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### Med-e-Tel 2014

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Abstracts of

## Med-e-Tel 2014

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#### A Conceptual Model of Practitioner Authentication for Telemedicine Services in Developing Countries

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Identification and authentication of practitioners participating in telemedicine consultations is of legal and ethical importance. In the developing world, with its extreme shortage of health professionals, international cross-border telemedicine potentially offers increased access to specialist advice and improved quality and continuity of care. Aims: The aim of this study is to develop a generic, conceptual model, addressing regulatory concerns regarding identification and authentication of health professionals engaging in telemedicine services in developing countries and provide identification and authentication irrespective of the platform used, in a manner that is modular, adaptable and sustainable. Methods: Five electronic databases were searched extracting papers on identification and authentication. From these, relevant architectures, frameworks, models, robust modular designs, and agent methods were studied for practitioner trusted identity enrolment and authentication. Results: A generic framework was developed using serviceorientated architecture and software agents. It provides the technology and data transmission structure to facilitate international cross-border telemedicine practitioner identification and authentication. Expanding telehealth services, ongoing development of technology devices and evolving levels-of-authentication necessitated the development of a robust modular workflow. These include interface agents, service directory facilitators, broker agents, service agents, matchmaker and presentation agents. These software agents provide end-user transparency to metadata changes and facilitate practitioner mobility, autonomy and trusted identity. Conclusion: This conceptual model is novel for a developing country, bridging legal and ethical shortcomings in the telemedicine process. Regulations require that practitioners must know precisely with whom they are interacting in every tele-consultation. From a regulatory perspective, authentication serves to protect both the patient and the practitioner, assisting in preserving patient privacy and improving access to and quality of care in the developing world.

Keywords: authentication, telemedicine, ethics, security

#### A Fast, Android Based Dietary Logging Application to Support the Life Style Change of Cardio-Metabolic Patients

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It is well known that life style change is the principal intervention for patients with cardiometabolic disorders. A major barrier in nutritional counselling is the practical difficulty to get



accurate information about the actual nutritional habit of the patients. Mobile information technology systems can help overcome this barrier. Purpose: To test the time that the users need for dietary logging with the android based application "Lavinia lifestyle mirror", developed at the University of Pannonia, Hungary. Method: Five volunteers, new to Lavinia's set based food search feature received a short (3 to 5 minutes) introduction to the operation of the Lavinia user interface. After that they received a 22 day long menu listing of the Cardiac Rehabilitation Center with three main meals for every day, for entering in the Lavinia system. The activity of the test subjects was tracked using hidden time stamp logging from the start of any new item entry to the completion of the process. The users were allowed to change from the set based search method to the keyword based search at any time. Results: The five persons recorded the 1318 items of the 5 institutional menus for the investigated 22 days. The average net time consumption for entering a new item decreased considerably from 25.60 sec on the first day to 12.45 sec on the last, with a typical learning curve (time=-4,06\*ln(days)+26,95, R2=0.60). This decrease was determined by the acceleration of the set based recording (24.89 to 12.00, time=-3,52\*ln (days)+22,71, R2=0.75), while neither the frequency nor the time consumption of keyword based search was changed (13,4%, 22,15 sec.) The average total daily time consumption of dietary logging decreased from 6.80 min. to 2.61 min. (time=-0,86\*ln (days)+5,49, R2=0.65) Conclusion: The set based dietary logging application is a viable system to generate a nutrition mirror for the users. The daily total time consumption of dietary logging is highly acceptable. Users possibly need longer practice to reduce the extra efforts connected with keyword based search.

Keywords: life-style-change, dietary-counselling, mHealth,

## A Qualitative Case Study to Evaluate the Organizational Aspects of a Telehealth Service Introduction in a Greek Hospital

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Introduction: Telehealth has been proposed as one of the solutions to the challenges faced by healthcare systems. Effective implementation of these technologies in the main care pathways is subject not only to technological change but also to organizational and cultural change. Objective: To evaluate the organizational aspects of the introduction of the telehealth services at the outpatient department of the Regional University Hospital of Larissa, in Central Greece within the context of the EU co-funded Renewing Health project. The service was provided from 2011 to 2013 to patients with chronic diseases, including Chronic Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD) and Diabetes type 2. Participants: Personnel (directors, physicians and nurses) of the outpatient hospital departments where telehealth service was introduced, after signing the informed consent form. Methods: A qualitative case study was performed with the methodology of in-depth, semi-structured interviews, for the assessment of the organizational changes (on structure, processes, culture) due to the introduction of the telehealth services. The interviews were recorded and were analyzed using content analysis. Triangulation of data was based on the available quantitative data. Results: Disruption to daily routine and lack of user-engagement (inadequate physician-based leadership, limited involvement in design or implementation) were crucial aspects to be considered prior to the introduction of the service. Additional work load and time management were the major challenges. Proper personal training in the application and practicalities of the technology were crucial factors for the adoption of telehealth services. Concerns of the personnel included privacy, security and liability issues.



Conclusion: Change management dealing with the organizational aspects from the introduction of telehealth services in everyday clinical practice seems to be a important factor for its successful implementation.

Keywords: telehealth, qualitative study, organizational changes

### A Roadmap for Mobile Mental Health in Denmark

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In partnership with the Danish Mental Health Foundation, the Danish Technological Institute is establishing a national collaborative on mobile technologies supporting mental health treatment and prevention in Denmark in partnership with public provider organizations, research, businesses and NGOs. Our main objectives are: To identify opportunities for practical application of mHealth technologies in mental health promotion as well as assessment, monitoring and treatment of mental disorders To engage with and discuss mobile mental health research and development trajectories in Denmark and abroad with a view to capacity building among Danish technology suppliers and public health care providers To facilitate opportunities for further research and development, in partnership with the industry, health care sectors and civil society A first task is to conduct a technology roadmap pointing out future directions for prevention, treatment and recovery using ICTs in a Danish context. The Med-e-Tel presentation will present the results of the roadmapping and discuss possibilities and challenges related to the use of ICTs in mental health promotion using case studies from Denmark.

Keywords: mobile mental health, prevention, self-management

### Acceptance of Diabetes Apps among Diabetes Patients 50+ and Attending Physicians M. Arnhold, W. Kirch

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Mobile applications (apps) are increasingly used for supporting persons suffering from diabetes mellitus type 1 and 2. However, due to a lack of acceptance and usability, apps are rarely used by the elderly. We therefore examine the following question within the framework of our study: How should a mobile application be designed to support an effective self-management for diabetes patients 50+? We carried out a systematic review in the first quarter of 2013 in order to get an overview of all currently available diabetes apps for the currently leading operating systems iOS and Android. Additionally, based on a 10%-sample of apps a usability-test was performed in order to examine the question: "Do the available applications serve the special needs of elderly diabetes patients?" The systematic review provides a comprehensive overview of the apps' range of functions, user groups, languages, acquisition costs, popularity/user ratings and the availability of interfaces to external sensors/devices. Moreover, as an outcome of the usability-test, first design features improving/hampering the user-friendliness for the elderly were derived. The review provided the basis for a survey among diabetics 50+ and attending physicians/ diabetologists we carried out between July and November 2013. Within 44 guided interviews we investigated the current use of mobile devices and applications, acceptance promoting/ inhibiting factors, potentially needed support and concrete design features for the development of a user- and needsoriented diabetes app. Amongst others, the results provide evidence for differences in acceptance



between different age groups, type-1- and type-2-diabetes patients, and between patients and attending physicians. Merging the results of the systematic review and the conducted survey, a user- and needs-oriented diabetes app will be developed for diabetes patients 50+. In order to guarantee user-friendliness, the prospective users are involved in the product development from the beginning. The results of regular usability tests are integrated continuously in the app optimization process. This study is conducted within the ESF-funded project InnoMedTec.

Keywords: apps, mHealth, diabetes, elderly, acceptance

### Accountability in a Sub-Saharan Hospital: Impact of Use of ICT Tools at the Gabriel Touré Hospital of Bamako

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Introduction: The University Hospital Gabriel Toure University Hospital is a third reference of the health pyramid of Mali. As such it is one of the largest hospitals in terms of offers tertiary care in the nation's health system. Added to this is its central location and proximity to the people of the Malian capital Bamako. These factors make this the busiest and most sought by citizens of the Republic of Mali hospital. As part of an efficient operation and provides quality service to the public, senior management of the hospital wanted to achieve concrete improvements of the framework for the benefit of its employees and users actions. But she was quickly confronted with problems of availability of quality information necessary for the proper control of the institution. The most pressing problems were the lack of reliable information on the situation of income and also the exact number of operational human resources in the hospital. Hospital manager decide to use ICT tools to improve quality of service. Methodology: The project was carried out by ANTIM, focusing the discussion and inclusive involvement of various stakeholders in the hospital. She was accompanied by the most senior leaders of the hospital in the process, which was to carry out an audit of existing information systems to determine the needs of all stakeholders and finally propose a technological solution taking into account all these factors. Which helped to implement a package called OpenClinic for fund management and human resources of the hospital information system. Results: The OpenClinic software became operational from 29 January 2013. From its inception in operation, it has improved significantly the revenues of the hospital. In terms of direct revenue (payment by patients money cash directly perceived at checkout) without insurance reimbursement and hospital cesarean recorded ten months of operation a total of 446 054 837 XOF. This equates to a monthly average of 44,605,483 against 35,090,725 XOF XOF before. Conclusion: The implementation of modular hospital information system OpenClinic improved comprehensively revenue of the institution.

Keywords: hospital information system, telehealth, accountability

Advanced Technology Services for Supporting Active Seniors: The Mobile.Old Project L. Spiru<sup>1</sup>, I. Karlhuber<sup>2</sup>, I. Turcu<sup>1</sup>, N. Vaart<sup>3</sup>, S. Schurz<sup>2</sup>, J. M. Laperal<sup>4</sup> <sup>1</sup>Ana Aslan International Foundation, Bucharest, Romania <sup>2</sup>F&E- & Innovationsmanagement LIFEtool gemeinnützige GmbH, Austria <sup>3</sup>Nationaal Ouderen Fonds, The Netherlands



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In Europe, the global aging challenges triggered the initiation of innovative concepts, programs and actions aiming at better managing the needs of seniors. The developments of smart technology apps able to support seniors' daily life assure the infrastructure of the currently evolving complementary, non-human component of seniors care. The Mobile.Old EU funded project aims at developing a smart mobile phone application able to support the indoor and outdoor mobility of seniors. The Mobile.Old app provides ten services running on smart phone, smart TV or tablet: Mobile.News (access to the latest traffic news), Mobile. Activity (recording, share and compare walking routes), Mobile.Trip (for travel route planning), Mobile.Training (physical training and keeping fit based on appropriate videos), Mobile.Aid (based on illustrated instructions for emergency cases), Mobile.Checklist (for organizing trips, shopping medication etc.), Mobile.Compass (orientation and navigation outdoor and abroad), Mobile.Quiz (play the digital version of the famous "Scavenger Hunt" game), Mobile.Insight (for exploring POIs around the world) and the Mobile. Security service for traveling). The project meets the core of important EU programs such as the EIP on AHA (2011), or the AAL-JP, as well as the aims of improving seniors' quality of life, health care systems, family and society burden. All the old people in the end-users group of the project proved interested in the virtual companion provided by the Mobile.Old app, and thus well motivated to proactively contribute to the accomplishment of project activities (identification of mobility needs, design, evaluation and validation of interfaces and prototype). Friendly interfaces, the easy access and navigation through various functions and a good initial training with a human assistant are the prerequisites of a successful push on the market of a smart application dedicated to seniors.

Keywords: active seniors, mobility, smart applications

#### An International Telemedicine Curriculum

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Several member countries have asked the ISfTeH for assistance in providing education and training in telemedicine. Currently few medical schools or nursing colleges offer such education or training, other than in specialties like radiology and ophthalmology which have integrated aspects of telemedicine into routine practice. Telemedicine courses do exist in several countries (USA, Russia, South Africa), and these are aimed at practicing healthcare professionals. Also, the ISfTeH has developed and run a structured 2 - 3 day awareness and training course for healthcare professionals. Several disciplines have also developed clinical and operational guidelines for the practice of telemedicine - but these set standards for the provision of care and do not constitute education or training. Further, accreditation, proposed by some, would be an obstacle and counterproductive to the uptake and use of telemedicine, especially in the developing world with its extreme shortage of doctors and nurses. So what is needed? Several issues must be considered. It is necessary to differentiate between: formal education in telemedicine leading to an academic qualification (MSc, PhD); training in the use of specific technologies, devices and services, with possible certification; and raising awareness of telemedicine. All are important, but have different objectives, outcomes, and audiences (health professionals, administrators, technicians, and the patient community). Without such capacity building there will be little consumer demand for telemedicine. What is being sought is a generic, hybrid, model of awareness, training and education that covers the needs of health professionals, administrators, and decision-makers. The generic programme must be flexible enough to be readily adapted to local and regional differences



in clinical practice, regulation, telemedicine services, and infrastructural and human resource circumstances. Device or service specific training must be developed and offered locally. The ISfTeH Education Workgroup is working towards developing this hybrid curriculum by adapting and refining existing offerings.

Keywords: education, training, curriculum, telemedicine, global

## Analyzing the Nigeria's e-Health Policies; Seeking Solutions: A Case Study of the Nigerian e-Health Policies

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This paper is a thorough research on Nigeria's e-health Policies. It seeks a more concise document that suits the Nigerian society by finding the means towards moving e-Health to a better position in the country. It seeks to build local skills and infrastructure to create demand. In Nigeria, few health institutions use telemedicine and e-Health tools to provide efficient health care services. The absence of a National e-Health policy to facilitate a systematic, coherent and sustainable telemedicine and e-Health structure has undermined the e-Health development and integration in the nation's healthcare delivery system. In Nigeria, only19.8 % of Doctors, nurses and midwives attend to a 10,000 population of patients; this clearly indicates an unequal distribution of health workers. Countries like India, Rwanda, Kenya and Uganda have overwhelming evidences to further affirm the potentials of e-Health in transforming health systems and economies. In recent times, the Nigerian government called on Nigerian doctors in the Diaspora, including physicians practicing locally, to develop draft policies. The team attracted the attention of doctors from more Nigerian states; the outcome of their deliberations include great ideas such as; National Information Technology Development Agency (NITDA) Data Protection Act, Medical Records Policies, E-health Policies. Others are, Telemedicine Policy, ICT Policies at the Federal Ministry of Health (FMoH). The long term goal of these will be to create an enabling environment for the development and deployment of a sustainable e-Health structure at the national and sub-national levels. We also seek to know if some of these policies have been enablers of Telemedicine and e-Health in Nigeria or not. Identify the gaps and make suggestions on way forward. In conclusion, good policy is the core to sustaining every e-Health initiative; it requires a very wide scope that should expand every day. Policies form a crucial aspect of the e-Health strategy development process. This research paper tends to summarize best practices and sustainable policies and guidelines for users to easily adopt in Nigeria.

Keywords: analyzing, e-Health, policies, Nigeria, telemedicine

Applying a Computerized Care Pathway Orchestration System in the Hospital F. Roucoux<sup>1</sup>, R. Florquin<sup>2</sup>, C. Quintens<sup>3</sup>, V. Remouchamps<sup>3</sup> <sup>1</sup>UCL, Cancer Centre, Avenue Hippocrate, Brussels, Belgium <sup>2</sup>Palantiris SPRL, Belgium <sup>3</sup>CMSE Hospital, Belgium

We will present a software system that we developed to support the orchestration of clinical pathways (CPs). In developing this tool, we expected to improve the quality and the overall efficiency of the care of patients enrolled in CPs. Our system currently orchestrates the daily care



of more than 400 patients in a mid-size Belgian hospital with a significant oncological activity. It gathers disparate and heterogeneous data from various information systems. From these data, the system infers and displays the progress of patients in their CPs in the form of animated flowcharts and timelines. It alerts the concerned caregivers when something goes wrong or late. It manages task lists, check lists and reminders aimed for CPs coordinators. It generates performance and quality dashboards based on continuous indicators measure. Finally, it automates the prescription of certain paramedical care. The system is based on a hybrid workflow- and rule-based orchestration engine, a message bus and an extensible library of software connectors. It is accessible on desktop and mobile clients from anywhere in the hospital. A fast access mechanism allows caregivers to consult the status of a patient's CP from its electronic medical or nursing record. The system relieves the CPs coordinators from tedious and repetitive administrative tasks like systematic checking of appointment dates, tasks completion and indicators computation. Coordinators have more time to spend with patients. By functioning all around de clock, the system provides a level of real-time monitoring unattainable by human beings. Even in absence of full automation, computerized orchestration of CPs already provides significant benefits. The systematic identification of variances reveals practices that would possibly harm patients. These practices have now almost completely disappeared in the hospital. The complete automation of CPs orchestration is a technological and human challenge. Improving the level of automation is an on-going process that does not prevents the actual fruitful use of the system. Further developments are currently in progress to give patients an access to an adapted version of the system.

Keywords: care-pathways monitoring orchestration indicators improvement

#### Are Our e-Health Applications Addressing the Right Health Needs?

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This paper questions whether there are lessons to be learnt from the Global Burden of Disease Study 2010 that would allow e-health to have greater impact on people-centred health systems through re-evaluating the focus of our research and implementation efforts. Examination of the literature shows current e-health applications focus on clever, narrow, or 'one disease' applications (e.g., telediabetes; telesurgery), or creation of electronic records (e.g., EHR's; EMRs; HIS's) and accumulation of 'big data' (e.g., biosurveillance). But patients typically do not have one disease, and few of the world's 7 Billion plus population will need or benefit from telesurgery, or a 'life-long' health record. If our focus is patient-centred health systems and poor, vulnerable, and at-risk populations, then we must answer the question: are our current e-health applications addressing the right health needs? The recently published Global Burden of Disease Study 2010 provides measures of the impact of hundreds of diseases, injuries, and risk factors in 21 regions around the world. Country Profiles also summarize changes in a countries health between 1990 and 2010, highlighting trends that must be addressed. The GBD data also describe leading diseases and injuries that cause people to die prematurely and become disabled, as well as the main risk factors attributable to different diseases and injuries. Of significance is that findings are very much regional and even country specific. Some examples of health risks are as expected (increase in diabetes or BMI), whereas others are unexpected (household air pollution). Such data are invaluable to policy- and decision-makers (particularly in developing countries), because they indicate where simple, low-cost, but targeted e-health interventions would best impact the most significant health issues. We summarize key findings and perspectives of the GBD study, and



contrast them with current e-health clinical application foci, and then promote a shift in the focus of our future e-health research and implementation efforts.

Keywords: e-Health; Global Burden of Disease

### Ariane: An Innovative Tool to Maintain Connectedness When in Hospital

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Hospitalization still involves physical and social isolation, even today. On top of physical pain, patients commonly experience disconnection from their usual backgrounds. The missing factor is communication, which should include contact with relatives, friends, helpers, daily news (radio, TV, etc.), thanks to modern communication tools. Paradoxically, the standard phone in a hospital room is actually more annoying than helpful. It is hardly convenient, intrusive and poorly adapted to the needs. This is precisely what the community hospital of Le Dorat in Limousin noticed, particularly for patients confined to bed. The object itself has many flaws (inappropriate ringtone, tiny or difficult to decipher keys, difficulties to hang up, unstable base, etc.). But in fact the rejection of the phone only reveals the patients' practical and social disconnectedness. Specifically, the patient, in an unfamiliar environment, is no longer in a position to manage his daily life or timetable. Thus the Ariane project consists in widening the very concept of phone to include multimedia communication with a broader set of uses and tools. The goal is to empower patients by enabling them to actively manage their daily lives, and providing them with familiar landmarks and enjoyable interactions. The device is a highly intuitive and user-friendly digital touch pad meant for people who are not familiar with IT. It is connected to a database of services. The range of functionalities offers reassuring landmarks such as socializing and time management tools, or access to media and leisure activities. Apps supporting cognitive, executive and visuospatial abilities will also be accessible on request. Later on, dedicated services will be implemented into the system so as to enable better coordination of care protocols, communication with the GP and administrative tasks. Care will be improved thanks to an enhanced patient file and better connectedness with relatives.

Keywords: ageing-well, social link - communication - hospital

#### Assessment of an Educative Program on "Hand Washing" Through A Mobile Device for Nursing Professionals

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Introduction: Mobile learning has been employed as a tool to facilitate the teaching-learning process. In nursing, we are aware of the importance and need to offer continuing education to these professionals, but this activity remains a challenge. Objective: To assess an educative program on "Hand Washing" offered through a mobile device. Method: Cross-sectional,



exploratory and descriptive survey. The data were collected at a small secondary public hospital in an interior city in São Paulo State, Brazil. Participation in the educative program took place during the work shift and involved daily accesses to the units of each course module on hand washing. The professionals assessed the educative program with the help of a Likert questionnaire with 26 questions, ranging from I strongly agree to I strongly disagree. Forty-seven nursing professionals participated in the study (auxiliary and baccalaureate nurses). Results: Female professionals (82.98%) were predominant, between 31 and 41 years of age (46.81%), mostly (78.72%) auxiliary nurses from the medical and surgical clinics (59.57%). The results indicate that most professionals: considered the device as a good continuing education means (78.26%). A large part of the professionals considered the course flexible (80.44%) and 78.72% would take another course through a mobile device (78.72%); some professionals (21.74%), however, did not find it pleasant to take a course through a mobile device. Conclusion: The use of a mobile device showed to be an efficient continuing education tool.

Keywords: nursing, hand hygiene, evaluation, educational technology

## Association for Ukrainian Telemedicine and eHealth Development - Report of Activity During 2012-2013

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Activity of Association for Ukrainian Telemedicine and eHealth Development (AfUTeHD) during last 2 years:

1. Clinical telemedicine: Development of methodology and approaches for a regional antituberculosis network; Participation in creation of such network at regional level, evaluation of efficiency, development of the good practice model for wide introduction at national and international levels.

During the first months of operating the network shows big number of teleconsultations, great improve of management and logistics, high level of end-users' satisfaction. Participation in creation of national teleoncology network linked main oncology centers in 6 regions. The current activity mainly focused on distant learning and teleradiology. Special evaluation of the network efficiency shows good level of end-users' satisfaction and allows to find ways for further development. Both networks mentioned above had been created due to kind efforts and financial support of Rinat Akhmetov Foundation "Development of Ukraine". In cooperation with clinical establishments the Association supports the teledermatology platform which focused on patient centred care and interaction between primary and tertiary levels of a medical care.

2. The intensive distant learning course in telemedicine and eHealth had been done in April 2013 for 1 and 4 years students in New Bulgarian University (NBU, Sofia, Bulgaria). The course includes 30 hours of videoconferences. The lectures will be delivered to the students through the Moodle platform, adopted for NBU needs, and e-Works videoconferences software. Digital textbook entitled "Information Technologies in Medicine and Healthcare" was published specially for the course.

3. Editions: There are 4 issues of "Ukrainian Journal of Telemedicine and Medical Telematics" were published (in paper and electronic versions). Journal is indexed by Copernicus®.

4. Events: VIII and IX International Conferences "Telemedicine – Experience@Prospects" took place in Donetsk. Each year there were about 200 participants from 15-20 regions of Ukraine, EU and Russia also. The official web-site is <u>http://www.telemed.org.ua</u>.



Keywords: telemedicine, Ukraine, professional society, eHealth

### Assure Health: A Disruptive Way of Improving Maternity and Cardiac Care

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Wipro's Assure Health initiative is a platform that integrates medical applications, automated healthcare monitoring with the aim to improve the delivery of healthcare services. Patient monitoring is done through hosted services and mobile apps that integrate medical devices, IT infrastructure and 24/7 customer support.

Remote Foetal Monitoring and Cardiac Care are two examples. Through the foetal monitoring service, recordings of maternal and foetal heart rate and uterine activity from the expectant mother are sent to the mobile device of the concerned physician. This enables urgent and accurate medical care. This service is also used during active labour and delivery.

# ASYSTED - Development of a mHealth Based Expert Support System for Ultrasonic Examination Performed by Laymen

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To get access to professional medical diagnostics in time is not guaranteed worldwide. Especially in large countries with sparsely populated areas in locations of industry in remote areas or off-shore the consultation of medical experts is often associated with life-threatening delays and significant costs for evacuation.

Ultrasonic investigations play an important role in medical diagnostics in emergency cases. But the lack of experienced examiners in the scenarios described above hamper the performance of ultrasonic investigations as an additional source of diagnostic information.

Telerobotic systems have been developed in the past to be able to perform examinations even from the distance. But these systems are quite expensive and thus not widely used.

To bridge this capability gap the German Aerospace Center in cooperation with the Austrian telemedicine solution provider SCOTTY Group developed a telemedical sonography support system which guides a non-experienced examiner when performing ultrasonic examinations. The system combines the transfer of the sonographic video data to a remote expert a video conferencing system and a signaling system visualizing the necessary movements of the ultrasonic transducer to be performed by the examiner.

ASYSTED (Advanced System for Tele Guidance Diagnostic) is an intuitive and cost-effective method for remote examination guidance and expert consultation. The system can operate ubiquitous (water, land, air) using satellite communications or other IP connections and can be used by unexperienced doctors or even trained paramedics.

ASYSTED is currently in a prototype stadium and has been patented and evaluated by physicians of DLR. In a next step it is intended to develop a system ready for the market together with the Austrian partners.

# **BBEEG:** An Internet Portal for Telemedicine & E-Learning in the Field of the Electroencephalographic Signals of Newborns



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The neonatal period is a risk neurological damage period because of the immature nature of the brain for the premature births or non-optimal conditions at birth. The consequences can be severe and cause permanent and severe disabilities. The EEG makes possible the evaluation of the degree of brain damage. It can also detect possible seizures and monitor their evolution under treatment. In this case we must couple the EEG with a synchronized video of the patient in order to properly identify abnormal clinical manifestations. The techniques of neuroprotection starting to be commonly used, as for example the controlled hypothermia for cases of cerebral anoxia, require that an accurate assessment of the severity of brain damage be done. The EEG allows the physiological assessment but requires highly specialized personnel. The French expertise is recognized but its daily practice suffers from a growing shortage of specialists. The Video EEG signals are recorded in digital form by a technician and visually analyzed by a doctor after their acquisition. They can also be analyzed by tools of signal processing in order to complement, accelerate or intensify the visual analysis. These characteristics prove that the EEG signals will fit well to telemedicine activities. It is very important to ensure that the development of remote interpretation is not accompanied by a loss of competence. The BB EEG project will thus pave the way for the industrial development of the telemedicine activities and will contribute to maintaining the recognized excellence of the French school in this area. Our consortium brings together all the players necessary to tackle these barriers. It combines several hospitals in the region of Pays de la Loire with industry specializing in the secure transport of medical data, the work flow organization and its potential applications for learning strategies, with researchers in mathematics and signal processing fields. the BBEEG project provide a portal offering a combination of different services for a much rapid and secure diagnostic and for the newborn EEG training.

Keywords: EEG, newborn, telemedicine, e-learning, research

#### Bika Health, LIMS for Health Care Laboratories

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LIMS (Laboratory Information Management Systems) has as its main features the management of laboratory samples and their analyses, but must also ensure compliance with international standards such as ISO 17025, Clinical Laboratory Improvement Amendments (CLIA) and the Good| Lab Practice (GLP) protocol. LIMS must guarantee Quality Assurance and Control processes for all products and services offered by the lab. LIMS should be regarded as a quality management system and essential in ensuring the consistency, reliability, reproducibility, traceability and integrity of all lab processes. Different types of labs have diverse needs and regulations to comply with and LIMS must stay flexible and adaptable to these varied lab disciplines. As a laboratory workhorse, LIMS must also be user friendly and reduce, as much possible, the learning curve for lab newcomers.

The Bika LIMS project includes a number of open source web-based LIMS applications, each geared towards a different laboratory discipline: Bika LIMS, Bika Health, Bika Epid, Bika Wine and Bika Interlab. Bika Health is the Bika LIMS branch developed specifically for health care laboratories, with patient samples and clinical cases the central elements in the lab workflow.

Bika LIMS provides a competitive advantage over proprietary LIMS, not only through saving licensing costs, but because the design and development team gets to focus all efforts and



resources on implementing custom-made LIMS, responding to specific customer needs. In addition, customers benefit from improvements aggregated from world-wide contributions by the Bika Open Source community. The continued development by project participants, sponsored by fee-paying clients, and the debate generated by users on community forums, ensure a high quality best-of-breed system with constant growth in new features and enhancements.

Keywords: LIMS, health, open source, Bika LIMS, laboratory

## **BIOSCREEN - Universal Cognitive Medical Expert System for Disease Screening and Therapy Monitoring**

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BIOSCREEN is a robust medical expert system, which allows classifying an unknown object to one of the previously known medical diagnosis of patient. Those diagnosis data should disjunctively cover an area of interest. The unique feature of the proposed system lies in the optimal algorithm for the most effective classification of unknown object (patient) into the appropriate diagnostic group accordingly to his state of health. For visualization of results the new approach of 2D and 3D interactive graphics was used, which allows to follow-up even progress of therapy System has modules CANSCREEN for cancer screening, CARDIOSCREEN for monitoring of cardiovascular diseases and DIABSCREEN for evaluating of diabetes subgroups. BIOSCREEN is flexible and modular and can be embedded into ambulance PC software and also into hospital systems based on cloud approach System was tested on several thousands of patient data with confirmed clinical diagnoses System was successfully used for diagnostics of prostate and lung cancer, prediction of heart risk, monitoring of osteoporosis and diabetes.

Keywords: expert system, statistics, interactive graphics

#### Blood Pressure Telemonitoring Integration in a Public Hospital's High Blood Pressure Ambulatory Care Program

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The high prevalence of hypertension in a population and the need to have good blood pressure control to reduce the cardio and cerebro vascular complications related do high blood pressure imposes the need to implement adequate programs. It's well known the need to improve the actual rate of blood pressure control. As a clinically silent situation it has been proved that most of the patients need to be stimulated to take blood pressure measures and to take their medications, traditionally that is done with repeated face to face episodes with the patient and a health care professional. This kind of solution is very human resource consuming, has low efficiency and



doesn't provide an organized solution in case of hypertension decompensation. The Centro Hospitalar Cova da Beira Hypertension control program in partnership with the University of Beira Interior and AIT - Austrian Institute of Technology developed a one year long proof of concept project, the PADISTUBI, to try to demonstrate the use and feasibility of telemonitoring in the context of a public hospital's High Blood Pressure Ambulatory Care Program. Blood pressure measurement devices and smartphones were given to 20 patients, it was asked that they take daily blood pressure, and weight measurements with information regarding general wellbeing and medication. The device information was transmitted to the smartphone through NFC and patient information using an interface developed by AIT. Information was then sent from the smartphone to the server through mobile phone network using SIM cards provided by Optimus. The system was designed with alarms that send messages to patients or to health care professionals according to a predefined algorithm. At the end of the project the data was analyzed and demonstrate the feasibility and the interest of the use of telemonitoring to improve hypertension control in Centro Hospitalar Cova da Beira's High Blood Pressure Ambulatory Care Program in selected patients, and the system will be included in day by day practice. Most of the patients that used the system felt comfortable and in connection with the team.

Keywords: hypertension, telemonitoring, self-control, hypertension-control-program

## BrainControl Basic Communicator: A Brain-Computer Interface Based Communicator for People with Severe Disabilities

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The "BrainControl Basic Communicator" is an augmentative and alternative communication (AAC) system based on Brain-computer interface (BCI) technology. The system has been designed for patients with severe disabilities due to pathologies such as Amyotrophic Lateral Sclerosis (ALS), Multiple Sclerosis, ischemic or traumatic injuries.

Brain-computer interface (BCI) technology interprets the electrical signals that correspond with certain brain activity and allows a computer or other external devise to be controlled with thoughts. BrainControl project aim to develop a BCI platform that allows people suffering from severe disabilities to overcome physical and communicative impairments. In particular, BrainControl can help patients suffering from diseases that paralyze the whole body or parts of the body, but who retain their intellectual abilities.

BrainControl Basic Communicator consists of noninvasive wireless EEG headsets, a tablet PC and software including a classifier of EEG patterns and a user interface designed around the needs of locked-in patients.

Future versions of BrainControl, which are currently under development, will include advanced communication and entertainment functionalities, home automation, the control of a wheelchair and robotics.

#### **Brazilian Journal of Telehealth (JBT)**

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Introduction and Aim: Brazil is dramatically implementing projects in telemedicine and telehealth. Thus, a journal is the mirror in the international technical community for these advances in research, health education, in teleconsulting and in remote diagnosis. For this purpose, the staff of UERJ Telehealth Center1 has developed the Brazilian Journal of Telehealth2, an exclusively online journal for the dissemination of scientific papers in the areas of telemedicine and telehealth. Material and Methods: Bilingual system (Portuguese/English) developed in PHP software (CodeIgniter Framework), Javascript, HTML, CSS and the use of PostGreSQL database, allowing, through registration made by an online form, the quarterly submission and publication of papers in relevant scientific areas. These papers are organized by title, author(s), edition, year and volume. The material submitted by the author is forwarded to the editors who make an initial review on the subject, standards and technical standards. Then the material is subjected to peer review, anonymously. The entire process is made by the system itself through sending emails and assignments of roles to users (author, editor, reviewer and designer). Despite being an exclusively digital magazine, there are several categories of publishing similar to a print magazine, namely: Editorial, Letter to the Editor, Original Article, Review Article, Experience Report and Summary of Thesis. Once approved by the editorial board, the paper is available in the following edition, in PDF format. Results: From August 2012 to November 2013, 6 issues of the journal and one supplement were published, with 17,190 accessions of the public - Brazilians and foreigners. Conclusion: There is a great interest on the part of the scientific and technical community in telemedicine and telehealth area.

Keywords: telemedicine, telehealth, scientific journal

### **Brazilian Telehealth Program: Follow Up of the Legislation Advancement along the Implementation of the Program**

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Brazil has adopted e-Health as a national policy applied to healthcare and education since 2006. It started as part of Ministry of Health national policy for development and capacity building of human resources for health. The multiple strategies for eHealth include mainly the Brazilian Telehealth Program (www.telessaudebrasil.org.br), Open University of the Unified National Health System - UNA SUS (www.unasus.gov.br) and University Telemedicine Network - RUTE (www.rute.rnp.br), the electronic health record (National Card of Health) and the Center for Strategic Information in Health Surveillance - CIEVS, equipped with the most modern technology to receive information about outbreaks and epidemiological emergencies that endanger the health of the population in any country site resource room, having a specialized team on call 24 hours a day, every day of the week, to receive notifications and notify the authorities in case of emergency. The Brazilian Telehealth Program offer teleconsultations and the Second Formative Opinion. It started in 2006 and it has been implemented and developed so far at 3 different stages concerning its legislation. The first edict by the Ministry of Health, in 2007, established the Pilot Project, defined criteria to implement the program predominantly in remote areas at the five different regions of the country. In 2010, a new edict recognizes not anymore as a pilot project, but as the Brazilian National Telehealth Program and determines its structure in each of the 27 states of the country. Up to that time, the program was applied to the primary health care level. Based on the proved results, especially the increased solvability observed with the teleconsultiations, the actual edict, published in 2011, expanded the Program to high complexity



services and as strategy to reinforce the network of health care delivery as a whole. Another set of evolution reflected at the legislation is that it brings the concepts of teleconsultancy, telediagnosis, Formative Second Opinion and also that the services of telehealth are incorporated to the list of health care services of SUS, the National Health System.

Keywords: telehealth, primary health care, legislation

# Building Innovation into Tele-Health and e-Health Delivery Agreements - A Legal Perspective

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What priorities should stakeholders place in innovation to achieve agility and scalability to enable Tele-Health and e-Health services to react more quickly to advancements in technology? Should commercial agreements reflect more a strategic relationship between parties that mutually fosters innovation to help ensure a sustainable, transformative future for relevant and effective e-Health and Tele-Health services? Effective procurement practices require intermittent approaches to market and in order to achieve value for money, service agreements with vendors may often be up to 2-4 years. The rate of change in technology is likely to be significant in that contract period alone. Difficulties arise when conventional contracting principles inherently result in a focus on drafting known deliverables, service levels and pricing. If at all, provisions in contracts requiring vendors to refresh solutions in line with technological advancements are mostly soft obligations to maintain environmental scans or at best, they're reflected in clauses that "agree to agree". The legal effect of such arrangements is generally weak and innovative solutions during a contract period are largely at the cost and effort of the purchaser. As with most contracts, clauses dealing with intellectual property ownership, the indemnities and warranties expected of vendors in the delivery of the service, act as inhibitors to what should be a collaborative arrangement where both parties realise longer-term commercial benefits. Hence contracts alone are not a panacea to achieving innovative solutions during a contract period. It is important for purchasers to use the approach to market and resulting competitive tension to get as much commitment from vendors to establishing frameworks for accommodating future innovative solutions. This paper seeks to share a legal perspective on contractual provisions that work and don't work in maintaining leading edge solutions during contract terms. Options such as cross-organizational governance arrangements, gain share and "earn back" mechanisms for innovation investment, intellectual property ownership and risk allocation in pilot programs are considered.

Keywords: legal, contracts, innovation, technology, agreements

## Capacity Building through Education, Research and Collaboration: AFRICA BUILD, an eHealth Case Study

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AFRICA BUILD (AB) is a Coordination Action project under the 7th European Framework Programme having the aim of improving the capacities for health research and education in Africa through Information and Communication Technologies (ICT). This project, started in 2012, has promoted health research, education and evidence-based practice in Africa through the creation of centers of excellence, by using ICT, "know-how", eLearning and knowledge sharing, through Web-enabled virtual communities.

Partners in the project are:

- 1. Universidad Politecnica de Madrid;
- 2. Ministry of Communications and Information Technology (CIT), Egypt;
- 3. Faculté de Médecine de Pharmacie et d'Odonto Stomatologie (FMPOS) de Bamako, Mali;
- 4. University of Geneva; 5. Institute of Tropical Medicine (ITM), Antwerp (Belgium);
- 5. 6.World Health Organization, Department of Reproductive Health and Research;
- 6. 7. Faculty of Medicine and Biomedical Sciences (FMSB) University of Yaoundé;
- 7. 8. University of Ghana, School of Public Health

Under the Work package 3, the AB project has been developing an innovative Web portal: this user-friendly, integrated, customizable, multi-lingual interface provides all the technical support needed for the educational activities of the consortium. Thanks to the potential of the Social and Semantic Web (Web 2.0 and Web 3.0 respectively) techniques, this portal supports networking and access to a wide variety of open-source informatics tools for health. It grants as well the generation of new virtual communities of health researchers, biomedical informatics developers and users, facilitating the exchanges of methods, tools, knowledge and expertise with EC groups and international matter-experts. With the final aim of embedding distance learning and remote ICT expertise tools in the AB portal, several facilities were included in this portal, such as: a) a social kernel, powered by Elgg —which is a social networking engine, delivering the building blocks that enable businesses, schools, universities and associations to create their own fullyfeatured social networks— to foster the virtual discovery and collaboration of African researchers; b) a method to plug-in Moodle instances to make their courses immediately accessible and reuse them in a social context; c) a research interface, called the eLaboratory —which is a Widget-based environment— that integrates different research resources as PubMed Central, BioMed Central, AJOL, WHO news, a Research Projects GIS and an African Educational catalog, among others; d) a Mobility Brokerage Service to find training opportunities, jobs or mobility stays. Moreover the distance learning courses and the additional tutorials developed for educational support to the African partners were embedded in this AB Web portal, using a very user-friendly software already tested in Africa and designed by the RAFT network (DUDAL software) to work in "infrastructure-deficient environments", in particular when faced with low-bandwidth and unstable internet connectivity. AFRICA BUILD has created networks and virtual communities in health research and biomedical informatics, where professionals could exchange all kind of material and knowledge.

The skills building workshop will show all potentialities and experiences gained through this portal, from the ICT profile to the benefitting educational role to health researchers and other health care professionals and biomedical informatics developers, deployed in resource-limited and/or North countries, with the following schedule:

1. A general overview of AB project.

- 2. Technical discussion:
- Introduction technical aspects and architecture of ABP;
- Specific experiences illustrated with technical cases and practical aspects;



- DUDAL webcasting: technical issues;
- Interactive discussion.

3. Closing - looking at the next steps for development of the ABP, and lessons learnt from the uptake of the ABP and courses by health researchers.

### **Cape Verde: Initiating a Telemedicine Program in a Country with Geographic Challenges** R. Downey

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The nation of Cape Verde is composed of ten islands formed by volcanic eruptions off the western coast of Africa. A former colony of Portugal, Cape Verde achieved its independence in 1975. Nine of the islands are inhabited and today are the home of 500-thousand people. Travel between the islands is limited to one or two flights and/or ferry rides per day. Only the Hospital Dr. Agostinho Neto in the capital of Praia offers advanced primary and some specialty care. Due to the cost and inconvenience of travel schedules, residents tend to procrastinate and seek care after health problems become serious. These sicker patients join others and crowd the hospital on the main island of Santiago. New procedures ordered by the government that require telemedicine consultations before patients are transferred to Santiago led the International Virtual e-Hospital to contact GlobalMed and request its participation in a roll-out of telemedicine systems to each island. This presentation will explain more about the genesis of the project, the challenges in shipping the telemedicine stations to Cape Verde, the strategy behind the deployment, lessons learned, and some early and hopeful successes of the project.

Keywords: Cape Verde, telemedicine, geographic challenges,

### Clinical Quality Control of a Large Brazilian Teleconsultation Service: The Telehealth Network of Minas Gerais

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The Telehealth Network of Minas Gerais (TNMG) is a large scale public telehealth service which assists 660 municipalities of the state of Minas Gerais, Brazil. It has already performed more than 54,000 teleconsultations for a large variety of specialties. Assessing the quality of the service is an important tool to promote its excellence. Taking this into account, the TNMG has created a clinical quality control service. The objective of this study is to assess the quality of the teleconsultations performed by the TNMG and the impact of focused interventions to improve the quality. The first phase of the study consisted on the analysis of the teleconsultations performed from 12/12/2012 to 12/01/2013. Questions and answers were classified as "appropriate" or "inappropriate". If inappropriate, the possible reasons were evaluated. Subsequently, an intervention was applied towards the most common reasons for inappropriate questions and answers, and then a second analysis was performed from 01/07/2013 to 31/07/2013. In the first phase, 459 teleconsultations were assessed; 17% of the questions and 14% of the answers were considered "inappropriate". The most frequent reasons were "unfriendliness", for example, use of only uppercase letters, and "not enough information provided" for the questions and mainly "unfriendliness" for the answers. Therefore, there was an improvement of the system to promote more structured questions; specialists from the TNMG and healthcare practitioners from the municipalities were re-trained; and a manual was elaborated for the specialists. In the second



phase, 436 teleconsultations were analyzed; 13% of the questions and 4% of the answers were considered "inappropriate". There was a reduction of the proportion of unfriendly answers. In conclusion, this study highlighted the importance of performing regular analyses of a teleconsultation service and implementing focused corrective measures, in order to improve the quality of the service provided.

Keywords: teleconsultation, quality control, primary healthcare

### **Clinical Scenarios in Telepharmacology**

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Introduction: One of the great challenges of using IT in a professional medical environment is also optimization of roles and collaboration of different members of the health care team. In this study we concentrate on the role of pharmacologist with computer supported knowledge of prescribing, administration, pharmacodynamics and drug interactions.

Methods: The scenarios for IT environment in simulation centre were prepared to test the usability of the pharmacological team and pharmacological software for different medical specialists via remote (telepharmacological) connection. Three different teams/rooms were proposed: (1) IT control team for equipment and scenarios management, (2) Telepharmacological team for remote pharmacological consultations (available 24/7) and (3) Clinical team with medical specialist and patient (in ambulatory or home environment). Telepharmacological team has available drug interactions and prescriptions decision support software/systems and other databases (including information on dosage regimens in patients with renal and/or hepatic dysfunction, in pregnancy, breastfeeding women, elderly, pediatric patients; drugs and medical devices dispensed in Slovenia) via common web interface. Only open-access databases like www.CBZ.si, Drugs.com, Lexicomp, PharmGKB were used. If medical specialists are in doubt on which drug or therapeutic regimen to use in specific clinical case, they are simply able to consult clinical pharmacologist on duty via safe and secure telepharmacology link.

Results: The basic installation at the simulation centre was made and two clinical scenarios were prepared: (1) atrioventricular block due to digitalis poisoning, and (2) hypoglycemic coma due to a drug interaction between tolbutamide (regular dosing regimen) and aspirin (overdose). Telepharmacological functions of the system are full-duplex multimedia (audio, video and text) connection between end-user and telepharmacological team. All communication is recorded and stored for later supervision.

Conclusion: Telepharmacology is making the use of pharmacological knowledge much easier and optimal considering that common medical informatics standards are used.

Keywords: telepharmacology, telehealth, computer simulation, IS

#### Cloud Teledermoscopy: System Development, Managing and Efficiency

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Teledermoscopy is method of obtaining digital dermoscopic images with the technology provided by teledermatology. Teledermoscopy is very convenient melanoma-screening tool especially for the high risk patients in the remote settings, where they cannot receive qualified dermatooncology service. The aim of this study was to assess the usability and quality of store-and-forward secure teledermoscopy system for pigmented skin lesions evaluation and further decision-making. The doctors in the primary and secondary health centers created digital dermoscopic images and uploaded them to the secure online cloud system with all accompanying clinical data. Special questionnaire was developed that simplified and accelerated patient data entry and also providing power validation algorithm. Within 24-hours 3 dermoscopy experts from pigmented lesions clinic evaluated images (macro and dermosopic) and filled report form. A total 136 cases were evaluated in one month. Results were classified by the referral site, diagnosis and decision taken by the expert. Results: from 136 cases 21 were diagnosed as skin malignances and sent for further surgery to the nearest regional skin cancer center. Conclusions: web-based secure store-andforward cloud teledermoscopy system is much faster and more convenient way of dermatooncology service, especially in the remote settings. Significant improvement in the patient care and document flow was reached. Further analysis on the long-term results and costs should be performed.

Keywords: teledermatology, teledermoscopy, cloud computing, teleoncology

### Communicating in 'e-Health' - Do We Really Know What We Mean?

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In its simplest sense, communication is the process of transferring a message or information from a sender to a receiver through some form of communication channel. For this to work, one of the requirements is absence of differing interpretations, which in turn means consistency in definition of terms within an accepted vocabulary. e-Health depends upon communication. But do we really know what we mean? For example, the term "e-Health" has been widely accepted verbally and practically, but we know that nearly a decade ago there were at least 51 'definitions'. There has been substantial miscommunication within the e-health community, disenabling effective interaction and consultation among health care providers, policy makers, and other stakeholders. This inconsistency in terminology and definitions for e-health and related terms leads to misunderstanding, inefficient action, and perhaps wasted resources. To understand more about the need for consensus for, and consistent use of, clear definitions within e-health, a 'definitions exercise' was performed to assess understanding of some definitions used in health and e-health. A total of 76 e-health proponents were asked to 'define' six common terms: population, urban population, total mortality, contact with medical doctors, doctors, and cross-jurisdictional. Their responses were then compared to that of 'gold standard' definitions (e.g., Stats Canada, Health Canada). Analysis of key content showed considerable discrepancy between personal and 'gold standard' definitions that would render meaningful communication around these topics difficult, or even misleading. Simply put, poor or inconsistent use of defined terms leads to unpredictable outcomes. This paper is a simple illustration of the importance of a common, consistent vocabulary and of the need for clear and simple definitions for that vocabulary. It is perhaps time that a recognized international entity rises to the challenge, and provides the world with thoughtful, considered, and consensus-based descriptive (not stipulative) definitions - or even simply descriptions – to aid global adoption of e-health solutions.

Keywords: e-Health, communication, terminology, vocabulary, definitions



### Comparison of Diagnosis Efficacy of Arrhythmias with Cardiac Telemetry Versus Holter Monitoring - Telemark Project®

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Introduction: Arrhythmias are the common problem and important cause of sudden cardiac deaths. Some arrhythmias like atrial fibrillation are very common but large percentage of the episodes is symptomless. The arrhythmia has a paroxysmal character with different occurrence rate. Conventional diagnosis process, most common in Poland and Europe is a -24- hour Holter monitoring. Long term telemetry monitoring 14 days, using intelligent automated technology might shorten the time to diagnosis and has a potential of higher diagnosis accuracy.

Aim of the study: The aim of the study was to compare the efficiency of diagnosis of arrhythmia detection in heart rhythm monitoring using Holter vs. long term cardiac telemetry and optimization of diagnostics and therapy of arrhythmias and syncope with innovative telemetric solutions.

Material and methods: Material consists of 648 randomized patients age 19-90 to the up to 3 Holter monitoring group vs. up to 14 days long term cardiac telemetry. The PocketECG® system was used in telemetric examinations in Telemark Project®. The data were collected and interpreted by the device and transmitted to the Monitoring Center with annotations and assessed by specialist. System automatically recognizes and qualifies the heart beats. Results The results of the study revealed that in 14 days long term telemetry correct diagnosis of arrhythmia was established in 98.4% patients and in normal 3 times Holter monitoring only in 42.5% of patients. The 38,2% of diagnosis in long term telemetry was established in first 3 days and rest (60,2%) was established in next days of monitoring. Conclusions Presented study reveals that long term monitoring in much better in diagnosis making of arrhythmia than traditional Holter examination what means that faster diagnosis goes to faster therapy. Less visits equals better economic impact. At a conclusion long term cardiac telemetry is more efficient diagnostic tool to establish the diagnosis of palpitations than Holter monitoring.

Keywords: arrhythmia, ECG, holter, telemetry

## Confirmation of Proper Endotracheal Tube Placement Using Telemedical Technology: a Technique to Improve Far Forward Airway Management

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Airway management is a cornerstone of medical care for the trauma patient. At far forward battlefield areas there may be a shortage of anesthesia personnel and intubation may be performed by lessor trained personnel. Improper placement of an endotracheal tube can result in death or brain injury. This study demonstrates the use of tele-broncoscopy to document proper



endotracheal tube placement in a manikin. The audiovisual connection was performed using adobe connect and low weight/cube airway imaging devices. The methods demonstrated offer great potential for documenting proper endotracheal tube placement during far forward battlefield airway management or patient transport

Keywords: tele-broncoscopy, video-laryngoscopy

## Consumer Perception and Needs of Home Telehealth Services among Dwelling Adults in Taipei

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As the population ages, telehealth is increasingly being used to tackle these problems. Home telehealth care therefore poses challenges and offers opportunities for patients and healthcare providers. The purpose of this study was to investigate the general public's perception and needs for home telehealth services. Random Digit Dialing was used to select 5,944 households listed in Taipei telephone directory. A total of 545 adults completed telephone interview. Most of the respondents (66.6%) had never heard of or did not know about home telehealth service provided by Taipei city government before the survey. After the brief introduction of the services, most people (62.4%) agreed that it would benefit their health care and self-management behavior; 68.6% believed that it will improve communication between patients and health care providers; however, 60.2% don't trust the safety of tele-information. Among 545 subjects surveyed, 512 (93.9%) owned computer and internet facilities at home; 71.6% know how to operate the telesystem, 51.2% used computer everyday which indicated the high capability of telehealth service literacy. Majority of subjects agreed with the services provided, with the highest need in daily biomeasurements and feedback (M=3.95, SD= .90) and health education (M=3.86, SD= .90). As to the demand for home telehealth service, 496 (91.0%) had not felt the need at present, 65.0% felt might use it in the future only at the reasonable price which majority of the respondents (67.5%) chose NT\$500 or less. Age was found to be the only factor predicting willingness to purchase. Older in age had higher acceptance in every home telehealth services proposed. This survey demonstrated that general public agrees with the concept and the potential benefits of home telehealth services when they have information about them. However, few people are willing to pay out of their own pocket unless it is very inexpensive. With the high capability of computer literacy, result o! f this study shows that the largest barrier to the development of home telehealth services is money. Policy makers and product development of industries should consider results of this study.

Keywords: perception, needs, home telehealth service

#### Context-Based mHealth Applications Based on Mobile Web Server

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The technological advancement has enabled us to acquire and to maintain our own health monitoring system at comfort of one's home. These mHealth applications consist on the one hand of various sensors continuously delivering vital sign data of the patient and on the other hand backend systems (usually based on smartphones) processing and presenting the data. Health



monitoring is not limited to the current state of vital signs but, also how the health has been changed during the past weeks, months or years. In addition vital data can be enriched with additional context information (e.g. location, movement, weather condition, daytime information) generated by the connected smartphone. Such a mHealth system may generate a huge amount of data depending on the frequency of the carried out measurements, which may result in "Big Data" and even information overload. The importance and the relevance of the collected data vary from user to user. For example a patient's general practitioner might be only interested in aggregated information about the patients' health status or data where vital signs have been drifted from the norm. He usually isn't interested in the entire sensor data pool, especially not as part of his own IT-System. This brings us to our main research questions, "How can user- and context-based filtering of large and complex data set collections be achieved?", "Which system architecture facilitates ubiquitous on-demand data access?" We will propose a mobile web server approach combined with a context middleware to deal with filtering of Big Data generated by sensor-based mHealth applications. All data will be stored encrypted as part of a mobile web server persistency on the smartphone. In terms of privacy considerations patients stay in charge of their data. A context and filtering module running on the smartphones mobile webserver works as a middleware between the user application and the mobile database. The mHealth application provides an interface to transfer filtered and contextualized data on demand to health professionals or other institutions, so webserver and context module function as a kind of proxy to the encrypted patient data pool.

Keywords: mHealth, Big Data, context, sensors, telemedicine

**Continuing a Journey towards Implementation of Innovative mHealth in Health Services** R. Bacigalupo, P. Cudd, O. Oguntuase, J. Elliott, . Williams University of Sheffield, School of Health and Related Research (ScHARR), Sheffield, United Kingdom

The National Institute of Health (NIHR) UK 'Collaboration for Leadership in Applied Health Research and Care' (CLAHRC) projects support developing new knowledge to implement research to improve health and wellbeing. The Yorkshire and Humber CLAHRC uses telehealth or mHealth technology to support the self-management of long term conditions. Obesity and diabetes are well-known global and local challenges to people's health, and health services. The authors are collaborating on a project looking at the use of mobile digital devices to help support weight loss amongst overweight or obese people with diabetes building on a systematic review for weight loss employing mobile digital technology. At Med-e-Tel 2013 the authors reported steps 1 - 4 of a case study observation of a journey from identification of a promising mHealth intervention by health researchers, to getting a clinical team to consider its use within a clinical setting for a research study. Stages 1-4 included finding an intervention of interest, examining details of 'best', forming a project team and developing a study protocol. During 2013 we conducted steps 5 - 8 of the overview in a feasibility study .Step 5 involved obtaining funding and approvals to recruit members of the public. Step 6 involved conducting a feasibility study of a commercially available motivational device, Aipermotion 500, which had previously been shown to be effective in German trial. Our study investigated whether it was an acceptable and effective device to aid weight loss in the UK. Step 7 involved analyzing the quantitative and qualitative results, which concluded that a full pilot was feasible fully informing stage 4 to develop a study protocol. Behavior change psychologists were added to the team of academics at the University of Sheffield, and clinicians at Sheffield Teaching Hospital NHS Foundation Trust. Step 8 involves disseminating and building upon findings but as the device is no longer commercially available



the authors have returned to step 1 to design a new device. Steps 5-8 and the need to track changes in available intervention technology will be discussed in the paper.

Keywords: mHealth, diabetes, overweight, obesity, innovative

**Cost-benefit Analysis of the e-Ambulance Project in Depopulated Areas in Japan** Y. Matsumoto<sup>1</sup>, M. Tsuji<sup>2</sup> <sup>1</sup>Graduate University for Advanced Studies, Tokyo, Japan <sup>2</sup>Univesity of Hyogo, Japan

This study aims at evaluating economic effect of e-ambulance, or emergency telemedicine in the rural areas in Kouchi Prefecture in Japan. Ambulances equipped with devices which transmit images of patient to remote hospitals are focused. In the depopulated areas, the number of clinics and medical specialist is small and a patient with acute disease or wounded by accident must be transported to hospitals with full facilities. Traditional ambulances are equipped with the mobile communication system for voice, and accordingly information transmitted from the ambulance to hospitals is limited. Kouchi Prefecture started the e-ambulance project in Aki and Muroto Cities in 2012. It takes about one hour to reach emergency hospitals in Kouchi City, the prefectural capital. One of the merits of e-ambulance with the image transmitting system is that doctors in the accepting hospital can monitor real time situation of a patient and prepare for necessary treatment when patient arrives. They thus save time and effort. In measuring benefit, this study takes different methodology. The e-ambulance project provides more sense of security and residents feel more secure. Thus the CVM (Contingent valuation method) is applied and WTP (willingness to pay) is estimated according to survey to residents. We conducted surveys in November 2013 in above two cities and Shino Town, Kouchi Prefecture. The numbers of residents who respond the surveys are about 170. Shino Town does not have e-ambulance yet but and plans to own later. The reason why it is added is to compare WTP with residents who own or do not. WTP of residents is the value of the project and it is compared with the cost of the project which consists of that of equipment, salary of staff, and operating cost including gas and maintenance. This study also identifies factors that affect WTP such as age, sex, income, experience of transported by ambulance, etc. which were asked in the surveys.

Keywords: e-ambulance, WTP, cost-benefit analysis, CVM

#### Costs Reduction Using a Tele-ECG Method in Southern Brazil.

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Introduction: Telemedicine has proven to be an excellent health promotion tool, demonstrating special importance in undeserved countries, like Brazil. Tele-electrocardiography, as one of telemedicine's pioneers, offers a great assistance in the diagnosis and treatment of cardiovascular urgencies and emergencies - the highest mortality cause all over the world. However, unawareness regarding information about the real economic benefit, still limits its large-scale application. Objectives: This paper aims to: 1. Measure and compare the costs of a conventional local electrocardiogram and of a digital tele-ECG system in remote and small towns. 2. Analyze the difference in waiting time for obtaining a report through both methods. Methods: The research was conducted between September and December of 2013 under the coordination of the



Telecardiology Centre of the Instituto de Cardiologia do Rio Grande do Sul – Brazil. Seven out of thirty eight cities were included in the study. Data analysis consisted of measuring the total cost per exam and the average waiting time to obtain an ECG report; both from local and tele-digital interpretation methods. Local health authorities provided the necessary data for this study. Results: Cost analysis demonstrated that the value for conventional routine ECGs was R\$ 67,33 and R\$ 134,17 for emergencies, while the digital system exams average was R\$ 24,82. Mean waiting time for conventional ECGs were 14 days while tele-digital reports take, at the most, 60 minutes. Discussion: This research demonstrated that the digital tele-ECG method can contribute to the improvement of cardiac disease diagnosis, both in routine and in emergency settings. It also promotes a significant reduction in costs and time interval for obtaining the diagnosis. These data further justify a large scale implementation of public Telecardiology networks, resulting in better health assistance for those living in the underserved areas and optimizes the use of scarce resou! rces in the health sector.

Keywords: telecardiology, cost reduction, tele-ECG, telemedicine

# Creating a Business Modelling Tool for Collaboration between Public and Private Partners in a Telemedicine Ecosystem

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A national initiative, the Telemed.nu project is collaboration between four Danish Research and Technology Organizations to develop a common national platform for development of open source telemedicine solutions based on international standards. The telemedicine ecosystem enables interaction between various health IT systems from different companies and across sectors. Through multiple measures Telemed.nu initiates a dialogue between public and private stakeholders to provide a common framework for successful adoption and implementation of telemedicine solutions. Key challenges identified in the project are the organizational and economical barriers for implementation of new digital health solutions. Making discussions about cost and benefit open are key in creating a platform where incentives and organizational challenges, such as new divisions of roles and responsibilities can be addressed. Research in this project uses business model generation theory from other industries to create a tool for collaboration and business model development, where partners can discuss investments and revenue structures for development and deployment of telemedicine solutions. The tool is currently being tested with stakeholders, divided into five main categories: regional government (hospital sector), municipal community care, medical device vendors, large EHR system vendors and ICT infrastructure distributers. The tool will be adjusted to accommodate the stakeholders' different needs in an iterative inclusive process. The goal of this research is to create a model for business model development, customised to the needs of the different stakeholders but where the main focus is to create innovative value-adding solutions for citizens with chronic conditions. The Med-E-TEL presentation will present ongoing work with the business modelling tool and discuss relevant tools, techniques and methodologies in measuring and mapping (inter) organisational cost/benefit in telemedicine.

Keywords: business modelling in telemedicine, ecosystem


#### Deploying GNU Health on a national scale: Lessons from Jamaica"

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Jamaica is the first country in the world to choose a Free/Libre Open Source Software (FLOSS) for their entire public healthcare system. In 2013, the Jamaica Ministry of Health opted for GNU Health, a Free Health and Hospital Information System under the GPLv3+ license.

The nature of such an implementation is multisectoral and demands pan regional cooperation, regulation and planning. While the approach of GNU Health aims to improve compliance with international health protocols and standards, it still addresses specific local requirements and legislations. Instead of enforcing a cumbersome bureaucracy, this strategy strives to reduce administrative costs and dependence of licensing fees or further lock-in software policies.

Other developing countries may recover valuable lessons from this experience, especially in topics like data synchronization or data replication, crisis management, localization, software functionality, and database or infrastructure setting.

Keywords: GNU health, Jamaica, free software, eHealth, public health

#### Deployment of a Mobile Based Child Immunization Alert System in an Indian Setting

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Infant mortality has been inversely linked to immunisation administered to children. In India, for the year 2012, the immunisation coverage in the rural areas stood at 58.5% whereas the national average was 61%. One of the major reasons for such a dismal indicator is the lack of awareness about the vaccines amongst the majority of the mothers. The other factor is attributed to the frenetic lifestyles parents live, especially in an urban setting. In such a scenario, it becomes imperative to introduce technology in this domain, which will also help to achieve the UN's MDG-IV target of reducing infant mortality. Given the scope and penetration of mobile technologies, Child Immunisation Tracking and Alert System (CITAS), a mobile application was conceptualised to address this issue. The key design considerations for CITAS were: a) Linkage to the Unique Identity (UID) of the parent with the registering child, b) providing access of CITAS over web and mobile and c) enabling an configurable Alert Control Mechanism (ACM) which would help configure i) 'How' to receive alerts with the user opting for the mode of communication which includes SMS, email and on-the-fly alerts, ii) 'When' to receive vaccinedue alerts, with the default setting set to receive it on-the-day and the day-before of the vaccine due date. An over-due alert is sent the following day if the vaccine is still pending. With the implementation of CITAS on the mGov app store, it is concluded that: 1) Cost effective alerts on mobile devices using multiple forms of communication modalities can be introduced to provide timely vaccination alerts. 2) For the section of populace that does not yet use smartphones; a web based system in parallel is useful for deeper penetration 3) Localisation factors like training, recruitment and empowerment of local experts is required to achieve speedier and deeper diffusion. This paper discusses the design and the outcome of the system CITAS which would aid the system designers to develop systems which would help reduce infant mortality, thereby improving the quality of life.

Keywords: mHealth, child immunisation, infant mortality



### Design and Development of Workspaces for Surgical Skill Development

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Historically medical students were allowed to observe live surgical procedures from a gallery attached to the operation theatre separated by glass partition. Surgical postgraduates, however get access to live surgical procedures when they assist their mentors during the procedure. Special arrangements needs to be made to capture and distribute the live surgical images during surgical workshops held occasionally. This limitation of surgical training can be addressed by adopting advanced information & communication technology, multimedia, high definition capture and display tools to develop an integrated solution enabling capture, distribution and storage of live surgical data. Surgical Tele-presence is a relatively new concept and not being adopted in any academic medical institution in India. The utilisation of high bandwidth enabled distributed surgical telepresence can contribute significantly to the patient care and boost up surgical skills among medical staff. Thus telepresence evolves collaborative surgical workspace in which remotely located medical students can virtually interact in face to face meeting. Surgical video hub in the OT complex at SGPGIMS was converted into surgical tele-presence suite for interactive surgical education using tele-presence concept. High definition videoconference with digital audio systems along with Digital Video wall was installed in the OT video hub where in 25 seats were designed with independent computer workstations. These nodes were networked with the video controller enabling personal visualization. Integrated Digital Operation Theatre was designed and deployed by networking multiple video feeds like room camera, in-light video, PTZ videoconference camera etc. through a video router. Surgical skills were shared with remote partners as well using IP technology. Entire surgical procedures were archived in storage systems at the data centre. This indigenous design and development of Surgical Telepresence suite (trademarked as Surgiplex(R)) could cut down the cost of proprietary solutions

Keywords: Surgiplex, surgical skill development, telepresence

### Design and Implementation of a Hospital Database Management System (HDMS) for Medical Doctors

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The paper "design and implementation of a Hospital Database Management System (HDMS) for Medical Doctors" is aimed at designing and implementing an automated system that will alleviate the problem of handling patients data in a hospital. The researchers were motivated to embark on this project because of the inherent problems of the manual system of hospitals file management. This manual system has so many problems associated with it such as insecurity of files, poor file retrieval and inefficient file update. And this problem in most of our hospital management has lasted for some decade which this paper wants to handle. This project examines an existing information system of Our Lady of Mercy Hospital, Owerri and designed an automated system that can help Medical Doctors and those who handle the hospitals' data to perform their work more effectively and efficiently. The System would be developed with a Window, Apache, MySQL and PHP (WAMP) software. The HDBMS would be a web application that runs in a



computer network. It would provide easy and fast access to stored data as needed by different users with security against unauthorized access. Any authorized user can add, delete and update data into the database based on their user-assigned-role. It would equally have the facility to give a unique identity for every persons and stores the details of every patient and the staff automatically. It includes a search facility to know the current status of each room in the hospital. A user can search availability of doctors and the details of a patient using the system. The interface is very user-friendly.

Keywords: implementation; database

# Design Considerations for a Wireless Sensor Network Architecture Attached to a Cognitive Training System for the Elderly

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A wireless sensor network (WSN) is proposed to be added to an e-health system dedicated to the training and therapeutic cognitive care of elder people. This system is focused on the elderly affected or threatened by neurodegenerative diseases as the Alzheimer's disease. While the main system is already deployed for real tests, here we discuss some considerations for the WSN's architecture's design. The goal is to have an architecture that favors an easy scalability and efficient manageability, no matter the number of sensor applications running or their type. We argue that a health system, as the one that we are developing, can be easily scalable with an efficient management capability and without demanding from the user a high-end hardware requirement, if it is deployed with a distributed paradigm-based structure and deployed on a Cloud computing architecture that is specified using a software-defined networking (SDN) based infrastructure. The addition of a wireless sensor network to the system must guarantee a future easy scalability and manageability of the network. This can be achieved by the application of the SDN paradigm to WSN but in such a way that it considers the special features of this kind of network in order to obtain an efficient performance. These features are:

- Communication in wireless sensor networks occurs at low rate.
- Energy consumption must be guaranteed to rest at a low level.
- Support of nodes mobility and resulting topology changes.
- Necessity to deal with the unreliability characterizing wireless links.

There are already some SD-WSN proposals that had added some modifications to the SDN architecture originally designed for enterprises and carrier networks. They show that it is convenient and possible to adapt the SDN paradigm to WSNs, validating it as the base for an efficient architecture to be used in the design of a wire-less sensor network for the cognitive training system.

Keywords: e-health care, wireless-sensor-networks, software-defined-networking

# Detection of Pages Respecting Quality Standards: Character N-Gram Tokenization in Automatic Detection of Web-Pages

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"Maintaining trust in the online health environment is critical to health security, health and medical education, and the protection and promotion of public health on a societal scale. " is one of the outcome of the Sixty-Sixth World Health Assembly held in Geneva the 14 May 2013. The amount of health information available on the Internet has grown tremendously in recent years. However, on the Web good health information is mixed with biased, incomplete or manipulated health information, so It is difficult to identify reliable information from the rest. Health On Net code of conduct, with its 8 principles was established in this purpose. With the growth of the amount of information available, the manual process of certification has become inefficient. Determining automatically quality standard is a path toward guiding and helping internet citizen to determine if they should trust or not the information they read in real time manner. This paper evaluates the supervised automatic classification of health related web-pages. The documents are assigned to different classes defined by HONcode of conduct. In the approach presented here, documents vectors are represented not by words but by character n-grams of various lengths. The collection of the web page fragments related to HONcode criteria, extracted by experts during manual certification process is used as training/testing collection. The effects of the n-gram tokenization are evaluated using document frequency, Chi-square and Z-score dimensionality reduction functions. The obtained results are also compared to those obtained by word and stem tokenization. The obtained results show that this type of tokenization can be used as a good alternative to stemming. This characteristic is useful in the case of the language lacking appropriate stemmer for the domain such as health.

Keywords: trust, automatic detection, reliability, ethical

### Development of a Mobile Application of Clinical Pharmacology for Dentists in Primary Health Care

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For the World Health Organization the most effective way to improve the use of medicines in primary care in developing countries is the combination of education and supervision of health professionals, consumer education and ensuring adequate access to appropriate medications. In Brazil, to reach professional Primary Health Care (PHC) becomes essential to use new technologies and learning strategies. Thus, the aim of this project is to develop a mobile application of clinical pharmacology for dentists working in primary care, to be used for view of prescription of drugs used in Basic Health Units. To select the content to be approached in the mobile application we performed a focus group where the main subjects in clinical pharmacology for dentists working in the PHC were identified based on the list of essential drugs for primary health care network. The mobile application was developed for Android platform and enables access to information even in the absence of internet connection. The evaluation of the object is performed using instruments that assess, with users, the mobile application quality. Thus, the application mobile of pharmacology of Oral Health in the PHC will be another mechanism to improve quality of care.

Keywords: mobile, pharmacology, primary health care



### **Development of A Wireless System for Measuring Ground Reaction Forces**

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Introduction: The development of a wireless system for the measurement of ground reaction forces can provide important information about human physical performance and the health of the locomotor system, as well as the magnitude and form of application of these forces on different surfaces. However, the majority of commercially available force plates have major limitations in respect of their lack of portability and ability to send data for interpretation and analysis using wireless technology. Objectives: To develop a portable, wireless system for measuring ground reaction forces permitting the real-time transmission of collected data by means of telemetry. Methods: Research comprised of two phases: 1) Development and 2) Testing of the components that make up the system. Results: The developed platform combined structure rigidity and low weight, being composed of the following systems: signal conditioner - for amplification and filtering of signals; data acquisition device USB6009 - for analog-to-digital conversion of the signals collected by the data acquisition card. The communication module operated through Bluetooth connection. Preliminary testing demonstrated adequate connectivity of the force plate. Further testing is required to assess its sensitivity and accuracy. Conclusion: It is believed that this system is capable of the remote measurement of ground reaction forces, whilst still retaining portability. This system has potential for application in the areas of aerospace, clinical and sports biomechanics, allowing, for example, the evaluation of ground reaction forces during human gait studies in simulated hypo gravity.

Keywords: biomechanics, eHealth, wireless, force plate

# Development of an Effective E-Screening Tool for Dyslexia Based On Visual and Auditory Perception

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Dyslexia is usually defined as persistent difficulty in reading and spelling in the absence of any neurologic or other causes, in an individual with normal intelligence and adequate schooling. Currently, there is no single test which permits a clear diagnosis of dyslexia. Early recognition and referral to qualified educational professionals for evidence-based evaluations and treatments seem necessary to achieve the best possible outcome. The aim of the paper is to develop a computer-based on-line screening tool by implementing multimedia elements that is suitable for dyslexic students. The e-tool R-U-LEXIC and will be an alternative to the manual screening. This tool has a great potential to be used to identify the probability of students having dyslexia. It can be used in mass screening of students in schools. Dyslexia is classified based on Visual, Auditory and Kinesthetic perceptions. The Screening tool has been developed for diagnosing students with dyslexia. For screening a particular student/child, the Assessments is based on inputs received from Parents, Teachers and Student/child him or herself. Parents, teachers and child has login separately. Once logged-in, the Assessments for Parents and teachers has list of questions about their ward. These questions are helpful for understanding the social behaviour of a particular child. And for every child the questionnaire is based on their age and class of study. The questions were framed based on their grades and contents as available in "Samacheer Kalvi" which is the Board followed in the state of Tamilnadu, India Currently, this Web based Assessment tool R-U-LEXIC has been developed for the diagnosis of Visual and Auditory perception and was put



under test cycle. A trial test with 100 students and their corresponding teachers and parents has been done and analyzed.

Keywords: dyslexia, RU-LEXIC, visual, auditory, e-assessments

## **Developments in and Uptake of the European Code of Practice for Telehealth Services** M. Fisk

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The evolution of the European Code of Practice for Telehealth Services is evident from successive releases of drafts at Med-e-Tel in 2012 and 2013. The final version of the Code was launched in October 2013. The framework by which telehealth services could become accredited to the Code was put in place early in 2014. This paper outlines the contents of the Code and points to the way in which it is helping to influence thinking about telehealth - moving it away from narrow understandings that have focused on vital-signs monitoring towards those that are equally concerned with lifestyles, prevention, behaviour change and self-management. Progress in the accreditation of services to the Code is also reported - with case studies offered to illustrate how this was achieved and how problems and challenges linked with the assessment process were overcome.

Keywords: Telehealth Code accreditation assessment

## Diabetic Foot Care- Experience in Kosovo-How we Manage to Provide Diabetic Foot Care in Diabetic Patients

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Diabetic foot care in Kosovo is still in baby-shoes. My work with diabetic patients is based on the guidelines. As first all patients has to have regular inspection. Those diabetic patients that don't have foot problems should be examined once a year, and patients hoe have more risk factors should be seen more often( once in three months). Identifications of patients at risk of ulceration is the most important aspect of amputation prevention. In 2010 with co-operation with Fonty's in The Netherlands four Dutch students stayed in Kosovo for 6 weeks and together we have implemented the education of patients. In 2001, also together with other students we made a programme as a part of IWGDF to implement step-by-step programme with nurses and house practitioners. Also due to this programme I had worked in other cities in Kosovo, with donation of World Diabetes Federation. Appropriate footwear is another reason that diabetes patients should take care of. A lack of good shoes is devastating for feet's of those patients. So we try to educate patients what the good shoes are. Because they have lots of problems due to some process they have in their body as a result of high glucoses in their blood. These are the main problems such as neuropathy, angiopathy and Limited Joint Mobility. So working with those guidelines, we will prevent so many amputations, and the costs will be much lower for so expensive treatment for Diabetic Foot. Wound treatment The principles of care of a chronic diabetic foot ulcer are prompt treatment of any associated infection, revascularization of appropriate and feasible, off-loading in

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order to minimize trauma to the ulcer site and management of the wound and wound bed in order to promote healing. Wound management is simple: regular inspection, cleansing, removal of surface debris and protection of the regenerating issue from the environment. Guidelines classification: PEDIS: P-Perfusion E-Extent-size D-Depth-tissue loss I-Infection S-Sensation SIMPLE! Treatment for diabetic foot ulcer: • Callus removal • Honey bandages • Off-loading Debridement Callus Removal with scalpel Off-loading Felt padding as protection against pressure during walking.

Keywords: wound care, off-loading, tele-medicine, insoles, materials

### Distance Medical Education Produce and Publish Your Own Lectures on the Web

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Nelson Mandela said "Education is the most powerful weapon which you can use to change the world". Distance medical education meets the needs of doctors and health personal that might be unable to attend classes, due to distance or time constraints. Medical personnel who is working can chose their lectures when it suits their schedule. Distance medical education saves time and money. Distance education can be asynchronous or synchronous. For asynchronous education written lectures and tests can be accessed at any time. Synchronous lectures are those that require students and lecturers to be online at the same time. For those lectures only audio or audio and video may be available. Students see the lecturer during a videoconference as in a classroom. Some universities provide stored lectures that are a combination of a stored live lecture and the written lectures. Students like this kind of distance education. At universities quite expensive technical equipment is available for the production of combined lectures. But how about a lecturer who would like to generate its own lectures? How about a university in a developing country who does not have expensive technical equipment for capturing lectures? CampusMedicus is a webbased telediagnostics and teleteaching platform. It is used in many countries for exchanging diagnoses for patient cases. Especially in pathology, cytology and radiology it is the number one telediagnostics platform. With CampusMedicus physicians can produce their own lectures combining a live lecture and a written lecture. The result is a video that shows the lecturer talking to his students including the written lectures on one screen. These videos can easily be produced on a normal computer. Students with access to the Internet may view the lectures on their computer, a tablet PC or a smart phone. Distance education is important because the knowledge and skills of medical personnel, also of those in rural areas, are a critical factor in establishing sustainable quality services.

Keywords: education, eLearning, web-based platform, videoconference

# Distance Medical Education Produce and Publish Your Own Lectures on the Web (Workshop)

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eLearning has become available worldwide. Even in remote villages Internet connections are available. Lectures are accessible in different areas of the world at the same time. Teachers and students need a computer with an Internet connection to be connected to the eLearning world.



In order to consider the relevance of e-learning standards from a didactic point of view, it is necessary to elaborate the expectations of the users.

We will talk about the basic types of eLearning, didactics and different concepts of teaching and learning strategies. One concept we will talk about is "blended learning" and why it can improve training of physicians in Low and Middle Income Countries (LMICs). As an example we will discuss how blended learning can improve cervical cancer screening in remote areas. eLearning combined with a web-based telediagnostics platform improves the maternal health in LMICs although there are no cytologists. We will understand why rural doctors will know how to do the diagnoses after some time of doing training with blended learning.

Virtual learning can take place synchronously or asynchronously. In synchronous systems, participants meet in "real time", and teachers conduct live classes in virtual classrooms. Students can communicate through a microphone or chat with the lecturer or other students. In asynchronous learning, which is sometimes called "self-paced" learning, students are expected to complete lessons and assignments independently through the system.

During the practical part of the workshop the participants will learn how easy it is to produce and publish lectures with the web-based platform CampusMedicus. We will prepare a lecture and start an eLearning session first with the asynchronous module and second with the synchronous module.

Examples and experiences from eLearning projects will show the knowledge gained by rural physicians in LMICs.

At the end of the workshop the knowledge gained will allow the participants to create their own lectures and publish them on CampusMedicus.

## Early and Non-Invasive Detection of Lower Limb Ischemic Disease in Rural Areas with Telemedicine

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Introduction: The rising prevalence of Diabetes Melitus and its related complications e.g. diabetic foot, often create a serious burden of disease. Thanks to new technologies these complications can be avoided. Early stage examinations through non-invasive strategies have been proposed as a means of diagnosing incipient vascular occlusion. As a result of partnerships already found to be successful between rural and urban hospitals, cooperating universities and relevant private companies, long term sustainable preventive programs have been prepared and are currently in operation. More than 1000 treated patients already stand to benefit from these existing programs, which statistically have led not only to avoidance of more than 50 potential amputations, but have also resulted in other effective and less invasive therapies.

Objectives: 1. To analyze the applicability of a non-invasive diagnostic strategy for the early detection of arterial flow reduction in a rural population; 2. To introduce an innovative telemedicine platform allowing data storage and transmission for specialized second opinion; 3. To promote technical qualification of remote health sector professionals enabling benefit from these new technologies.

Methods: The applied methods are based on plethysmography, and have been developed at the headquarters of Advanced Medical Systems Inc. (AMS), in Brno, Czech Republic. In November 2012, this system method was installed as a pilot project in the Hospital of Zdar nad Sazavou (HZnS).

Results: The plethysmography pilot phase was implemented in the ambulatory sector of the Hospital HZnS. Based on its successful pilot run, the project developed into a fully operational



program with long term sustainability. During its early operation more than 1000 patients already were able to benefit from the program that as stated above, has led not only to avoidance of more than 50 potential amputations, but also resulted in more effective and less invasive therapies. Discussion of conclusions: Early detection of worsening arterial flow indicators can avoid physical incapacity due to premature limb loss by early introduction of treatment interventions.

Keywords: cardio-vascular disease, diabetes, diagnostics

# Early Detection and Prevention of Complications Related To Cardio-Metabolic Risk Factors with Telemedicine

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Introduction: The rising prevalence of cardio-metabolic risk factors and the complications related mainly to Diabetes - retinopathy, diabetic foot and renal insufficiency, create a serious burden of disease. Systemic early stage examinations through non-invasive strategies have been proposed as a means of diagnosing incipient alterations. More than 1000 treated patients already stand to benefit from these existing programs, which statistically have led not to avoidance of more severe complications.

Objectives: 1. To analyze the applicability of a systemic, non-invasive diagnostic strategy for the early detection of arterial flow reduction and retinopathy; 2. To introduce an innovative telemedicine platform allowing data storage and transmission for specialized second opinion; 3. To promote technical qualification of remote health sector professionals enabling benefit from these new technologies.

Methods: 1.Cardiovascular Disease screening to detect atherosclerosis using echography of the carotid arteries to perform the Carotid Intima-media Thickness CIMT. This test is approved for cardiovascular screening in several international guidelines with a level of evidence IIa. When the CIMT is above the 50% percentile it's widely accepted that this patient as a vascular age above the biological age and therefore that individual is at high risk of Myocardial Infarction and/or Stroke, 2. Peripheral Artery Disease screening using Plestimography and Ankle Brachial Index to evaluate the onset of PAD avoiding premature amputation of toes and lower limbs. 3. The identification of pre-diabetic individuals would also be of a paramount importance in order to avoid the actual conversion rate to full T2DM patients with all the incurred costs.

Results: During its early operation more than 1000 patients already were able to benefit from the program has led not only to avoidance of more serious complications, but also resulted in more effective and less invasive therapies.

Keywords: cardio-metabolic risk factors, diabetes, prevention

## Economic Aspect of Medication Adherence Using a Wireless Medication Reminder in French Health System

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Orange and Isipharm (Astera group) have developed and tested with pharmacists a new application of wireless medication reminder using 2D barcodes. This application flashes the information of the prescription and automatically places medication reminders in the agenda of the smartphone. The purpose of this paper is to analyze the potential economic aspect of medication adherence using a wireless medication reminder in French health system. Analysis is made in terms of cost and benefits for the health system. The benefits of medication adherence, and in particular avoidable costs, have been widely reported through the literature. Indeed, literature reports many levers or actions to get a better use of drugs like: medication compliance, prevention of iatrogenic effects and medication errors, optimized use of generic drugs, management of polypharmacy and others. Literature reports also many tools and global solutions like - Telemedicine, Electronic Health Records and of course numerous medication devices. However, since a given tool can be linked in part to one or more levers and since a given lever can contribute in part to several adherence benefits; it seems difficult to evaluate which solution brings what part of the overall benefits and profits of medication adherence. For this reason, we developed a methodology of calculating the economic potential of an adherence tool: (1) using data from the literature, a rate of Potential Cost Reduction is assigned to each lever (2) the levers operated by the solution are identified and rated (3) the Efficiency Rate of the solution is measured by a test driver on Population (4) the economic potential of the solution is calculated in terms of reducing costs to the health system. Using this methodology, we have evaluated the costbenefit ratio when using a very simple and low cost wireless medication reminder and we have elaborated some potential business models for the French health system.

Keywords: eHealth, telemedicine, mHealth, business model

#### eDiazorg: Telecommunication to Improve Diabetes Care and Self-Management

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Background: In Belgium, 8% of the population has diabetes type 2 [1]. This chronic disease has a large impact on the quality of life of the patient, the healthcare system and healthcare budget. Diabetes requires sufficient self-management and ongoing support by a healthcare team. The Belgian government organizes diabetes care in the community by diabetes care paths.

Aim: The aim of this study is to improve the healthcare organization for diabetes patients, their self-management and the quality of life using telecommunication.

Method and Design: This longitudinal single center action research study used interviews and focus groups with diabetes patients and their healthcare workers and explored difficulties in 1) the organization of the diabetes care and 2) the self-management of the patients. A self-management tool for patients based on the trans theoretical model of change and a communication tool for the healthcare workers and patients was developed by informatics students. Both tools were pilot tested by diabetes patients and their healthcare providers.

Results: Healthcare providers experienced 1) a lack of time and knowledge to support selfmanagement, 2) a high need to share data between each other and the patient to optimize care and 3) a lack of a platform to share those data. Diabetes patients experienced a lack of information and support by the healthcare workers [2]. All respondents acknowledged the value of both digital tools. However the tools need improvement in usability and linkage with the electronic medical and electronic nursing file.



Conclusion: Chronic disease management needs shared care and ongoing self-management support. Telecommunication can support these processes if the tools are developed in close conjunction with all stakeholders. [1] International Diabetes Federation. Diabetes Atlas Fifth Edition. International Diabetes Federation 2011; accessed March 15th, 2012 from http://www.idf.org/diabetesatlas. [2] Prochaska JO, DiClemente CC, Norcross JC. In search of how people change. Applications to addictive behaviors. Am Psychol 1992;47:1102-1114.

Keywords: telecare, chronic diseases, self-management, diabetes

# Educational and Motivational Bridge between Hospital and Home for Patients with Infarction

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The patients who had an infarction have increased risk of cardiovascular problems. The risk can be reduced by adjusting a lifestyle. However by return to homecare from the hospital the patient faces loss of adequate information source and diminishing motivation with time passing after the event. In Slovenia we have a gap of 2-12 weeks from release from the hospital before the patient has any chance to join organized cardiac rehabilitation program. But by that time the highest motivation for lifestyle change is already lost. To bridge this gap we developed an internet educational and motivational platform. The platform is adapted for elderly use. Its content is composed of short educational units (each lasting 4-7 min). Each unit may include video (30-120s) from doctors, nurses and other patients, quizzes, texts and self-motivational praises. Upon leaving the hospital the patient receives internet access code which enables her accessing the content on internet from home. The code enables her complete anonymity. At the same time it enables us to extract statistics and learning patterns. At present we run a pilot study on cardiovascular department of University Clinical Center of Ljubljana.

Keywords: rehabilitation, cardiovascular, Internet, education

#### e-Health – Can We Be Certain There Is No Environmental Impact?

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To date, the e-health world has largely ignored the reality of its own environmental effects. At this time there is a perception that e-health has no or insignificant net environmental impact, largely fueled by evidence of dematerialization (reduction in the time, space, material, and energy required for any process needed to create information and communication technologies (ICTs)), which is said to have improved by about three orders of magnitude in the past few decades. Conversely, the ITU indicates the use of ICTs continues to rapidly accelerate worldwide. This includes availability of various e-health technology applications in almost every country. There are even suggestions e-health has positive impact, primarily through avoidance of travel (using teleconsults). In any consideration of environmental e-health, most of the limited literature focusses attention, naïvely, on the midstream or 'use' stage, and ignores other recognised periods of impact: Upstream (e.g., resource depletion, manufacturing, packaging, distribution), and downstream (end-of-life issues, in particular e-waste generation). Resource depletion through



increased extraction and (at this time) essentially irreversible global dissipation is unsustainable. Similarly the rapidly growing and poorly understood topic of e-waste raises specter that must not be ignored. As a consequence we may be making false claims as to the environmental neutrality or benefit of e-health. At the very least, it is necessary to consider the entire life-cycle of the e-health technology solution before being able to conclude they are, or are not, environmentally sound. There is no doubt that e-health is an important component of 'sustainable development', but we have a social responsibility to understand the whole story and ensure our solutions are indeed sustainable; otherwise any 'development' will be short lived or environmentally costly. This paper briefly recaps key issues of environmental e-health, and then describes Life Cycle Assessment approaches that may have value for assessing the overall environmental impact of e-health.

Keywords: e-Health, environmental impact, LCA

### eHealth Care for Multidrug-Resistant Tuberculosis Management

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Threatens of multidrug-resistant tuberculosis (MDR-TB) is becoming the dominant form of tuberculosis threat in many parts of the world because of decades of inappropriate treatment on a global scale. The accepted system of MDR-TB care is based on strict clinical protocols and special management measures. In most countries, decisions are made by a special medical commission (SMC). The SMC meetings require all medical documents to be transported to a regional hospital for a few days. The system incurs delays and risks.

Telemedicine has the potential to improve MDR-TB care and management. Due to financial support and kind efforts of Rinat Akhmetov Foundation "Development of Ukraine" an anti-tuberculosis telemedicine network was created in the Donetsk region of the Ukraine. The telemedicine network allows electronic document exchange, storage and tracking, direct communication with attending doctors and even patients, and epidemiological monitoring. The closed high-speed network was constructed especially for the Network. Desktop videoconferencing is used, and the software provides support for DICOM images (<u>http://www.e-works.com</u>). The web portal of the network (<u>http://www.itub.dn.ua</u>) allows access to the videoconferences. An electronic health records (EHR) system with business processes automation was specially created for the network.

During the first two months of operation, there were up to 300 telemedicine sessions in the network. We studied 277 patients for whom full clinical and other related data were available. The patients (202 males, 76 females) had a mean age of 39 years (range 2-90). The main reasons for a teleconsultation were: primary confirmation of diagnosis and approval of treatment (32%), monitoring of treatment at Stage 1 (53%) and at Stage 2 (3%), final control (6%), management of complications and treatment interruptions (6%). We found that the diagnosis was changed in 12,3% of the telemedicine cases, but there were no time delays. All patients receive medication very quickly. Thus the special-purpose anti-tuberculosis network for telemedicine appears very successful in its first months of operation.

Keywords: telemedicine, tuberculosis, drug-resistance, eHealth, EHR



#### eHealth in practice

I. Bartolo emCare Group Malta Limited, Malta

Our presentation will discuss the challenges & highlights of implementing an eHealth system across 6 large facilities. Our presentation will cover the real life experiences of delivering our solution - SCOPE (Safely Communicate health Observations in a Productive & Efficient way) catering to over 1,000 elderly care residents, the training of 500 care staff & 25 administration staff of various ages & IT experience. Our presentation will highlight the many benefits & improvements experienced by management, the staff & most importantly the residents over the last 12 months. We will share the results the solution has delivered, both anticipated & unanticipated. We will set up a live environment during the presentation using the solution from registration, through to a medical test, a simulated emergency situation in real time, how it impacts an Electronic Medical Record & how staff & management utilize the information received. The presentation will include a series of testimonials from all stake holders & photos of the journey from a paper based medical record system to an Electronic Medical Record system with a real life timeline of how it was delivered & fully functional within a 4 month period. Finally with an accumulating pool of very valuable data what insights that is telling us already & the influence it's having on better decisions & ultimately a better long term outcome for the current & future residents.

Keywords: eMonitoring, electronic medical record, real life experience, results, benefits

### E-Health Platform for Clinical Hospital as a Modern Frontend-Backend Open Source Solution

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SOA (Service Oriented Architecture) in the modern world is one of the most popular conception in web programming. We want present E-health platform for clinical hospital, which is example of SOA oriented web-application using frontend-backend architecture and only open source solutions. The system is part of the NCBiR project realized on Medical University of Warsaw, Poland. Our E-health platform demonstrate, that the open source solutions with engine, which is ruby on rails, could be safe, efficient and modern way to accumulate patience record in national healthcare. Because of using rest-api communication in frontend-backend architecture our system is easy to change and ready for mobile interfaces. One of the parts of the project is e-learning module which creates anonymous set of patient record with expert comments. This set of patient records is selected by experts to teach students and doctors. Every part of this software is using FLOSS, and create new standard of programing medical databases in Poland.

Keywords: medical, software, clinical, platform, SOA

# eHealth Service Experience and Care Models: Building a Parameter Framework for Their Design and Implementation

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Background: eHealth services with state-of-the-art technologies have the potential to assist patients and healthcare professionals in better managing therapy, help patients understand their disease, support self-management and reduce healthcare costs. These potential benefits can be unlocked through new experience and business models that facilitate their design and implementation. Our research develops a parameter framework that aligns experience and business modelling.

Research Objective: This paper identifies parameters that enable developers to determine the impact of eHealth systems in terms of personal, experienced quality of health life as well as organisational quality of labour and cost-efficiency. We draw on a socio-technical perspective incorporating eHealth service design, implementation and use.

Method: Through qualitative inductive research that aligns two 'research by design' methodologies this paper identifies bridges between: (A) 6 cases from the experience design method and (B) 6 cases from the business model design method. The experience design method creates current and envisioned patient and health professional experience journey profiles of eHealth systems. The business model design method employs visual modelling of actor profiles, transactions and value attributes in health network organisations.

Result: A parameter framework, to be used in eHealth service design and implementation, that integrates (A) experiences in the context of use and (B) care model innovation. Parameters bridging the methodologies are: actor and interaction profiles and impact criteria for personal quality of health life and organisational quality of labour and cost-efficiency.

Conclusion: The framework contributes to and innovates in the area of eHealth services design and implementation. It is intended to serve for analysis and design of positive interaction experiences and effective transaction modelling in eHealth services.

Keywords: eHealth, experience modelling, business modelling, service design, implementation

# eHealth Services over EPON – A Study on Authentication and Key Management Mechanisms

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Data communication is an important part of the entire telemedicine system, which is responsible for exchanging medical data and transferring diagnose records between the health care providers and the remote patients. A key feature of telemedicine system is security due to the legal requirements for protecting personal data. Our work aims to identify the security challenges and potential solutions in the optical access network regime. As Ethernet Passive Optical Networks (EPONs) become an increasingly popular replacement technology for the last mile connectivity in the access network, EPON segments are expanded, both in coverage and capacity, using various technologies. One of the major obstacles for telemedicine over EPON solution is the high security demand. Thus, it is imperative to design and enhance secure communication protocols for these networks. A typical EPON is a tree based architecture, which has the broadcast nature of transmission in the downstream and the sharing of a single optical link by multiple users in the upstream direction. Due to these network characteristics, several vulnerabilities exist in the current protocols of EPON. These loopholes can be exploited by potential attackers to lunch attack on EPON. Therefore, security issues are main concerns in developing EPON for telemedicine services. To enforcing message confidentiality and integrity, strong authentication and access control mechanisms should be in place in order to prevent fraudulent accesses by



unauthorized intruders in a network. This paper at first discusses several types of attacks that are related to authentication in EPON and then presents a comprehensive discussion on the current authentication and privacy protection schemes for EPON. In addition, it presents a threat analysis on the potential security protocols and ranks the threats from three aspects: likelihood, impact and risk. This work is supported by the Danish welfare technological research and innovation initiative project – Patient @ Home.

Keywords: telemedicine, EPON, security, authentication, authorization

#### **Electronic Identity Systems For Physicians: the CPME eID Policy** B. Beger

CPME (Standing Committee of European Doctors)

On 23 November 2013, the CPME Board adopted the CPME Policy "Ensuring the secure use of telemedicine and e-health applications in an integrated Europe - Towards a Common Policy Agreement on Electronic ID Systems for Physicians" (CPME 2013/039) The eID for physicians suggested under this policy is meant to facilitate the identification of physicians in cross-border situations by setting up common security standards that would be accepted as appropriate in the Member States where the policy is being recognised.

The presentation will aim at discussing the potentialities of the CPME eID policy and challenges ahead.

### **Enhancing Bluetooth Connection Establishment Delay for Telemedicine Devices**

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Bluetooth is a low power wireless personal area-networking (WPAN) standard which is wide spread used by pulse oximeter, blood pressure, blood glucose devices in Telemedicine applications. The major drawback of Bluetooth is its rather long connection establishment delay, which is the time required for two devices to setup a connection in order to exchange information [1]. Experiments and simulations show that two Bluetooth devices generally need almost two seconds to establish a connection in between, which imposes a limit to the flexibility of usage of Bluetooth enabled devices for mobile users [2]. The high connection establishment delay stems from the inefficient inquiry and inquiry scanning procedures given in Bluetooth specifications [3]. Several methods are introduced in the literature to mitigate the connection establishment delay of Bluetooth devices in [1, 2], by which the Bluetooth specifications are modified and the delay is approximately halved. In this study, we aim to propose a new method, which decreases the connection establishment delay by an additional frequency freezing function added to the inquiryscanning device. Results show that the average connection establishment delay to set a Bluetooth piconet with an eight nodes is decreased by almost 72,5% up to 96% compared to current devices. This means that a patient has to wait about 0.08-0.55 seconds, instead of 2 seconds, for any Bluetooth enabled device to connect and be ready for communication. Moreover, it is shown that a 8-node-piconet is formed with probability 1 in less than 0.55 seconds. This method can easily be applied to current Bluetooth devices by minor modifications ensuring backward compatibility. References [1] Y. Gelzayd, "An Alternate Connection Establishment Scheme in the Bluetooth System", Master Thesis, Polytechnic University, Jan. 2002. [2]Welsh E., Murphy P., Frantz P., "Improving Connection Times for Bluetooth Devices in Mobile Environments", International



Conference on Fundamentals of Electronics, Communications and Computer Sciences (ICFS), Tokyo, Japan (2002). [3]Bluetooth SIG, "802.15.1: Wireless medium access control and physical layer specifications for WPANS".

Keywords: Bluetooth, inquiry, connection establishment delay

### e-Prevention in LAC and Caribbean

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This is a joint project from the Care Challenge, connecting nurses, Millennia2025 Foundation in Paris, France, Institute Tropical Medicine Alexander von Humboldt University Peruvian Cayetano Heredia and Pan American Health Organization, Lima, Peru. We hereby present the information and communication technology (ICT) 'revolution' has been hailed as the enabling force for developing countries to become more active participants in the global economy. Developed countries are concern about how to address the dramatic changes in development, urbanization, ageing environmental shifts that are modifying in the diseases for a continuing education in health program. e-PREVENTION's goal is to accelerate technology development, deployment, and implementation for sustainability and widespread public health impact. As explained in relation to the remedy of health, there are in turn a series of problems: health professionals concentrated in urban areas and high concentration of resources at all levels of assistance, usually distant from the neediest populations and neglected. Similarly, in remote locations, where a large number of vulnerable people, are presented group of health professionals who need assistance, support and accompaniment in the handling of cases of health problems of the population that will attend, also require a set of actions leading to continuing education, which will allow them to be at a level appropriate to upgrade to interact with other health professionals and community, for the purpose of providing solutions to the health problems that exist in these populations. The adoption of measures would be due to encourage to facilitate the access to the Internet and to increase in general the knowledge using of the ICTs.

Keywords: eHealth, infectious diseases, e-Learning, m-Learning

#### **E-Psychotherapy: Awareness, Usage and Challenges among Nigerian Psychotherapists** N. C. Uwaoma

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This paper will examine the level of awareness, usage and challenges as in encountered by Nigerian Psychotherapists involved in e-psychotherapy within the nation. It will concentrate on evaluating the awareness of e-psychotherapy among Nigerian psychotherapists, the extent of its usage, challenges facing it and the way forward. It will make use of interviews of a cross section of psychotherapists in South-East Nigeria.

Fifty psychotherapists practicing in the universities and hospitals would be drawn using the simple random sampling method. Mean and percentages will be used for data analyses. Three hypotheses will be tested in the study: i) Nigerian psychotherapists have a significantly low



awareness of e-Psychotherap;y ii) e-Psychotherapy is rarely employed by psychotherapists in Nigeria; iii) there are no significant challenges facing the use of e-Psychotherapy in Nigeria. The results of the study will be discussed based on existing literature.

Keywords: e-psychotherapy, Nigerian, psychotherapists

### European Junior Doctors and European Medical Students' Association Perspective on E-Health: A User Centered Approach and Engagement

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In 2013 the EJD (European Junior Doctors) WG analysis of the literature showed that Junior Doctors can be more critical than senior doctors about usability of e-health products (particularly electronic health records). This survey revealed that Junior Doctors would like to be implicated in the analysis, evaluation and development of e-Health. Nevertheless the majority of Junior Doctors is still not involved in e-health projects and a career in e-health does not seem a possible option for Junior Doctors. The lack of careers in e-health for Junior Doctors suggests a deficiency in medical education on e-health since evidence suggests that there is a direct correlation between the core skills acquired through university education and the subsequent employability of University graduates. In order to shed light on medical education in e-health and the related lack of careers opportunities in e-health for doctors EJD and EMSA (European Medical Students' Association) decided to perform a common literature analysis and European survey.

### **Evasion in Distance Education Courses**

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The aim of this study was to understand the general profile and causes of dropout students in a specialization course by distance learning modality. 32 dentists who voluntarily completed a form available on the course platform participated in the survey. 53% of professionals were in the age group between 26 and 35 years, 16% were aged between 61 and 65 years. 60% of study participants were male. 62.5% were married and 31.3% single. Fifteen (15) professionals had children (54%). Most participants had up to 12 years after graduation (67.0%). 62.5% were specialists, and only 5 dentists (25%) had expertise in the Public Health area. The contract appears to be the most prevalent employment (40%), mainly through the Social Health Organizations. Twenty-three had professional experience in Family Health. Of these, 15 (65%) had 1 to 5 years of experience in strategy. Access to information and course registration happened to 13 dentists indicated by the manager (48%). Of the remaining 14 respondents (52%), 9 (64%) had access to information and travel across the Internet. 23 professionals (82%) did not release the officer to devote to the course. Lack of time appears as the most prevalent factor and determinant of avoidance personal, followed by family problems. Among the didactic and pedagogical factors that led to the withdrawal of the course, we can mention the difficulty of adapting the method and its tools, as well as the lack of communication and integration with the tutor. It is concluded that



professionals were mostly young, with experience in the FHS, but without necessarily qualifying area. Lack of time appears as an important factor in the dropout process, thus being the participation and awareness of municipal managers important step for the permanence of the professional course. Moreover, the team responsible course must be more careful for adaptation and needs of students to the educational method, seeking greater integration with them.

Keywords: evasion, courses, distance, education, students

#### **Evidence for Person-centeredness in Telehealth Research Involving People with Diabetes** C. C. Bartz

International Council of Nurses, Suring, USA

The purpose of this paper is to describe the second phase of an ongoing bibliometric study of telehealth research for evidence of person-centeredness. Drawing from the UNESCO Universal Declaration on Bioethics and Human Rights, the Helsinki Declaration and the Belmont Report, the three characteristics of person-centeredness that have been identified are respect, benefit and justice in the sense of fairness. Studies involving people with diabetes provide the data for the multi-phased study for two reasons. First, using a defined research population narrows the otherwise immense diversity of subjects and methods in telehealth research. Second, diabetes is a worldwide chronic disease, affecting more than 170 million people in 2000, with constantly increasing morbidity and mortality. The first phase of this study explored a convenience sample of 14 studies for evidence of respect, benefit and fairness. A framework based on this exploration was proposed that included 17 items supporting the characteristics of respect (eg. use 'participants' rather than 'subjects' or 'patients'; have participants set own goals), benefit (eg, include families in discussions with participants, give participants feedback during and after the study), and fairness (eg, offer participation to the whole population targeted, educate all participant groups). This paper will present results of a systematic literature review from 7 databases (eg, PubMed). After eliminating chart reviews, retrospective reviews and cost analyses, 26 prospective studies published in 2013 were identified. An analyses of these studies for purpose, design, population/sample, data collection and analyses, findings and limitations will either substantiate or refute the proposed framework for person-centered research. If support is found for the framework, the next phase of this work will focus on dissemination of the person-centered research framework to the telehealth research community with the goal of improving the research experience for persons with diabetes.

Keywords: telehealth research, human subjects, diabetes

## Experience of Tele-Medicine Implementation to Counteract Professional Isolation of the Healthcare Specialists

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Analysts who studied problems of medical specialists noted the aggravation of healthcare staffing issues in the world. Urgent and coordinated measures should have been taken to counteract HR crisis. The analyses of staffing issues of various countries indicated the similarity of the formed



problems. The shortage of medical specialists in the world was higher than 4.3 million people. In spite of the fact that the staffing issue was higher in Belarus than in other countries there was also indicated the evident shortage of both doctors and nursing personnel. There were 46760 specialists with higher education and 112992 with secondary education who worked in the system of the Ministry of Health in Belarus in 2012. The provision of the population with the doctors and nurses counted 49,4 per 10000 people and 119,4 per 10000 correspondingly[5]. Together with that staffing issue, healthcare system was characterized as the shortage of employees, concentration of the specialists in cities, the large number of hospital staff and the small in PHC system. There were problems of professional staff structure (misbalance of the specialists and non-optimal doctor-nurse correlation). The problems of HR in the healthcare of Belarus were similar with the problems of the post-soviet union countries (irrational usage of the existent HR, their limited production, discontinuation of work based on the brain drain from the healthcare system). One of the main reasons for staffing problems in Belarusian healthcare was the peculiar demographic situation – ageing of the population. Professional brain drain and migration were indicated as also hot issues for the healthcare system. The main reasons for professional brain drain were the following: external and internal migration, natural loss of medical staff connected with retirement, disability and death. The great number of foreign analysts mentioned that professional isolation of medical specialists also influenced the shortage of the staff. The main reasons were the following: territorial remoteness, inaccessibility to the modern IT, lack of finance, technical resources and etc.

Keywords: staffing issues, professional isolation

### **Expert Tele-Fitting Mode for Cochlear Implant Recipients**

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Purpose: In a telefitting method an experienced audiologist from the cochlear implant clinic provides fitting service for the patient in distant, cooperating policlinic. Teleconference equipment provides audio and video connection while remote desktop application allows taking the control over the distant computer and performing all necessary measurements. This method proved to be a reliable alternative for standard fitting, but it does not save work-time for a clinician and is not a way to cope with the growing number of patients. In expert telefitting mode the idea is to involve less experienced support specialists from cooperating clinics in basic tasks and to leave the decision making in the hands of experts performing their duties via telemedical solutions.

The aim of this work is to present the concept and preliminary data showing outcomes of the new telefitting mode.

Material: The study group consisted of randomly selected patients: 6 children (age 7-16 yrs, mean 11,2) and 7 adults (age 17-64 yrs, mean 44,7) with CI experience ranging from 18 months to 16 yrs. The control group consisted of randomly selected patients: 9 children (age 3-14 yrs, mean 8,8) and 5 adults (age 21 - 36 yrs, mean 27,2) with CI experience ranging from 6 months to 8 yrs. Method Each patient in the study group underwent expert telefitting procedure: local ENT, structured interview, free field audiometry, local objective and psychophysical measurements. Then a Remote Expert interpreted the results and created a new map. The controls underwent standard telefitting consultation.

Results and Conclusions: The expert telefitting mode seems to be comparable to the standard telefitting mode in terms of patients' satisfaction and appreciation of the results. It allows substantial saving of time of experienced specialists, and in this way may lead to the reduction of cost. These advantages complement benefits of the standard telefitting mode: saving of time,



money and effort for the patient, better access to specialists, educational value for less advanced staff.

Keywords: teleaudiology, telefitting, cochlear implants

# Factors Influencing the Implementation of Electronically-Delivered Patient Reported Outcomes for Chronic Diseases

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Introduction Traditional medical outcomes have mainly focused on physiological endpoints that often do not capture these critical aspects of living with a chronic disease. Patient-reported outcomes (PROs) consist of information provided by the patients on their quality of life, functioning and well-being, without any interpretation from a healthcare professional. The implementation of PROs has been suboptimal previously and only recently has there been renewed interest to study their integration in clinical practice and research. PROs can facilitate communication and the patient-centred model of care by providing a unique insight into one's health status and by systematically collecting personal data on symptoms, particularly for those patients with chronic diseases and multimorbidity. Internet- and electronically-delivered PROs (ePROs) have several advantages over the traditional distribution of paper-and-pencil based assessment. The responses to PROs may be affected by different factors, such as the way information is collected, the amount of effort it takes to respond to a question, the willingness of the patient and the respondent characteristics, including the health literacy level. Aim The aim of this presentation is to report on the factors that may influence the implementation of ePROs for the management of chronic diseases. Methods A review of the literature will be carried out to identify the articles that include the keyword "patient-reported outcomes" in their abstract and are indexed under the "Information Science" MeSH major topic. Publications related only to acute conditions and opinion articles will be excluded. The selected articles will be analysed to identify those factors that can affect the integration of ePROs in a workflow for the management of patients affected by chronic diseases. Expected Outcomes The review will identify the most notable factors affecting the implementation of ePROs.

Keywords: patient-reported outcomes, Internet, chronic diseases

### Google Hat: Treat Yourself to a Solid as Rock Butler

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Today hosts of mobile applications can be used on the go, which redefines the notions of assistance and safety. However, setting up scenarios and connecting several applications together remains tricky due to the large number of functionalities, interfaces and uses available. The Google set of applications notably stands out. The built-in modular units, seamless interfaces and adjustable user profiles, let us anticipate the feasibility of building a personalised environment for each user (cf. Google home page). However, the existing links between these applications seem



largely underutilized. The challenge here is to study the criteria which will enable to define groups of apps capable of providing ubiquitous real-time assistance to persons losing their autonomy. The Google Hat project consists of an application pack managed by a hat ie an adjustable supervisor application. It should integrate spatiotemporal tools thanks to Google apps. The novelty lies in the overall supervision and user-friendliness which will make the personalized user experience more intuitive and seamless. There will be a smooth integration from one app to the next and thus from one functionality to the next one. Google Drive, Google Keep, Google Goggles etc. are to be part of the pack. Our concept takes the notion of hat, or service handed on a plate, a step further. The connectedness lies in between the pack of applications and the user, but also between the apps and the saved profile. Under the hat, each application is considered as a brick that the user can pick and choose to meet her needs. Once it has been parametered the supervising layer reacts in realtime as specified by the profile and ubiquitously responds like a butler. In a more advanced version, the hat could support disorientated users thus helping them to move around and get assistance. With users' consent, and depending on the seriousness of their conditions, adequate supervision by helpers could also be considered.

Keywords: intuitive, assistance, service, interaction, cognition

## Hardware and Software System to Transmit and Process 3D Visualization Data during Surgeries and Diagnostic Procedures

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Introduction: The main aim was to develop hardware and software system for storing, processing and broadcasting stereoscopic image from surgeon's or diagnostician's helmet.

System is designed to be used in master classes, carried by leading surgeons, for novice surgeons' qualification improvement, by showing them the whole surgical field and the tiniest details, like surgical tool position e.g.

Another usage of the system is tele-counseling, when teacher is able to control novice surgeon's course of action in online mode.

There has been developed a unique system for high definition (1080p) online broadcasting, storage and processing (editing) of stereoscopic visualization data received during surgeries. A stereo headpiece for the surgeon included in the system is certified for usage in operating theaters. The project is carried out by:

- The Telemedical Department at Medical Dentist University named after A. Evdokimov.
- Posterior Eye Segment Diagnostics and Surgery Center.
- Camera Lab., LLC
- Russian Telemedicine Association
- The Scientific Clinical Center of the Russian Railways.

12-inonth testing of the system took place at:

• The Department of Dental and Maxillofacial Surgery at Moscow State Medical Dentist University named after A. Evdokimov, headed by Professor A. Drobyshev.

• The 5th Department of Cancer (with use of laser medical technologies and photodynamic therapy), headed by Professor M. Stakhanov.

• The Cancer Center at the 2nd Central of the Russian Railways and the Department of Cancer at Moscow State Medical Dentist University named after A. Evdokimov, headed by Professor L. Velsher.



• The Center for Spinal Cord Pathology at the 1st Central Hospital of the Russian Railways, headed by Professor A. Baskov.

Currently we continue to improve our system by developing new technologies in view of surgical and diagnostic specificity

We consider that this work could be the base for international project.

# Healthy Eating QR Codes - A Mobile-Based Technology for Wise Management of Eating Habits

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Smartphone platforms have introduced to make management of daily diet easier. These apps help the users to add the consumed foods in a day and then to add their contents to reach the whole daily calorie and nutrient received. These Apps have tools to collect data of the "nutrition fact" tables of the food added by users, for example MyNetDairy app for iOs. In this app the user can select the food from the list to add it to the list of daily consumed foods or can use smartphone camera and a Barcode scanner module to scan the barcode printed on the food package and connects to an online database to extract the nutritional content and add to the user's daily file. These apps in various studies have been shown effective in weight reduction, fitness and reaching the optimum nutrition profile by tight monitoring the detail of consumed nutritional goods. This is especially in diabetic, or those due to other metabolic illnesses need a tighter control of consumed materials to avoid subsequent complications. But the only limitation of such apps is need to internet connection to connect to the database and also need availability of food barcode in the database related to the app. QR codes are a quadrant barcodes first designed and used in Japan for automobile industry and are so called 3D barcodes as they are two dimensional (as a quadrant) and indeed the normal line barcodes can store not just the numeral, but also any string within them. These codes are readable by cameras of Smartphone with the special apps. In a research project we used PHP programming, US food and agriculture database of food "nutrition facts" of more than 8000 records and designed a database of QR codes for all of these foods. This equipped to a search engine with QR code generator module that as soon as a food is selected, the QR code of it beside its nutritional fact table in a standalone dynamic webpage is displayed. We registered a new format of QR code in US trademark and patent database (application no. 4993) so called "Healthy eating QR code" that has two types of online and offline. The online format is a link to a particular webpage showing a nutrition fact table of a certain food.

Keywords: healthy eating, QR codes, smartphone, nutrition

### HeRo (The Health Robot)

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One of the challenges in the medical care is to obtain key information for an effective prevention and control of the individual health. It is advantageous to complete the data from medical examinations by continuous monitoring. Most of the current equipment are single-purpose devices which monitor a limited amount of data with limited options regarding non-intrusive



measurements, e.g. pressurizing cuffs for blood pressure. In this paper, we report on the recently completed project HeRo (Health Robot). Its results seem to be ready for a mass deployment.

The goal of the project HeRo is a mobile terminal, robot, which supervises an individual and checks autonomously his vital signs and communicates with home center, medical center and emergency first aid centers. It handles data like temperature, blood oxygen, heart rate, systolic and diastolic pressure etc. Further, it can be connected to other modules like ECG, etc. It passes the data to other devices and calls for the first aid, if necessary. Results of the project will be demonstrated in form of a simultaneous measurement and evaluation of temperature, oxygen content, heart rate, systolic and diastolic blood pressure. All measurements are based on a noncontact sensing. The most important result is not only the miniaturization of the device, but a novel method for evaluating and calculating the systolic and diastolic blood pressure based on the plethysmographic curve, i.e. without the use of any cuff and its inflating. The cuff-less measurement of the blood pressure introduces novel possibilities and it consequently changes not only the measurement itself, but it opens new space for its global deployment. At present, the solution composes of five basic variants comprising e.g. a "bracelet", "ring" or "earring". Each of the variants is either a completely autonomous system or it cooperates with smartphones. The conference participants will become the opportunity to view and test the sample devices. The deployment may have a significant impact in the near and distant future, not only in the health care, telecommunications etc., but also in the daily life of population.

Keywords: HeRo, medical care, non-contact sensing

### Hospital Information Management System for the Armed Forces of Nigeria

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The proposed Hospital Management System is a Network Based Electronic Medical Records Implementation with the aim and objective of unifying both new and existing military medical facilities of the Armed Forces of Nigeria under a uniformly structured central database for easy dissemination of medical records and data for diagnosis, treatment, monitoring, research and general hospital services in the capacities of both clinical and non-clinical activities piloted by the Nigerian Army Medical Corps. Built from the ground up, it is a Multi-User Feature-Rich, Microsoft windows SQL based electronic hospital management system which incorporates an electronic medical record designed for the healthcare industry. It is a system designed to organize hospital services as well as simplified for Novice PC Users to have all the information and tools needed at their fingertips in order to properly do their jobs. Methodology would involve the development, adaptation and deployment of a local driven software(proposed herein); harmonize & upgrade existing paper health medical records into paperless (ie, electronic formats) to enhance module simulations such as 'Medical Records, A&E, Patient Consulting, Billing, Cash Payments, Retainers, Pharmacy, Triage/Nursing Care, NHIS, Appointments, HR, Audit Trail, etc; Training and familiarization of selected healthcare workers initially with EMR functionalities; Create



public awareness within the Armed Forces and country at large amongst others. Technically, basic hardware and software tools required would include: Workstations, Servers, Working Local Area Networks, Anti-Virus Softwares and Personal Firewalls, etc. Results: Saves Time; Saves Money; Reliability with an SQL database framework; Feasibly dynamic and upgrade-able with new information technology trends. This without doubt upon successful implementation nationally, will aid in the effective & efficient integration with already existing International/Global Telemedicine and eHealth links/networks so as to equally benefit optimally from the advantages of this field for both our troops and citizenry.

Keywords: EMR, Microsoft-Windows-SQL, Nigerian-Army-Medical-Corps, hospital-services, network-based

### How the Diplomatic Council network helps when it comes to healthcare

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The motivation for the foundation of the Diplomatic Council (DC) was the encouragement of international relations. Thus, one of the Diplomatic Council's aim is to assist with global contacts including the healthcare sector. Therefore, as members the DC welcomes not solely members of the diplomatic and consular corps but also personalities from healthcare, society and economy.

The Diplomatic Council is the publisher of the "Hospital directory for international patients" series including the "Best hospitals of the world" directory. The directories are distributed free of charge to embassies, consulates and international organizations all over the world to help them direct requests to the listed hospitals to make sure patients get the best treatment. In order to get included in the directory a hospital must conduct the self-assessment "Approved for international patients" or qualify for the "Best hospitals of the world" award. For further details, please visit:

www.diplomatic-council.org/en/certificates/hospitals. "Best Hospitals of the World" is the highest qualification standard and is awarded based on experts evaluation only. The "Best hospitals of the world" awards are granted yearly at a conference organised by the international healthcare certification specialist Temos. The Diplomatic Council Certification Program is designed for patients striving for more security and quality as well as for medical facilities seeking more international patients.

#### ICT in Counteracting Brain Drain and Professional Isolation of the PHC Specialists

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The aim of the survey within the PrimCare IT project was the study of the opinion of Belarusian PHC specialists on the ICT usage in Healthcare. The project was focused on the counteraction of brain drain and professional isolation via tele-mentoring and tele-consultations in remote areas.

Materials and methods: There were 22 specialists of Ostrovec Central Regional Hospital and 4 professionals of Belarusian Medical Academy of Post-graduate Education interviewed during the survey. Interview was chosen as the method of the study.

Results of the study: There were 26 specialists who defined the following factors of influence on brain drain: payment, lodging provision, professional isolation, territorial remoteness, available



technologies and etc. The main factors of influence on professional isolation were the following: territorial remoteness, absence of the possibilities to communicate with colleagues, low information provision level, working load of a doctor, low level of technologies, lack of motivation for self-improvement. 12 of 26 specialists considered that tele-mentering and tele-consultations had not been the leading factor of counteracting brain drain in remote PHC. However, 15 of 26 professionals considered that tele-mentering and tele-consultations could counteract professional isolation in remote PHC.

Conclusion: All the interviewed specialists acknowledged the importance of tele-mentering and tele-consultations implementation to support PHC specialists in remote areas.

Keywords: ICT, brain drain, professional isolation

### Impact of Information and Communication Technologies (ICT) on Health Care

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ICT has made a tremendous impact on health care. The most important are accessibility to health care services by citizens: cost reduction and improvement in quality of health care. The goal is to provide access for the citizen at any time and in any place. eHealth certainly provide such an access especially in remote areas where physicians may not be available. The development of teleconferencing mobile communications, facilities. multi-media capabilities of telecommunications and the internet has been of immense benefit in the health care delivery. By this revolution differences between medical specialists, medical centres and patients have been limited. The improvement of the quality of care has been demonstrated in several medical disciplines e.g. cardiology. The transmission of ECG signal directly from the ambulance to invasive cardiology centre significantly improved Acute Coronary syndromes patient diagnostics and reduced time from the outset of symptoms to intervention. ICT has an impact on education of both patients and medical staff. There are many www sites aiming at prevention of some common diseases like cancer, diabetes, hypertension etc. The effect of e-learning cannot be overestimated as far as medical education is concerned. There are many e-learning courses and videoconferences on variety of topics. Some medical virtual Universities have been established. The best model of learning for medical science is blended learning. The contact with a real patient is a core of the learning process in medicine. The shift from medical services to prevention and health promotion can be observed in recent time and we suggest that ICT applications in health should adapt to new situation.

Keywords: eHealth; ICT; accessibility

# Important Determinants in Successful Adoption and Sustainability of Use of an m-Health Self-management System

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Self-management is becoming a new emphasis for healthcare systems around the world. The new generation of mobile technology (i.e. smartphones, tablets, etc.) has made it possible for many



healthcare-related applications, including mass patient customization, real-time monitoring of vital signs, delivery of healthcare information to clinicians, collecting patient health data, direct provision of care, monitoring patient status, etc. Moreover, self-management of chronic disease has become a focus due to potential healthcare savings, as well as to provide more effective care. But there are many different problems with adoption of new health-related intervention systems. The situation is even more complicated for chronically ill patients with disabilities, illiteracy, and impairment in judgment in addition to their conditions, or having multiple co-morbidities. Providing online and mobile decision support to manage patient health and to provide better support for chronically ill patients is a new way of dealing with chronic disease management. In this study, an m-Health system that supports self-management interventions including the care provider, family and social support, education and training, decision support, recreation, and ongoing patient motivation to promote adherence and sustainability of the intervention are discussed. A proposed theoretical model for adoption and sustainability of system use is developed, based on UTAUT2 and IS Continuance of Use models, both of which have been prevalidated through longitudinal studies. The objective of this paper is to identify and resolve issues surrounding the successful adoption and more importantly sustainability of use of an m-Health system which will result in commercially sustainable self-management support for chronically ill patients with or without disabilities.

Keywords: m-Health, chronic-illness, self-management, adoption, sustainability

#### **Innovation Framework for People with Dementia and Their Carers as Users** P. Cudd

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Dementia has been and remains headline news in many countries globally as a major health and social care concern for society. With large numbers of people with dementia currently projected and the focus on maintaining their independence as long as possible, the need for telehealth, telecare, mHealth etc. systems and services tailored to that population is obvious. The poor state of the art in reported innovation of digital technology for people living with dementia has been revealed by a recent literature review. The articles put considerable emphasis on the appropriate/participatory involvement of people with dementia to the neglect of many other aspects of scientific study, e.g. strength of evidence generated, consideration of the support and organisation needed to achieve successful use by people with dementia, thoroughness of evidence and indeed giving a realistic view of the generalisability of their work. The importance and issues in such aspects will be discussed. It is inferred by the above that researchers/inventors need guidance to contextualise and improve their approach. The design of any digital health (or other) technologies for people with dementia themselves to use, needs to take proper account of the end users but also the support for that use. Thus a new innovation framework to guide innovators in developing evidence is proposed. It will allow for situations where it can be appropriate that the person with dementia is the only user, or, where that use is supported by a career. The assumed innovation goal is an evidenced prototype where support needs are understood; thus allowing a more trustworthy commercial exploitation plan to be formulated. This should provide future inventors such as those found in the review with an appropriate context to place their work, and importantly allow care service organisations to have some confidence in planning their digital inclusive care.

Keywords: dementia, digital, technology, design, framework



#### **Innovative ICT Systems for Integrated Care**

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Research on innovative ICT systems - enabling new models of care organization - is needed to respond to the increasing burden of chronic disease and the complexity of co-morbidity and polypharmacy. The challenges addressed in this paper involve the design of ICT systems that offer integrated care, especially for older persons and patients suffering from multiple disorders. The design is patient-centric, pro-active and coordinates across disciplines and organizational boundaries. The design places an "in silico" counterpart of the patient at its center. This is a persistent computing process offering services that, going beyond the state of the art, is capable of taking initiatives on behalf of its patient, following instructions from health care professionals, the patient, social workers, etc. The design has provisions ensuring that only suitably authorized actions are taken. The ability of ICT components to take initiatives is instrumental for the realization of proactiveness. While monitoring patient status, activity and compliance with therapy, patient models and pathways are used to anticipate. In combination with organizational models, the near-future interventions are assessed and the affected persons and facilities are kept informed. The proactive information processing accounts for the availability, authorization and qualification of health care providers well as the availability, capability and medical condition of the patient. The patient-centric design, through the patient counterpart within the ICT system, connects all the organizations and disciplines involved, and it connects them in manners mirroring the corresponding reality, thus limiting the need for interoperability. Privacy is supported through the use of services like VITALINK (cf. www.vitalink.be) and through delegation where delegator and executor are sharing information on a need-to-know basis. The research software development employs technology - among other used in the Danish Shared Medication Record providing scalability and a high 24/7 service availability (i.e. capable of 99,999%).

Keywords: Integrated care, poly-pharmacy, co-morbidity, patient-centric

#### Inspectlife - Complex Services for Telehealth of Diabetic Patients

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InspectLife is a web based platform for telecare and telehealth. It consists of several services which together represent complex tool for telehealth of chronic patients especially with diabetes mellitus type I from their home environment. The main services are telemonitoring of blood glucose, telemonitoring of blood pressure, telemonitoring of body weight, telemonitoring of physical activities and surveillance of diabetic patients. Telemonitoring measurement devices with wireless Bluetooth data transfer and mobile application are utilized. InspectLife solution is accessible for authorized user with different user roles (physician, patient, family member, operator) via internet with the help of standard web browsers. InspectLife solution includes receiving and storing of measured data, data processing, visualization and their analysis and also communication between all participants in the process of treatment of chronic diabetic patients. The InspectLife solution can help to diabetic patients and their physicians in terms of better diabetic compensation, better motivation and more effective treatment. Also the frequency of communication between patient and physician could be increased and also the quality of life of diabetic patients could be improved.



Keywords: telecare, telemonitoring, diabetes mellitus

#### Integration of Home-monitoring Data and PHR, EMR

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While much attention has been paid to the implementation of electronic patient records (EPR), electronic medical records (EMR) and integration of them into one region- or nation-wide health information exchange (HIE) platforms less has been discussed about the integration of personal health records (PHR) consisting of health data with EPR, EMR or HIE.

This presentation discusses implementation of new medical data exchange standards to integrate personal health data collected by using home monitoring devices or entered manually by the citizen with PHR and HIE. As an example of the personal health data exchange platform Estonian nation-wide health information system (EHIS) is used. EHIS is a secure internet based data exchange platform provided by the state and functional since the end of 2008. It aims to connect different health related databases in Estonia and providing on-line access to medical professionals and patients if they are entitled to do so.

### Inter'Actions Promoting Efficiency and Societal Wellness in a Rural Community

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Longer life expectancy has become a societal issue, with major demographic social and economic challenges commanding immediate response. Although Creuse is among the oldest European territories, it recently enjoyed a modest entry of new inhabitants, while country planning favoured the deployment of new technologies. Broadband in particular offers development opportunities without requiring industrial infrastructure. However, lack of communication between age groups or lack of knowledge of the communities and their real needs plague service providers. This often leads to poorly thought out actions or shortage, while recurrent inefficiency yields disappointing social and economic results. The ambition of Inter'Actions is to energize and optimize the community's daily life. The goal is to generate participatory cultural activity and intergenerational connectedness, provide retailers with opportunities and bring IT into service efficiently. We will finally experiment and launch e-health solutions. The project notably relies on a university centre set up 5 years ago (with degrees focusing on the silver economy) and home automation providers. The philosophy consists in empowering community members, regardless of their cultural, economic and social circumstances or « usefulness ». Everyone will thus play a gratifying and valuable part that benefits the whole community. Typically, personal assistance services shouldn't be restricted and defined as home-care for the elderly. They should be services for all, of all ages and from all walks of life. The aim is explicitly to promote connectedness, to make optimal and profitable business within a renewed social framework. National program Monalisa enabled to set up « pub venues for all ages », which will offer appropriate think tanks to generate new ideas and practices. Finally, collaboration with medical staff should enable to define new public health tools and protocols, for better coordination of care resources and services.

Keywords: participatory, technology, services, efficiency, added-value



### Inter-Organizational Process Collaboration and eHealth – A Review of Theoretical Perspectives

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Background: This article provides a systematic review of literature and theoretical perspectives on inter-organizational collaborative business process management (cBPM) and suggests implications for eHealth research. eHealth is process intensive and involves inter-organizational collaboration where responsibility for patients shifts across many organizations in most countries. As a result, inter-organizational cBPM is necessary for coherent and efficient production of health care services and quality of patient treatment.

Methods: We conducted a systematic literature review involving four research questions used to describe the research so far and to identify gaps and further research opportunities. We indexed the article after the contexts or areas of concern that was studied, eHealth and others.

Results: Studies at earlier phases of cBPM involving initiation and implementation dominate, and most studies adopt the perspective of cooperation where collaboration is seen as largely free from competition and conflict. In analyzing the research from the inside and outside of the eHealth context, we identified research gaps as well as research opportunities that can form the basis for new research in the eHealth context. Finally, our study has implications for practitioners who should be aware of the balance between cooperation and competition.

Conclusions: Our review contributes to forward the research in eHealth on inter-organizational collaboration within the broader area of business process management. By summing up the status of research within eHealth we were able to identify several research gaps and based on research findings from outside of eHealth we suggest opportunities for future research in cBPM in eHealth. Our findings suggest that collaboration in eHealth poses relational challenges that are more important for process improvements than in other contexts. The results have implications for future research as well as for practice in this important and growing area of interest.

Keywords: inter-organizational cBPM eHealth theories review

#### **Introducing the ISfTeH's Chronic Disease Management Working Group** G. Mochi H2000 ITALIA, Italia

According to the WHO, in Europe chronic diseases cause at least 86 percent of deaths and 77 percent of health expenditure paid by the public and/or private healthcare services. In the USA, chronic patients determine 78% of the total national health expenditure. Worldwide, 60% of deaths are caused by chronic diseases that percentage will increase by 17% over the next 10 years. The so called "Chronic Disease Management" (CDM) approach wants to achieve two clear goals: a better life for chronic patients and a better use of healthcare resources. That can be done by implementing a sound organisation and standardised procedures, as well as taking advantage of the more and more rapidly developing ICT applications. This presentation wants to introduce the ISfTeH's Chronic Disease Management Working Group. The Group aims to promote the cooperation among professionals, companies and institutions with different viewpoints, approaches, expertise and cultures in the field of Chronic Disease Management. The Group's Vision is focused on the shift towards new models of homecare, generating a better quality of life



for the patients and a more sustainable use of the available resources. The Group's Mission is employing ethics, technology and multidisciplinary expertise to achieve measurable outcomes on chronic patients' wellness and healthcare cost containment. Through the cooperation and the commitment of professionals, companies and institutions, we expect to achieve several important goals:

• Consensus about terminology and fields of application.

• Flexible CDM models suitable for different cultures/organizations and operational guidelines for different pathologies.

• Support to multinational/multispecialty projects and experiences.

• Detection of tools and procedures aimed to measure the projects' outcomes.

• Definition of minimal requirements for data management, medical devices and software applications.

• A web-based database collecting and spreading information about: - professionals, companies, sponsors/funders interested in CDM cooperation and/or partnerships, - hardware/software/ICT providers, - published or in-progress CDM projects and experiences.

Keywords: chronic disease management, cost containment

# Investigations on Veil Psychology for Telemedicine System Acceptance in South Punjab, Pakistan

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Telemedicine as pilot project was introduced in Pakistan in 2007 and laterally established in Punjab province at Mayo hospital Lahore in 2008. The services were provided at District head quarter Hospitals (DHQ) in Attock, Gujrat (North Punjab), Sahiwal, Jhang (Centre Punjab) and Rajanpur and Dera Ghazi Khan (South Punjab). Consultancy services through these workstations also provided to adjacent districts of the workstations at DHQ level. Cultural psychology of 7452 patients was studied through structured questionnaire, First visit and follow up interviews from 2008 to 2013. The religious schools of thoughts did not propagated against the benefits of the system but submitted reservations against operations of the system. System acceptance rate in south was 58% higher than north and central parts of the province. Communication problems with female and children which is the major beneficiary were higher than male. The social and cultural aspects of Veil (parda), inter personal relations, male consultant for female patients, fears for

aspects of Veil (parda), inter personal relations, male consultant for female patients, fears for misuse of patient data, trust on virtual examinations and Communication gap between recipients and physician in case history and investigations. Among the issues described, veil ranked at top position in creating a package of complexities in relation to sound quality and dermatological investigations. The problem was pronounced among the age group 14 years to 45 years irrespective of the social class linkages. Informal and formal analysis report of consulting physicians highlighted that in veil group, attendant of female dominates in history description especially on family issues. The investigations highlighted on appointment of female psychologist at Main Hub station for minimizing the communication constraints.

Keywords: telemedicine, veil, quality, interpersonal relations

### IoT for Early Detection and Treatment of Depression in Elderly: A lesson Learned



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One of the major diseases that afflict the elderly population in Mexico is depression. This document describes the process of designing a system for early detection and treatment of the state of depression in older adults, taking advantage of the technological development of the Internet of Things, the Context Awareness and the concept of e-Health to determine the Daily Activities living (ADL) using the gesture recognition log events to determine an abnormality in as a means to conclude the variations in the ADL.

Keywords: IoT, elderly, depression

## Issues and Scope of M-Health Using Tablet for Patient At Home: From a View of E-Health Economics

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The objectives of this paper is to present necessary conditions of further implementation of m-Health using tablet which becomes popular among physicians, nurses, public nurses, care takers, and other healthcare providers. Based on the field survey on Taka Red Cross Hospital in Taka Town, Hyogo Prefecture, in November 2013, this paper introduces how tablet is used for sharing information on patients at home among above shareholders. The background of m-Health of this category lies in facts such that (i) the number of the elderly who stay and receive medical services at home has been increasing due to the aging society and the medical reform aimed at reducing medical expenditures by early discharge from hospital which raises and (ii) the number of the elderly who want to die at home. m-Health is a suitable system to cope with the above situation, this paper addresses how tablet is used to achieve sharing information by taking above hospital as an example. In particular, we focus on the system how tablet is connected to electric health record at the hospital and how it improves not only the communication between nurses at patient's home and physician at the hospital, but also sharing information among medical and care staff around patient. Although m-Health has above potentiality to solve current medical issues, there are still many problems to be solved for further diffusion, and this paper suggests necessary solutions such as (i) deregulations on medical services; and (ii) imbursement of m-Health from medical insurance which is required for economic basis. One example of deregulation is to expand the roles of nurse and co-medical in such a way to participate in m-Health, which is related to the "credentials "of telemedicine. Pharmacy is also connected in this system, which enables to issue prescription at patient's home. Regarding reimbursement of m-Health, only diagnosis using telephone is admitted for telemedicine which amounts to JPY680 (USD6.80). Reimbursements for consultation, management and guidance are required to be admitted. Other frameworks which secure the economic basis of m-Health are also discussed in the paper.

Keywords: m-Health, tablet, reimbursement, deregulation, credentials

**IT and Engineering Education: How to Make It More Attractive for Women?** L. Lhotska Czech Technical University in Prague, Prague, Czech Republic



In last decades the effort to increase the number of women applying for studies at technical universities, and consequently for a job in the field of technology, can be seen in European countries. However, the advance in the decreasing of gender disbalance is very weak and the amount of female students in technical fields is still quite small. Reasons for this are for sure historical patterns and society prejudices that maintain and encourage gender discrimination. We have analyzed the situation in the Czech Republic and found out that there are differences in ratio of females in individual engineering disciplines. According to various studies, Czech society is conservative considering the dividing the male and female roles in the society. Also, employment of a woman in any field of engineering is considered nontraditional. This clearly points out to social stereotypes in this country, considering only the close connection of men and technology to be natural. The total number of university students at all 73 universities and colleges (both public and private) in the Czech Republic has been slightly increasing during the last decade. Since 2010 the total number is almost constant - 392 thousand of students, out of which 219 thousand are females. In Bachelor and Master Study the gender structure is almost the same: 46 - 49 per cent males and 51 - 54 per cent females. Certain shift is observable in PhD study; there are only 42 - 5444 per cent females. Completely different situation is observed at engineering faculties at all educational levels. Technical sciences are studied more by men: overall percentage of women is about 11 per cent (from the whole number of females studying at universities) and slowly decreasing, while this percentage in male population is around 40 per cent (from total number of male students). However, if we analyze the numbers in interdisciplinary areas, such as biomedical engineering, biomedical informatics, eHealth and telemedicine, we see certain shift. There are usually up to 30 per cent of female students. In the paper we will discuss in more detail the reasons of this situation and the possible solutions.

Keywords: education, gender ratio, inter disciplinarily

# IT Support of Training in Cardiology: The EUCARDIA Platform of UEMS Cardiology Section

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Union of European Medical Specialists, Belgium

The Cardiology Section (CS) of the Union of European Medical Specialists (UEMS) has developed a unifying concept for training in the specialty of cardiology (document "UEMS 2012/29 Cardiology"). In order to implement a proof of concept CS will launch a "European Diploma General Cardiology" in 2014 for which the administrative software "EUCARDIA" has been developed (www.eucardia.org/publicbeta). This software is now open for public testing, and will offer an independent opportunity for traceable and verifiable documentation of your activities regarding practical skills (logbook), knowledge and professional attitude, not only during training but for your whole lifelong working time.

Thus, EUCARDIA is also an example for IT technology offering equal access to trainees throughout Europe to a tool supporting their local training activities, and will by thus also facilitate professional mobility

### Language, an Impediment to Telemedicine Use in Africa?

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Telemedicine holds great potential for Africa with its extreme shortage of doctors and nurses. The issue of language and the preference of patients to be given health related information in their own language is well documented. The language of information communication technology is replete with complex technical terms, some of which are used in informed consent documents. It is assumed that these words are translatable and will be understood. In Africa the development of technical terminology in most languages has been neglected and this may be a barrier to obtaining proper informed consent for telemedicine. AIM: The aim of this study was to determine whether translations of technological terms relevant to telemedicine and the consent process from English to isiZulu, the most spoken of the 11 official languages of South Africa, exist. METHODS: Fortyone key words relevant to computer terminology and concepts used to gain informed consent for a telemedicine encounter were selected and translated by an IT technician, a surgeon, an isiZulu translator, and a teacher of isiZulu, all isiZulu first language speakers. The words were back translated by the IT Technician. Eight words were not translatable, two of which were transliterated. A questionnaire with the list of words was developed and administered in isiZulu to 54 patients at four outpatient departments in rural KwaZulu-Natal hospitals involved in telemedicine services. RESULTS: Comprehension of technical and ethical terms in isiZulu was poor: 4 people (7.4%) understood the word telemedicine, 5 (9.3%) video-conference, 5 (9.3%) electronic records, 10 (18.5%) the World Wide Web, 12 (22.2%) digital photograph and 18 (33.3%) the Internet. Only 19 people (35.2%) understood the word consent and only 4 (7.4%) understood both consent and telemedicine. CONCLUSIONS: Obtaining informed consent for a telemedicine consultation in an African language is problematic. Patients do not understand technological terms in their mother tongue. While they may give "informed consent", its validity must be questioned. With over 2000 languages in Africa, it is unlikely that the problem is confined to South Africa or isiZulu.

Keywords: telemedicine, informed consent, language

**Learning Opportunities: Teledentistry Contributions to Continuing Education in Brazil** M. Pereira Rendeiro<sup>1</sup>, A. Monteiro<sup>2</sup>, R. Postorivo<sup>1</sup>, R. Jorge<sup>1</sup>, M. I. Souza<sup>1</sup> <sup>1</sup>School of Dentistry, State University of Rio de Janeiro; Rio de Janeiro, Brazil <sup>2</sup>Telehealth UERJ, Brazil

Brazil has continental dimensions; it is the fifth country in size in the world. Currently, its population is estimated at 190 million people, who live in 26 States divided into 5 different regions, there are 5,563 municipalities, all of them with considerable regional differences, regarding access to education and health services. Political analysts emphasize economic growth, political stability and poverty reduction as some of the main positive Brazilian characteristics. Health is known as a universal right and the implementation of a National Dental Health Policy has been developed in Brazil since 2004. Some challenges faced by the States have also highlighted the need for Continuing Education development, in order to improve all the required skills to operate in the Brazilian Unified Health System - SUS. The program named Telehealth Networks Brazil / UERJ has offered in a systematic way, some distance educational activities, such as virtual seminars and community coursework. The objective of this study was to get to know and map the pattern of access to these two different courses, in order to verify their nationwide reach. We have selected the two most accessible courses: "Pediatric Dentistry" (ODO, in Portuguese Odontopediatria) and "Atraumatic Restorative Treatment" (TRA, in Portuguese Tratamento Restaurador Atraumático) and the information about the number of enrollees and place for residence for the years 2011, 2012 and 2013. We have organized all data in an Excel spreadsheet and analyzed them according to the percentage. For the course named as TRA, from



the total number of participants (877), 63% are from the Southeastern region of Brazil, 23 % are from the Northeastern region and 9% are from the Southern region. The Central-West and South have shown fewer participants (1% and 4% respectively). For the ODO course, considering the total number of participants (709), 43% are from the Northeast, 27% from the Southeast and 20% from the South. North and Central-West have shown a smaller share (5% each). Based on the data, we conclude that the courses offered and analyzed by Brazil Telehealth Networks / UERJ, located in Rio de Janeiro, Southeastern Region

Keywords: teledentistry, telehealth, education

### Medical Data Acquisition and Analyzes Using 3D Video and Images

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The presented paper discusses results and analyzes obtained under investigation about possibilities to use autostereoscopic 3D live streaming and pre-created pictures and videos to for remote diagnosis purposes. Methods how to implement 3D live video are discussed. Additionally different methods for obtaining 3D images based on different technologies and their comparisons are presented, too.

Keywords: 3D images, remote diagnosis

### Medico-Economic Evaluation of a Teleconsultation Program in Lorraine (France)

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Telesanté Lorraine is a non-for-profit institution in charge of promoting telehealth Solutions in Lorraine. It has implemented a platform of telemedicine supporting various uses of teleconsultation (tele-stroke, teleconsultation for inmates, teleconsultation for ESRD patients, ....). HMS has performed a medico-economic analysis of various uses. The model is based on a comparison of costs incurred, based on Total cost of Operations (TCO) over a 5 year period. Main findings are: 1) A huge Return of Investment, varying according to uses, but which can in specific circumstances, reaches 500 %; 2) Economic benefits are clearly related to economies of scale resorting from the use of a single infrastructure for various use; 3) "Free riders" benefit from development of teleconsultation without supporting the cost; 4) A fee for service model is clearly not appropriate to reimburse telemedicine technical costs. An economic model, derived from reimbursement by French authorities of CTs and MRIs, is proposed.

Keywords: teleconsultation, medicoeconomics, telemedecine invoicing model

Merging Medical Device and Clinician Generated Information for Monitoring the Burden of Diabetes and Hypertension in Public Reference Health Facilities in Central Africa F. Verbeke Belgium Background: Chronic diseases are an increasingly important cause of death in sub-Saharan Africa. This study explores to what extent secondary use of clinical information originating from diagnostic devices and hospital information systems can help to provide evidence related to the burden of diabetes and hypertension in DR Congo, Rwanda and Burundi.

Methods: The reference hospitals of Kisangani, Bukavu, Kigali and Bujumbura implemented open source hospital information management tools (OpenClinic GA) based on international classification systems: ICD-10 and ICPC-2 codes for diagnostic coding and LOINC for recording of laboratory and clinical observations extracted from lab analyzers and blood pressure devices.

Clinical and financial data from treatments in the period 2006-2012 were merged into Diagnosis Related Groups (DRGs) and case load, mortality load and financial burden metrics were calculated.

Aggregated data were sent to a central data warehouse (Global Health Barometer) using DXF messages.

Results: A total of 89,765 electronic out-patient and 59,434 in-patient records were screened based on care-provider and medical device generated evidence for hypertension and diabetes. A significant growth from 6 to 15 diabetes related admissions a month was seen between 2006 and 2012 also showing a remarkable seasonal variation, with lowest incidences in June and the highest between October and March. In-patient hypertension case load showed a constant growth from 3 to 9 cases a month in the same period with a high mortality rate above 10%.

The overall results show a worrying growth of both chronic diseases in the region with disease related costs expected to increase by 10% (diabetes) to 70% (hypertension) between 2011 and 2015.

Conclusion: The study demonstrates the successful integration of medical device measurements with an open source clinical information system for systematic reporting of public health problems to a regional data warehouse Global Health Barometer.

The problems of diabetes and hypertension grow rapidly in the Great Lakes region. Urgent steps must be taken by governments, the international donor community and local hospital boards to deal with this new challenge.

## mHealth in Chronic Disease Management: Case Study of a Mobile-to-Mobile Delivery Model

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The United States health system in its current architecture is unsustainable. As the culture integrates online communication, patient engagement in mobile technology will drive the evolution of health delivery. New care models that capably address chronic disease, 75% of the health dollar, are imperative. A 30-month pilot study investigated a novel mobile e-visit application in the care of established patients in a primary care practice. Patients were given 24-hour access and completed an online interrogation engine with an option to add up to five photographs. The history was formatted, added to a previously stored PHI, then submitted to physician. Physician reviewed history, completed assessment/plan, and submitted prescription to the pharmacy from the mobile device. Unilateral option to contact patient by phone/video was possible. A care plan with encounter-specific education was returned to patient and medical record. Average provider turnaround <4 minutes. First year care was limited to minor acute problems to establish safety. The ongoing study expanded treatment to stable chronic disease care, accounting for 20% of visits by design. In 664 consecutive cases, no adverse events were noted, clinic productivity increased 19%, and per-capita costs declined 15%. Most care (79%) was after-



hours but before 10PM. Mean patient age was 41 years (16-90) with female to male ratio 1.7:1. The results suggest mobile-to-mobile technology improves the productivity of primary care medicine and the efficiency of care delivery for stable chronic diseases. Chronic disease care via telehealth was feasible solely because mobility provided efficiencies that engaged providers to open access. The medical home model was strengthened by increased patient engagement, more flexible care options, and a reduction in physical boundaries. In summary, a mobile-to-mobile delivery model provides a new generation of telehealth that can be effectively translated into the medical home. Mobility increased quality of experience for patient, provider, and practice--all the while, safely rendering cost-effective access to care to the nation's largest driver of health costs, etc.

Keywords: mHealth, mobile-to-mobile, m2m, telehealth, telemedicine

#### Mobile Health is worth it! Economic Benefit and Impact of a Population Based Mobile Screening Program in New Mexico

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Background: HABITS for Life was a 3 year initiative to deliver a biometric and retinal screening program via a mobile unit throughout New Mexico.

Introduction: The program goal, to identify health risk and improve population health status, was tested over a 3 year period. Value to participants and impact to the healthcare system was measured to quantify impact and value of investing in prevention at the community level.

Methods: Mobile Health Map ROI calculator, mobile screening unit, biometric screening, retinography, community coordination. Materials: Systems: satellite, DSL and 3G, Tanita® automated BMI, Cholestec® - biomarkers and A1C. Canon CR1 Mark II camera, and Picture Archiving Communication System (PACS).

Results: Reported for FY2011 timeframe. 6,426 individuals received biometric screening, 5,219 retinal screening. A 15:1 ROI was calculated; this excluded retinal screening for the under 65 year olds, estimated at \$10Mil in QALYS. Statistically significant improvement in health status evidenced by sequential screening indicates decrease in total cholesterol (p=.002) (Nt=308), increase in HDL after the 1st and 2nd screening (p=.02, p=.01), decrease in mean random glucose not statistically significant (p=.62). Retinal results indicate 28.4% (N=1,482) with positive/abnormal finding, 1.79% (N=93) required immediate referral for sight threatening retinopathy, 27% (N=1,389) required follow-up from 3 month - 1 year. Discussion: Screening programs are cost effective and provide value. They should be considered in healthcare redesign. Conclusions: Community based screening is an effective strategy to identify health risk, improve access, provide motivation to change health habits and improve physical status while returning

Keywords: mobile health, eHealth economics, compliance

### Mobile Medication Scanner

significant value.

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Elderly persons (> 65 years) often use three or more prescribed medications. Polypharmacy or polymedication can be appropriate, but sometimes it is not. For the general practitioner, it is often difficult to keep track of the current state of medication as also specialists prescribe pharmaceuticals and patients do sometimes change doctors. In contrast to Germany, the pharmaceuticals in Luxembourg do NOT bear a unique identifier like the Pharmazentralnummer (PZN). We present the development and implementation of the Mobile Medication Scanner application for Android devices. This scanner enables the automated acquisition and administration of medicaments by simple "picture taking" of the medication packaging. The collected information can be shared with, for example, the general practitioner. We describe the necessary steps of image processing and image improvement, the use of OCR-technology (Optical Character Recognition), the managing of the information, as well as the user interaction with the application. Finally, an evaluation of user experiences is presented based on a usability questionnaire.

Keywords: mHealth, polymedication, pharmaceuticals

## Mobilecare - Improving Preventive Healthcare with a Mobile Telemedicine Model

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Access to medical care is sometimes difficult for citizens living in distant and underserved areas. Recently, telemedicine has been helped by advances in mobile communication and the adoption of tablets and smartphones. Tele-homecare is already being implemented in Brazil by São Paulobased Unit Care Health Services, which is using a technology developed by the Brazilian startup i9access Technology Ltd to capture vital signs named MobileCare. Electrocardiograms, blood pressure, oximeters, thermometers, scales, glucometers, pedometers and spirometers are connected via Bluetooth to a tablet or smartphone that transmits information over a cellular network or the Internet to a cloud storage where a medical center has access and analyzes the data. Using cloud computing, medical professionals can communicate with several medical centers if needed via Web services. They analyze the vital signs of their patients (visualized using Java applets), perform a diagnosis, send alerts to the tablet application, and even contact patients via teleconference — all of that using a Web browser at the medical center, which provides ondemand access to the main application in the cloud (based on the Java EE computing platform). The goal is not to replace medical consultation, but rather complement and expand the service. One of the important goals of using tele-homecare is to encourage prevention and health. In line with the concept of social networks, MobileCare lets patients interact with other people with similar medical situations, encouraging information exchange, and commitment to self-care, having an active role in their healthcare. Additionally, the patient can optionally subscribe to an exclusive social network offered by the solution/health provider and focused on diabetes. There, patients can interact, post disease educational videos or materials for common access. We run a pilot targeting diabetics over 12 months in Brazil: 30 patients with a glucometer, 30 using a phone homecare service + glucometer, and 30 using MobileCare. Patients using MobileCare went 30% less to the hospital than before, 80% less in comparison to the 1st group, and 25% less upon the 2nd group.

Keywords: telemedicine, homecare, vital signs, diabetics



### Mobil-e-Desk A Mobile Solution for More Efficient Nursing Staff

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In rural areas health professionals perform most of the medical care duties at their patients' homes. Medical practice and nursing care from house to house now require medical staff to carry along multiple documents for medical purposes but also for administrative and communication tasks. In this regard new technologies should be able to bring more comfort and efficiency insofar as they can relieve the nursing staff from a number of constraints by assisting them (with automated data keyboarding and transmissions, by validating prescriptions, etc.). However the large range of tools required can end up making the whole process more complex and penalizing than beneficial. Connectivity, seamlessness of tools, as well as autonomy over a whole workday are challenges. Our concept aims at supplying health staff with the same tools as those they would use back at the doctor's office. The mobil-e-desk is a piece of luggage which encapsulates an allin-one small-scale mobile office. It provides a set of convenient functionalities meant to optimize all patient-related tasks: adapted wiring, power supply to operate or recharge various devices (for medical purposes, communication or data processing, etc.). Making sure devices remain both operational and handily available all day long are key to a practitioner's increased serenity and efficiency throughout long workdays. The mobile desk will be powered and recharged thanks to an electric plug or a vehicle power adapter. Devices will be easily accessible without extracting them from the luggage. Included wiring will enable to use various devices simultaneously. Finally the mobil-e-desk as a whole will be customizable and evolutive to meet various users' needs. This modular approach combined with innovative product specifications also make it possible to consider transposing the concept to other situations or professional requirements so long as mobility is a key operational constraint.

Keywords: health professional – mobile office – efficiency

### Needs Assessment of Telemedicine in Afghanistan and a Call for Action for a Global Tri-Partnership Agreement

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Mitigating the immense global, national, and personal burden of the lack of access to healthcare for millions of disadvantaged members of the population will require a greater emphasis on global responsibility through enhanced global health awareness and a firm thrust towards a stronger proactive approach to providing international assistance. Developing countries are plagued with unrelenting poor health of its citizens due to such factors as shortages in financial and material resources, political volatility, chronic decline of economic stability, and deficiencies in technology. War-torn Afghanistan, holding one of the highest infant and maternal mortality rates in the entire world, is one such developing country where health stability has not been in existence for decades. A global health initiative in this country has the potential to make an immense impact, with the ability to improve health and reduce disparities for millions. One means to make this impact is telemedicine, which has the promise to increase access, decrease costs, and improve the quality of healthcare in the most destitute regions of the world. This study investigates



telemedicine in Afghanistan and its ability to form a critical component of best practices in the effective health system strengthening of the country. A comprehensive literature review and survey of Afghanistan's key public health leaders and stakeholders was conducted to investigate the implementation, management, and sustainability of telemedicine initiatives. The results indicated the lack in technical capacity/resources, funding, and policies/procedures to support telemedicine efforts and the need for greater demand and operational stability of such programs. Recommendations were then made in aim to help define a national Afghan telemedicine plan, establish national standards and operational aspects, and better identify and evaluate all stakeholders needed for a successfully sustainable global telemedicine network.

Keywords: telemedicine, eHealth, Afghanistan, developing countries

**'Needs Assessment' – What, Why, and How?** R. Scott<sup>1</sup>, L. Affleck-Hall<sup>2</sup> <sup>1</sup>University of KwaZulu Natal, Durban, South Africa <sup>2</sup>University of Calgary, Canada

Both the literature and e-health proponents opine that any e-health application must be 'needs based'. Yet a literature scan showed these same sources are unclear on what constitutes an ehealth 'needs assessment', and provide no clear guidance on performing one. Literature scans linking telemedicine, telehealth, m-health, or e-health with needs assessment revealed confusion. Studied aspects included 'assessment' approaches for evaluation of implemented solutions, reference to readiness considerations prior to implementation, and some 'needs assessment' initiatives in specific settings. No models or frameworks for determining the potential need of an e-health intervention pre-implementation were found. e-Health is an opportunity cost, therefore our ultimate goal must be to ensure that any resources allocated to e-health adoption and application are used in the most effective and efficient manner, and address priority health needs. A 'Needs Assessment', performed correctly, ensures any technology solution put in place is objectively identified and carefully considered through collection and analysis of solid evidence, rather than subjectively 'identified' through projection of perceived personal or collective beliefs. Through presentation of a hypothetical setting, this paper outlines a simple and logical process for performing an informative e-health needs assessment. A research paradigm is adopted, with formulation of a sound and guiding research question viewed as critical to the process. Thereafter, 6 steps are proposed to ensure adequate data collection, analysis, and knowledge transfer to inform and encourage action by decision-makers: 1. ASSESS the setting (e.g., 'situational analysis' approach); 2, IDENTIFY and MEASURE needs (e.g., stakeholder mapping and input); 3. RECOGNISE gaps and barriers (e.g., gap analysis); 4. PROPOSE solutions (e.g., programs, not projects); 5. UNDERSTAND cost vs benefit (e.g., cost consequence analysis); 6. INFORM decisions (e.g., knowledge transfer to decision-makers). Application of such an approach might reveal discrepancy between 'planned' and 'needed' initiatives.

Keywords: e-Health, needs assessment, evidence-based

# Network System of Electronic Patient Medical Record for Telemedicine and Telecare in Kagawa Prefecture and International Future Deployment K. Hara

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The Great East Japan Earthquake on March 11, 2011 caused devastating damage on the coastal area of the northeastern region of Japan. The medical field was also seriously affected by this earthquake, such as death of medical professionals, destruction of facilities, and damaged/loss of medical records. For short-term disaster medicine and emergency medicine, medical professionals dispatched not only from other parts of Japan but from all over the world devoted huge contribution and managed difficulty.

Lately, introduction of telemedicine has rapidly attracted attention in the field of emergency medicine and perinatal medicine as well as chronic disease management. It is necessary to introduce the latest medical information technology (IT) such as telemedicine and electronic record network to reconstruct the medical system in the stricken area. Furthermore, it is necessary to build comprehensive medical IT network that covers whole region, linking medical facility, pharmacy, patients' residence and the resident health check system, let alone mutual cooperation among a core hospital and individual clinics.

Kagawa Prefecture has developed a perinatal electronic patient record system called maternity health record book, "IHATOVE". This system was very effective for maternity management in Iwate Prefecture, one of the stricken areas. Thus, the importance of data center type medical IT network has been recognized. Telemedicine technology draws attention from the government and other related parties as a foundation to urgently reconstruct the stricken area's medical provision system in case of a possible future disaster, Tonankai earthquake in southwest area of Japan.

In this presentation, the telemedicine network developed in Kagawa Prefecture, especially the outline of Kagawa Medical Internet Exchange (K-MIX) and the videoconference system "Doctor Com", combined with electronic medical record functions will be reported.

Keywords: telemedicine, telecare, electronic patient medical record, perinatal electronic patient record

# **Observing Telemedicine and eHealth for Women At All Ages of Life: The WeObservatory** V. Thouvenot

Foundation Millennia2025, Namur, Belgium

As women remain the forgotten group in many countries, together, "Connecting Nurses" and the Millennia2025 Foundation have decided to join their forces and launch the WeObservatory an innovative Digital Inclusion Platform dedicated to women's global health challenges, hosted in the Foundation Millennia2025. The overall objective of the WeObservatory is to serve as a unique Resource Center on Telemedicine for nurses, to promote women empowerment through the access and use of advanced technologies combined with innovative integrated collaborative leadership programs. And more specifically to(a) accelerate the access and use of Information and Communication Technologies (ICTs) to nurses for the provision of eHealth, mHealth and Telemedicine services to all women, especially to the developing world, in the context of the UN Millennium Development Goals 4 and 5, as a global framework, (b) optimize connections, generate creative solutions, contribute to the drastic reduction of maternal and child mortality by 2015, and (c)support nurses to engage all generations to use tools in advanced technologies, to promote the access to Telemedicine to improve women's and family health. By making all Information Communication Technologies (ICT) tools and services fully accessible to nurses, the WeObservatory improves the communication between female patients and nurses, facilitates access to the healthcare services and provides cost effective connections. In 2013 and 2014, the WeObservatory is planned to expand its activities through additional partnerships to develop the WeLibrary to share knowledge, expertise and implementing and using telemedicine services. It is



expected to become a unique innovative e-platform at the service of health professionals within the global framework of the UN Millennium Development Goals, to support the development of studies, registries and guidelines, and disseminate the major outcomes at international conferences and publications.

Keywords: eHealth, telemedicine, women, digital inclusion

### **Ontology-driven Interoperability in Virtual PHRs**

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Personal Health Records (PHRs) can be viewed as a repository of information regarding the patient's health status in a computer-readable form constituting the information dimension of patient-centred care, hence, allowing patients to be the owners of their own health information. The virtual PHR, as considered in this paper, is an entity on the network created on the fly and consists of (a) physically stored patient information contained in traditional PHRs, (b) physically stored health information from medical devices connected to patient such as from assistive telecare systems, (c) social care information retrieved on request from social care organizations, (d) health information extracted from various healthcare systems such as primary and hospital care electronic medical records - EMRs; and (e) genomics information such as genotype and sequence data extracted from biobanks and genetic databanks. Through such a rich picture of patient information, it is possible to derive fine-grained patient phenotypes from health record data allowing fine mapping of genotype-phenotype correlations. Despite this potential, healthcare providers and researchers are still faced with technical challenges of integrating scattered, heterogeneous patient data, in addition to ethical and legal obstacles; as such data often suffer a lack of semantic and syntactic interoperability. This paper presents architecture of an ontologybase, interoperability platform which can act as a middleware amongst the various systems involved in a virtual PHR to enable the creation of integrated patient information for multiple purpose use. Moreover, the availability of integrated patient information substantiates the growing realization that transactional medical data can be used secondarily for population-wide research to bridge the translational gap between bench and bedside and to move towards a realization of personalized and stratified medicine.

Keywords: personal health records, interoperability, ontologies

# **Open Source in Healthcare: What? Why? How?**

E. Saliez ISfTeH working group, Collaborative Care Team in Open Source, Belgium

What? Introduction to what means "Free/Libre Open Source Software". Why? Why Open Source makes sense in function of healthcare requirements. How? Collaboration Shared software documentation, including source code, made available in the public domain on a server, free of charges for any number of new sites; Transparency and quality control by peers; Open exchanges promote creativity and interoperability solutions; Shared new developments in communities based on informatics professionals, both volunteers and sponsored; More affordable costs, although installation and support services remain traditional business; Better continuity based on



independence from any single provider; Overview of software modules in MEDFLOSS and other repositories; Perspectives for next developments.

Keywords: FLOSS, open-source, collaborations, software, affordable

# Patient Access to the Clinical Note in the Electronic Medical Record - Provider Attitudes and Concerns

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Introduction: The patient portal is a web service which allows patients access to their medical records. This access may be important for shared decision making and a potential tool to improve self-management. Setting a goal for essentially complete online record transparency, in March 2012 Mayo Clinic allowed patients web portal access to their clinical notes. We surveyed a group of providers prior to this implementation to assess their opinions and how this might impact their clinical note process. We looked for factors that could alleviate or offset concerns about the possible increase in workload. Methods: This was an e-mail survey of 352 primary care providers at the Mayo Clinic in Rochester, Minnesota USA. The survey comprised of 11 questions with opportunities for free text comments. Questions pertained to the provider's current process in generating a clinical note and anticipated changes to this process, impact on provider to provider communication, clerical burden, and patient safety and self-management. Results: There were 197 responses from the 352 invited providers. They anticipated major process changes due to online accessibility of clinical notes to patients including changes in workflow. One hundred twenty six (65%) anticipated changing how candid they would be regarding patient behavior and social history. Fifty seven (29%) thought there would be modification of differential diagnoses to avoid anxiety provoking or sensitive possibilities. Providers anticipated that this access would increase in patient self-management. Fifty one (26%) indicated they would create an area in the plan specifically dedicated for the patient to follow. Most providers thought ability to communicate with peers would decrease. Only a small percent of providers thought safety would increase with this online access. Conclusions: These results have implications for change management in institutions desiring to allow patients access to clinical notes. To ensure a smooth transition it is important to understand and address providers' concerns. Systems should be in place to facilitate workflow without compromising patient safety and satisfaction.

Keywords: patient online access, provider attitudes

### Patient View: Digital Support for Coproduction in Health and Social Care

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User involvement is increasingly seen a means of minimizing risk and maximizing value in the design of eHealth services. The paper gives an overview of research with patients and staff on the benefits and barriers of the Open Source PatientView portal www.patientview.org which is accessed by over 20,000 users / patients around the UK, and originally developed by the renal community, to support patients between home and hospital. Users of the PatientView portal can not only access their records, results, letters, within 24 hours of issue, but can now share them with a distributed team in health and social care, and use a secure messaging system to



communicate directly with them if they have concerns. They can also upload data they collect themselves through mobile applications, or from other services, where they have co-morbid conditions, to better coordinate information across a distributed team. The extension to other chronic conditions is expected to facilitate coordination, coherence and continuity of care which is currently fragmented across disciplines, and where communication is poor. The portal is increasingly being used by other groups to support shared monitoring and management, to avoid unnecessary hospital visits, and to develop better protocols for managing this, building on the potential for patients to add their own additional data, such as BP and glucose monitoring. This also provides a basis for exploring new diagnostic algorithms, and the potential for patient groups to curate manage and benefit from the data resource they create, with health data and lifestyle and sensor data. Collaborative action research/participatory research with users is highlighted as a vehicle for both research, (to identify service development issues on the ground), and for service development acting as a catalyst for stakeholders engagement in the reconfiguration of roles, risks and resource allocations implicit in increasingly digital service redevelopment.

Keywords: patient portal, telehealth, coproduction, user-centred

# Patients Inclusion in a Diabetic and CHF Telemedicine Services - The United4Health Slovenia Experience

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General Hospital Slovenj Gradec (GH SG) and Healthcare Centre (HC Ravne) participate in so far the largest European R&D project United4Health (united4health.eu) regarding patients involved in a telemedicine (TM) study. Among 34 project partners 15 will do piloting in their regions in 10 EU member states offering telemedicine service for at least a year to almost 15.000 patients suffering from CHF, diabetes, COPB or hypertension. GH SG and HC Ravne will enroll 400 patients with diabetes and 200 patients with CHF. In the project diabetic patients will measure their blood sugar once a week as a whole day profile (6 measurements) while CHF patients will take weight, blood pressure and oxygen saturation measurements. Although patient selection criteria were designed by the project members, inclusion of 600 patients is still a challenge for GH SG and HC Ravne as newcomers to the telemedicine services world. There are several tasks that need to be addressed at once when setting up a telemedicine service that cover technology, patients, personnel and organisational issues. The most challenging are patient relates processes: identification of patients from a hospital/healthcare centre (HIS) database/registry suiting the project inclusion criteria, personal addressing with presentation of benefits, check of mental, cognitive, social and other conditions, an interview, training for use of the service, equipment individualization, installation and pass-over, and finally in-vivo service tests. The process of patients' inclusion has been determined and all related documents have been prepared e.g. invitation, training plan, written consent, user manuals for the equipment, instructions for measurements and emergency situations, user satisfaction interview template, and termination declaration. A patient related medical response scheme has been also determined. To manage all the data coming from different sources a common database was set up covering patients' personal data, data related to telemetry and data that would enable assessment of social/medical benefits of the project for the patients and their healthcare system.

Keywords: telemedicine, services, CHF, diabetes, criteria



### Perinatal Telemedicine in Ukraine: Achievements and Further Challenges

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Teleneonatology network in Ukraine join national Association, primary-tertairy hospitals in six regions, university clinics in 3 regions, international perinatology project and industry. Main tool for the store-and-forward tele-neonatology is a telemedicine web-platform iPath (open source web application written in PHP scripting language and storing the data in MySQL database). Implementation of the iPath telemedicine platform in Ukraine started in 2003 as part of the Ukraine-Swiss perinatal health project. Since 2009, the Ukrainian iPath platform has been running on a server in Donetsk hosted and maintained by Association for Ukrainian Telemedicine and eHealth Development. By 2013, this server has more than 1,200 users in 12 groups. More than 1,200 clinical cases have been posted. As a tool of teleneonatology network the iPath platform is officially used by more than 80 medical institutions in 4 regions.

The pilot project of tele-ECG consultations at neonatal ICU shows good technical and clinical results, including fast and comprehensive diagnostic of cardiac pathology, suggestions for treatment and patients' management tactics. Tele-ECG consultations (duration 10-15 min) were performed for the newborns in age 1-27 days (premature infants - 25%, pregnancy pathology – 80%). Different changes at ECG were found in 83% cases.

During last 2 years a National Cardio surgery center operates a few videoconferences networks (room-units and desktop solutions) for teleconsultations of pregnant women and newborns with congenital heart diseases.

A new challenge: In 2013 an anti-tuberculosis eHealth network was created in the Donetsk region of the Ukraine (due to financial support and kind efforts of Rinat Akhmetov Foundation for Development of Ukraine). The Network is focused on better management and care of multidrug-resistant tuberculosis (MRTB), but after a few months of operating we found that about 2% of telemedicine consultations in the Network made for children and pregnant women. This is extremely hard clinical and social situation. Thus, we should create special patient-focused approach for such cases. External experts in perinatal medicine, psychologists and social workers have to be involved in work-flow of the Network, also as individual telehealth services at the second stage of MRTB have to be proposed for this category of patients.

### Personal Health Systems Foresight: Visions on Innovations and Societal Demands

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Personal Health Systems (PHS) assist in the provision of continuous, quality controlled and personalised health services to empowered individuals regardless of location. PHS provides a horizontal development area across variety of patients, clinical specialties, technology fields and health services. The development of PHS requires and can mobilize the emergence of novel cross-disciplinary and -sectoral innovation partnerships. Hence, we started a PHS Foresight project that expands across different PHS areas of application such as chronic disease management, life-style



management, independent living and emergency services within and beyond the European Union up to 2030. With this project we want a) to achieve a deeper understanding of mismatches between the potential of PHS and current policy and innovation initiatives and framework conditions; b) to support more mobilized and networked innovation communities, promoting PHS around jointly formulated issues which support pooling resources and streamlining diverse innovation initiatives; c) to tackle future opportunities and alternative trajectories, aligning actor perspectives for the development of a joint strategic action plan, including recommendations for a possible new European Innovation Partnership (EIP); d) to achieve a transparent, open and inclusive engagement of stakeholders, and targeted dissemination of results in society. An online platform for launching a systematic online consultation process to generate and cluster visions on breakthrough innovations and societal demands has been deployed. The ideas and online community activities are analysed not least, to identify partnerships for innovations. A comprehensive presentation of all the findings of this research can be found online (http://www.phsforesight.eu/). While we expect that the identified clusters of promising visions analysed from multiple perspectives will provide valuable support for the scenario and road mapping work of the PHS Foresight project and the development of policy-recommendations, we continue developing the online activities and engaging more stakeholders. The evolving list of promising PHS visions will be maintained and updated constantly based on user assessments. The further assessment of PHS visions will support the identification of the most promising visions and will provide improved understanding of the PHS community preferences and future directions.

Keywords: personal health systems

# **Perspectives of Biologists, Epidemiologists and Geneticists Controversies in Sciences and Health Systems' Reforms** C. Huttin

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In the upcoming trends showing increase of the Global Burden of Diseases (e.g. in dementia, World Alzheimer reports or UN declaration on NCDs), urgent needs have to be adressed in order to help policy makers in dealing with societal costs of diseases. Recent technologies help in particular to detect and prevent mild cases of cognitive impairments or to integrate more and more individualized genetic traits and pedigrees in genomic medicine. However, scientists disagree: recent study results from population base studies use population imaging (Breteler et als, 2011) versus integrative genomics approaches (e.g. Rhinn's 2013 and network biologists). Other controversies in asthma genetics between molecular biologists (Vercelli, 2011) and geneticists (Weiss et als, 2009) lead to different predictive disease modeling and impact assessments of aging and environmental modifiers. This contribution will highlight some implications for governance of health systems, using current debates on evolution of these major fields of science, their possible translation for use in clinical practice, especially with new IT delivery systems and forecasts on medical services and expenditures.

Keywords: scientific controversies, health system reforms

# Potential Business Models for Innovative ICT Platform of eHealth Services

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The recent widespread of innovative ICT eHealth services platform at the international and transnational levels confirms their market booster position in structuring the emerging eHealth sector. Indeed, such platforms can provide different types of both medical and social services packaged in a "bouquet", for example: a free general information portal giving access to paying medical and social services; a mobile phone application enabling patients and their close relatives to consult their Personal Medical Record via a secured network; a terminal allowing the sharing of digital data between patients, family, friends, caregivers. The integration of ICT platforms in the medico-social sector brings interesting opportunities in terms of economic and social benefits (medical cost reduction, better health care, enhanced coordination and data sharing amongst stakeholders etc.), but also risks, causing economic, human and ethical barriers. While many studies have identified key success factors for these projects, this paper proposes to move forward and study how to structure this emerging intensive ICT sector, what are the possible sustainable business models for Innovative ICT Platform of eHealth Services. In the light of digital economy and through microeconomics theory, this paper offers potential solutions to deal with various types of contracts and pricing models, related to revenue structure models. However, the potential models discussed may be difficult to transpose to the ICT eHealth sector since its specific nature in terms of data security and confidentiality as well as ethics needs to be taken into account. Therefore, we discuss these different models considering the issue of confidence which has been proven quite important in this sector.

Keywords: eHealth, ICT, business model

**Pressure Ulcer: Software Integration for Development of Interactive Content to Moodle** G. Teshima, P. Nogueira, S. Godoy, C. A. Seixas, I. A. C. Mendes University of Sao Paulo at Ribeirao Preto College of Nursing, São Paulo, Brazil

Objective: Evaluate the integration of software which enables the creation and broadcasting of interactive exercises for educational purposes, the Virtual Learning Environment (VLE) Moodle. Methods: Descriptive study conducted in a public university in Brazil. First we reviewed the literature on risk factors and preventative measures to Pressure Ulcer. Later exercises were developed in software using the four formats of existing content available on the same: scrambled word, sentence scrambled text with gaps and loopholes items. Participants were 03 professionals who evaluated the computer software as their technical and operational characteristics and the characteristics of integration to Moodle. For this evaluation, the participants responded to the instrument adapted Sperandio (2008). The data were analyzed quantitatively. Results: There were two exercises available for each content format. These were entered into the software. All survey participants were male with a mean age of 43.3 years (SD = 7.09), the majority (66.6%) with formation time between 11 and 20 years. To access the software necessary to install the program Java version 7, update 9 + add Java fx 202, this was the biggest problem for software execution, once took time and did not accept recent updates, according to information of the subjects. Only 10 (30.30%) of the 33 questions of the instrument had the "agreement" of the participants in a percentage> 50%. The question "is easy to install VLE Moodle?" got only 33.3% "agree". One



subject failed to make the software work within Moodle, it described the screen went blank after the loading of Java in the three major browsers: IE, Firefox and Chrome. In addition, participants reported that "the software is not in accordance with the standards of portability between browsers and among other versions of Java" and "use older plug-ins for their execution." Conclusions: With these results we can conclude that the software is not feasible to install the Moodle VLE due to its format, failures presented and operational data.

Keywords: pressure ulcer, software, education, nursing.

# **PrimCareIT - Counteracting Brain Drain and Professional Isolation of Health Professionals in Remote Primary Health Care through Tele-Consultation and Tele-Mentoring** S. Perälä

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The overall aim of PrimCareIT -project is to raise the attractiveness of remote primary health care for medical professionals by the means of tele-consultation and tele-mentoring, and thereby to counteract brain drain and professional isolation of health care professionals. PrimCareIT project objectives are:

- To assess the needs, opportunities and barriers of tele-consultation and tele-mentoring
- To motivate health care professionals to work in rural areas
- To promote equal access to health services
- To eliminate barriers of distance and thereby to counteract professional isolation
- To offer experience and support throught tele-mentoring
- To foster sustainability of telemedicine
- To raise eHealth awareness among policy makers

Background: At the background of the project is the problem of ageing population in Europe, which causes new challenges for our society. Demand for primary health care services is rising. With the retirement of older professionals and unwillingness amongst younger professionals to relocate to remote areas, there is a shortage of physicians, especially in rural areas.

PrimCareIT meets these challenges through promoting and developing technical support among health care workers in rural areas. Tele-mentoring supports continuing medical education and tele-consultation provides technical support for communication and networking between professionals.

Conclusions: During the PrimCareIT project we found out that Differences and challenges between Baltic Sea Region countries are largely similar. Some countries have started using eHealth solutions earlier and therefore use eHealth more than others. However challenges between countries are similar. In order to develop eHealth solutions it is necessary to develop also work processes and to change health care professionals' attitudes.

One observation from the project pilots was that using tele-consultation and tele-mentoring together with changes in work processes can reduce professional isolation and brain drain in remote primary Health Care.

Key words: eHealth, tele-consultation, tele-mentoring, professional isolation, brain drain

### **Pseudo-Coloring Method for Diagnostics of Lung Diseases**

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In the report a new method for the pseudo-coloring of lung x-ray images will be presented. This will allow determining easier total lung volume and some structural changes needed for diagnosing many lung diseases. The presented method is a part of a computer assisted methods developed by our group to support work of pulmonary physicians

Keywords: X-ray, computer assisted diagnosis, pseudo-coloring

# Reaching Remote and Disadvantaged Communities at Scale with ICT: SOS Telemedicina Venezuela

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Venezuela is characterised by marked inequality in the availability of specialist medical services across rural populations. The "SOS Telemedicina para Venezuela" programme led by the Faculty of Medicine in the Universidad Central de Venezuela (UCV), has set up a Telemedicine network that makes use of information and communication technologies (ICTs), equipping and connecting remote centres for primary care with medical specialists from the UCV to improve their capacity to deal with clinical problems, to provide distance education, to support technology transfer to these regions, to develop skills and to evaluate the benefits of Telemedicine in Venezuela. The SOS methodology includes research in telehealth, tele-education, software engineering, telecommunications engineering, the processes of tele-consulting and tele-diagnosis, technical platforms, issues in deployment and management, user requirements, integration with social networks and relations with academic, governmental and commercial business organizations After five years of implementation of the SOS Telemedicine for Venezuela Programme, we have achieved a clearly conceptualized programme, financing, a committed team, 35 health centres benefiting from links to the Faculty of Medicine in the Universidad Central de Venezuela, a technical platform for telemedicine and tele-education, support from the University and regional health authorities as well as a strong alliance with commercial business organizations (HP, CISCO, Microsoft, Digital). "SOS Telemedicine for Venezuela" has succeeded in demonstrating that, with the commitment of the different stakeholders, and the appropriate use of Information and Communication Technologies (ICTs) it offers support for doctors, residents and healthcare staff, uses the network to provide continuing medical education, and benefits patients, providing specialist medical attention as a contribution to human development. The latest project to minimize maternal mortality uses mobile GIS to monitor mothers in rural centres in the Amazon from the hub in the University Medical School, and uses a range of media to educate rural workers, including short video clips. As many of

Keywords: telemedicine, ICT, Latin America

Readiness to Manage Intimate Partner Violence in Primary Care R. G. Bravo<sup>1,</sup> C. Lygidakis<sup>2</sup>, C. Vögele<sup>3</sup>, S. Cambiaso<sup>2</sup>, M. Melis<sup>2</sup> <sup>1</sup>WONCA, Luxembourg, Luxembourg <sup>2</sup>Lumos, Bologna, Italy <sup>3</sup>Université du Luxembourg, Luxembourg



Background: Domestic violence is a widespread public health problem affecting one in four women, with serious consequences. For example, the World Health Organisation (WHO) Multicountry study on women's health and domestic violence against women showed that 15-71% of women experience physical and/or sexual violence by an intimate partner at some point in their lives. Despite this high prevalence, it is estimated that only 3% of cases are presently being identified in primary care settings, and general practitioners (GPs) as the most likely first-line professionals to be contacted are uncertain of what to do if a case is discovered. The reason is that most of them have received little or no training and are currently not well prepared to address it. Aim: The aim of this research is to seek input from Primary Health Care health providers in Europe on their perception of their needs for specific training to address Family Violence and preparedness to manage this kind of patients. Methods: A pilot study using PREMIS (Physician Readiness to Manage intimate Partner Violence Survey), a 15 minutes questionnaire, will be carried out from the 1st-31st of January through the primary care network in Europe with the aim to investigate physicians' perceptions of their competencies and training needs in Family Violence. This descriptive study will be self-reported online using the "lumos!" platform, which enables the development and coordination of questionnaire-based studies, and the possibility to share the questionnaires on different Social Networks and invite different professionals to participate in the study. Conclusions: Domestic violence remains a major public health and clinical problem with a poor health care response. By using this tool it will be possible to identify potential deficits in the Primary Care professional's curricula, evaluate possible training initiatives to develop their competencies and develop curriculum guidelines including assessment of perceived learning needs.

Keywords: medical education, family violence, assessment

### **Receiver Operating Characteristic (ROC) Analysis: Better Way to Evaluate Remote Monitoring Programs in Chronic Disease** N. E. B. Connolly

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Background: There is a need for a more rigorous method to validate and quantify evidence-based value for RM systems. This foundational study applies the process of Receiver Operating Characteristic (ROC) analysis to evaluate utility and predictive value of a Disease Management (DM) model that uses Remote Monitoring (RM) devices for Chronic Obstructive Pulmonary Disease (COPD). Introduction: ROC analysis is an engineering approach widely applied in medical testing but methodology has not been evaluated for its utility in RM. Classifiers (SPO2, BP, Pulse), optimum threshold and predictive accuracy are evaluated based on patient outcomes. Materials and Methods: Parametric and non-parametric methods are used. Event-based patient outcomes include in-patient hospitalization (IP), A&E (accident & emergency) and home health visits (HH). Statistical analysis tools include Microsoft Excel® and MedCalc® version 12© 1993-2013 to generate ROC curves and statistics. Population: Persons with COPD monitored a minimum of 183 days, with at least one in-patient (IP) hospitalization within 12 months prior to monitoring. Data Source: Retrospective, de-identified patient data from a UK National Health System (NHS) COPD program. Data sets include biometric readings, alerts and resource utilization. Results: SPO2 identified as a predictive classifier, with optimal average threshold setting of 85-86. BP and pulse are failed classifiers, areas of design are identified that may improve utility and predictive capacity. Cost avoidance methodology developed. Discussion: Results can be applied to health services planning decisions. Methods can be applied to system design and evaluation based on patient outcomes. Conclusion: Validates use of ROC in RM program evaluation.



Keywords: remote monitoring, evaluation, disease management

### **Recommendations for Future Projects**

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eMedic recommendations are experience-based concerns that have emerged during the project implementation in four countries. Other projects or organizations can use these concrete recommendations as a guide for how to execute eHealth implementation. Presentation discusses e.g. the importance of personnel engagement, technical feasibility and clearly defined evaluation criteria.

# Remote Control of Diabetes in Patients on Insulin Treatment: eMedic Pilot Results from Latvia

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Objectives: Care and treatment of patients with diabetes mellitus is a growing burden for economy. Quality of care in treatment of diabetes is of crucial importance. However, long waiting time for endocrinologist or diabetologist visit interferes with efficient diabetes care process. "eMedic – Developing New Practices for Teleconsultation and Diabetes" (eMedic) is a project funded by the Central Baltic INTERREG IV A programme 2007-2013. The objective of the project is to develop new practices for virtual consultation in medicine. The aim of eMedic pilot study in Latvia is to implement methods of remote diabetes monitoring into diabetes treatment and to compare it with conventional diabetes care strategies.

Methodology: The pilot study with 53 patients had been carried out from January 2013 till December 2013. 29 patients were enrolled into diabetes remote monitoring group, 24 patients – into conventional care group. In the conventional care group, patients had onsite visits with an endocrinologist and diabetes nurse every 3 months. In the diabetes remote monitoring group, patients were supplied with special glycometers and mobile phones, which enable data transfer about glycaemia to a web portal PHRBOX. Treatment plans had been constructed by doctors in PHRBOX portal. Further, during virtual visit, patient's data were analyzed by doctors in the PHRBOX portal and if necessary, treatment plans are corrected. PHRBOX portal was used also for communication with a patient. Onsite visits were planned at 6 and 12 months after beginning of the study.

Results: several sets of data are being collected and evaluated: data about patients' compliance, clinical data about diabetes compensation, frequency of hypoglycaemia, number of unplanned visits to the doctor, sick leaves and hospitalizations because of diabetes, life quality assessment. In order to evaluate the technology, patient and medical personnel were asked to fill in special questionnaires (system usability score, modified Kaplan 4C). Recommendations about improvement and implementation of the tested solutions into everyday care of diabetic patients will be elaborated.

Conclusions: The preliminary results show that applied techniques can be used in order to improve quality of care for diabetic patients with the help of the virtual visits. However,



implementation of e-medicine solutions in Latvia requires specific education for medical personnel and patients.

# **RJ-UERJ** Nucleus: Satisfaction Survey of Health Professionals as Users of a Teleconsulting System in Primary Health Care

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Introduction: SIATES is a teleconsulting support system directed to specific health issues in primary health care. This system was developed by the team of the Telehealth Center of Rio de Janeiro State University1 in order to provide specialized second-opinion2 to health professionals working in primary health care in the Brazilian Unified Health System (SUS). The aim of this paper is to present quantitative and qualitative results of satisfaction survey applied to SIATES users.

Materials and Methods: The operational process of teleconsulting includes the use of a web system in which texts, clinical information, files and images can be sent either when the question is made or answered. The questions are grouped into "clinical case", "general practitioner doubt", "family and/or community approach", "team work process" and "continuous learning at work". At the end of this process, the user is prompted to fill out an online evaluation form in which the following questions are made: "The use of teleconsulting modified your personal conduct?", "Did it avoid referrals?", "Would you like another type of expert?".

Results: The nursing was the most prevalent group which filled out the form (45.6%), followed by physicians (30.3%) and dentists (13.3%), among other professions (10.8%). In the relationship between the frequency of the type of questions and modification of personal conduct, "general practitioners doubts" was the dominant (65.9%), followed by "clinical case" and "family/community approach", both with 8.6%; "team work process" got 7.9% and continuing education, 5.6%. There was avoidance routing of patients in 69.4% of general clinical questions and in 7.2% of clinical cases, and the physicians were the professionals that most avoided referral (45.5%), followed by nurses (43.2%) and dentists (11.3%). Regarding the demand of the specialist, the physician was the most prevalent (40.4%), followed by nurses (39.4%) and dentists (10.1%) and the neurologist (8.7%). Conclusion: Teleconsulting effectively changes the practice of health professionals by reducing referrals

Keywords: telemedicine, telehealth, teleconsulting

# **RJ-UERJ** Nucleus: Satisfaction Survey of Brazilian Health Professionals in the Use of Distance Learning Courses

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Introduction: In a country of continental dimensions like Brazil, distance learning courses may enable digital inclusion largely contributing to professional qualification. In this context, the Rio de Janeiro State Nucleus- UERJ1 of the Telehealth Brazil Networks Program2 offers courses for



upgrading of primary health care professionals working in the Brazilian Unified Health System (SUS).

The purpose of this paper is to present quantitative and qualitative results of a satisfaction survey applied to course participants.

Materials and Methods: Exclusively professional distance updating courses with a workload of 15 hours. Data collection was performed by analyzing the proper forms developed by the staff; the forms were made available individually for each course. The questions were the following: "Have you ever made any distance learning?", "What's your type of internet connection?", "Were you familiar with the subject matter covered in the course?", "The course reached your expectation?", "Did you have any trouble accessing the course material?", "What were your biggest challenges?" and "Do you intended to make other courses?"

Results: From June 2010 to November 2013, 18.368 professionals conducted 71.370 entries in total of 36 courses. Of these, only 9.318 participants answered the questionnaires for analysis. 70% of professionals had already attended some distance course, and from these 47% had attended 2-5 courses. To access, 77% used broadband, 10% used Internet radio, 10% used mobile Internet (3G) and 3% used dial-up Internet. Concerning courses subjects, 80% had knowledge of the subject matter covered. The course reached the expectation of 96% of the participants. In the assessment of difficulties, 84% found no difficulty when accessing the course material, 35% found difficulty when issuing the certificate, 29% found difficult to access the lessons, 24% found difficult to understanding the methodology and 12% found difficulty for performing the tests. 99.5% of the professionals plan to do other courses.

Conclusion: Although there are still limitations in the speed of the Internet there is also a high degree of user satisfaction with this way of learning

Keywords: telemedicine, telehealth, health e-education

# Satellite Based Medical Support - Solutions for Medical Emergency Management in Rural Areas

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Mobility in dense populated regions and rural areas differ in various aspects. From the medical point of view distances between patient general practitioner and medical specialist are much longer in scarce populated regions. To get access to medical care or expert knowledge could take hours or even days depending on the conditions for travel. This applies especially to of shore locations and illustrates the need for the implementation of telemedical services to improve access to medical care.

From the technical point of view the telecommunication infrastructure in rural areas very often is restricted to satellite communication especially of shore. This restricts e-health services in rural areas to villages and small towns providing 3G or 4G mobile networks or WiMAX covered areas. Outside these locations in the outback or hinterland or of shore mobile satellite communication is the only e-health capable communication infrastructure available.

Against this background the Institute of Aerospace Medicine of the German Aerospace Center, specialised in research and development in e-health, and the SCOTTY Group Austria, a manufacturer and provider of satellite communication technology well established in the telemedical scenario, started a close cooperation. Utilizing synergetic effects of competence in technology development on one hand and medical expert knowledge in the realization and



evaluation of e-health projects on the other hand the two partners offer e-health service integration adapted to the customer's requirements and intended care models.

### Scaling Up, the Future of Telemedicine and Health Management

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In the healthcare industry, "management" is a magic word that blankets all manner of excuses and that often fails to address basic issues such as "disease education", which is the axis on which healthcare should be balanced. There are as many definitions of disease management as there are disease management programs. The confusion is perhaps rooted in a fundamental paradox: In disease management, we really should try and manage patients, not diseases.

New technologies and user-friendly communication protocols are now available which are redefining the boundary between wellness and disease, and these technologies are having a profound impact on the future of telemedicine.

# Serious Games in a Health Care System Aimed To Train and Monitor Cognitive Functions in Elderly People

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The e-health system at the base of this paper promotes improved quality of life through preventive and therapeutic actions, focusing in the elderly affected or threatened by neurodegenerative diseases as the Alzhaimer's Disease. The core of the system is a set of specially designed activities to exercise the cognitive capacities of patients, including reading newspapers, watching videos and playing educational and therapeutic games (serious games). The activities' difficulty level can be adapted according to the progress of each particular user and can be continuously monitored on-line. At the base of the system there's a touch computing device, a tablet, through which all activities are effectuated and the patient's information and progress is remotely managed at the system's site. The first tests have shown that the tablet is rapidly accepted by the targeted users. The educational and therapeutic games represent the system's activity with the greatest chance of cognitive impact in the patients. This kind of games is part of the so-called serious games which are considered as a new type of digital games specialized in other purposes than just entertaining, such as educating, training, simulation, health, and sports. In our case the games are defined in such a way that 6 cognitive domains of the high-order thinking functions are stimulated: memory, attention, executive functions, language, visual and spatial skills, and volition. They take into account, and in real time, the patients' psychological and cognitive state, his environment, his family circle, and his expectations, placing the individual into a dynamic of trust, respecting at the same time his dignity. The designs cycle of a game into our system observes the following steps: 1. The medical team defines the cognitive and social goals to be reinforced by an activity. 2. The game concept is transmitted to the cognitive games expert team who develop a prototype game. 3. The prototype is review and feedback by the medical team. 4. The prototype is delivered to the production team who produces the final game taking into account aspects as the game art and the usability.

Keywords: health care; serious games



# Should We Plan A Service Delivery Alternative When Implementing A Telerehabilitation Approach?

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In-home telerehabilitation (H-TELE) was found non inferior to face-to-face home visits (H-VISITS) in a multicentre randomized clinical trial performed recently with patients who underwent total knee arthroplasty (TKA). Patients of both groups had a comparable functional recovery 4 months after hospital discharge as demonstrated by the WOMAC questionnaire and various tests (6 min-walk test, stair test), knee range of motion and strength. However, some participants of the H-TELE group had to receive face-to-face visits during the intervention period. The goal of this presentation is to analyse the reasons that justified the use of face-to-face visits in patients of the H-TELE group and to determine if alternatives to telerehabilitation should be planned in the future implementation of such an approach. In our study, 205 patients (mean age:  $66.0\pm 8.3$ ) were randomly assigned before hospital discharge in the H-TELE group (n=104) or the H-VISITS group (n=101). Patients of both groups received the same rehabilitation intervention (16 supervised exercise sessions) over the first 2 months after hospital discharge and were evaluated 4 times by a blind evaluator: before TKA, at discharge, 2 months and 4 months postdischarge. Almost all patients (100 out of 101) of the H-VISITS group received most (75% or more) of the planned H-VISIT sessions (mean±SD: 16.0± 0.2). A lower but still large number of the patients in H-TELE (88 out of 104) received most of the allocated TELE sessions ( $14.8 \pm 2.5$ ) although 21% (n=22) of them received also some home visit sessions ( $2.3 \pm 2.2$ ; range 1 to 10) in combination with H-TELE sessions. The documented reasons for visiting TELE participants at home were: poor internet connection or persisting technical problems (n=6), delayed technology installation (n=12), abnormal profile of knee recovery (n=3), unavailability of clinicians (n=2), anxiety of the participant (n=1). Our results support the non-inferiority of in-home telerehabilitation however, in few occasions and for some participants, face-to-face visits may be necessary. It is therefore recommended to plan for alternatives in the future implementation of telerehabilitation intervention.

Keywords: telerehabilitation, total knee arthroplasty, homecare

### **Smart Internet Teleconsults from Phones, Tablets and Browsers to Your EMR** P. Killcommons Medweb, USA



The Speaker will show how low cost Real time video telemedicine consults are now available on smart phones, tablets, and browsers, and can be integrated into the electronic medical record using standard HL7 and DICOM messages.

The Speaker will also address the convergence of both real-time (RTC) and web based telemedicine workflows with the electronic medical record and PACS system.

### Smart Technologies for Seniors' Mobility: The MobileSage Project

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Background: Older adults face various sensory, motor and neuro-cognitive changes, loneliness and reduced communication that progressively alters their quality of life. The actual ICT-based solutions for supporting seniors' daily life may preserve and improve their mobility skills, and may compensate their various functional impairments. The MobileSage EU project aims at developing a smart mobile phone application able to support the indoor and outdoor mobility of seniors. Based on NFC or QR codes scanning and a series of cloud services, the four main functions of the MobileSage app (scan, map, search and help) may significantly improve the accomplishment of daily living tasks, as well as the orientation when traveling locally or abroad. The project addresses old people, with or without age-related sensory or mild-to-moderate memory dysfunctions.

Estimated impact: The MobileSage project innovates in the area of supporting old people to accomplish their daily activities in an independent manner, to train, regain or compensate their mobility skills. This support is equally important for old people carers.

Lessons learned: In terms of acceptance, despite the general belief that people become reluctant to advanced technologies as they grow old, all people in our end-users group proved very interested in a virtual companion able to remember medication, appointments etc., to provide guidance for using domestic robots, for choosing a needed service provider or an appropriate brain training game. Help to navigate outdoor or travel abroad, as well as the guidance to operate ticket machines were also highly appreciated. All the above possibilities highly motivated our voluntary end users to proactively participate to the accomplishment of project activities: detection of mobility needs, design of interfaces, pre-prototype and prototype design, evaluation and validation. The main requirements for a high acceptance are the user centered design, friendly interfaces, easy access to various functions of the application and a good initial training with a human assistant especially in case of people with cognitive dysfunctions.

Keywords: smart technologies, seniors care, mobility

### **Sustainability Planning in eHealth Projects**

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Despite the large number of eHealth projects today and the positive outcomes of evaluation studies, the actual take-up of eHealth services is lower than expected. Many projects fail to



survive beyond the pilot phase and studies that investigate the effectiveness of eHealth applications most often do not show any long-term effects.

Current frameworks for eHealth development suffer from a lack of fitting infrastructures, the inability to find funding, complications with scalability, and uncertainties regarding effectiveness and sustainability. Therefore, in the case of any eHealth pilots, holistic sustainability planning and implementation should be conducted.

Sustainability planning should be a solid part of the whole project cycle. Project Cycle Management in the EU draws attention to feeding the information from the evaluation phase back to the programming phase. In general, project results should have a stronger steering effect on regional, national and international decision making.

Recommendations on how sustainability could be improved are many. Most of the literature on this matter emphasizes the importance of taking sustainability into focus as early as possible. This article presents a process for how to build a sustainability plan and discusses how sustainability planning should be included in eHealth pilots from the very beginning of project design.

Keywords: project design, sustainability planning, eHealth projects

# Teleaudiology Net between World Hearing Centers (Kajetany, Poland) and Africa, Asia and Europe

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Telemedical solutions are more and more popular in present medicine. Otorhinolaryngology and audiology specialities give possibilities to fulfil procedures in diagnostic and rehabilitation procedures. From many years have been working teleaudiology net in Poland. It consists of 20 centers where patients could have fitting of cochlear implants speech processors. It allows for patient to save money and time. Another gain is condition of each patient. Especially children are more relaxed and not exhausted after long travel to Kajetany gives it the ability to move more efficiently and more effectively through the process of rehabilitation. After success in Poland we started cooperation with different centres in other continents. Such example is Odessa in Ukraine where there is cooperation with Black Sea Center of Hearing and Speech "Medincus". There is possibility to diagnose patients with complicated ear diseases with videotoscopy and objective hearing assessment (for example ABR). In Bishkek Kyrgyzstan there were first telefitting between World Hearing Center as well as ABR assessment. In other countries there was hearing screening in children performed with automated database analysis. Coded date was sent and there was feedback information to centers which took part in research. Such project was realized in Tajikistan. In Africa there are in progress another project connected with screening and assessment (Senegal and Ghana). As a sum up we claim that telemedicine is very good way of support for less experienced centers where during such consultations there is high possibility for education of local specialists. We should always look for local law and restrictions.

Keywords: teleaudiology, cochlear implant, hearing screening



# Tele-Cardiology Program Implementation: Saipem Approach & Experience

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In addition to the in person care of patients, telecardiology and eHealth solutions help cover and control the care provided to Saipem employees and subcontractors in remote locations. Due to the fact that circulatory disease is the common cause of morbidity and mortality in Saipem perhaps in Oil&Gas industry, an effective tool was desired to enhance specialist support to our physicians. Telecardiology enables the remote exchange of data between Saipem doctors (45 sites)and specialist cardiologists (TelBios center, Milan) to facilitate management of cardiovascular conditions. In 2006 Saipem in agreement with TelBios have developed a service for assistance in cardiovascular pathology in remote area to be used both in emergency cases and for prevention of cardiovascular disease among employees. The system is available 24hours 365 days in both real time ONLINE and store and forward OFFLINE format. This service is provided utilizing a phone and a high reliability trans telephone ECG device that records and transmits ECG derivation. When required, ECG is recorded at the clinics and is transmitted to the TelBios. After the cardiologist interpretation the report is sent back to the physician in peripheral clinic and is automatically saved in the employee medical record. In the year 2013 alone, a total of 3073 ECGs were sent to TelBios for specialist interpretation and out of these 121 ECGs were in ONLINE mode. These 121 cases have been considered at that time potential cardiac emergencies or were related to a certain cardiac disease. A number of 8 cases out of 121 emergencies marked ECGs have been considered MEDEVAC worthy. Thanks to Telecardiology 113 cases have been managed onsite. The remaining 2952 cases were part of constant monitoring and under cardiovascular disease prevention program, CVDPP. Telecardiology on Saipem projects has brought a net optimization of 345000 Euro in 2013 and a million Euros in 3 years. Its implementation in Saipem affords: earlier intervention, which optimize patient's case management and reduces the frequency with which expensive hospital care is required; assist implementation of CVDPP; monitoring of employees with cardiovascular disease is assured around year.

Keywords: telecardiology, TelBios, cardiovascular-disease, CVDPP, optimization

# Telecardiology Project of Rio Grande do Sul State - Brazil: Mistakes and Lessons from the First 5 Years

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Introduction: Since 2008, a public telecardiology project started in southern Brazil, under the coordination of the Instituto de Cardiologia do Rio Grande do Sul (ICFUC-RS). It consists of: Tele-ECG diagnosis on a 24/7 basis; medical counselling via videoconferencing facilities, and; a telecardiology training program (presence mode and periodic webconferencing lectures). Currently the method includes 37 remote villages and 48.873 teleECGs were analysed from the start.

Objectives: This study aims to: Report major mistakes made during both the implementation and operational phases of the telecardiology project; Describe some solutions and technical alternatives to the identified barriers.

Methods: The staff - nurses, medical doctors and IT experts - was in charge of reporting all issues that could somehow jeopardize the smooth progress of the project, at the same time providing



some input about potential solutions and alternatives regarding the Tele-ECG equipment, methodology of qualifying sessions (face-to-face and multiseat web-based sessions), videoconsultation method and administrative issues.

Results: Aspects identified as more relevant: 1) Delay in equipment acquisition and installation, resulting from bureaucratic and local administrative difficulties; 2) Technical issues related to ECG patient cable; 3) Inadequate local infrastructure in the ECG room, including the unavailability of stable access to the Internet; 4) Performing a single training session in remote health institution did not result in providing adequate training; 5) Insufficient motivation to attend training sessions; 6) Shortage of videoconsultation method utilization, with preference for phone calls. Discussion: Identifying and dealing with major technical and administrative obstacles to the operation of the telecardiology project is expected to contribute to the adoption of appropriate strategies towards the upcoming project expansion to additional 120 institutions. Long distances, absence of local long term educational programs and, finally, economic restrictions are all relevant aspects that justify keeping a web-based qualifying program bound to eHealth and telemedicine initiatives.

Keywords: telecardiology, mistakes, lessons, qualifying program

# Telecare Manual for Neurogenic Bladder Patients Using Intermittent Urethral Catheterization

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Introduction: The construction of a theoretical framework to support telecare in nursing is fundamental to enable nurses to deliver organized and systematic care, promoting the expansion and strengthening of telenursing, mainly in countries where this practice has not been consolidated yet. Objective: To construct a telenursing manual to support nurses in telecare delivery to neurogenic bladder patients who use clean intermittent urethral catheterization.

Method: The main telenursing practices for patients with chronic illnesses were surveyed in the literature, selecting the most compatible resources and the theory that best sustains nursing care when providing orientations to neurogenic bladder patients who use intermittent urethral catheterization. The manual was constructed and subject to face and content validation by experts in the area.

Results: The manual included the main video call, audio call and text message resources available through the web, as well as audio calls with a free local telephone system for patients to contact the nurse who received training for telecare and clean intermittent urethral catheterization. It was verified that neurogenic bladder patients present self-care deficits, and Orem's General Nursing Theory was selected to support the nursing consultations.

Conclusions: The development of ICTs (Information and Communication Technologies) enhances the opening of new areas which nursing should use for individual health promotion, recovery and maintenance. The organization of protocols and manuals that help to apply these resources in an organized manner, so as to enable nurses to promote high-quality care, is a strategy that should be sought, practiced and disseminated.

References: International Council of Nurses (ICN). International Competencies for Telenursing. Geneva Switzerland: International Council of Nurses, 2007. Orem D.E. Nursing: Concepts and practice (6th ed.). St. Louis, MO: Mosby, 2001. Mendes IAC, Godoy S, Seixas CA et al. Telenursing: Current Scenario and Challenges for Brazilian Nursing. In: Sajeesh K, Helen S (Org.). Telenursing.New York: Springer Link, 2011, v. 1, p. 17-27.



Keywords: telecare, telenursing, neurogenic bladder

## Teleconsultation in Trauma Care and Oncology: Cross Enterprise Access to CT & MRI Images in DICOM Quality

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In cooperation with the AMC University Hospital based in Amsterdam, The Netherlands, a web based teleconsultation environment (www.imagehub.nl) has been implemented. Via the ImageHub medical images (e.g. CT and MRI) are directly available to doctors located in other locations for teleconsult in the original DICOM-quality. The images are accessible via the browser through a secure environment. Through the same infrastructure the images can be made anonymously available for research.

Case: Oncology expert panel: A patient has been diagnosed with pancreatic cancer in a general hospital. In order to select the appropriate treatment option, the MRI and other relevant information is provided to an expert panel of surgeons and radiologists via the web based ImageHub. The experts are located in various University Hospitals across The Netherlands. Based on the feedback from the experts the appropriate surgical procedure is decided.

Case: Teleconsult in Trauma care: A patient has been admitted to a general hospital with a complex trauma. A CT-scan has been taken. Given the complexity of the trauma, the responsible surgeon wants to consult a specialist in an University Hospital. The surgeon in the general hospital sends an invite by e-mail to the specialist in the University Hospital. The specialist logs in to the web based ImageHub and has direct access to the CT-images in DICOM-quality and other relevant information. Based on the consult from the specialist the appropriate treatment is decided.

In case the patient is transferred to the University Hospital the CT-scan and other relevant information is already available upon arrival of the patient. Based on the scan the treatment can be prepared optimally. Once the patient arrives in the University Hospital, the medical surgery will start directly.

Keywords: teleconsultation, trauma care, oncology, cross enterprise, CT, MRI images, DICOM, expert advice

### **Teleconsultation Practices and Foot Ulcer Care in HDSWF**

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The target of the eMedic project is to develop new practices for virtual consultation in medicine. Turku University Hospital (plastic surgery, internal medicine) participates in the eMedic project by assessing the feasibility of remote management of diabetic foot ulcer patients through communication within primary health care and between specialised and primary care facilities. The objective of the pilot study for teleconsultations for diabetic foot ulcer patients is to decrease patient visits, to enable a faster referral process and to improve the quality of care. Increasing the knowledge of correct diabetes foot ulcer treatment at primary care units is also of interest.



Teleconsultation pilots were carried out between February and November 2013. A set-up consisting of a mobile camera connected to a telecommunication system was used to transfer clinical images and online communication between the nurse making house calls and the diabetes care general practitioner or specialised outpatient clinics.

The general practitioner could also contact a consulting plastic surgeon or endocrinologist and the treatment could be decided during teleconsultation.

Diabetic foot ulcer treatment pathways were evaluated in the piloting organisations. Education in technology, wound care and diabetes care were given prior to the pilot period. Wound care practices were synchronised in the participating municipalities

Compared to the time prior to the project in terms of medical and economic aspects, teleconsultations may reduce, in a clinically equivalent way, the number of visits to a specialised clinic, decrease wound healing time, while still maintaining high standards of wound care. Synchronised protocols with defined intervention points are required.

Key words: eMedic, teleconsultation, wound care

### **Teleconsulting: Problem-Solving Capacity in Primary Health Care in Dentistry**

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Brazilian Telehealth Networks in Primary Health Care aim not only at expanding the problemsolving capacity of Primary Care, but also at promoting their integration with the Health Care Network, developing actions to support health care and workers continuing education, improving attention and promoting increased clinical capacity, having as main offerings the Teleconsulting, Medical Second Opinion and Telediagnosis. The teleconsulting is a registered consultation conducted among workers, professionals and managers in the health field through two-way telecommunication instruments, in order to clarify doubts about clinical procedures, health activities and issues related to the work process. This study aims at determining the problemsolving capacity of teleconsulting in Dentistry. We studied the teleconsulting database undertaken during the years 2012 and 2013, organized it in an Excel spreadsheet, and analyzed it according to the percentage. Dentists themselves have carried out 97% of teleconsultations. Regarding the requested topics we observed that 40% of teleconsultations address issues related to clinical questions in general, 17 % of the working process of the teams, 10% of community approach, and 7% on family and health education approach. As for problem-consulting, 98 % of professionals reported that teleconsulting intervened in conduct, reducing the number of referrals to another level of care. All reported there was no need for specialist consultation to resolve the case. Based on data analysis, we conclude that the teleconsultation has contributed to the problem-solving capacity in Primary Health Care, reducing the number of referrals to other levels of care.

Keywords: teledentistry, teleconsulting

**Telehealth** – Next Stage Evolution What will be Different, Important and Worth Looking out for? M. VanderWerf Nonin Medical, USA



Telehealth has shown strong positive results to date. These results have been repeated in many programs on a variety of countries around the globe. Technical evolution is accelerating. Early solutions were primitive, low volume and custom made, followed by gradual development of purpose built devices, designed for reasonable volume. We are now moving to ubiquitous platforms (smart phones, tablet, pads) this will change solutions in cost, deployment and the user experience. The application in health systems is also changing. What is next? Value will be demanded in all phases of these programs from planning to sales to deployment and then through use, support, effectiveness, acceptance, and outcomes. Effectiveness, acceptance and outcomes will depend on accuracy, the user experience and the real measure of quantified results. In the middle of all of this, the move toward ubiquitous platforms will homogenize the solutions that are available. These solutions will begin to look more and more alike. How will the buyer differentiate? What will be important? What will drive the difference between value and price? This presentation is from the perspective of leaders in this industry.

Keywords: telehealth, technology, future

## **TeleHealth – THE Patients' Perspective**

T. Szelagowski Treasurer European Patients' Forum, Belgium

The "Chain of Trust", 2011-2013 project entitled "Understanding patients' and health professionals' perspective on Telehealth and building confidence and acceptance".

The main objective is to assess the perspective of the main end-users of Telehealth services across the EU, exploring whether and how views have evolved since the initial deployment of Telehealth, and what barriers still exist to building confidence in and acceptance of this type of service delivery. You can learn more about this project at www.chainoftrust.eu.

The final report presents the main findings of the activities implemented by the Chain of Trust Consortium. These activities consisted of a literature review, an online survey and six national workshops, undertaken to gather information on the views and perceptions among patients and health professionals regarding the benefits of Telehealth services and their concerns. Four European Focus Groups were held to develop evidence-based policy recommendations to be carried forward at both European and national level.

The findings and recommendations have been presented and discussed at six national roundtables – in Greece, Latvia, Poland, Portugal, the Netherlands, and Norway (the same countries of the national workshops) – with a view to raising awareness among national stakeholders on the project findings and recommendations and promoting the integration of users' perspective into their national Telehealth strategies and programs.

We are confident that project's results covered in the final report will be useful to many of you working in the field of Telehealth and eHealth in your efforts to develop policies and services that meet the expectations of the end-users.

# Telehealth Brazil Networks Program RJ-UERJ Nucleus: Telehealth as a Means to Professional Update in Primary Health

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Introduction: The Rio de Janeiro State Nucleus-UERJ1 of the Telehealth Brazil Networks Program, offers exclusively and multidisciplinary distance courses to senior and middle level audience. The objective of this paper is to present qualitative and quantitative results of this methodology to update primary health care professionals working in the Unified Health System (SUS) in Brazil.

Materials and Methods: Distance learning courses of university extension for professional development with a workload of 15 hours, including 10 hours of lessons; availability of interactive instructional material; quantitative evaluation for approval and qualitative evaluation form at the end of the course. All courses are available on the Moodle platform of the Telehealth Center at Rio de Janeiro State University (UERJ).

Results: From June 2010 to November 2013, 18.368 health professionals conducted 71.370 entries in a total of 36 courses, with an average of 4 courses per user. The courses were grouped as follows: 18 courses on Primary Care Network, 4 on Maternal and Child Health Care, 7 on Elderly Health Care, 2 on Mental Health, 2 on Buccal Health, 2 on Health Research and 1 on urgency and Emergency health care. From these total, 30 courses were offered for top-level professionals and 6 for mid-level professional. There were 16.293 higher education professionals from whom 45% were nurses, 22% physiotherapists, 13% nutritionists, 8% physicians and 3% dental surgeons, among other occupations (9 %). Among the 2.075 mid-leveled professionals, 44% were community workers, 41% nursing assistants and technicians, 8% oral health agents, 5% oral health technicians and 2% nutrition technicians. The Brazilian national-regional distribution of these professionals was of 55% in the Southeast, 29% in the Northeast, 7% in the South, 5% in the Midwest and 4 % in the Northern Brazil.

Conclusion: The use of health technologies is effectively contributing to the professional qualification, therefore to better serve the population.

Keywords: telemedicine, telehealth, e-education

### Telehealth Commercialisation: An Investigation into Store and Forward

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The goals for the future of health care delivery include improving the patient experience and health of populations, while reducing the costs per capita. Albeit, store and forward (SAF) telehealth is used across the world, within the context of Australia's health system, SAF remains under-utilised. SAF telehealth offers Australian policy makers a new model that delivers on these future health themes, especially in regards to health equity to patients in rural and remote locations.

Aim: Within the context of primary and secondary care within Australia's health system, an investigation into the factors affecting commercialisation of SAF telehealth is carried out exploring: 1. SAF telehealth applications and resulting services; 2. Telehealth billing models; 3. Requirements to run a national SAF telehealth system; 4. Australia's e-health thought leaders' views on the barriers and potential for the widespread adoption of SAF telehealth; and 5. Recommendations for policy creation supporting SAF telehealth.

Methods: A systematic literature review uncovers SAF telehealth applications, billing models and infrastructure requirements, while semi-structured interviews identify policy and legislation themes required to support SAF telehealth in Australia.

esults: With a deep examination of many SAF telehealth programs throughout the world, details are shared on how SAF is integrated into health systems. The interviews focus on barriers, who is



responsible and what it will take to build a vibrant SAF telehealth offering as part of a larger telehealth program.

Conclusions: Recommendations are provided which may be used to inform policy and legislation needed to signal to stakeholders to develop this approach for delivering health services on a commercial scale. The evidence suggests that once the government takes the first step, industry will follow to deliver improvements in health costs, quality and access through SAF telehealth.

Keywords: telehealth, payment, store and forward

Telehealth for Patients with Heart Failure: A Comparison between Telehealth Systems

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With the improvement of technology, home monitoring systems have become widely available at lower costs. As a consequence, the importance of telehealth systems has increased significantly over the last decade. Because of this, it is paramount to know how the efficiency of such systems can be improved. This study shows that the inclusion of educational material and a user-friendly platform leads to significantly better compliance by the patients. Here, patients suffering from heart failure were studied, and two telehealth platforms were evaluated, namely Docobo and Philips.

### Telehealth to Provide Support and Promote Continued Education for Primary Care Practitioners in Minas Gerais, Brazil

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In Brazil, there is a high concentration of healthcare professionals and resources in the largest cities, so the small and isolated ones have difficulty accessing specialized care. Furthermore, the professionals who work in these small cities are frequently young, inexperienced and have no access to programs of continued education. Thus, telehealth has arisen as a strategy to provide support for these professionals by performing teleconsultation (second opinion).

Our aim is to assess the teleconsultations performed by the Telehealth Network of Minas Gerais, Brazil, in order to demonstrate the importance of telehealth to support healthcare professionals in remote and isolated cities of the state. This retrospective and observational study included all teleconsultations performed between April 2007 and December 2012. They were classified according to the professional who requested them and the specialist who answered. The teleconsultations performed between January and March 2012 were analyzed based on the type of the doubt and the ICD-10 chapter. During the study period, 47,689 teleconsultations were performed; 53.2% by nurses and 34.3% by physicians. Family physicians (23.3%), dermatologists (19.8%), nurses (12.2%), obstetricians and gynecologists (10.7%) answered most queries. In the



analysis of the teleconsultations performed between January and March 2012 (n=2,027), 77.7% of them were related to patient's assistance and 22.3% were general queries. The most frequent queries were about etiology (33.3%), pharmacological treatment (24.8%) and non-pharmacological treatment (22.3%). According to the ICD-10, the areas in which professional had the most questions were: skin and subcutaneous tissue diseases (15.4%), infectious and parasitic diseases (10.8%), digestive (7.8%) and genitourinary (7.1%) diseases. In conclusion, this study shows the telehealth potential to provide support and promote continued education for the primary care practitioners in remote cities, in addition to improving the access of the population to specific care. The large number of teleconsultations shows that the service has already been incorporated into the healthcare system.

Keywords: telehealth, teleconsultation, primary health care

# Telemedicine: A Success Story of Assessment and Rehabilitation of Psychiatric Patients in RajanPur District of Southern Punjab, Pakistan

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Rajanpur districts lies along the west of Indus river at the border of Sindh and Baluchistan province and is among the most poorly facilitated districts of The Punjab Province. The district has the population of 1.2 million and is dominated by religious and cultural values. Among the 720 psychological disorder patients 615 patients belonged to Rajanpur and catchment areas of adjacent districts of Naseerabad (Baluchistan) and Jackobabad (Sindh) provinces consulted during the period of 2008-2013, drug dependency patients exceeded to 269, schizophrenia patients numbered 29, 49 patients of brief psychotic episode, 51 hysteria and 217 belonged to other disorders including psychotic depression, epilepsy, annoyances, and nervous breakdowns etc. Indigenous coined Religious believes, poverty, social threats and injustice were observed as key causes of the disorders but in community psychology it was not considered as a medical issue. Due to unavailability of psychiatrists in public and private health sector psychological issues were treated by faith healers and customary practices. The consulted cases were critically analyzed for cause identification and developing community confidence on consultancy through telemedicine. The consultants equally treated patient and elders attending the patient, methodology of treatment and follow-up's. The doctor at remote hub for translating the patient was also motivated for propagation against the established views and believes for psychological disorders. As result of struggle against illegal psychiatric practitioners trust on the system established.

Keywords: telemedicine, psychological disorders, faith healers

# Telemedicine as a Support for the Discipline of Radiology from the Faculty of Medical Sciences

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Purpose: The Discipline of Radiology from the Faculty of Medical Sciences is developing telemedicine activities for integration over the Internet with other national and international universities and centers of excellence, in order to provide qualification for the training of students at graduation. The objective of this paper is to present the positive results of the use of teleconferencing as a means of interactive communication among the groups. Methods and

Materials: From March 2005 to June 2013, monthly teleconferences, video and web conferencing were collected, with the target audience of undergraduate medical students, general practitioners, pediatricians, and radiologists. All virtual meetings were recorded and are available for free reuse in the collaborative platform of UERJ Telehealth Lab.

Results: 77 teleconferences, with an average of 435 participants were conducted: 29 anatomic clinic-pathologic tele-sessions, 45 distance classes and 3 themed webinars. All Brazilian states have participated in reliance of the topic presented. Other countries that have presented and/or participated: Canada, USA, Germany, Chile, Bolivia, Colombia, Argentina, Guatemala, Spain, Panama and Australia.

Conclusion: The use of new technologies in medicine has led to continued integration between the undergraduate students who try on the experiences of other institutions.

Keywords: telemedicine, radiology, teleconferencing

# Telemedicine as an Innovative Project-Study in Adherence Improvement after Living Kidney Transplantation

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Living kidney-transplantation is since more than thirty years a main focus at the University Hospital in Freiburg. During this time more than 600 living kidney transplantations were performed. The successful operation is an important factor, but also the post-transplant care and treatment for the possibly longest patient and graft survival. Therefore in Freiburg started a prospective, controlled, randomized and open project-study to screen the adherence and psychosocial factors of living recipients.

A group of 25 patients get a normal aftercare and additional they get an advice to enter at home daily their data into an interactive web-based telemonitor. The entered data are daily checked by medical staff of the Transplantation-Center. Additionally the patients are monitored by Interviews and Questionnaires. The BAASIS-Interview, including the analog scale VAS, is to gather the adherence concerning the immunosuppression-intake. The ESRD-SCL TM to measure the quality of life and the BSI-18-Instrument to cover the psychological liability for kidney recipients. As a control group 25 living kidney recipients without a telemonitor are matched. The data-evaluation is reviewed with inductive and descriptive statistics. Medical observation in patient's environment, less activities in health facilities and encouragement of patient's self-responsibility are proven as result of the project-analysis. Also early diagnosis of rejections and infections. All those points result in an early rejection-therapy, increasing patient's safety and quality of life and positive psychosocial aspects. 6 month-results confirm this thesis. The project confirms evidence that a telemedicine supported post-operative care, give the recipient's medical and social benefit. The daily communication between patients and the Transplantation-Center induces a high degree of trust and reduces activities in health facilities and hospital-readmissions and will give the recipients more safety and life quality and confirm cost-reductions to health care utilizations and health insurance funds.



Keywords: evidence based telemedicine, patient compliance

# Telemedicine Evaluation and Assessment in Mpumalanga, Department of Health

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Background: Telemedicine is one of the most important strategic instruments for delivering health care to rural communities. But few telemedicine and eHealth implementations survive the initial pilot implementation or funding stages and the return on investment on capital expenditure seldom materialises. One reason for this in South Africa is that insufficient analysis is made of need and eHealth readiness.

Objective: The aim of this study was to develop a systems based tool to evaluate, assess and describe the state of current eHealth implementations and readiness in Mpumalanga Province for future planning purposes.

Methods: A systems approach, using metrics around the elements People, Processes and Technology, supplemented with (physical) Infrastructure, was used to measure the appropriateness of telemedicine sites and implementations. These elements were sub-divided into critical telemedicine related metrics. Using balanced Score Card principles, each metric was scored between 1 (poor) and 10 (good). This enabled a review of current performance. By formulating this approach in Excel a Telemedicine Evaluation and Assessment Tool for Health (TEATH) was developed, allowing comparison and graphical representation of data. Results: TEATH allows easy identification of weak and lagging telemedicine implementations supporting evidence-informed project prioritisation. Project plans can then be developed and costed to improve weak implementations and turn-around failing projects.

Conclusion: TEATH provides a simple, generic tool to evaluate planned and existing telemedicine sites and implementations and the soft (non-technology) side of telemedicine. It provides guidance to health planners and minimize wasteful expenditure which will facilitate implementation and uptake of telemedicine in South Africa.

Keywords: telemedicine, economics, dashboard, score card

#### **Telemedicine, Professional Autonomy, Patient Empowerment and Conflicts of Interest** G. Kostkevicius

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How traditional health care systems, which don't apply yet telemedicine solutions, comply with the standards of good medical practice and legislative requirements: case study of three EU countries. How efficient are their health care quality management systems and how feasible - operating costs. Telemedicine is not a revolution. It is an integral part of complex changes that are taking place in modern health care systems. Changes in objectives, approaches, patient info flow, focuses, service models, treatment methods and reimbursement systems. Telemedicine is innovation, which gives possibility to redesign traditional health care processes. Investments into new technologies are paid back via processes optimization, service improvement, advances in treatment quality assessment and medical fraud prevention. Today there is more enthusiasm about telemedicine is safe, properly tested and creates added value. But why does no one question whether health care services, the way it was before telemedicine, complied with the requirements of good medical practice and the law?



Keywords: health care, telemedicine

# Telemedicine, the Law and the Economics: A View from Both Sides of the Atlantic (US and EU)

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Telemedicine and E-Health is one of the fastest growing areas of medicine and continues to be one of the most challenging from a legal/regulatory and economic perspective. The populations in the US and the EU are aging at a rapid pace, there is a growing shortage of qualified medical providers and the increasing cost of health care on both sides of the Atlantic Ocean require new legal rules for delivering quality health care and new economic strategies and models. Both the US and the EU need to timely resolve these legal and economic hurdles to allow for the full expansion of the use of telemedicine and e-health which will not only reduce costs for the citizens of the US and the EU but will also provide greater access to high quality care. The audience will be provided with an interactive presentation that outlines the why the legal and regulatory issues that surround telemedicine and e-health as well as the economics of providing such care must be resolved in the near term. The presentation will include a concise summary of the primary legal and regulatory issues related to the delivery of care via telemedicine and e-health and examples of solutions to many of these issues. In addition, the presentation will include several examples of how the economic challenges of delivering care via telemedicine and e-health to the populations of the US and the EU can be resolved. The presentation will be provided by professionals supporting an international academic medical center with a robust telemedicine and e-health delivery platform that is centered on providing patients in both the US and the EU with high quality, cost-effective clinical care via telemedicine and e-health technology. The audience will gain a better understanding of several important legal, regulatory and economic issues including provider licensing and credentialing, patient privacy and data security, online prescribing, developing cost-effective models for incorporating telemedicine and e-health across multiple clinical specialty areas and best practices for developing and expanding programs for maximum benefit including the better health of an aging global population.

Keywords: legal, regulatory, economics, international, technology

# Telemedicine Use as a Learning Resource to Monitor and Discuss Surgeries: The Perception of Brazilian Medical Students

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A possible telemedicine application is for use in classroom situations to complement theoretical and practical activities, such as in telesurgery. The goal is to analyse the perception of Brazilian medical students concerning telemedicine as a learning resource, specifically the live transmission of surgical procedures from the operating theatre (OT) to the classroom. Data collected represents the perception of students enrolled in two disciplines at the Medical School/PUCRS. Students received an assessment tool upon completion of the surgical procedure teletransmission. A total of 59 surgeries were carried out (2009-2013) involving 37 different procedure types from 14



specialties. These were teletransmitted from the surgical block of the Hospital São Lucas/PUCRS to the classroom.

Students completed 798 questionnaires using a 5-point scale. Students participating in the data collection were all Brazilian, however, students and professors from other countries were invited on many occasions to remotely watch and discuss the surgeries. The educational aspects analyzed as mean were relevance (4.8), teaching method (4.8), and content (4.7). Students also recorded a qualitative opinion.

A content analysis of the 764 open-ended responses allowed them to be grouped into five categories: ease of viewing in comparison to surgery participation in the OT; understanding of the surgical plan, anatomical structures, patient history and prognosis from commentary given by the surgeon being watched; the possibility of exchanging experiences with the remote participation of students and academics from other countries; the increased possibility of contact with surgeries in vivo as participation in the same quantity of procedures would be impossible without the solution of telemedicine use; increased understanding of opportunities for telemedicine use. An expected response in the categories was not expressed by students, being the potential for risk reduction during surgery due to the reduction of disturbances that could impact on the surgical team concentration. This study contributed to a better understanding of telemedicine as a teaching tool, still little used in Brazil.

Keywords: telemedicine, telesurgery, eHealth learning

# Telemonitoring Blood Pressure By Secure Message on a Patient Portal: Use, Content, and Outcomes

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Introduction: Home telemonitoring is available for a number of patient measurements including blood pressure, blood glucose, weight, and oxygen saturation among others. Telemonitoring has generally sent data directly from a home monitor to an in home hub which then transmits data to a server. The patient portal has opened up another secure platform for telemonitoring data. Patients can self-monitor blood pressure, glucose and other parameters and send the results to their provider in a secure portal message.

Methods: We searched all 56,000 Mayo Clinic Rochester patient-generated secure messages from 2012 for content concerning blood pressure. We performed a detailed review on a random sample of 100 blood pressure messages. Measures for review included blood pressure reading counts, type of blood pressure data (individual readings, averages, and blood pressure range). We also examined whether the data provided was sufficient to treat blood pressure with a new medication. We captured the provider secure message response to the patient-generated blood pressure message and determined outcomes of prescriptions for antihypertensives, change in medication dose or if an appointment was suggested.

Results: Almost 1% of the 56,000 secure messages contained content about blood pressure. Of those blood pressure messages we sampled, there were specific blood pressure values in 85% with a median of 2 blood pressure measurements per message. Individual blood pressures were supplied in 53% with blood pressure ranges in 20% and implied or stated average blood pressure in 20%. The number of blood pressure readings in each message ranged from 0 to 92. Providers responded to these messages 15% with a new medication prescription but in 15% of the cases more information was requested and in 17% an appointment was suggested.

Conclusion: Patients and providers are using secure messages on the patient portal for blood pressure telemonitoring. Despite blood pressure content that is highly variable, providers are using



the supplied data to make changes in medication and to prescribe new antihypertensive medications.

Keywords: telemonitoring, eHealth, patient portal

## Telemonitoring of Patients with Cardiovascular Disorders by a Pulse High Resolution Oximetry Method

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The paper presents the High Signal Resolution Pulse Wave (HSR-PW) which is based on increasing the resolution of the pulse wave signal recorded during a standard test. The linear transformation method is used to increase resolution of the pulse wave. This procedure allows obtaining more detailed structure and analysis of received signal. In contrast to the results of a standard measurement, HSR-PW allows observe even minor changes in the circulatory system. The study involved twenty-four patients with hypertension and fifteen healthy people as a control group. Registration of pulse wave involves a standard CMS-50E digital pulse oximeter, placed on the left hand index finger. The performed tests, FMD (flow - mediated dilatation) and NID (nitroglycerin-induced dilatation), describe temporary changes in the blood vessels. Also wireless OEM Pulse Oximeter model 3150 Nonin was tested with finger and an ear clip sensor to compare results of HSR-PW from finger and ear pulse wave. The standard pulse wave has been recorded, transferred by the Internet to the analytical medical server and the HSR-PW analysis has been performed. Computation time did not exceed 15 seconds so practically analyses were done online. The analysis showed that changes of the shape of the pulse wave in HSR PW took place in both groups conducting the FMD and NID tests. The HSR PW method proved to be more sensitive to changes in the body then the standard pulse oximeter. Comparison high resolution pulse wave recorded on the finger and ear shows a similar structure in the case of healthy peoples and big differences in the case persons with arteries problem. The received record of the pulse wave after the HSR PW analysis showed significant changes, which could not be observed by the use of the standard pulse oximeter. The new HSR PW method helped to distinguish people with hypertension from healthy people. The applied modeling satisfactorily allows describing the changes of the vessel resistance. The obtained results provide a good basis for further tests, which may introduce an important element into the complex diagnostics of the circulatory system.

Keywords: pulse oximeter, pulse wave analysis

### **Telepharmacy: A Brazilian Experience**

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Introduction: The Brazilian Health Reform (Reforma Sanitária Brasileira) strengthened primary health care, which became a strategic governmental area. Within this context, eHealth serves as a support tool for the diagnosis and management of diseases. One of its areas of activity is telepharmacy that enables remote pharamceutical assistance, promoting the optimum use of medicines and medicinal plants, as well as continuous health education.

Aim: To present and discuss projects in the area of telepharmacy of the Joan Vernikos Aerospace Pharmacy Laboratory, Microgravity Centre/PUCRS.



Methods: Three telepharmacy assistance projects were conducted involving remote Brazilian communities in the Alto Xingu-MT (2008), Manaus-AM (2010) and Palmares do Sul-RS (2012) regions. Possible adverse effects of medications and their interactions were evaluated through the use of online questionnaires that were transmitted to a tertiary health centre. A human resources training tool in pharmaceutical assistance was developed in 2010.

Results: Compiling data from the three assistance projects, a total of 271 patients were evaluated, where 120 (44.3%) were using medications. Remote support from a health professional in respect of the pharmaceutical interventions applied was provided in 60 (22.1%) cases, helping in the most effective use of medicines. Difficulties were encountered in evaluating the medicinal plants used in the Alto-Xingu and Manaus projects as these are regions with a great diversity of plant species, which highlighted the need to involve local botanical taxonomists for the correct identification of these plants. The human resources training project demonstrated that telepharmacy can be used as an educational tool in health.

Conclusion: Telepharmacy is an essential tool in the promotion of pharmaceutical assistance, especially in remote and underserved areas, by being an important contributory factor in pharmacotherapy guidance and by assisting in the construction of health knowledge.

Keywords: eHealth, telepharmacy, pharmaceutical assistance, health education

# The Application of Telemedicine in the Follow-Up of Lung Transplantation in a Patient with Cystic Fibrosis

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The Cystic Fibrosis (CF) Unit of Children's Hospital Bambino Gesù in Rome has more than 25 years of experience in diagnosis and treatment of CFTR related diseases. The CF Unit actively collaborates with the Transplantation Division for the follow-up of patients with CF who undergo lung transplantation, performed in our Unit since 1991. We present the case of a 19 year old girl with Cystic Fibrosis, with severe respiratory failure for which it was subjected to two lung transplant. During the follow-up the remote monitoring has allowed the identification of an early episode of pulmonary relapse and graft-versus-host reaction even before the onset of symptoms, allowing an effective intervention and a complete recovery of lung function.

Keywords: telemedicine, cystic fibrosis, telemonitorinng, transplant

### The Experience of an Oral Health Blog after Two Years of Follow Up

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The present study aims to present statistical data on the volume of traffic, search terms and blog user type about oral health: "Taking care of your teeth" (<u>https://cuidardosdentes.worpress.com</u>). Data were collected for two years and nine months (February 2011 to November 2013). The blog was initially designed to provide information about oral health care for school children. The content available was edited by graduate students under the supervision of lecturers in the Department of Pediatric Dentistry and technical support performed by the Teledentistry Center of Faculty of Dentistry of São Paulo University. Now it is maintained by the Teledentistry Center. As development method we used the Wordpress content management system application, since it



enables the creation and maintenance of blogs on the web, making it easier to use by people who have no prior knowledge of editing HTML codes. Through statistical analysis of the blog, provided by Wordpress, we obtained as a result that there is a growing demand for specialized information on oral health by adults.

It was also noted that from January 2013 to November 2013 there was an 800% increase in visits to the blog traffic. One can attribute this significant increase to the fact that for some of the most popular terms in the search engine Google, related to the topic exfoliation of deciduous teeth ("teeth falling out") and eruption of permanent teeth ("teeth rising") the blog appear in the first positions of Google Brazil organic search. When we analyze the most frequent inquiries sent through the "contact" page it is also evident that they refer to exfoliation of deciduous teeth and eruption of permanent teeth. They also reveal that the vast majority of people seeking clarification on the issue are mothers of school children and adolescents. It can be concluded from the study that there is a growing demand for more specialized information on oral health as the internet has allowed access to information in an easier way. It is also important to note the need to stimulate the production of websites and blogs able to provide information on oral health that are reliable and appropriate to the people.

Keywords: telehealth, blog, teledentistry, social media

### The Implementation of Care2x in a Tertiary Hospital of Approx. 60,000 Patients

R. Meggle care2x, Marktoberdorf, Germany

Care2002 began in 2002 in Stuttgart, Germany as an attempt to bring together the computerized health care functions provided for by disparate non-compatible proprietary and commercial software into one freely available system. In 2014 it has developed into Care2x a multilingual environment which can not only provide WHO health statistics based on the patient medical records but also crucial management tools. It is now blossoming into a resource planning environment capable of managing not only the healthcare requirements, but also automatically integrate the financial and accounting data needed to run a large modern hospital as well as combat fraud.

Keywords: Open Source Software, eHospital, Health Informatics, Hospital Information Systems, ERP

### The Journal of the International Society for Telemedicine and eHealth

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The Journal of the International Society for Telemedicine and eHealth (JISfTeH) is a one of the instruments that helps the International Society for Telemedicine and eHealth (ISfTeH) to realize its mission. The journal is available at ISfTeH web site <u>http://www.isfteh.org/</u> as well as at <u>http://journals.ukzn.ac.za/index.php/JISfTeH/</u>.



JISfTeH is set up as an international, open access, electronic peer-reviewed journal covering the full spectrum of applications of Telemedicine and eHealth.

The journal accepts original research papers, critical reviews and preliminary reports on all aspects of Telemedicine and eHealth including informatics and related topics.

JISfTeH is indexed in Google Scholar and the Directory of Open Access Journals. Its ISSN is 2308-0310.

If you would like to hear about current applications and best practice examples, see a glimpse of future trends in Telemedicine and eHealth, and their effect on the healthcare system as a whole, receive and an update on new developments that will allow you to stay ahead and make more effective and efficient use of technologies to improve quality of health, medical and social care – this is your journal!

# The Post-Course Dilemma: Teaching A Student How To "Fish" Versus Offering Him/Her "A Fish"

C. Kiyan, L. Jiang, B. Ingelbeen, L. Lynen, M. Zolfo Institute of Tropical Medicine, Belgium

The aim of this presentation is to describe how the Institute of Tropical Medicine (ITM) in Antwerp has designed an electronic short course with the aim of training health care professionals dealing with HIV/AIDS patients in low resource settings in making evidence-based medical decisions. Initially our distance-learning course was designed to provide the latest information on how to treat HIV patients. However, in the medical field information (and evidence) changes rapidly, due to the most recent research results, and evidence in medicine might become obsolete after a short time. As a solution, many training centers opted to organize continuous post-course programs updates. It is questionable whether this is the optimal strategy to enable students in accessing new information or if a different approach is needed to promote sustainable lifelong learning. From our experience, we believe students should be appropriately trained in order to be able to select, discriminate and analyze the vast amount of information available in literature and make medical decisions evidence-based.

With this goal in mind, we revised our distance learning course and introduced the following adaptations:

- Different eLearning activities, emphasizing the 21st century skills (such as promoting critical thinking, collaborative problem solving and identifying useful and reliable information using Information Communication Technologies) were introduced. All these generic skills are essential to improve a core competency in the medical field, such as clinical decision-making.

- A specific training for tutors/facilitators was designed and implemented with the aim of improving the quality of the online tutoring. This has ensured that students are well directed and guided during the overall length of the course.

- Standardization of the assessments and increased transparency in evaluating the students has been granted with the introduction of rubrics.

Teaching students how to catch fish by training them on evidence-based medicine and clinical decision making might be more effective and sustainable than passively pass through post-course digested notions.

Keywords: lifelong learning; medical education; eLearning; critical thinking; empower; evidence based medicine; capacity building


#### The Potential of the iPath-Network is not Widely Known

M. Hubler

Coordination, administration and enduser support for iPath, Basys Data, Binningen, Switzerland

iPath-Network is a web application service offered by Basys Data. The aim of this service is to offer a hosted and supported platform based on iPath, an open source collaboration platform which was originally developed at the University of Basel. iPath is being actively used in 35 countries, in the domains "consultation", "teaching" and "research".

iPath is one of the few, if not the only telemedicine platform based on open source software. The system is stable, easy to use and is not highly demanding of resources. For that reason it is used in many developing countries, where connectivity may be difficult or high bandwidth unavailable.

At first iPath was only used for diagnostics in the areas of histopathology and cytopathology. After the platform had become more established, the iPath network was grouped into communities, and started being used in many more medical fields, and also for the education of doctors and their co-workers.

Tumor boards etc. began to take place as teleconferences. The users have access to the cases prior to the meetings through their group membership. For the transmission of speech we use Skype, which works well in developing countries. Open source solutions like Mconf and openmeeting have shown to be unsatisfactory so far.

Our presentations can be shown in small and large groups, and can also be used for self-study (where previously uploaded and discussed clinical cases can also become a valuable resource). Presentations can individually be set for public viewing (access for non-members). By integrating iPath into existing e-learning programs, even more potential uses for iPath can be exploited.

At universities, internally accessible installations of iPath are being used for scientific research. The amount of these installations is not known to us. On our server alone, over 4300 users are working in 170 groups and closed communities.

Besides the web-interface, iPath has a feature-rich e-Mail interface, which can be a simple option on smartphones.

#### The Real Scientific Evidence of Prevention Health Apps

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The widespread use of mobile phone applications (app) in healthcare using embedded sensors is increasing at an exponential rate. They are widely used to monitor health-related physical condition variables. Notwithstanding, developers of health app do not show a scientifically document the assessment methods used, leading to considerable uncertainty as to the reliability of the measures and related assessments. The strategy has been to use the mobile devices because offer remarkably attractive low-cost, assessment in real-time, sound-movement, HD images, among other possibilities. Thus, this study describes assessment method of three-axis accelerometer, beginning with the raw data obtained from a sensor embedded in a mobile phone. Here, we report a detailed description of the method for data acquisition, processing and analysis; a statistical study, and the developed software for assessment. This study represents a valuable technical and social contribution, which gives rise to a scientific discussion on the actual reliability of healthcare applications based on accelerometer sensors embedded in mobile phones.

Keywords: app, scientific, evidence, mobile, health



#### The Realization of PrimCareIT Project in Belarus

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Analysts who studied problems of medical specialists noted the aggravation of healthcare staffing issues in the whole world. There should have been taken urgent and coordinated activities to counteract the human resources crisis. The analyses of staffing issues of various countries indicated the similarity of the formed problems. The shortage of medical specialists in the world was higher than 4,3 million people. In 2012 the project "PrimCareIT - Counteracting brain drain and professional isolation of health professionals in remote primary health care through teleconsultation and tele-mentoring to strengthen social conditions in remote BSR" was initiated to solve the problems of HR in European region. The Republic of Belarus was one of the members of the project. The main aim of the project was to counteract brain drain and professional isolation in sparsely populated areas for more equal access to primary health care. South Ostrobothnia Health Care District, Finland was the lead partner of the project. There were 7 countriesparticipants of the project: Finland, Germany, Lithuania, Latvia, Estonia, Sweden and Belarus. Belarus was represented by State Educational Institution Belarusian Medical Academy of Post-Graduate Education, Minsk and Ostrovec Central Regional Hospital, Grodno district. Within the framework of the PrimCare IT, project partners carried out the following: analyses of the existent obstacles in the implementation of tele-consultations and tele-mentoring into practical healthcare, development of the strategic perspectives of using tele-medicine to get over the brain drain from PHC in remote areas and decrease the level of professional isolation. In Belarus 4 outpatient clinics of GPs were equipped with the required telecommunication technologies; the educational center for GPs was founded; e-learning seminars were conducted using the systems of teleconsultations and tele-mentoring.

Keywords: PrimCare IT, tele-consultations, tele-mentoring

# The Regional Cancer Counseling Center: Technologies and Psychology for a New Organizational Model to Serve Cancer Patients and Their Relatives

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Regional Cancer Counseling Center, Tuscany Region, Italy

In recent years, cancer patients have become increasingly proactive with regard to their disease management. Patients and their relatives wish to be more informed about their illness and therapeutic options. In addition of this, psychological support is an essential element to ensure a better quality of care and life and to promote adherence to treatment. However, the economic crisis puts us in front of the need to find new ways to help citizens with health needs. eHealth and ICT can help the health institutions and the citizens facilitating the access at information and the contact with the professionals. For this reasons, it is essential the use of new technologies in health care, to help the greatest number of citizens throughout the course of treatment. In November, 2009, the Regional Cancer Counseling Center initiated a "free phone line" for patients and relatives.



The Counseling Center is a contact centre, located in the health politic institution (Tuscany Region). The mission is to provide information and counseling about health regional facilities and their professionals and resolution about organizational issues; besides it provides psychological support via telephone. 10 psychologists work through telephone, e-mail and sms as means of communication and interact with all professionals in all Tuscany hospitals around the region through a platform web; this platform is used to communicate with all health professionals and to share all information relating to patients. In 4 years of operation, the Service responded to 8500 calls. Most are cancer patients (42%) and their relatives (43%) and, interestingly, a small percentage (4%) of users are service providers within the Tuscan Health Service. The age of users is between 25-75 years old. The questions are related to the clinical course of care (75%) and to psychological needs such as emotional and relational suffering by oncological disease (25%). Most of all prefer psychological support via telephone, only 5% prefer a face to face relation. The patients like this operative model as is easily accessible and effective than their needs, and they feel the health professionals near to their needs. The gap is about the users that have under 25 years old; probabily the youth generation prefer other means of communication. For this question our project is to equip our Counseling Center with the Web 2.0 technologies so that all citizen are also facilitated with adequate means of communication to interact with us and in particolar with the young people.

## The Role as PHR and the Specific Case about the Electronic Maternity Passbook

Y. Ogata Mitla Co., Kagawa, Japan

The Role as PHR and the Specific Case about the Electronic Maternity Passbook

The Japanese government has announced its various ICT Strategies for 2001-2015. To enrich the social environment infrastructure, digitization and communication services are substantial. ICT in the health care field is the most important item in the "i-Japan strategy 2015". Especially, PHR and telemedicine have become a major theme. The Hokkaido Toyako Summit said that the maternity passbook (paper) is a specific way to contribute to the reduction of infant mortality and maternal in 2008. The maternity passbook originated in Japan has attracted attention internationally in recent years.

Since seven or eight years ago, we have a view that the starting point of PHR is the maternity passbook. Professor Hara says "Data from birth to death should be collected and managed for the health of the people."

Some data are from the hospital; some data are from the municipality, or some are to be entered on your own in to the maternity passbook. When we develop the electronic maternity passbook from paper, we would add important elements to support the family. They are shops, support groups and NPO, and companies.

Various types of PHR will be requested to enter your own data. But we believe that it is necessary to be support by the surrounding for us to the continuation of PHR. We will discuss the nature of electronic maternity passbook along with the specific case of efforts in Iwate Prefecture.

Keywords: electronic maternity passbook, PHR, telemedicine, reduction of infant mortality

### The Telemedical Project "Moscow - Regions of Russia-2"

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More than ten years we impart our experience of development of a telemedicine in Russia. In the second part of the 90th of the last century the telemedical project "Moscow — Regions of Russia" assisted appearance of the first telemedical aid stations in several large regional clinics. Further development of the project allowed creating telemedical aid stations practically in all regional clinics. In our new article we focus attention on the main factor of success of this project – principle implementations "do with us". We think that at a new stage of development of the Russian health care – development of medical institution of "step accessibility" experience of our first telemedical project could promote innovative conversion of the lowest link of the Russian health care – rural medical stations (RMS). Our idea consists in that development of the lowest link of the Russian health care leaned on universal tendencies of development:

• Appearance of a large number of devices of primary survey and diagnostics of patients which have opportunity to transfer results to the personal computer on the unified channels – USB, blue tooth, wi-fi, etc.,

• Possibility of information exchange on the modern communication links between healthcare institutions,

• Excess concentration of doctors in large megalopolises and the cities, in case of their absence in small settlements.

According to the Minister of Health of Russia in the country there is a lack of about one million doctors and nurses. However the excess number of experts is measured in the large cities by tens of thousands. We suggest to refuse primary trip of the patient to the doctor-diagnostician (in rural regions of Russia it is hundreds kilometers). The modern level of a telemedicine can provide delivery of the doctor to the most removed patient. The telemedical project "Moscow — Regions of Russia — 2" could help this process. In its frames successful strategy of implementation of the principle "do with us" can be repeated at new level:

• Development and delivery of diagnostic units to regions,

- Staff training,
- Organization of distant diagnostics of RMS patients
- Solutions of organizational problems.

Keywords: telemedicine, RMS, primary survey

## The Use of mHealth Technology within a Continuum of Care Approach to Reduce Maternal and Neonatal Mortality: The Experience of WAHA International and Sanofi Espoir Foundation in the Arsi Zone in Ethiopia

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Background: The use of mobile technology for improving health outcomes (mHealth) holds great promise for rural African settings, where the existing health infrastructure is limited, but mobile network coverage is rapidly growing. We aim to demonstrate that in the context of maternal and child health programmes, mHealth can be used to enhance interventions, if applied within a broader comprehensive approach. mHealth is unique in its capacity to provide healthcare education and training on a large scale while also being easily adaptable to any country and geographical setting, provided there is mobile phone coverage. In collaboration with the relevant health authorities, mHealth programs have the capacity to provide a positive lasting impact on the health programs.

Setting and Project Description: WAHA International has been working in the Arsi Zone in the Assella Region of Ethiopia since 2010, in partnership with the Ministry of Health, to implement

fistula care and maternal and child health programmes. The population of the Arsi Zone is largely rural, poor and dispersed over a large geographical area, and the region is characterised by high maternal and infant mortality ratios. The ratio of 1.36 midwives per 1,000 live births (compared to the recommended 6 per 1,000 live births) translates into low rates of attendance at antenatal appointments and low rates of skilled attendance at delivery that hovers around 10%.

In September 2013, WAHA International, in partnership with Sanofi Espoir Foundation, initiated a project in the Arsi Zone with the overarching aim of reducing maternal and neonatal mortality using a comprehensive approach that includes i) building the capacity of 184 local midwives and promoting the networking between them; ii) refurbishing, equipping and supplying 42 health centers; iii) implementing a referral system using WAHA International's tricycle ambulances and mobile phones to link communities with maternal and child health services and iv) mobilising communities to use maternal and neonatal health services. The project will directly benefit 700,000 women of reproductive age, and has a total estimated cost of 1 million Euros over 4 years, with funding from the Sanofi Espoir Foundation of 750,000 Euros.

The mHealth components of the project include distributing 184 mobile phones and airtime to midwives to promote networking, troubleshooting and liaising with colleagues, to facilitate referral arrangements and to receive relevant news and information regarding key skills, interventions and training opportunities. An innovative tablet-based application is under development to enable midwives to make decisions regarding the need to refer mothers and newborns, while the implementation of a call centre enables them to receive real-time advice in the event of complications. In order to improve the uptake of maternal health services at the community level, SIM cards are distributed to pregnant women, with text messaging campaigns used to encourage attendance at antenatal appointments and delivery in a health centre with a skilled attendant.

Initial Findings and Next Steps: Early monitoring data will be presented that indicates that the project is on track to meet its objectives for the first year. Initial challenges in the project's implementation and steps taken to address these will also be presented. Suggestions of how to adapt these interventions for other settings will also be discussed.

### The Use of Tele-Education to Increase Access to Expert Lecture Support for a New Health Informatics Masters: Rwanda

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Introduction: Since 2010 Rwanda has hosted the regional E-health Center of Excellence funded by the Rockefeller foundation in collaboration with the government of Rwanda. The Center is currently hosting its first two cohorts seeking the Masters in Health Informatics, while the Center's local faculty provides the majority of the lecture support for the new program, visiting lecturers from outside of Rwanda must sometimes be leveraged to provide support where specialist knowledge is difficult to harness locally.

One such area is Medical Imaging and telemedicine Module, where lecturers from outside Rwanda are teaching this module courses via videoconference. The objective of this case study is to assess student satisfaction with a tele-education approach in combination with learning management system.

Methodology: The teaching was done via videoconference and teaching materials were posted on Kigali Health Institute learning management system for student access. Among 22 students requested to fill the questionnaire 17 filled the questionnaire. Students were requested to provide their views at the end of their teaching and learning process.



Results 88 % participants agreed that teaching via videoconference was comparable to face-toface with regard to quality of learning experience. 82 % agreed that they would wish to follow another module teaching delivery methods. 94 % of the respondents agreed that the technical support and tutorial assistant are needed in remote training site. 88 % agreed that videoconference system should be integrated in normal teaching and learning activities.100 % of participants have agreed that the quality of audio and audio was good .100 % participant have internet access at their workplace. 100 % participants have their personal laptops and their own modem. This type of teaching methodology has saved approximately \$ 5000 per month.

Conclusion Tele-education is an appropriate teaching methodology. In comparison to face-to-face teaching, students are similarly satisfied with the use of a high definition room-based videoconference.

Keywords: tele-education, health informatics, video-conference

#### Three Months Experiment in Telemedicine in Care Home for Disabled Adults

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Telemedicine is still at the experimental stage in France, especially in the field of disability. The "Centre départemental de repos et de soins" (Departmental center of rest and care) of Colmar (FR-Alsace) is one of the five pilots participating in a regional telemedicine project in care and nursing homes. This structure led its experiment in a disability care home of 100 beds. The experiment was performed over 3 consecutive months with an exclusive coverage in telemedicine by a unique practitioner, gathering teleconsultations, mobile collaborations and coordination sessions by video conference. On the 120 teleconsultations, the average duration of the act was 14 minutes. The motives for consultation were varied (dermatology, traumatology, ENT, neurological, psychiatric...). The average age of patients was 49 years, half had cognitive impairments. All patients were satisfied or very satisfied 85% compliant or feeling comfortable. Nurses were satisfied or very satisfied in 89% of cases. The remote doctor had a raised level of confidence in her diagnosis (3.5/4 on average). During these 3 months, the organization has improved: technologically, in terms of premises, concerning the development of new skills. The duration of a teleconsultation approached the duration of a conventional consultation. The physical examination was limited but it can be improved thanks to the next implementation of tele-ultrasound system. The patient compliance was excellent, with for some a feeling of valuation. Behavioral disorders diminished thanks to the diversion of their attention by the effect of novelty. This innovative experiment in France showed that telemedicine is possible in the field of disability. It is a useful tool for the medical and psychosocial coordination, the continuity of care, the development of new multi-professional skills, and the ethical appreciation of the patient with disabilities.

Keywords: telemedicine disability care coordination

### Towards an eHealth Policy: A Study about the Utilization of ICT in the Israeli Community Health Care Delivery System

G. Catan<sup>1</sup>, D. Chinitz<sup>1</sup>, O. Toren<sup>2</sup> <sup>1</sup>Hebrew University of Jerusalem, Israel <sup>2</sup>Hadassah Ein Keren, Israel The Israeli healthcare sector has benefited from the utilization of Information & Communication Technologies (ICT), offering a more efficient way to reach the patient and to manage the system. At the same time that costs can be reduced. In addition, the Israeli Ministry of Health (MOH), aware of these potential benefits has been working to develop national projects to integrate information. How these trends are unfolding requires further investigation.

The objective of the study is to analyze if the implementation of ICT or eHealth has led to changes such as patient empowerment, how doctors and managers perceive the change, and other related questions. Additionally, the study is aimed at better comprehending the role of the national policy and to explore options for building a national strategy regarding ICT in healthcare in the country. In-depth interviews with the MOH, the private sector, hospitals and research institutes were used to collect data.

The sample was built using a snow-ball methodology and secondary sources were used for triangulation. The findings of the research work show that the increased deployment of ICT has increased patient empowerment. From the doctor's perspective, although ICT have provided more information, changes of these magnitudes were not easy in the beginning and good leadership was the key for success. At the national level, not all the respondents agreed on the necessity of a national strategy leaded by the MOH, however it seems that the role of the government is becoming more important. The work concludes that ICT tools were successfully implemented and the general perception is that has been beneficial. Following implementation in the field, government has become more involved and initiated future national projects. It will be important to monitor how the different initiatives in ICT become integrated in the future.

The work provides information in order to understand and improve ICT services. Additionally, the results suggest alternatives for future investments in these technologies and provide input regarding national policies in the area.

Keywords: eHealth, strategies, empowerment, organizational change

### **Training of Health Professionals Using Telemedicine Technologies**

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Currently, the Department of Health "Russian Railways", together with the Department of telemedicine Moscow State Medical and Dental University named after A. I. Evdokimov actively implemented training of health workers on the basis of telemedicine technologies.

The purpose is to transfer of practical experience, and improve the quality of education of health workers as well as improving their theoretical knowledge and the formation of a conscious approach to treatment; improving quality of care; providing training at the workplace without departure. Least but not last - the economic feasibility of training is also a goal.

We conducted a series of lectures based on videoconferencing. The thematic schools were organized by chief specialists of the Department of Health "Russian Railways".

The cycles consist not only of lectures and analysis of specific clinical events. As a part of the certification process, conducted by the Department of Cardiology, Family Medicine First Moscow State Medical University named after I. M. Sechenov, cadets were trained without departing from the regions, at work and got standard form documents/ certificates.



As a result, students were trained and completed knowledge, the ability to get answers to their questions and put them into practice, which in turn is an indicator of the effectiveness of training. Analyzing the results of these cycles, we have concluded that the traditional "face to face" lectures and modern videoconferencing courses have certain differences. However, despite the limitations due to the lack of nonverbal communication components, unusual forms of communication, emotional distress contacts and some other features, videoconferencing courses do make learning more complicated.

In conclusion we would like to underline that the use of telemedicine technologies in training of health workers have several advantages over full-time education, which can greatly reduce the cost of institutions in training the staff, reduce time away from work, etc. As a result of video training employees can gain the knowledge and skills which can radically change the way they work in a better way.

# Transmission of Dental Surgery in UHD (4K) on Real Time - The First Latin American Experience

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Follow up surgery in real time is a great way to learn in the area of health, but includes issues. The most common issues: breaking the aseptic chain (students in the environment); inability to properly observe (small surgical spaces); one in front of each other (a prejudice viewing), and lack of interaction with the operator. For this relayed in real time to allow students to watch the procedure, but without interacting with the operator surgery may be offered. Another fact that can be observed is that the dental field is difficult because there is a competition between the incoming light, the action of the operator and the capture by the camera. The Brazilain National Education and Research Network (RNP), based on experience of Network RUTE (University Network of Telehealth), has invested in the broadcast on real time, with quality UHD (Ultra High Definition - 4K) of various medical surgeries and also dental, technology developed by the Federal University of Paraíba, Brazil. The first experiment was conducted in November 2013, passing up a surgical procedure FOUSP (Faculty of Dentistry, University of São Paulo) for the Faculty of Medicine, University of São Paulo (USP). The initiative adds up to 3 more countries (Netherlands, Japan and USA), but is focused on software development (other countries have invested in hardware). This proposal therefore ensures the flexibility of quality transmission, extremely interesting in surgery in miniature surgical fields, such as the oral cavity. Edited images can be magnified greatly, without loss of optical quality (pixelation). 4K displays each frame of the film of 8.2944 million pixels, which allows the increase. The great relevance of experience is being developed as software allowing multiple video streams with minimal bandwidth requirement, and incorporating Kinect technology for operator interaction with the students, without breaking the chain of aseptic operative field.

Keywords: telehealth, teledentistry, UHD

#### **UniversalNurse Speaker: Improving Multilingual Communication**

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UniversalDoctor Project, Millennia2025 Foundation and Connecting Nurses launched a partnership to develop multilingual eHealth and mobile health applications dedicated to women's health and Nurses communication. The main objective of UniversalDoctor Project is to facilitate multilingual communication between health professionals and patients who do not share a common language. With 620 experts from over 65 countries organized into regional communities and international working groups, Millennia2015 has a strong network of experts from which we will draw expertise from on women's health and nursing issues to ensure these tools are relevant and well-informed. UniversalNurse Speaker will be dedicated to supporting Nurses, enabling them to communicate with patients in several different languages. Nurses will feel more empowered to deliver care to patients in diverse multicultural settings. UniversalNurse Speaker will be tailored to meeting the needs of Nurses across the globe. UniversalNurse will be officially launched during Med-e-Tel 2014, at the Women's Special Session, organized by the Working Group on Women at ISfTeH.

Keywords: nurses, multilingual, patients, communication, mobile

#### Use of Computer Aided Detection in Breast Cancer Screening Programmes

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Computer-aided detection (CAD) systems have been developed to improve mammographic detection of breast cancer at screening, by reducing the number of false-negative interpretation that can be caused by subtle findings, radiologist distraction and complex architecture. The introduction of a screening protocol based on single reading of mammograms + CAD, in substitution of the traditional independent double reading, has been proposed. However, available data on the clinical effect of CAD are limited and conflicting. We carried out a prospective comparative study to evaluate the impact of CAD use in screening mammography on the referral rate to the diagnostic workup and the detection of in situ and invasive breast cancer, compared to the performance achieved by standard double-reading by breast radiologists. The study was carried out in the population-based breast screening programmes of Ferrara, Modena and Padova (Italy). In brief, the mammograms of women attending the three screening programmes were independently read by two radiologists in two sequential phases, first without and then with CAD. Women were recalled to further assessment based on positivity to mammography at either screen read. Outcomes were measured from final assessment or excision histology. Primary outcome measures were the number of detected cancers per 1000 screens, the proportion of false positive recalls, and incremental cancer detection rate and referral rate attributable to the use of CAD. By 30/11/2013, 23,932 women have been enrolled in the study. The main results of the study will be presented.

Keywords: CAD, mammography, breast screening



### Use of Teleradiology in Distance Education in Brazil, Latin America

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Demonstrate a Brazilian experience in the use of teleradiology for distance learning, research and improvement of heath care services through Telemedicine University Network (RUTE), through the creation of a Special Interest Groups (SIG) in Radiology. Telemedicine University Network (RUTE) establishment of the organizational and technological infrastructure: national coordination, advisory committee made up of telemedicine experts of the country's best teaching and research institutions and interest groups on specific health areas. Special interest groups [SIGs] are group who are concerned with some particular part of interest in health services, telehealth infrastructure or legislation who work on education, services or research. Until now, Brazilian Teleradiology SIGs include: Pediatric Radiology, Neuroradiology, Thoracic Radiology, Abdominal Radiology and Medical Residency/Specialization in Radiology. Monthly virtual meetings include discussion on difficult cases for second opinion, classes to update and to refresh and seminars. The access is free with previous invitation through a specific mailing. Every meeting is recorded in order to be reused by the groups. The connection for SIG's among the university hospitals is made through video conference demanding high speeds as well as specific equipment while web conference, connecting the universities with remote municipalities, uses just a computer with internet. To associate the two technologies the Telehealth Center of UERJ included an endpoint linked to a work station with a web server that transmits the videoconference's audio and video to remote points. SIGs in Teleradiology are now creating international networks of collaboration and integration for interactive education and facilitating multicenter research. The Radiological SIGs represents a major advance for improving the comprehensive training of the radiologists and promotes the integration with the Brazilian and international medical entities.

Keywords: teleradiology, education, telehealth, distance learning

### User Involvement and Adaptability of the Systems

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Based on our experience from previous projects and development of applications for elderly and disabled people we found out that the most important issue in assistive technologies and ambient assistive living is active involvement of potential users. In case of long-term monitoring the possibility of application of adaptive systems should be considered. The systems can be personalized because they learn from the data of a particular person. The idea is to recognize changes of health state and cognitive abilities of the potential users. To summarize the 'gaps' from our point of view, the following issues are important: higher involvement of potential users in the development process; education of the users – showing them that technology can help them and they need not fear of technology; harmonizing technological solutions with legal and ethical regulations. If we plan to offer and test new technological solutions for improving quality of life of seniors and challenged persons, the solution should be very low cost and easy to use; it should provide entertainment and health care functionalities, support their independence when living on their own at their homes with tele-assistence, e.g. of local public services. The solution may combine tele-medicine, tele-assistance, tele-entertainment and tele-company into a federated



internet based system usually intended for 3 very different and complementary groups of users: the customers (elderly/handicapped persons who need some sort of support), their care givers (e.g. organized in public or non-for-profit services) and health professionals (medical doctors and nurses). Each of these groups requires/ensures specific type of services and consequently the developed system should provide them by group specific access rights. In the paper we will try to address some of the technological and psychological issues that must be solved in the future. The aim is that the lay users (mostly elderly people or people with different impairments) will be willing to use the technology, will accept it and it will not cause them any problems. The designers and developers have to have in mind that the design must be user centered.

Keywords: user centred design, assistive technologies

# Using a Mobile Phone to Assess Dietary Intake in Young Children N. Seal

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Currently a number of people around the world increasingly own a mobile phone due to its availability and affordability. There are more than 5 billion mobile phone connections worldwide reaching more than 73% of the global population. In North America, there were more than 320 million mobile phone subscribers. Because of the popularity of mobile phones and their utility for health applications and interventions, to date mobile health has become a focus of research. Obesity and other chronic diseases including hypertension, diabetes, cardiovascular disease, and cancer have a strong association with nutritional components; therefore, information on dietary intake is essential in helping parents and children to understand the connection between diet and diseases. There are several methods available for dietary intake assessment such as a 3-day food record, food frequency questionnaires. However, these assessment methods have some disadvantages including underreporting, incomplete reporting due to memory dependent or subject to bias. Technological progress in mobile phone features including camera and real time video has further prompted the enhancement of dietary assessment methodology and may help to improve quality of dietary assessment. This proposed study aimed to examine the perceptions of African American mothers with young children aged between 4 and 5 years toward the use of mobile phone to assess dietary intake in their children and as a means of receiving information about nutrition. The findings of this study will inform future development of mobile phone features and applications to be used in dietary assessment and interventions.

Keywords: mobile phone, dietary assessment, young

**Using Open Source Software and Open Data to Support Clinical Trial Protocol Design** N. Matskanis, J. Roumier, F. Estiévenart CETIC, Charleroi, Belgium

Clinical trials for drug repositioning aim at evaluating the effectiveness of existing drugs for new treatments. Their protocol design requires a clear specification of the trial hypothesis and is followed by the challenging step of selection and recruitment of eligible subjects. Both steps have complex information requirements and involve managing many interdependent parameters and details that are distributed over several data sources. The PONTE project (Efficient Patient Recruitment for Innovative Clinical Trials of Existing Drugs) has developed a platform that



assists authoring, fast navigation and management of the Clinical Trial Protocol documents, provides services of translation of medical terms between different standard and open vocabularies and enables querying of the hospital Electronic Health Record (EHR) systems. In order to support the platform information model, several ontologies have been developed following a multi-layered and modular approach integrating external ontologies, nomenclatures, and vocabularies. Throughout its course the project relied on the availability of Free libre Open Source Software (FIOSS) to achieve its goals. The biomedical domain provides numerous FIOSS and Open Data resources for ethical and pragmatic reasons. Such licensing scheme is also very relevant for clinical trial design. The Linked Open Data initiatives offer access to a variety of medical and healthcare information including - but not limited to - drug profiles, diseases and their mechanisms, gene data sources and past trial results. The platform consumes this data, by providing mechanisms that assist navigation and querying of these open data sources. Additionally it provides intelligent aggregation of available information through semantic technologies and reasoning and presents the query results in a coherent and structured manner, assisting the clinical researcher's hypothesis investigations.

Keywords: semantic, FlOSS, LOD, EHR, clinical

US-Mex Border Region Dental Students' Perspective in the Future Application of Teledentistry as A Tool for Preventive Care

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In California and likewise in the rest of the US-Mexico Border Region, there have been many proposals to improve the accessibility and quality of Dental care, new dental insurance companies have emerged under the Knox-Keene Act in California, and Community Dental clinics have been developed along the border region. But the reality is that despite of many efforts, the Dental care system in South California, and the rest of the Border Region, will remain insufficient in the near future. Times have changed and existing players must redesign themselves to improve better dental care delivery methods, pursue the implementation of new technologies in the market and promote the use of Teledentistry. Teledentistry can aid in consultations, diagnosis, treatment planning and coordination between California's population and Dental practitioners in the US-Mexico Border, resulting in B-national assistance to reduce California oral health disparities among low income, underserved populations and specially Hispanics or Latinos in California. Teledentistry has the ability to alleviate many barriers that currently exist regarding access to oral healthcare with a minimum of travel, and can also provide an opportunity to supplement traditional teaching methods in dental education.

Research Question: Is Teledentistry among students in the last semester of Dental School a useful tool for Preventive Dental Care, Diagnosis, Dental Treatments and Timesaving?

Participants and Methods: A study sample of (n=40) Dental Students in the last Semester and last day of class Generation 2013, from the Universidad Autonoma de Baja California (UABC) located in Tijuana, Baja California Mexico. Participants were male (n=12) and female (n=28) range in age from 21 to 27 years. A 5- point Likert scale was used.

Results: All participants (n= 40) completed the questionnaire, 30% male (n=12) and 70% female (n=28) with age range between 21 to 27 years (mean= 22 SD = 1.2) 78% of the participants Agree that the use of Teledentistry can reduce referrals time to the Maxilofacial specialist. 75% of participants Agree on the reliability of Teledentistry for X-rays interpretation.



Keywords: teledentistry, US-Mexico Border area, dentistry

# Utilization of Web-Based E-Medical File to Improve Case Management and Continuity of Care in Remote Areas of Mongolia

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The article covered about how the telemedicine supports and services in cardiovascular field of Mongolia were introduced with the help of the software.

Keywords: teleconsultation telemedicine software cardiovascular disease

#### What Did I Post to Make the Prime Minister Follow Me?

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Social Media is a tool to connect quickly, as well as make personal and professional mistakes through impulsivity. Health information can be shared instantly and accurately. Learning how to communicate adequately using only 140 characters can be a challenge, but once met can be fruitful, even viral. Connections with like professionals or those who can support your vision can be made in this emerging period with direct communication in a way that doesn't work as well with in person meetings, phone calls, videoconference or email. This of course, will change over time. This session will focus mostly on Twitter, but will also apply to Facebook, Pinterest, Instagram and other like modalities. Topics covered: The Case of Justine Sacco, Tips for responsible use, gaining quality "followers", determining purpose, research shortcuts, and creating policy for your organization.

Keywords: social media, ethics, promotion, tools

# What is the Impact of Physician Secondary Telephone Triage on Emergency Department and Office Visit Utilization?

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Introduction: Telephone triage is primarily nurse directed. Physician secondary triage occurs when the triage process involves a real time second opinion from a physician, and this process has not been well studied. At Mayo Clinic Rochester, where a nurse directed triage is used, there were concerns that the triage process resulted in an inappropriately large number of emergency room visits and urgent outpatient appointments.

This study examines the impact of physician secondary triage on a primary care nurse triage call center.

Methods: During November 2013, nurses used ExpertRN decision support software when gathering clinical data and forming triage recommendations from incoming patient calls.



Recommendations for emergency care, office visits, or physician advice were reviewed and modified by physicians, who could access to the electronic medical record and talk to the patient. We measured potential ED visits saved, and redirection of care from office visits to home care. Physicians, nurses, and appointment coordinators were surveyed about satisfaction with the process.

Results: Nurses logged 1008 symptom calls. Nurses gave 60 (6%) recommendations for emergency care, of which 45 (75%) were redirected to lesser acuity by physicians. Of patients triaged to lower acuity, one patient (2%) was subsequently admitted for a related condition. Nurses recommended 512 (51%) office visits and were indecisive for 293 (29%) calls. Eleven physicians logged 775 of these calls, and recommended visits for 372 (48%), home care for 403 (52%), labs or tests for 105 (14%), and prescriptions for 133 (17%). Nurses recommended home care or protocol treatment for 116 (12%) without secondary triage. Medical care and service delivery was judged by physicians and nurses as equal to or better than usual care, and they favored continued implementation of secondary triage. Conclusion: Secondary triage redirected calls away from the ED and office visits. Staff satisfaction with secondary triage was high. Further study is needed to look at patient-centered outcomes to assess whether or not patients sought emergency or office care outside the triage physician recommendations.

Keywords: utilization, decision support, inter professional, service

#### What Patients Expect from Mobile Device?

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The limitless penetration of mobile technology in everyday life has great potential to widen the spectrum of tools used for home monitoring of patients' health condition. However, the change of patients' habits to register their home monitoring data in mobile device instead of paper diaries seems to be quite a challenge.

The paramount condition of health data collection for the citizen is simplicity. Measuring of the blood glucose, blood pressure or pulse rate and writing the results on the paper diary is the golden standard for the patients with diabetes already for decades. It is a simple process and easily achievable. Planning, implementation and operation of mobile devices for home monitoring should follow the same principles – patients with chronic conditions assume that modern technology will not interfering their daily routines but would make data acquiring and communication with healthcare professionals simpler.

This presentation gives an overview of patients' expectations and opinions of using mobile devices for medical data collection based on the one year experience of home monitoring pilot (eMedic) of diabetic patients. The data are collected using questionnaire based on Kaplan 4C framework and SUS (System Usability Scale).

# Will a 6-week Telephone-based Physiotherapy Intervention Improve Quality of Life in Patients with Knee Osteoarthritis?

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Knee osteoarthritis (OA) results in poor quality of life (QoL). Tele-physiotherapy, which involves the use of telecommunications technology as a medium for therapeutic care appears not to have been explored among patients with knee OA.

This study was carried out to investigate the effect of a 6-week telephone-based physiotherapy programme on QoL of patients with knee OA. Fifty randomly selected patients with knee OA were assigned equally into two treatment groups; Clinic Group (CG) and Tele-physiotherapy Group (TG). The CG received thrice-weekly physiotherapist administered osteoarthritis-specific exercises in the clinic for six weeks while the TG received structured telephone calls thrice-weekly at home, to monitor self-administered osteoarthritis-specific exercises.

Participants' QoL was assessed using World Health Organisation Quality of Life-Bref Scale (WHOQoL-Bref). Assessment was done at baseline, second, fourth and sixth week of intervention.

Data were analyzed using ANOVA and Independent t-test. The mean ages of CG (54.96±7.81years) and TG (56.04±7.40years) were not significantly different. Within group comparison showed significant improvements in TG and CG's physical health domain of WHOQoL between weeks 0-4, 0-6, 2-4 and 2-6. The TG's psychological domain of WHOQoL showed significant differences between 0-4 and 0-6 weeks, while the CG's psychological domain of WHOQoL showed significant differences between weeks 0-2, 0-4 and 0-6. There were no significant differences in TG and CG's social relationships domain and environment domain of WHOQoL across baseline, 2nd, 4th and 6th week of intervention. Between-group comparison of CG and TG's showed that there were no significant differences between CG and TG's physical health, psychological and social relationships domains of WHOQoL across baseline, 2nd, 4th and 6th week of intervention. Between CG and TG's physical health, psychological and social relationships domains of WHOQoL across baseline, 2nd, 4th and 6th week of intervention. Between CG and TG's physical health, psychological and social relationships domains of WHOQoL across baseline, 2nd, 4th and 6th week of intervention. However, there was significant difference in the environment domain. Six-week tele-physiotherapy improved QoL in patients with knee OA, comparable to clinic based treatment.

Thus, tele-physiotherapy should be incorporated into the rehabilitation programme of patients with knee OA.

Keywords: tele-rehabilitation, quality-of-life, physiotherapy, exercise, osteoarthritis

# Zero Mothers Die: 100.000 Mobile Phones for Pregnant Women to Improve Maternal Health

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Mobile phone networks cover 96% of the world's population, with 77% of mobile subscriptions held by nearly 90% of the population in low- and middle-income countries. The impact of mobile phone technology on health can be far-reaching, cost-effective and replicable. With regards to maternal health specifically, mobile phone interventions targeting pregnant women have been associated with an increase in skilled birth attendance, which is one of the most important factors for saving women's lives during childbirth according to the World Health Organization (WHO), and the provision of prenatal care by linking pregnant women to healthcare providers when they can't otherwise reach healthcare facilities. Evidence shows that mobile health tools can help minimize time barriers and facilitate urgent care, as well as support health promotion and increase access to healthcare information through mobile messaging services. Zero Mothers Die is a global project envisioned by an innovative public-private partnership to support and empower all expectant and new mothers by employing a comprehensive approach to improving maternal, newborn and child health (MNCH) through the systematic use of mobile phones.



The project contains six main components: (1) MumHealth, a mobile messaging service delivering information to pregnant women through voice and text messages in local dialects; (2) Systematic distribution of 100.000 mobile phones per year to pregnant women to increase their access to healthcare information; (3) An allocation of 36.000.000 minutes of free airtime per year to pregnant women to enable their communication with local health workers and facilities; (4) Capacity-building of community health workers (CHWs) in rural communities using ICTs and tailored content; (5) A mobile money savings scheme to help finance and increase access to skilled care during childbirth; (6) A solar power business generation scheme to bring financial empowerment to pregnant women and provide sustainable energy to support the charging of their Mobiles. Zero Mothers Die is led by Advanced Development for Africa, the Millennia2025 Foundation and UniversalDoctor.

Keywords: maternal health, mobiles, pregnancy