is somewhere else. There is little published on this probably because it is so obviously beneficial. The telephone is also used extensively by epilepsy specialists in high-income countries, both nurses and doctors. [3]

Methods:

During 4 month we selected from all our senior neurologists records using WhatsApp messages with their PWE.

During the month of January 2021, we studied all whatsapp messages received by epileptologist of the neurology department during this month and selected all messages concerning epilepsy and identified all those for urgent requests.

We performed a systematic review of the articles published between January 2000 and January 2020 using the PubMed search engine (<http://www.ncbi.nlm.nih.gov/>).

We had the consent of all the patients before publishing the messages.

The following keywords were used: telemedicine, epilepsy problems, phone messages.

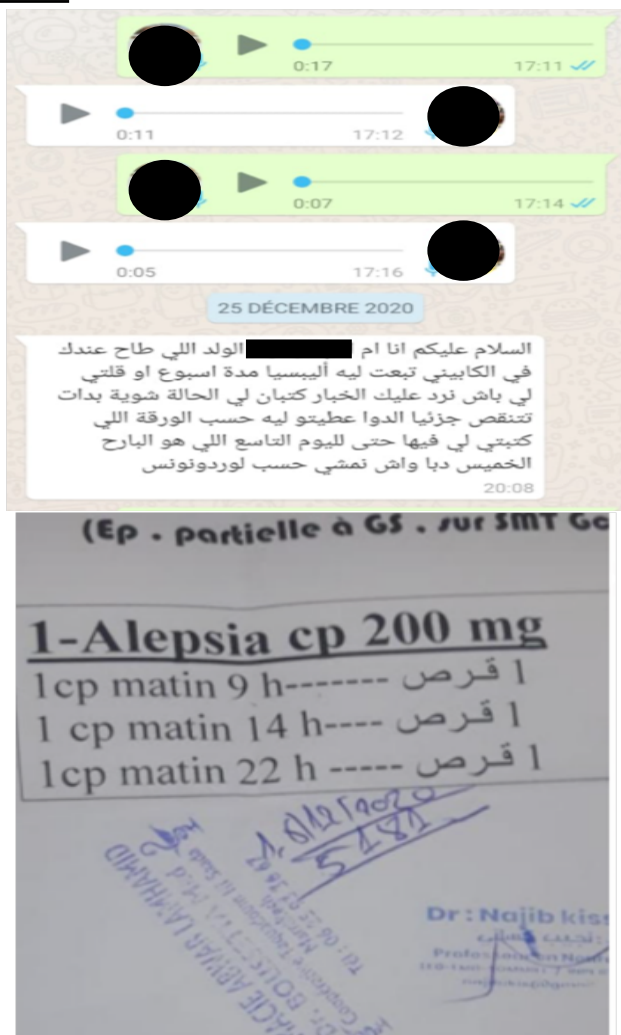
Objectives:

One of the article desired goals is to show how the patient could be satisfied with a reduced cost of care, having medical appointments wherever by using a variety of telemedicine tools.

Results

Our experience: within 1290 message per month, the message concerning patients constitute 150, and epilepsy is found in 29 messages and 8 were urgent situations, from which we selected 5 different stories:

Case 1 :



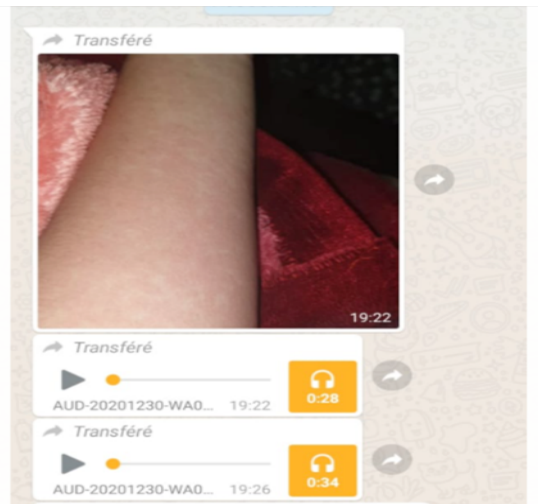
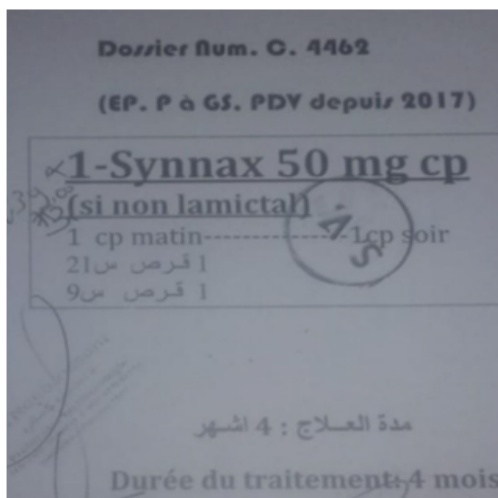
Translation

Hello, I am the mom of the patient who fell in your cabinet follow up epilepsy for 1 week and you tell me to give you news of his health. He feels better now. Should I keep the same treatment?

Situation

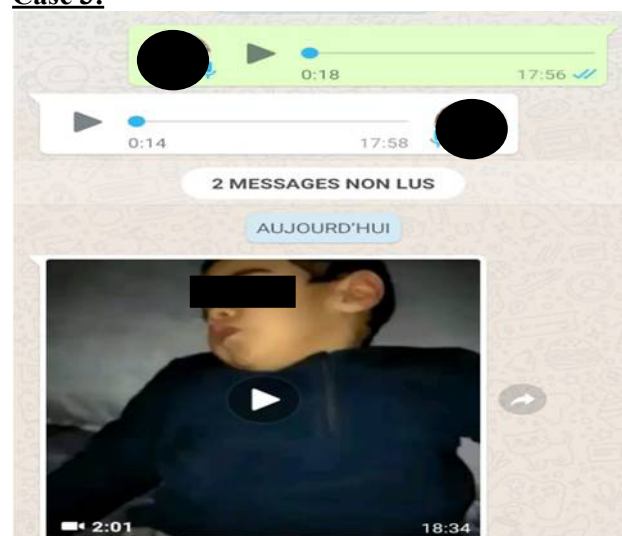
This patient went to Italy and he couldn't come back to morocco for his medical follow up so we solved the problem by using a simple mobile phone message.

Case 2 :



This patient with history of epilepsy who had an allergic reaction to the 1st treatment. We were able to solve the problem with whatsapp messages and calm the mother who was panicked.

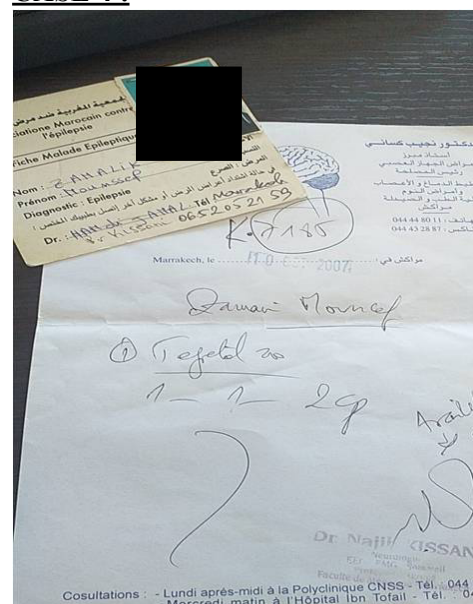
Case 3:



Spasms in LG syndrome treated with Vigabatrin efficiently.

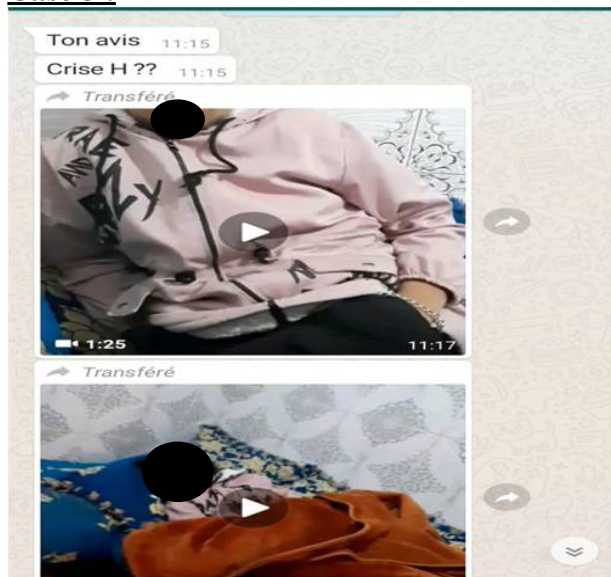
At first, there was a diagnosis doubt. the mother sent this video during the seizure by WhatsApp which helped us confirm the diagnosis.

CASE 4 :



Former patient of the Amcep (Moroccan association against epilepsy with whom we communicate by whatsapp

Case 5 :



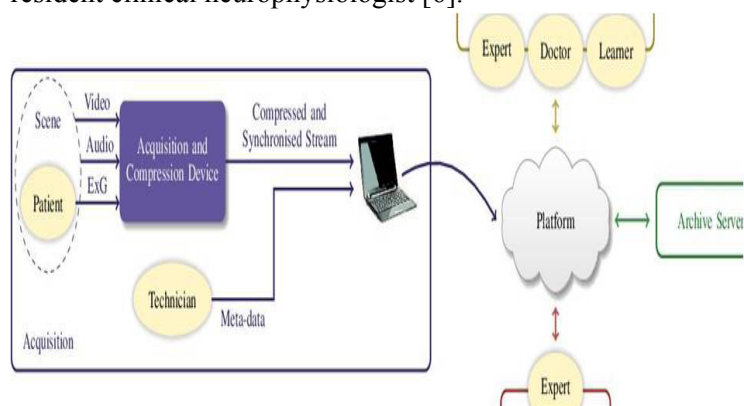
Doctor in Safi asked for an opinion about his patient by sending a video during the seizure to find out if it was CE or CH.

Discussion :

Tele EEG:

Electroencephalogram (EEG) is an essential examination in the diagnosis and management of epilepsy. The shortage of neuro-physiologist doctors in southern Morocco makes it difficult for patients to access this examination. The creation of the project TELE-EEG or EEG connected is an innovative solution to this problem? in collaboration between the military university neurology center of the city of Marrakech, the regional hospitals and the neuroscience research laboratory of the Faculty of Medicine allowing the performing and reading EEG remotely. Patients and medical staff expressed their satisfaction with the use of this connected EEG service. The impact on the number of trips, the cost and the total time invested in the EEG test have been significantly reduced [5].

Tele-EEG is a feasible, secure, timely and effective method of providing an EEG service to hospitals which cannot recruit a resident clinical neurophysiologist [6].



Text messaging using short messaging service (SMS) on mobile phones has been used as a way of continuing with epilepsy education in epilepsy patients under review.

Phone application for epilepsy diagnosis: use of the diagnostic tool :

The previously described tool was incorporated into a phone app to run on Android™ phones. This app was developed by

NetProphets Cyberworks Pvt Ltd. Each record consisted of an identifying clinic number and the 11 questions which had been defined in a previous study. These are shown in Table 1 with the available answers.

Table 1

Questions and possible answers used in the phone app.

	Questions	Possible answers		
		Male	Female	Not known
Prior to the episode	Gender			
	Predisposing factors excluding family history	Yes	No	Not known
During the episode	Colour change to red or blue	Yes	No	Not known
	Stiffness	Yes	No	Not known
	Shaking	Yes	No	Not known
	Tongue bitten	Yes	No	Not known
	Incontinence of urine	Yes	No	Not known
	Head turning to one side	Yes	No	Not known
	Eyes	Open	Closed	Not known
	Able to communicate	Yes	No	Not known
After the episode	One-sided weakness	Yes	No	Not known

This app gives the probability of an episode of altered consciousness being due to an epileptic seizure based on the answers to 13 questions [7].

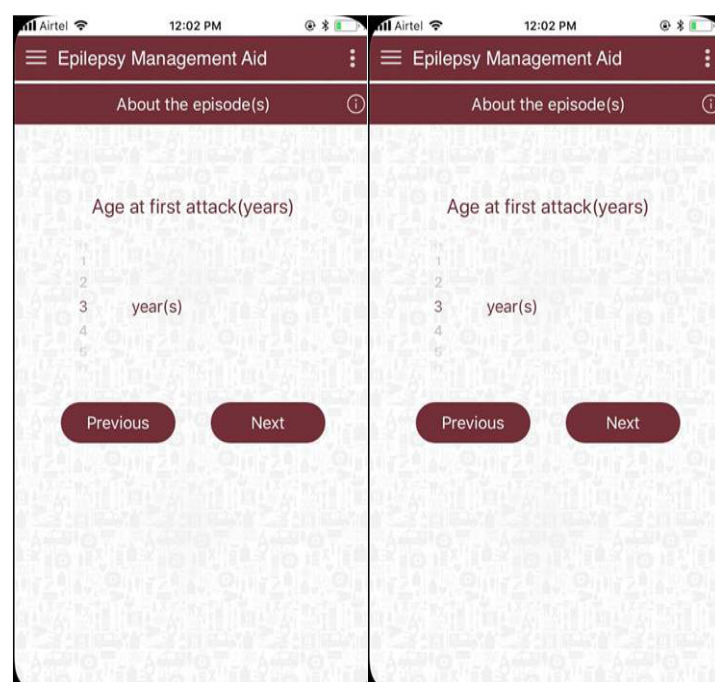
It provides an interpretation of the probability score obtained. It enables each record to be stored on the phone or tablet and uploaded on to a secure web server for later download as a .xls or .csv file.

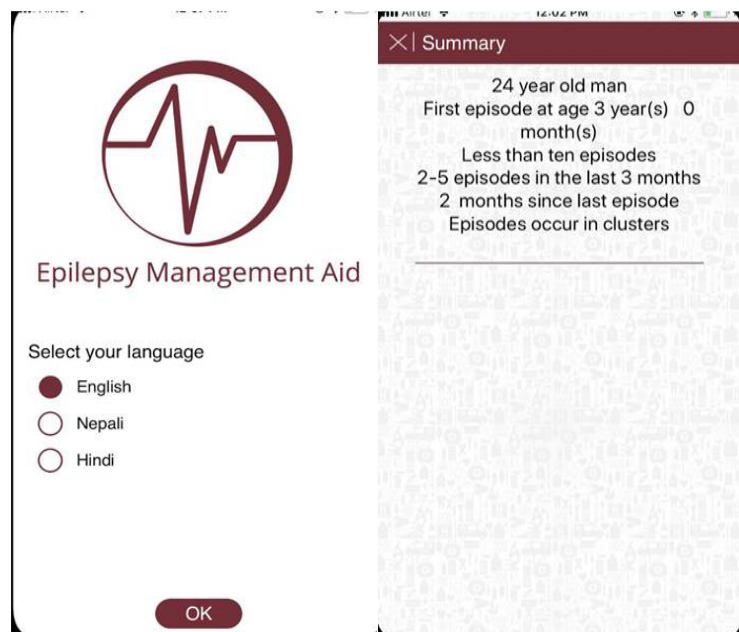
The work underpinning the app was carried out in Nepal and the app is likely to be applicable to the resource-poor world. It has been tested further in Nepal and India and the results published in scientific journals.

The app is likely to be useful in poorer countries of the world and is simple enough to use by health workers working in conjunction with doctors. Doctors in these countries who are not experienced in epilepsy may find it a useful aid.

The app should NOT be used in the developed world.

The app has should NOT be used in children under the age of nine. The app has been developed by Dr Victor Patterson, founder of Synapse Teleneurology Ltd and built by NetProphets Cyberworks Pvt Ltd who jointly hold its intellectual property [5].





Telemedicine:

Telemedicine (TM) is the use of telecommunications' technologies to provide medical information and services. Telehealth (TH) permits broader and psychosocial support for patients and their families. More than 50 million people have epilepsy, and barriers to care include shortage of human resources, medical facilities, and resources. Eighty (80) percent of people with epilepsy (PWE) live in low- and middle-income countries. Telehealth has the potential of addressing limited resources and improving access to PWE across the globe. [8]

It is practical to use this modality where direct physical contact with the patient is not necessary and physical signs and verbal communication is sufficient. Tele-epilepsy is most effective and useful where the majority of the appointment is focused on clinical discussion, counseling and focused neurological examination only requiring inspection. It is most convenient and useful for patients living at considerable distances from the specialist care. Patients who develop a drug rash may not be ideal for telemedicine as the resolution of observation is not optimal. Similarly, patients who require palpation or auscultation either need a nurse or physician on the other end or alternatively need to visit the conventional clinic. [9,10]

Teleconsultation seems useful answering the patients' needs according to both physicians and families. Despite some limitations, it is most likely that TCs become a new part of the clinical activities in rare pediatric epilepsy centers.[11]

Conclusion :

Our study demonstrates significant cost savings for patients (in terms of transportation, accommodation, and missed work) with telemedicine technology, and a high rate of patient satisfaction. In the future, telemedicine will see wider applications in the care of patients with chronic diseases, especially those requiring a long-term and frequent follow-up care. Telemedicine offers a unique opportunity for a Global Health Care network addressing issues related to individual patients as well as a wider application in the education of health care providers. [10]

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