The Influence of Telemedicine in the Health Care Industry – Preliminary Study

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INTRODUCTION: International experiences with telemedicine are numerous. International organizations such as the World Health Organization (WHO) have stimulated the adoption of telemedicine by its members. It has been adopted in both developed countries, and developing countries, due to the numerous advantages that it has when distance is a critical factor.

The epidemiological profile change and the demographic transition occurring worldwide, demand the expansion of health services, increasing costs and imposing greater challenges for health systems. Telemedicine has emerged as a solution to an increasing population´s need for specialized services. Alternative uses include preventative medicine and education, as well as its utilization as a tool to decrease cost.

Telemedicine, considered an emerging industry, allows users to collaborate, and innovate, thereby increasing the productivity of the health industry. The supply chain of the health industry is composed of different subsectors including providers of data, network infrastructure, Information Technology and Communication (ICT), medical equipment, disposable medical supplies, etc., and Telemedicine has great potential in the global market, it has been estimated to be worth US$ 9.8 billion, and US$ 11.6 billion in 2010 and 2011 respectively.

METHODS: In 2016 Telemedicine is estimated to be worth US$ 27.3 billion, and has a growth rate of 18.6% per year as shown by the BBC Consulting Company research.

The prospect of telemedicine in Brazil is extremely promising, with large potential for expansive telemedical development, due to Brazil´s unique geography, population of 200 million people, unequal distribution of national health services, and the challenges of a Universal Health System (SUS). In addition, the country has some competitive advantages in this emerging industry such as, high quality research facilities, a pioneering national business center, political initiatives, as well as Brazil is a large consumer of health products.

Objective: This study presents an overview of preliminary observation of the electromedical equipment manufacturers installed in Brazil, in relation to the capacity of remote communication, which is a basic and essential feature of Telemedicine. In addition, this work discusses the possibilities of this industry and the opportunities that will arise as Telemedicine grows in Brazil.

Methodology: a study was designed with the electromedical equipment manufacturers installed in Brazil, using the survey methodology procedure, with a quantitative approach to assess, among other things, the perception of connection to systems suppliers, management of health services and mobile devices, by industry professionals, given their importance to telemedicine.

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The research tool (quiz) contained a total of 74 questions, including two of particular interest to this project, with answers on a likert scale, as below:

Question 1: Does your company evaluate the integration of communication functions of your equipment within the management systems of hospitals, clinics and patient?

Question 2: Does your company evaluate the integration of communication functions in your equipment within mobile communication devices (smartphones, tablets, etc.)?

A likert scale was defined as zero (no), one (rarely), two (sometimes), three (often), four (constantly) and five (constantly and systematically).

In relation to population and sample, a database was created from *Associação Brasileira da Indústria de Artigos e Equipamentos Médicos, Odontológicos, Hospitalares e de Laboratórios* (ABIMO) and companies of valley of electronic in Minas Gerais State. After analysis of the database, identified up a total of 83 electromedical equipment manufacturers installed in Brazil, which 33 representatives of industries answered the questions.

RESULTS: The data analysis of this research reveals that, in perception of industry itself, only 24% of rating companies form and systematic constant the merger in communication functions in their equipment with the management systems of health service providers, and still less (15%) with mobile devices.

Expanding the analysis for companies that evaluate in a constant way, but not systematic, the merger in connection functions for remote access in their equipment gets up a percentage of 48% for communication with management systems and 42% to access the mobile devices.

The preliminary data of this study point for a low perception of productive base in relation to the opportunities of emerging industry of Telemedicine, even that Brazil presents strong potential for its development with important competitive advantages highlighted in this study.

CONCLUSIONS: The results indicate that more than 75% of the universe researched no way to evaluate constant and systematically the incorporation of the connection functions for remote access in their equipment, even we are still living what many authors have called the age of information and knowledge. As ICT has revolutionized social and organizational relations, estimates up deep changes in health services, just with the spread of Telemedicine.

The change in epidemiological profile and the demographic transition in Brazil causes increasing costs to health. Telemedicine arises then as an alternative to provide the expansion of such services, providing immense economic opportunities for productive base. However, be noted up by the government efforts that have been advised in Telemedicine basically for expansion and improvement of health services offer, and in the private initiative, be noticed the huge move of multinational companies and timid initiatives by national companies to capture these opportunities.

Given this panorama, it is pointed up the need for new researches that contribute to a better understanding of determining factors for health production base to development with the perspective of Telemedicine. ■

Technical-pedagogical monitoring system as a tool to reduce evasion in specialization courses in Family Health

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INTRODUCTION: This paper intends to evaluate the use of a monitoring system entitled Monsys as an educational support tool to prevent and control evasion in a distance learning specialization course in Family Health. Monsys was developed and patented by UNA-SUS / UFMA. It uses PHP programming technologies with JavaScript and HTML and was created with the intention of enabling data mining in Moodle, a virtual learning environment (VLE).

METHODS: This is an exploratory study using documentary research, bibliographic research and analysis of Monsys' database. The Specialization Course in Family Health was implemented in the VLE Moodle, and Monsys was employed as a tool to help preventing evasion. Two classes of different years (2010 and 2011) were selected as research material, one with Monsys intervention and the other one without it. Both samples were paired by sex, age, marital status, year of graduation conclusion, presence of a previous graduation, location and profession in the ratio of 1: 1. Statistical analysis of data was performed using the chi-square test and the multivariate logistic regression model with a significance level of 5%.

RESULTS: The findings showed that the class of 2010, in which Monsys was not employed, presented an evasion of 43.20%. The class of 2011, in which the tool was used as an aid for the pedagogical team, showed an evasion of 30.60%. After statistical adjustment the monitoring system Monsys remained in association with the conclusion of the course (adjusted OR = 1.74, IC95% = 1.17-2.59; p = 0.005), suggesting that the use of this tool, isolated to the adjusted variables, can be a factor that enhances the students chance of conclusion. In a profile analysis of students by the chi-square test, there was a higher percentage of completion among women (67.7%) compared to men (52.2%). The analysis of age demonstrated that students between 40 and 49 years evaded less (32.1%) and, regarding professional training, nurses are the group with the lowest evasion (36.3%).

CONCLUSIONS: The use of Monsys decreased by 12.6% the evasion in the specialization course in Family Health, and presented the best results between the variables Presence of the Monitoring System and the Female Gender, which remained associated with the conclusion of the course. ■

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Evaluating the relative interest in dental pain by means of the Google Trends

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INTRODUCTION: Orofacial pain is a debilitating problem and toothache has been the most common acute manifestation, and there are few epidemiological studies about toothache. However, toothache can affect people's daily lives, causing an impact on daily activities, such as working, playing and also affects interpersonal relationships. In the last twenty years, the emergence of new media, information and communication technologies (ICT) has changed the way information has been communicated, and since then an exponential increase on health information has been available on the Internet. Information can empower patients to gain control, take initiative, solve problems, talk to their physicians, make decisions and improve patients' understanding on their medical condition. Furthermore, there are substantial evidences that patients tend to obtain health information from sources other than physicians. Results of the Internet Steering Committee in Brazil (ICT) Households 2013 survey indicated that the proportion of Brazilian Internet users exceeded half the population. Half of them went online to look for health information.

The aim of this study was to evaluate internet search trends for "toothache" ["*dor de dente*"] in Brazil using data for Google Trends from January 1, 2004, to June 1, 2015.

METHODS: Google, Bing and Yahoo! search tools enabling users to seek documents on the World Wide Web.

Google (Google, Inc) is the most used search engine in the world. Popular web search engines, such as Google, generate trend data that can be analyzed over time to detect regional outbreaks of diseases. One tool that allows users to interact with Internet search data in health is Google Trends (Google Inc.). This is a keyword research tool that evaluates the percentage of Google web searches and figure out how many searches have been done over a certain period of time.

On June 10th, 2015, the keyword "toothache" in Portuguese ["*dor de dente*"] was entered in the Google Trends (Google Inc.) main page (available at: http://www.google.com/trends). We chose the search term "toothache" ["*dor de dente*"] due to the importance of the topic. Dental caries is among the most prevalent chronic diseases affecting human populations and consequently, toothache is the most frequent complication and the main source of patient complaints. We attained search data using Google Trends, extracting data from Brazil within the period of January 1st, 2004 to June 1st, 2015 using the "health" query category.

To the best of our knowledge, no previous study examined the internet search trends about "toothache" in Brazil. We chose the "health" query category because we were expecting to assess the interest for the context of health.

We descriptively evaluated the changes in interest for the term "toothache" ["*dor de dente*"] over time.

RESULTS: Results included the exact term "toothache" ["*dor de dente*"] for double quotation marks, possibly with words before or after.

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Our study found a significant growth in the population interest for toothache ["*dor de dente*"] in the last 11 years as indicated by the Google search queries. We observed a growth of (+118%) in June 2015 compared to January 2004, after applying the "health" query category.

The study showed several limitations, mostly related to the Google Trends. Trends only analyzes data for popular terms, so search terms with low volume appears as zero. What's more, Google Trends analysis is restricted only to the population of internet users.

CONCLUSIONS: Our findings showed a progression in population's general interest for the term "toothache" ["*dor de dente*"]. A better understanding on this interest might be important for dental professionals to inform and help people on how to search and evaluate health information.

Despite the limitations of this study, we concluded that there has been an increasing demand for information on toothache as the internet has allowed to the access of information in an easier manner. ■

Evaluate Telehealth in Pernambuco: assess the implementation degree of Municipal dimension in RedeNUTES

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INTRODUCTION: The Telehealth Network Centers (RedeNutes) is part of the Brazilian Telehealth Program and develops actions for Family Health Strategy, through Teleassistance and Tele-education services. Main goals: to assess the implementation degree of Municipal dimension in the RedeNUTES (DMR).

METHODS: An evaluative research on the type of implementation analysis was carried out. The implementation analysis is concerned on the one hand to measure the influence that can have a variation in the degree of implementation of an intervention in its effects; on the other, it enjoys the influence of the environment, the context in which the intervention is implemented. This type of analysis essentially aims to identify the procedures involved in producing the effects of the intervention, and these can be seen among others from the study analyzing the contextual determinants of the degree of implementation of the intervention. Between the right strategies it was used the multiple case study.

RESULTS: The degree of implementation of DMR observed after application of a maximum score for each component, pointed out that the intervention is implemented in general, though partially implanted in the City dimension. The components, Planning, Development, Portal and Tele-education observed individually were classified as partially implemented, while not deployed Telecare (*Table 1*). The observation of the group of municipalities indicators pointed out that the Planning, Development, Portal and Tele-education is well structured, with adherence 77.3%, 77.2%, 75.6% and 77.3% respectively, while the Teleassistance component presented to the assembly, the lower adhesion with 58.7% (*Table 1*). And indicators separately obtained values of 0% to 100%. In the Planning phase, only the indicator related to compliance the goals of services achieved the proportion of 33% of expected. The development phase it was observed that 100% of the points are accompanied by managers and 77.3% of health workers are trained on services offered, but the observed results did not reflect the attainment of goals. Regarding the Portal, it was observed that 81.8% of the services offered are used, but only 15.2% of users use the online service, Web conferencing service available and attendants from Monday to Friday. The Tele-education indicators presented adherence of 23.6% to 96.2% concerning the use of the Virtual Library content by professional and caregiver updated video / web conferencing. Telecare got the worst performance among all components with percentages ranging from 0% to 44.3%, referring to the teleconsultation indicators / month for a specific computer system and tele / month per text respectively.

CONCLUSIONS: In DMT there have been verified the processes related to the training of professionals on Telehealth and monitoring points with good performance, which may have contributed to the results achieved by components Planning and Development. While the Telecare showed little adherence, it may is related to lack of doctor in three of the six units that participated in the study. Already at the Tele-education activities presented higher adherence, being the head of telehealth development strategy in Pernambuco, which has been constituted as an important tool for improving the comprehensive care the health of the population assisted under the Family Health Strategy. ■

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Experts views on what is going on with the adoption of health informatics standards in Brazil

Felipe Azevedo Moretti[1]; Paula Valadares[2]; Ivan Torres Pisa[3]

INTRODUCTION: The central theme of Health Informatics (HI) presents a series of norms and standards that drive technological development, process improvements, and better healthcare services. However, in Brazil, this development seems to lack dynamism and there seems to be a need of appropriation of these norms and standards.

There are data standards that can aid information exchange, management and integration in Health Information. Health Informatics norms and standards seeks, for instance, for interoperability, semantic coherence, and a better data usage.

The International Organization for Standardization (ISO) is a non-governmental organization that, since 1947, promotes a common technological language among several countries where the standardizations are the result of a consensus of several specialties. ISO has 127 HI standards in effect. In Brazil, the Brazilian Association of Technical Standards (Associação Brasileira de Normas Técnicas [ABNT]) is the official ISO representative member, with 8 HI standards currently published.

This work aims to analyze the main constraints on the adoption of norms and standards. We also investigate potential models aiming to mitigate these difficulties and promoting technological advance in the studied area.

METHODS: Qualitative design study that analyzes 25 speeches of experts directly connected to Health Informatics from entrepreneurial and academic sectors. Subjects include: Health Information Technology (IT) professors and consultants, hospital managers graduated in Health Informatics, partners and directors of Health Informatics companies, the head of the IT department of a large public hospital, and system managers of medical software companies or of a University Hospital. This set of subjects was primarily comprised as a population potentially concerned by compliance or acquisition of norms and standards. Firstly a survey was conducted from April to December of 2014, and then a semi-structured guide was developed for the interviews. The central questions are as follows:

1. Do you consider the Health Informatics standardization process important? Justify why this is important. Are we doing it appropriately? How should it be done?

2. What are your main criticism regarding the Health Informatics technical standards? State whether you have used them or not, and if so, when and how?

3. We believe the technical standards are scarcely adopted by the companies or by the potentially concerned public. Do you agree? What is your opinion on that? Why does this happens?

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4. Do you see a path or a solution to circumvent the standadization issues discussed regarding Health Informatics?

Suggestions for the Health Informatics standardization process improvement in Brazil?

After the interviews, we categorized the main problems and solutions indicated. Then, the frequency of each category was manually defined for each expert speech, with the exclusion of redundancies within the same speech.

This survey was approved by the Research Ethics Committee of the Federal University of São Paulo (UNIFESP), under the process number 167/2015 at CEP/UNIFESP.

RESULTS: Issues related to the difficulties in adopting the Health Informatics standards in Brazil moved through topics such as: little dissemination, lack of belief in the process of adopting standards, lack of popularization and training, lack of regulation and little political and economic incentive for adoption, little diffusion of the ways of implementation, having to pay for standards.

A complementary result obtained from the in-depth interviews is that all subjects agree that the standardization process is important in Brazil and that norms and standards are useful paths towards progress or technological advance in the area.

Although both entrepreneurial and academic populations value the standardization process, most of the interviewees have difficulties understanding the benefits or tangible results justifying the standards adoption or purchase.

The results agree with those found by Santos and coworkers, regarding radioprotection standards and protective equipment usage in dentistry, where most professionals acknowledge the standards existence but show a lack of understanding of their importance and require further clarifications on the subject.

The standards adoption resistance appears in other areas and is a phenomenon not restricted to Brazil. One survey participant, owner of a medical software company, emphasizes this scenario in his speech: "other countries also have difficulties in implementing these HI standards. There are too many agents involved and market implementation takes a long time". Regarding the difficulties in adopting the standards in other specialties, Netto and Silveira state that the main motivational factor for the adoption is avoidance of financial losses and, among the discouraging factors, are lack of knowledge, the investment value, the difficulty in measuring costs and benefits, and the organizational culture.

Experts further suggested the need of a better communication between the agents involved in the standardization process, such as standard developers, companies, universities, and final users seeking for a better alignment of interests. In this context, mixing regulations and intercommunication between stakeholders, one of the public policies strategies suggested by Chute and coworkers for the development of guidelines and standards that involve the selection and usage of healthcare terminologies is the integration of developers, systems suppliers, purchasers and government. The authors suggest that the government participates in the development of the requirements.

CONCLUSIONS: The data shows that there is a large resistance to the adoption of HI standards in the country. Standards are perceived more as obligation than as a desirable process. According to the subjects' reports, the standards are

still unknown or little disseminated.

We conclude that Health Informatics standards are recognized by both entrepreneurial and academic contexts as an important process for the technological improvement of the field, but there are still strong resistance and barriers for their adoption. Resistance is associated to the lack of information about the standards and their benefits, lack of confidence in the normative process, difficulties in understanding the actual benefits or tangible results of the standards adoption, lack of a national regulation requiring compliance, access charge to the standard texts, and lack of guidelines for their use. Paths suggested by experts pass by multiple dissemination strategies, encouragement of systems certification, development of public policies by the government, and promotion of integration between stakeholders, such as companies, universities, professionals, managers, developers, and users. ■

The impact of eHealth and mHealth on physician behavior and patient involvement: an Israeli and Portuguese comparative approach

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INTRODUCTION: Based on the experience of a Short Term Scientific Mission (STSM) promoted by COST Net and developed in CIES/ISCTE-IUL (Portugal), together with previous research on Israel, this paper presents a reflection about the implementation of Information & Communication Technologies (ICT) in the healthcare sector in Israel and Portugal. Specifically, we focus on the impacts of ICT or eHealth on patient empowerment, as perceived by physicians and managers in order to better comprehend the role of national policy and explore the options for building a national strategy regarding ICT in healthcare.

METHODS: Methodologically, in-depth interviews with the Ministry of Health (MOH), the private sector, patients associations, health plans and researchers were used to collect data. Purposeful sampling was used to select respondents, and secondary sources were used for triangulation.

RESULTS: The findings of the research work show that the increased deployment of ICT has, according to respondents, furthered patient empowerment. From the physicians' perspective, while ICT has provided more information in the long-run, changes of these magnitudes were not easy in the beginning. These findings were similar in both countries. At the national level, differences were found. While in Israel all the implementation came from the field and government intervention can be found in a later stage, in Portugal the government was the main developer and strategies were built from the beginning. These two approaches present different advantages and disadvantages.

CONCLUSIONS: The work suggests that ICT tools were successfully implemented and the general perception is that they have been beneficial. In addition, government involvement in earlier stages could provide benefit in terms of interoperability of systems between different healthcare organizations. However, innovation could be slowed down due to government bureaucracy or lack of leadership. The work provides information in order to understand and improve ICT services. Additionally, the results suggest alternatives for future nvestments in these technologies and provide input regarding national policies in the area. ■

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Mobile Health in Pregnancy: users profile and metrics in Brazil

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INTRODUCTION: The Brazil has a context of high maternal mortality rate and has not been able to reach the Millennium Development Goals proposed by WHO for this indicator - largely due to the excessive cesarean sections practiced in the country. The World Health Organization expects cesarean deliveries to occur in up to 15% of births, but the Brazilian rate is 54%. At the beginning of prenatal care, about 70% of women want natural childbirth, but at the end of pregnancy only 46% of babies are born this way. Thus, new tools and actions are needed to qualify the health care, and empower pregnant women with high-quality information.

The Canguru is a mobile application for prenatal care with interfaces for pregnant women and healthcare professionals. It's freely available on Android and iOS platforms since July 2014. At the time of the study, there were about 12,000 pregnant users. Information from Canguru's database was used in this study.

Goals: to describe users profile and usage metrics in a mobile platform for prenatal care.

METHODS: Cross-sectional study using a mobile prenatal care application database. Quantitative variables were described with average to measure central tendency. Qualitative variables had their absolute frequencies calculated. All pregnant users in Brazil with gestational age from 4 to 40 weeks who completed the registration and accessed the system at least once from 01.12.2014 to 05.30.2015 were considered eligible. Information from 11,084 women was analyzed. Since the data was used for pooled and unidentified analysis, terms of consent were not applied.

RESULTS: The mean age of patients was 27.4 years. Almost a third (31%) of users were in the Southeast Region, but pregnant women were observed distributed in other 20 states of Brazil, with similar frequencies ranging from 3 to 4%. The state of São Paulo had the highest number of users, with 13.9% of the total. No users from the states of Amapá, Rondônia and Roraima were found.

The mean adherence to prenatal care reported by users was 10%, considering the complete protocol of the Brazilian Ministry of Health. This value is consistent with the national average reported in the literature, considering all the recommended exams, ultrasound, consultations and vaccines.

Fifty-one percent of users responded to a questionnaire with 40 questions concerning the presence of risk factors or warning signs during pregnancy. It was observed that 41.6% of the subjects had normal prenatal risk. In 31.2% of cases some warning sign was reported and 27.2% of them could be characterized as high-risk prenatal. The most common risk factors among high-risk pregnant women were: bleeding in a previous pregnancy (18%), BMI above 30 before becoming pregnant (14%) and reported hematological disease (12%).

Information from the symptom tracker functionality was also analyzed. Among the most frequently reported symptoms are: nausea (727 records), tiredness/weakness (578), anxiety/nervousness (569), breast pain (558) and heartburn (475).

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The system also allows users to create discussion forums ("communities"), which during the data collection period were moderated regularly by one midwife and one family physician (both volunteers). The users created, over the 6 months, 342 discussion forums with a total of 1333 comments.

According to Google Analytics metrics, during the studied period 96,627 sessions were held with 538,596 screen views, with an average of 5.6 screens accessed at each session. The average time spent per session was 2.5 minutes. The daily rate of return (the percentage of users who access the application daily) was 7.1%.

Regarding the device's operating system that originated the session, the observed frequency was 54% for Android and 45% of iOS. Devices that most often accessed the system were from Apple (45.5%), Samsung (28.1%) and Motorola (15.5%).

CONCLUSIONS: Utilization and engagement levels were considered high, but no comparison parameters were found on scientific literature. The level of usage of the "communities" functionality characterized the users' interest for interacting with healthcare professionals and other pregnant women. Although there is some concentration of users in the Southeast region, a rapid spread of application usage throughout the national territory was observed - suggesting that this type of technology may be adopted broadly, in different contexts. The author concludes that the described platform can serve as a tool to enhance institutional actions designed to promote a more person-centered model of care, focused on pregnant woman's health. ■

Implementation of innovative technologies for Teleradiology: a case study in the Government of the State of Amazonas

Leonardo Severo Alves de Melo[1]; Alessandro Severo Alves de Melo[2]

INTRODUCTION: The Amazon Forest comprises some states of Brazil, and completely the state of Amazonas. With a land area of 1,559,159 km^2 (20% of Brazil); dense vegetation; high humidity, rainfall and lightning; mostly flat terrain; and transportation logistics dependent on winding rivers with ebbs and flows; It translates into a challenge for the implementation of any engineering projects.

Given the major operational difficulties of any public service also includes a challenge in hospital care, for not having basic infrastructure and available medical supplies, and no trained staff. Moreover, its population density - 2 people per square kilometer - makes the cost-benefit almost prohibitive.

Telemedicine could be a way out, however due to logistical difficulties; an unstable telecommunications environment, difficult operation, management and maintenance; high costs provided by the scarce satellite presence; and little structural availability in hospitals and clinics inside; its implementation, although relevant local people, would be impossible.

This presentation aims to present the challenge of implementing a specialized and innovative solution in the transmission of radiological data in hostile environments in the state of Amazonas and its results, enabling the operation of more than 400,000 radiological examinations per year.

METHODS: Situated in the northern part of South America, the Amazon Rainforest has an extension of approximately 7 square kilometers, spread over several countries. Most of the forest is in Brazil. Human settlement in this region is one of the lowest in the country. According to IBGE (Brazilian Institute of Geography and Statistics), its population density is 2.23 inhabitants per square kilometer. There are economic interests that justify a higher presence of space communication satellites, the most conventional form of telecommunication in hostile environments like this.

It is a closed tropical forest, composed of large trees; Relief mostly flat with few ripples; and temperatures, rainfall and the amount of atmospheric electrical discharges are high. These factors constitute a region with great difficulties in installation, operation and maintenance of any telecommunications environments.

Meanwhile, breast cancer is the second most common type in the world and the most common among women, according to the National Cancer Institute (INCA). In Brazil, mortality rates are high because the disease is diagnosed late and due to the failure to carry out routine tests, such as mammography. From the age of 40, women should perform it annually.

In general, the first sign of the disease is usually the presence of a single node, not painful and hardened in the breast. Other symptoms, however, should be considered, as the deformity and / or breast augmentation, the retraction of the

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skin or nipple, increased axillary nodes, redness, swelling, pain and fluid in the nipples.

As for the technological environment, it is possible to highlight:

- The telecommunications environment available by the Health Department deployed and in operation is characterized by radio links to TV with 256-Kbps communication skills. This is of great instability, subject to various interference (rain, cloudy, lightning, winds, etc.) and shared use with other state communication needs;

- The exams had to be referred to a Radiological Reports Center in Manaus, so that professionals University Hospital Francisca Mendes, linked to the Federal University of Amazonas, can carry out the medical report of mammography and x-ray.

RESULTS: - The team Diagnext.com improved its transmission equipment that worked

remotely and without any internal moving part (hard drives, fans, etc.);

- The management of our network is realized through its own technologies and automated virtual private communication.

CONCLUSIONS: It was achieved with the project to implement our communication system in the Amazon rainforest, directly serve an assistance demand unthinkable scales for such an environment before reaching superlatively the population of the interior.

Technologically saying also new technological achievements have been made:

- Tests were conducted in transit boats in Guanabara Bay in Rio de Janeiro, together with the Navy of Brazil. These demonstrated the ability and strength of the technology employed, including mobile environment - such as ships and trucks;

- By the results of studies acquired in the harsh environments of the Amazon rainforest, The Diagnext.com is the first telecommunications provider specializing in telemedicine with technologies capable of unifying the capacity of any communications channel. Thus they can be used to access Internet provided by mobile 3G or 4G, alone or in combination, for example, enabling you report truck any digital radiological examinations to transmit while moving;

- The Diagnext.com is capable of storing large volumes of data radiological distance. It provides that clinics and hospitals no longer need to store your tests locally, compact storing and appropriately in Data Centers;

- The Diagnext.com provides its engineers and technicians to work remotely on remote clinical and hospital environments, providing a specialized service. ■

Factors influencing the success of an immunization information system in Quebec

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INTRODUCTION: Proper vaccine storage and handling practices is key to ensure that individuals and communities are protected from vaccine-preventable diseases. Ensuring safe and timely availability of immunization products for the population is thus a public health responsibility. In Canada, a national public health information system – Panorama – is being developed to support immunization and vaccine-preventable disease surveillance. In the province of Quebec, the implementation of the first module, vaccine inventory management, began in 2013 and its deployment was completed in 2014. This module aims to ensure appropriate and timely stocks of vaccines and other immunization products across the province. The system allows stock management, cold chain monitoring, as well as sharing and transfer of products between sites when required. The main benefit expected from the deployment of the vaccine inventory management module is the diminution of vaccine wastages in order to save costs for the health system.

Objective: This study aimed to evaluate the implementation and adoption of the first module of this system, targeting vaccine inventory management, in the province of Quebec. In order to evaluate the success of this information system, we used the Clinical Adoption Framework (CAF) proposed by Lau and collaborators.

METHODS: We conducted this study in two phases, corresponding to the implementation and deployment phases of the vaccine inventory management module of the Panorama system in Quebec. The first phase took place from January to April 2013, and the second phase, from February to March 2014. We used a mixed methods approach that combined qualitative data from interviews with key informants and quantitative data from a survey among potential users of the system. For the first phase of the evaluation, we conducted semi-structured interviews with people involved in the system implementation at the central (provincial government) and regional (regional health authorities) levels. We developed an interview guide based on the CAF that covered perceived benefits related to the implementation of the system, as well as factors that could facilitate or limit its implementation. We also invited respondents to make suggestions in order to improve the system. We digitally recorded interviews with participants' consent. Interview content was transcribed verbatim and analysed with the support of NVivo.

For the second phase of the evaluation, all potential system users who worked in health care facilities that provide immunization services in the public health care system of Quebec were invited to complete an online questionnaire. The questionnaire was also based on the CAF, and comprised nine questions assessing constructs from the CAF on a 5-point Likert scale, four multiple-choice questions on socio-demographic characteristics (profession, level of work, age group, gender), two questions on system use (duration and weekly use) and an open-ended question for providing other comments about the system.

RESULTS: A total of 18 key informants participated in the first phase of the evaluation. Given the timing of the evalua-

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tion, it was still too soon for respondents to identify net benefits related to the vaccine inventory management system implementation. However, they identified potential benefits related to system implementation. The main potential benefit identified was improved access to information, more specifically the possibility to follow the quantity of available products and where they were stored in real time. This information is key to ensure better forecasting and more appropriate orders for products, which could then translate into less wastages and stock ruptures, and ultimately in cost savings. Another benefit identified was the easy traceability of vaccines in the information system that could allow reacting promptly when a problem is identified with certain products. Finally, the system allowed uniformity between regions that used to have different vaccine inventory management systems, which also facilitated communication between partners across the province.

For the second phase of the evaluation, a total of 267 individuals competed the survey on a possibility of 879, for a response rate of 30%. Almost half of respondents (48%) were moderately to highly satisfied with the system, while 11% were dissatisfied. However, a majority of respondents (60%) indicated that the system was difficult to use. With respect to the information provided by the system, most respondents also showed moderate to high satisfaction (69%). Moreover, technical support was considered adequate by a great majority of respondents (88%).

CONCLUSIONS: The widespread adoption of the vaccine inventory management module is the first step towards an integrated public health information system on immunization. The results from this evaluation can provide avenues to overcome some irritants related to the system and its use. The evaluation of net benefits related to the vaccine inventory management module will be pursued in order to assess to which extent the system can improve the use of vaccines, which could translate in cost savings for the health care system. ■

PACS in the cloud: impact of tunneling and encryption security protocols implementation over image communication-archival performance

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INTRODUCTION: Picture Archiving and Communication System (PACS) consists of an interconnected set of hardware and software aimed to the acquisition, storage, retrieval and display medical images. In general, medical images exams tend to have large volumes of data (either due to its large acquisition matrix, as in digital mammography, for example, or due to a large number of slices, as on computed tomography (CT) exams), requiring high performance communication infrastructure.

Cloud computing has emerged as an alternative for sharing medical images between health organizations, as well as to promote physical space virtualization and high availability of PACS solutions.

Given the shared and distributed nature of cloud computing environments, to increase security in Internet communications some technologies as tunneling and encryption can be used.

The work presented here is part of a larger study that seeks to analyze the feasibility of using PACS solutions in cloud computing environment for clinical applications, having as its main focus evaluate the impact over data communication performance when Secure Shell (SSH) Tunnel and Advanced Encryption Standard (AES) are used.

METHODS: First scenario consists of two servers, one (physical) hosted on a Local Area Network (LAN) machine, as the origin of images and another server (virtual) hosted on the cloud environment provided by the University of São Paulo (USP-Cloud), as the destination of the images. A SSH tunnel was built between the two servers using Putty software.

Second scenario is similar to the previous one, but with no SSH security implementation. Here, some functions were inserted in Conquest software scripts regarding Data Anonymization, allowing encrypt and decrypt the patient"s name information during the transmission of images using AES encryption and a key (password).

Dcmflow software (http://www.dcmsys.com), which allows to simulate the generation of images in DICOM standard, was used for performance evaluation. Exams were generated according to the model of CT modality with a matrix of 512 x 512 pixels per image and 2 bytes (16 bits) of gray levels per pixel. Exams with several volume of data have been simulated and transmitted. The value of the average speed for each transfer was obtained with the security functionalities implemented and not implemented and a comparative performance rate was calculated. The average of each transmission was achieved by adding up the sizes of images (obtained through the *du* command in command line of the Linux server) and dividing them by the total time of transmission recorded in the log of the Conquest software.

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RESULTS: To evaluate the impact of SSH Tunnel implementation over the performance of data communication, initially several transfers were performed without any security mechanism implemented resulting in an average transfer rate of 2.46 megabytes / second. The same transfers were redone using the SSH Tunnel as the security mechanism and an average transfer rate of 1.83 megabytes / second was obtained. The loss of performance in image communication with SSH implementation was 25.6% in average.

To evaluate the impact of AES encryption over the performance of data communication several transfers were performed with and without the encryption functionality enabled. The loss of performance in image communication using encryption was 18.02% in average.

CONCLUSIONS: The present study aimed to evaluate the impact of using security mechanisms based on SSH Tunnel and on AES encryption in PACS environment installed in the cloud. Results obtained have shown a significant loss in performance considering data rate transfer with the use of these mechanisms. Considering the requirement of secure connection for healthcare data communication and archival in cloud computing environment and the performance degradation measured in this study, it is strongly suggested a careful evaluation of the workflow impact of using cloud solutions with security mechanisms before the adoption of such technology in a clinical environment. ■

BH-Telehealth Program: an analysis of data from 2006 to 2013

Renata Trad Campos[1]; Sandra M. Mitraud[2]; Neuslene R. Queiroz[3]; Alaneir de Fátima dos Santos[4]; Maria do Carmo Barros de Melo[5]

INTRODUCTION: Advances in communication technology have increased the potential methods and speed by which healthcare professionals can communicate and exchange opinions. Telehealth potentially increase quality and access to health care and lower health expenditures. The BH-Telehealth program is a pioneer in telemedicine actions in the public health system in Brazil and was designed by the Municipal Health Department of Belo Horizonte (SMSA-BH, *Secretaria Municipal de Saúde da Prefeitura de Belo Horizonte* in portuguese) in 2003. This program started in 2004 with the establishment of a network directed towards supporting assistance and continuing education of professionals in the Basic Health Units (UBS). The program provides access to experts in UFMG (Federal University of Minas Gerais State/*Universidade Federal de Minas Gerais* in portuguese) and Medical Specialties Center (SMSA-BH/CEM) through teleconsultation online, offline and webconferencing. The waiting time for specialist consultations is still a challenge for managers in public health system and teleconsultation can help to solve this problem. Experiences exchange and integration resulted from this project are advantageous for the public health service and public university. Currently in Brazil there is a National Telehealth Program whose model was was based on BH-Telehealth.

METHODS: The data were captured by the store-and-forward teleconsultation tool (BH-Telehealth program) and from the personnel management system of the Municipal Department of Health (Health System Management Network). These were systematized and analyzed by version 18.0 SPSS program. For statistical calculation was used average and percentage. This project was approved by both of the Ethics Committee of UFMG and SMSA-PBH (CAAE: 21863813.1.0000.5149).

RESULTS: 1,827 subspecialist teleconsultations were performed from 2006 to 2013 and the data are presented sequentially: 32 (1.75%), 54 (2.96%), 281 (15.38%), 281 (15.38%), 77 (4.22%), 635 (34.76%), 401 (21.95%), 66 (3.61%). The growth in the extent and geographic use of BH-Telehealth observed in 2008 and 2009 may reflect the investments made by the Municipal Department of Health. The number of teleconsultation requested failed dramatically in 2010 most likely by management changes during this period, but other factors may have interfered. In 2011 the SMSA-BH invested in a project to reduce the waiting list of patients for consultations with angiologist specialty and this explains the increasing number of teleconsultation this year. The data demonstrated that the most requested subspecialists were: angiologists (n= 510/ 27.91%), cardiologists (n= 199/ 17.02%), endocrinologists (n= 153/ 25.40%) and neurologists (n= 99/ 5.42%). The BHTelehealth program is implemented in all UBS Belo Horizonte, but not evenly. The teleconsultation presented instability and mismatch in their use by professionals. The number of the physicians that request teleconsultations was 227. The teleconsultations and the solicitants physicians number of each Health District

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were, respectively: Barreiro 109 (5.97%)/ 25 (11.01%), South-Center 394 (21.57%)/ 37 (16.30%), East 331 (18.18%)/ 41 (18.06%), Northeast 152 (8.32%)/ 22 (9.69%), Northwest 252 (13.79%)/ 22 (9.69%), North 244 (13.36%)/ 22 (9.69%), West 75 (4.11%)/ 7(3.08%), Pampulha 69 (3.78%)/ 19(8.37%), Venda Nova 197 (10.78%)/ 39 (17.18%). Center-south and East Districts were the ones that most used the system and those who had more professional applicants. The Venda Nova district had a large number of applicant professionals, but the number of teleconsultation was lower. Nowadays, shared care is important for providing optimum care and best use of resources and the telehealth tools could improve this. The number of physicians registered as users was lower than the number of potential physician users and we intend to analysis the data. The decision of physicians to adopt a new technology such as telehealth can be challenged by their relatively low computer literacy, the possible alteration of their traditional routines, and their high professional autonomy. Possibly that context influence the technology adhesion. Some factors could explain these different results: the organizational and cultural environment, support of the organizational hierarchy, quality of network connectivity, opinion leaders, and local supporting computer experts. Physicians and managers support the use of telemedicine tools with varying degrees of adhesion. The consistent support of opinion leaders will therefore be important for generating more pre-encounter enthusiasm. Videoconferences have been organized about important issues of the primary health care. With increased physician knowledge and support and the advent of new learning technologies patients may soon have better assistance.

CONCLUSIONS: The number of the teleconsultations and their users is still small in BH-Telehealth Program. The authors have been working in a qualitative research looking for the answers. It is necessary to analysis how the telehealth should be a central mediator in the construction of a new model of assistance in primary health care in order to qualify assistance and reduce costs of public health system in Brazilians municipalities. Significant results from this study provide insight and direction for those planning to implement a telehealth system. Concentrated effort from health professionals, managers, institutions and governments are necessary for improve and increase the use of telehealth tools. ■

Mapping of the informatization of the Basic Health Units of Rio Grande do Sul

Vânia Ames Schommer[1]; Celina Adams Silveira[2]; Andréia Silveira de Souza[3]; Ricardo Heinzelmann[4]

INTRODUCTION: In Brazil, since 1920, with the Health Unit Schools, various models of organization for the Primary Health Care (PHC) were created. This process was deepened with the Sanitary Reform and the formation of the Brazilian Unified Health System (SUS – Sistema Único de Saúde). The present Nacional Policy of Primary Health Care reinforces the PHC's role to coordinate care and ordinate.

Collaborating with this process, integrated policies for the health information and information technology area have been growing worldwide. The Electronic Patient Record (PEP) starts to earn extreme relevance for the qualification of PHC, reinforcing its role in the coordination of patient care and information in heath.

In 2012, through the Primary Care Department, the Ministry of Health introduced the "e-SUS" Primary Care (e-SUS AB), a strategy which aims a restructure of the PHC's information. The information gained in the Basic Health Units (UBS) can be registered and sent to the Health Information System for Primary Care (SISAB).

The current study aims to describe and analyze the conditions of informatization of UBS in the state of Rio Grande do Sul, as well as correlate them to development indicators and the GNP of these towns and cities.

METHODS: This is a cross-sectional study, with exploratory goals of mapping the informatization of Basic Health Units (UBS) of the state of Rio Grande do Sul. Were analyzed total of municipalities belonging to the state who replied to the TelessaúdeRS ("TelehealthRS") survey.

To begin with, the municipalities' managers were contacted by the coordinators and field monitors of TelessaúdeRS ("TelehealthRS") to raise awareness to the transition from the Information System for Primary Care (SIAB) to the new Health Information System for Primary Care (SISAB).

To identify and analyze the possible strategies of implementation of e-SUS, data referent to the level of informatization of the UBS of the municipalities were collected, applying surveys which could be replied to by managers or UBS representatives, from January 2014 to January 2015.

The guide for the questionnaire was defined based on the basic requirements for the use of Proposal of Amendment to the Constitution (PEC): numbers of computers and their locations. The data of GNP per capita were obtained from the DATASUS website according to the year of 2010, the Human Development Index of the municipalities were obtained through the ATLASIDH, according to the year of 2010.

An analysis was carried out with the help of the Statistical Package for the Social Sciences (SPSS version 18.0). The categorical variables were described in the form of N (%), while the continuous variables were described as mean ± standard deviation (DP). To evaluate correlations the Spearman Correlation was used. For multiple comparisons the

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Krudkal-Wallis Test was used. In all comparisons, it was considered a 5% significance level.

The description of the data was performed according to the standards established by TelessaúdeRS ("TelehealthRS"), prioritizing a minimum setting for UBS with networked computers in the following rooms: medical, nursing, reception and triage, as well as internet connection. This logic is function of the systematization that the electronic medical records use, maintaining a flow of assistance that corresponds to the idealized by the Ministry of Health.

RESULTS: The state of Rio Grande do Sul consists of 497 municipalities and 2752 Units of Health Care, distributed in 281,730.223 square miles of geographical area, with a population estimated for 2014 of 11,207,274 inhabitants according to the Brazilian Institute of Geography and Statistics (IBGE).

All municipalities were contacted to answer the questionnaires relating to all UBS.

The scenario of at least one UBS of 447 municipalities was identified (89.74%) and 4345 UBS (7.61%) of the state of Rio Grande do Sul.

The average of computers for one UBS in the state is of 1.50 ± 0.64, at the reception the average is of 1.25 ± 1.08, in triage is 0.83 ± 0.55 and in the medical room 1.25 ± 1.08, in nursing is of 1.25 ± 0.59, 0.66 ± 0.74 at the dentist, other UBS rooms have an average of 3.25 ± 4.30 computers.

When we analyze correlation between HDI and number of computers that municipalities had, we found a positive association between the variables in all cases ($p < 0.001$).

Therefore when we analyze correlation between the quantity of computers and GDP per capita of municipalities this association was not maintained.

Comparison was made between tertiles of GDP per capita of municipalities in the state and the average number of computers they had in UBS, and was statistically significant difference between the first tertile of GDP per capita and the last tertile were found. In the multiple comparison test, it was noted that significant difference is in the first tertile compared with the third tertile. Thus, municipalities with GDP of less than 14,490 have fewer computers in relation to municipalities with GDP of 20.418 ($p = 0.025$).

In the analyzed period, 1650 UBS' computerization scenarios were taken into account. 502 (30,42%) of the units had adequate setting for use of electronic medical records of e-, 368 (73.30%) of these have already been trained on site for the PEC e-SUS AB.

CONCLUSIONS: We found that the higher GDP per capita is correlated with greater quantity of computers for each UBS, although there was no significant correlation in the univariate analysis. However, the HDI appears to influence mostly the UBS computerization, the human development when associated with income in the region, this is possibly a more important factor than the income factor alone for this analysis.

We still point out a challenge for the advancement of PHC in the state: the high percentage (69.58%) of units which do not have conditions to implement PEP due to not having minimum conditions of infrastructure. ■

Analysis of access to the Babies' Portal Website by Google Analytics Tool

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INTRODUCTION: The Babies' Portal Website aimed at providing information regarding the processes and communication disorders and oral health to parents and caregivers of children aged 0 to 3 years. Objective: Describe the potential of Google Analytics tool to the analysis of visitation to Babies' Portal Website.

METHODS: The following data were obtained by Google Analytics tool, about twenty one months: umber of visitors, type of visit, site access, device used, keywords, most accessed pages of the Babies' Portal, traffic sources and visitors flow.

RESULTS: In this research, there were 36,883 visits (88.75% and 11.25% first access return visits), originating in Brazil (88.61%) and other countries (11.39%). The visits were carried out on computers (90.8%), smartphones (5.8%) and tablets (3.4%). The keywords that more directed visitors were related to oral health (pacifier, gingilone baby, toothpaste for baby bottles, food), hearing health (frequency-specific auditory brainstem responses, visual reinforcement audiometry, care ear, infant hearing assessment) and respiratory health (care nose, how to clean the baby's nose with saline). The contents with the highest number of visits were, in descending order, the main page; "How to breastfeed your baby?"; "Prevent the appliance moisture"; "What is the Deaf?"; "Degree of Hearing Loss"; "Tests by Via Bone"; "The mother's preparation for breastfeeding"; "Treatments - breathing" and "Welcome". The five sources that led most users to the website were: Google search (69%); direct traffic (14%); Google / Referral (8%); Facebook (1%) and search of Google.com (1%). As for the influx of visitors, it was found that the user accesses the website through the homepage, and the main selected links are the "Latest updates" area. The fact that the website be in Brazilian Portuguese was expected that most accesses will be held in Brazil, which in fact was found. Despite technological advances, there was the largest number of access through computers, this may be due to the website does not have its format for tablets and / or smartphones. The traffic source information shows that organic Google search is the main ally of the website due to content generated by texts and specific terms of the subjects addressed. The flow of visitors shows that after the first click, few users still browsing the website by accessing only the content available on the latest updates, should consider that there are only 6 links on the home page highlighted, and can restrict user navigation. In general, the analysis of information from the website by Google Analytics converges the reflections of possible reformulations, ensuring that the primary objectives of the website are successfully achieved.

CONCLUSIONS: The analysis by Google Analytics tool was reported for the period of 1 year and 9 months, watching updated information about how visitors use and access the Babies' Portal Website enabling the creation of strategies to optimize it according to the interests of the public target. ■

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Analysis of a training program about obstructive sleep apnea

Camila de Castro Corrêa[1]; Giédre Berretin-Felix[2]; Wanderléia Quinhoneiro Blasca[2]

INTRODUCTION: The "Young Doctor Project" involves high school students, graduate students and university teachers in the development of activities that encourage health promotion with the help of education and technological resources. Objective: Analyzing a health education model, based on the dynamics of the Young Doctor Project on "Obstructive Sleep Apnea".

METHODS: The study was approved by the Ethics Committee of Research (045911/2012). Participated voluntarily five 8th graders of a public school in Bauru / São Paulo. The training program was about Obstructive Sleep Apnea (OSA), composed of two classroom sessions, access to cybertutor, activity practice and social action to multiply knowledge. For the evaluation, the students answered a questionnaire about the level of knowledge research (on the lack of instruments, there was the need for the establishment), motivational research record and behavioral profile of access to cybertutor. It is noteworthy that in the questionnaire were embraced questions about the hygiene of the student sleep (block 1), specific knowledge OSA (block 2) and situations, problem-solving (block 3), seeking to measure the theoretical and practical relationship.

RESULTS: The content of the lessons and Cybertutor was divided into "OSA - Introduction"; "Diagnosis and Treatment" and "Prevention". After the classroom sessions, students had 18 days to access the Cybertutor on site and more appropriate time. There was a practical activity in the form of mime game, enhanced content. Social action was carried out by means of banners, brochures, posters, television news, play by puppets and mime game, resulting in the involvement of 985 people from the community. Regarding the questionnaire level of knowledge, specifically in block 1, the sum of the results showed a mean of 14.6 (maximum 20 points) before the training, and the average after 16.8. As for block 2, the sum of the correct questions was 2.46 before and 9.01 after (maximum score of 10). In the last block was observed at point 15 average 1.4 5.2 before and after (maximum score of 10) and, finally, in question 16, comparing the two times before and after the training, it was observed the description of an appropriate course of action when there is suspicion of OSAHS. The FPM was applied after access to Cybertutor and according to 100% of the students, was the classification of Cybertutor as an "Awesome Course". The three supplementary materials prepared for the behavioral assessment of access to Cybertutor were accessed by 100% of students showing interest in accessing content not mandatory. For the creation and implementation of an education model for the promotion of health should consider the use of different dynamics, especially when it is aimed at the multiplication of knowledge, yet summing up the realization of student performance assessment of the situation before and post-training in an attempt to measure the change in attitude and level of knowledge.

CONCLUSIONS: With the analysis of the training program at SOAS, noted the increase of students' knowledge, satisfactory classification of cybertutor and access to more information that was not required, and broad relevance to directly reach many people in the community. ■

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