

Economic Impact of Health Intervention by Telemedicine during COVID 19 Pandemic at Nicaragua, June-July 2020

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Abstract

Introduction: SARS-CoV-2 its infectious diseases was named coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO) pandemic.

The first report on prevalence of SARS-Cov2 at Nicaragua, showed the first cases March 2020 and during the months of June and July began exponential growth period.

The telemedicine can provide rapid access, efficient and immediately available person. This approach has been explored most fully in the context of Covid 19 stroke. The estimates of intervention costs are really challenge, particularly for low- and middle-income countries. Create a health strategy during a health emergency with the lowest cost investment but great population health impact is the primary objective. The gold of this study decided the economic impact, through of the cost benefit of medical advice through mobile phone during the COVID-19 pandemia, as health strategy at Nicaragua.

Methods: A cost-minimization analysis was carried out, during two months after the use of telemedicine as health intervention face to Covid 19 at Nicaragua. A sensitivity analysis was carried out increasing the baseline of telemedicine by users.

We have reviewed the file records of 5,712 mobile phone call as Interactive Voice Response (IVR) service.

The economic impact of this health intervention was decided the Cost benefit through of the cost efficient of this.

Direct costs: administrative resource, domestic cost to physician payments. Cost of medical training, cost of mobile phone equipment and service. Estimated Costs for face-to-face medical care vs medical advice through telemedicine. Publicity Cost. The unit price: International Dollar (\$). The cost estimate is based local market price. The cost of medical care vs use of telemedicine identified as social savings.

Results: A total of 5,712 service of telemedicine were registered during June and July 2020. The number of visits weekly to telemedicine: June- week # 1: 1008

Week #2: 1289 /Week #3: 987/ Week #4: 923

July-week # 1:439 / Week #2: 371/ Week #3: 365/ Week #4: 330 The Cost of administrative resources: \$3,000.00 (plan, organize, execute, and monitor team) (Table 1).

The Domestic cost to physician payments: \$2,000.00 (4 physicians to medical advice by telemedicine).

The Cost of medical training to medical advice: \$ 706.00 (medical training about COVID 19 using WHO guidelines).

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Citation: Medrano F, Castro P, Vásquez JA, Gámez A, Pérez A, et al. (2021) Economic Impact of Health Intervention by Telemedicine during COVID 19 Pandemic at Nicaragua, June-July 2020. J Health Med Econ. Vol.7 No.3:52.

The Cost of mobile phone equipment and service: \$ 640.00(mobile phone equipment and network internet service).

The Publicity Cost: \$ 1,000.00 (publicity of telemedicine strategy for radio) Total Cost to health intervention by telemedicine: \$ 7,346.00

Estimated cost in the local market for 5,712 face to face medical attention: Low price: \$57,120.00.

Median price: \$ 66,259.20 Highest price: \$ 85,680.00.

The Social Saving got in Public Health with economic impact: between \$ 49,774.00-\$ 78,334.00.

Conclusion: During the months of June and July 2020 were the highest peak of Covid 19 pandemic at Nicaragua. This permitted to develop a quick health strategy of low cost but large health improvement to vulnerable population. Making use of technological development and adequate medical training permitted wide coverage, indirect decrease in cost incurred by the patients and his family, helping to avoid the collapse of hospital emergency and significantly reducing the economic cost that would have been obtained if the medical attention were in person.

Keywords: Obesity; Covid-19; Inflammation; Hypertension

Received: April 01, 2021, **Accepted:** April 22, 2021, **Published:** May 04, 2021

Introduction

In December 2019, an increasing number of cases of patients with pneumonia of unknown etiology emerged in Wuhan, China [1]. SARS-CoV-2 its infectious diseases was named coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO) [2]. With its rapid spread, the virus has extended to most parts of China and whole world, a pandemic according to WHO [3,4]. The first confirmed case of coronavirus disease (COVID-19) in Nicaragua was reported March 2020 [5]. Nicaragua made up of 15 departments and two autonomous regions. Nicaragua is part of undeveloped countries with low incomes [6]. Health intervention includes any use of resources aimed at improving health outcomes be they preventive, promotive, curative, rehabilitative or palliative. It includes clinical care and public health programs and strategies.

The WHO made a guideline about to use the digital technology intervention in the health field. The mobile phone uses by the health worker in general to allow them to offer more tasks and reach more people and work more efficiently; To find treatment algorithms on digital devices useful and reassuring because they guide and simplify deliver care may use their mobile devices to toast information and advice online [7].

After the Covid 19 pandemic as a true health emergency, the WHO and the PHAO find an excellent opportunity to use medical advice through telemedicine as health tool against it [8]. Several international experiences used of this strategy are found in the medical literature. Hollander and Brendan reported that the telemedicine can provide rapid access to subspecialists who aren't immediately available person. This approach has been explored most fully in the context of Covid 19 stroke [9]. Telemedicine connects the convenience, low cost, and ready

accessibility of health-related information and communication using the Internet and associated technologies. Telemedicine during the coronavirus epidemic has been the doctors' first line of defense to slow the spread of the coronavirus, keeping social distancing and providing services by phone or video conferencing for mild to focus personal care and limited supplies to the most urgent cases [10].

Emergency Telemedicine Consultation System has demonstrated substantial benefits in terms of the effectiveness of consultations and remote patient monitoring, multidisciplinary care, and prevention education and training. This facilitates the avoidance of direct physical contact, thus reducing the risk of exposure to respiratory secretions and preventing the potential transmission of infection to physicians and nurses [11]. Estimating the costs of health interventions is important to policymakers for number of reasons including the fact that the results can be used as a component in the assessment and improvement of the performance of their health systems [12].

The estimates of intervention costs are really challenge to some countries, very few countries are able to estimate these; particularly for low- and middle-income countries where the majority of the world's poor live, there has been little progress towards the goal of providing affordable and timely information on the costs and effects of a wide array of interventions to inform policy [13]. Create a health strategy during a health emergency with the lowest cost investment but great population health impact is the primary objective. The Covid 19 pandemic permitted to develop emergency health strategy, through of develop technology of the mobile cell phone that used to medical advice about Covid 19.

The PAHO and Inter-American Development Bank created a tool

in the face of the Covid 19 pandemic. This tool has been designed to help health institutions assess their level of maturity to offer telemedicine services. The Central American Health Informatics network, RECAINSA PAHO Information Systems for Health (IS4H) network of experts, contributed to the regional implantation of this strategy [14]. Medrano et al. presented their expertise during Covid 19 pandemic at Nicaragua, using telemedicine to medical advice through mobile phone with successful result to vulnerable people [15].

Every time that health interventions is carried out, it is necessary to use financial resources, which are increasing limited in developing countries. Implement high cost strategy with poor results in health benefits to the population it is a really tragedy in public health in the cost benefits evaluation. Knowing the economic impact of the health strategy will allow the develop of health police that make the difference in achieving more efficient health benefits at low cost.

The gold of this study is decided the economic impact, through of the cost benefit of medical advice through mobile phone during the COVID-19 pandemia, as health strategy at Nicaragua.

Method

Study type

A cost-minimization analysis was carried out, during two months after the use of telemedicine as health intervention face to Covid 19 at Nicaragua. We have reviewed the file records of 5,712 mobile phone call as Interactive Voice Response (IVR) service,

using mobile phone as established by Derenzi and Borriello [16]. The economic impact of this health intervention was decided the Cost benefit through of the cost efficient of this.

Direct costs: administrative resources, human resources to organizing, planning, implement and executive the health strategy, Domestic cost to physician payments: payments to professional service according to local market (Table 2).

Cost of medical training to medical advice: payments by period to medical training about Covid 19 disease (Table 3).

Cost of mobile phone equipment and service: payments by cost of mobile phone equipment, network and Internet service. Estimated Costs for face-to-face medical care vs medical advice through telemedicine (Table 4).

Publicity Cost: payments by radio publicity about health strategy according Baltussen and Adam [17].

The unit price: International Dollar (\$) according to Mirrlees JA. Project [18]. The cost estimate is based local market price.

The cost of face-to-face medical care vs use of telemedicine identified as societal savings (distinguishing between those of the healthcare system and of the users) from the use of telemedicine in comparison to usual care. Indirect patient costs were not included.

Cost assessment: All resources consumed during health intervention. Detailed listing of quantities and prices used in the analysis [19,20] (Table 5).

Table 1 Cost of administrative resources.

Human Resources	Person	Unit	Unit cost	Period (Months)	Total Cost \$	25% Local Market price
Director	1	1	\$250.00	2	\$1000.00	\$2000.0
Co-Director	1	1	\$250.00	2	\$1000.00	\$2000.0
Supervisor	1	1	\$250.00	2	\$1000.00	\$2000.0
Administrative Cost	3				\$3000.00	

Table 2 Domestic cost to physician payments.

Human Resources	Person	Unit	Unit cost	Period (Months)	Total Cost	50% working day / local market price
Physician 1	1	1	\$250.00	2	\$500.00	\$500.0
Physician 2	1	1	\$250.00	2	\$500.00	\$500.0
Physician 3	1	1	\$250.00	2	\$500.00	\$500.0
Physician 4	1	1	\$250.00	2	\$500.00	\$500.0
Physician payments	4		\$250.00		\$2,000.00	

Table 3 Cost of medical training to medical advice.

Human Resources	Course	Unit	Unit cost	Time	Total Cost	
Course management	One course	7	\$50.00	One day	\$350.00	3 curses online (8hours)
Personal time	One day	7	\$42.87	One time	\$300.00	Local market price
Internet network / PC use	One day	7	\$ 8.00	One time	\$ 56.00	Cost local price \$2.00
Medical training Covid 19					\$706.00	

Table 4 Cost of mobile phone equipment and service.

	Unit	Unit cost	Total	Period service	Total Cost
Mobile Phone	4	\$120.00	\$480.00	2 months	\$480.00
Internet Network	4	\$ 20.00	\$ 80.00	2 months	\$160.00
Total mobile phone service					\$640.00

Table 5 Estimated cost in the local market for 5,712 face to face medical attention.

Cost for Call	Unit cost	Total Cost	Period service
Low price local market	\$10.00	\$57,120.00	2 Months
Medianprice Localmarket	\$11.60	\$66,259.20	2 Months
Highest price Local market	\$15.00	\$85,680.00	2 Months

Table 6 Total cost of telemedicine Health intervention during Covid 19 pandemic at Nicaragua June – July 2020.

Cost of administrative resources	\$3,000.00
Domestic cost to physician payments	\$2,000.00
Cost of medical training to medical advice	\$706.00
Cost of mobil phone equipment and service	\$640.00
Publicity Cost	\$1,000.00
Total Cost by Intervention	\$7,346.00

Table 7 Total cost of telemedicine Health intervention during Covid 19 pandemic at Nicaragua June – July 2020.

Total cost of telemedicine as Health intervention during Covid 19 pandemic for two months	Estimated cost in the local market for 5,712 face to face medical attention	Social Saving in Public Health with economic impact
\$7,346.00	Lowprice \$57,120.00	\$ 49,774.00
\$7,346.00	Median Price \$66, 259.20	\$ 58,913.20
\$7,346.00	Highest price \$ 85,680.00	\$ 78,334.00

A sensitivity analysis was carried out increasing the baseline for use of telemedicine by user.

Personnel time allocated is used in the start-up and post start-up periods is expressed in person-months. The results presented in table using Excel office 2010.

Results

The strategy of medical advice using mobile phone call, (interactive voice response). During the two months (June and July 2020) due Covid 19 pandemic in Nicaragua. The number of visits weekly to telemedicine with an increasing the baseline by users as show in the Figure1.

The service message system (SMS) was added in July month, a modality used by visitors, with lower prices (Table 6).

Discussion

World Health Organization (WHO) declared SarCov2 a real Pandemic, divers ministries of health of several countries developed health intervention as strategy to reduce the health impact in their citizens. Countries have experienced the COVID-19 pandemic under various circumstances and have adopted a variety of policy responses [21].

Strong public health measures and surveillance capacity are essential to prepare, prevent, detect and respond to health emergencies. WHO is examining the relationship between COVID-19 data and self-reported country readiness measured

by International Health Regulations (IHR) capacity and health emergency preparedness to understand the weakness of current public health system against public health events and risks, to assess and close the gaps to reduce the risk of future pandemics [22].

Anation's preparedness to respond to the COVID-19 pandemic depends to a large extent on the healthcare system capacity, but also on the abilities of institutions to effectively maintain essential public services, provide a social safety net for most vulnerable, prop up the economy, and mobilize collective action in all segments of the society. Every society is vulnerable to shocks and adversities, but some suffer far less harm and recover more quickly than others. Countries at lower level of human development are at a higher risk when crises strike [23].

Every time it shows up a health emergency, health strategy arises to reduce the impact of it on the most vulnerable population. Due to technological development of last decade, several health care platforms have surged as new tools to provide healthcare, (mHealth, eHealth) principally vulnerable people as low incomes countries [24]. There are lots research realized principally at low income countries taken advantage mobile phone technology to implement various programs in health field [25,26]. We consider reproducing these examples in our country, hit by pandemic Covid 19; it would be an excellent alternative as a strategy due to the health emergency.

The first report on prevalence of SARS-Cov2 at Nicaragua, showed that during the months of June and July 2020 began five

weeks into exponential growth period [27]. The result published by Huette et al, coincides that during the period in which the telemedicine strategy began after exponentially growth reflected in our work after the number of visits per user every week, an element that allowed us to evaluate the efficiency of the strategy. Our paper allows us to compare that through telemedicine were able to efficiently provide medical attention, similar to face-to-face medical attention. With this strategy we reduced the cost of patients due to not charging for care, avoid transportation and mobilization cost to the emergency units of hospital, we avoid the collapse of these by reducing the arrival of patients.

The Covid 19 pandemic at Nicaragua permitted to implement a health intervention using advantage mobile phone technology, following the recommendation by WHO in this filed and taking the experience in health strategies of the other countries [28-30]. Innumerable benefits in the field of health had shown telemedicine, not only in terms of care, data collection, follow up chronic patients, but also in the economic advantage in public health [31-33].

Several researches showed that the patients with Covid-19 with mild symptoms could be treated at home with medical advice and symptomatic treatment [34-36].

This behavior of Covid 19 provided an excellent opportunity for us to efficiently attend to patients, advise family member to care for them, identify those at greatest risk early and when to go to the health United. The analysis of the benefits in our intervention is translated into avoiding the risk of exposure and contagious to other members of the family, the unnecessary mobilization of health units with reducing exposure for health care workers and other patients. The economic impact of telemedicine has been demonstrated in several trials, allowing significant social saving for citizens and health public system [37]. The benefits achieved in our paper are like those obtained in other institutions at USA that used telemedicine before the Covid 19 Pandemic [38,39]. To select a health strategy, the evaluation of the cost of the intervention and the health benefits achieve must be used. The interpretation of results is only straightforward in cases where the intervention produces more health benefits at lower cost in comparison with current practice, in which case the intervention should always be chosen. Using this scoop, our trial take two fundamental elements: a quick and simple intervention of great benefits to the community and low cost. The results of this type of strategy are more and more efficient, it might suggest a new intervention.

Carry out health intervention always is necessarily having financial resources that even develop country present somehow limitation, even more in undeveloped countries as Nicaragua [40]. The health intervention represents a real challenge, from planing, the identification of costs, the selection of the target people, the use of the appropriate technologic, among others technical aspects, to be effective the health benefit that is intended.

Several researchers have demonstrated health intervention with few achieve and high cost. Health economics literature provides ample evidence for existing inefficiencies in health. Economic

appraisal seeks to improve efficiency by guiding policy-makers in how scarce resources can be used to derive the greatest possible social benefit [41].

The knowledge of the cost benefits of health intervention allows planning health budget between interventions in such a way as to maximize health in a society. The development of valuational measures of outcomes of health care treatments and programs, these outcome measures are designed to guide health policy and so must be able to be applied to substantial numbers of persons, including across or even between whole societies [42]. Our results showed that an adequate planning of the strategy against COVID 19 allowed to elaborate budget to execute it correctly and efficiently with the expected social coverage.

Under the principle of reducing intervention cost, our trial considered only administrative cost, use of equipment and Internet network service and publicity cost. This study calculated the cost, adjusting to local market price, as suggestion WHO and classifying only administrative. This paper only quantifies the cost for publicity of the strategy through the radio, we know the other cost to consider: Media inputs television time, leaflets or posters are provided in terms of their unit of measurement (size of newspaper advertising) but those increase the intervention cost.

Globally, more than 93% of the world's population is covered by mobile phone networks, and more than 87% of people living in the developing world are mobile phone subscribers [43]. The development of the telecommunications in the health field has broken various barriers, however have arisen new problems that limit effective access to these benefits as network connectivity, access to electricity, system integration and usability of the device, and concerns about data confidentiality, the cost of call [44]. The cost to enable available phone, available hours to phone line, number of available phone line, the trainer of health workers, are some aspects that influence the number of call. Lee and Chang reported their expertise at Korea [45].

When we treated to reduce the intervention cost, one barrier to overcome is the equipment mobile phone cost. The smart mobile phone with high technology are very expensive compared with others, however, mobile phone with cheaper price, allowed adequate medical advice to target people during COVID 19 pandemic, to reach the goals of health intervention.

We had a small group dedicated to organizing, planning and executing the strategy, taking the local market referral cost. The cost of training medical personal have been necessary in view of training in a new disease. Some consider that this variable should not be included, prior medical knowledge, however, when the appearance of this new entity, the WHO made various training courses available free of charge, allowing us to decrease our intervention cost, only assuming the cost generated during training time as reflected this study.

Other point to evaluate the economic impact of health intervention is the coverage level. This could involve regional place, remote area even international coverage as achieved in our study. The greater coverage in the urban area, distant place and even some user outside the country, reflecting the scope of

telemedicine during health emergency. This item can constitute a substantial component of costs and should not be ignored in the economic evaluation of health interventions even adapt the regional estimates to their local setting to make the results more relevant for local decision makers [46-48].

Finally, when comparing the telemedicine strategy versus face-to-face medical care, the social saving generated, it is very significant, in our results as other papers. The importance of cost benefit study is to know the efficiency of the health intervention, especially at low expenditure levels. These findings can in part be explained by variation in factors outside of health systems, such as the education level of the population [49]. However, a further part can be explained by the fact that some systems devote resources to expensive interventions with small effects on

population health, while at the same time low-cost interventions which would result in relatively large health improvements are not fully implemented or even ignored as this trial [50].

Conclusion

During the months of June and July 2020 were the highest peak of Covid 19 pandemic at Nicaragua. This permitted to develop a quick health strategy of low cost but large health improvement to vulnerable population. Making use of technological development and adequate medical training permitted wide coverage, indirect decrease in cost incurred by the patients and his family, helping to avoid the collapse of hospital emergency and significantly reducing the economic cost that would have been obtained if the medical attention were in person.

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