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CONCURRENT SESSIONS ABSTRACTS

M1A BUILDING A STATEWIDE PROGRAM

M1A1
HOW TO BUILD A TELEMEDICINE NETWORK TO SUPPORT RURAL TRAUMA AND CRITICAL CARE

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Providing definitive care to severely ill or injured patients in rural communities can be hampered by lack of access to medical specialists. To address this problem in Vermont and Northeastern New York state, a telemedicine network was established to connect rural emergency departments to the level 1 trauma center. Telemedicine can be used to support rural communities. However the emergent nature of trauma and critical care requires a system design capable of providing medial services when and where they are needed. The Vermont Telemedicine Program has been successful in transitioning from scheduled events and consults to providing ad hoc support to rural patients needing access to specialty care at the level 1 trauma center. This implementation went through several phases before successfully becoming integrated into the process of care. This presentation will review the successes and failures encountered when implementing a telemedicine network for supporting critical care and trauma. Lessons learned will be presented along with case studies to illustrate the impact telemedicine can have on the quality and access of specialty care for rural patients.

M1A2
CENTER FOR DISTANCE HEALTH: TOWARD A STATEWIDE TELEHEALTH NETWORK

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The Center for Distance Health at the University of Arkansas for Medical Sciences (UAMS) facilitates innovative responses to the demands for dynamic, contemporary healthcare in the rural state of Arkansas. The Center for Distance Health is facilitating a unique collaboration between the states telehealth stakeholders to create a statewide telehealth network. There are three primary telecommunication networks in the state: the Arkansas Department of Health network, the Arkansas Division of Information Services network, and the UAMS network. Until recently, these networks were basically independent of each other. However, these stakeholders and several others around the state are working together to integrate these networks, supporting efficient and effective utilization of resources. Though a collaboration of this magnitude requires thoughtful facilitation, Arkansas has recognized the potential in telehealth to expand quality healthcare. The state is already benefiting from the award-winning ANGELS program, a partnership between UAMS and Arkansas Medicaid focused on high-risk obstetrics. The Center for Distance Health strives to eliminate disparities in healthcare. A statewide integrated clinical network is a huge step in the right direction.

M1A3
STATE OF AFFAIRS: ANSWERING KEY QUESTIONS ON STATES' TELEHEALTH NETWORKS

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M1B NEW APPLICATIONS FOR TELEPATHOLOGY

M1B1
A NOVEL WHOLE SLIDE IMAGE USER INTERFACE DESIGNED FOR ANATOMIC PATHOLOGY WORKFLOW

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The clinicopathological assessment of a patient by a pathologist entails the synthesis of contextually relevant information to arrive at a diagnosis. The incorporation of technologies such as whole slide images (WSI), into this workflow will require awareness of this information and its sources. We design and implement a novel WSI interface that presents WSI in clinical context.

Current anatomic pathology workflow was evaluated to identify information helpful to the analysis of the patient. This included obtaining information from the clinician, laboratory information system (LIS), slide, and microscope. Particular attention was paid to the visual scanning behavior at different microscope magnifications. Based on these observations, a novel browser-based application was created that presented contextually relevant information to the pathologist when needed.

Through iterative cycles of development and testing, an application was created that offered pathologists a WSI-based sign-out experience similar to conventional sign-out workflow. Pathologist feedback led to key changes in the application. The application integrated and presented information traditionally provided by the LIS, slide, and microscope.

Ethnographic considerations are important in the design of workflow-related WSI applications in anatomic pathology. Optimally designed user interfaces should allow pathologists to efficiently analyze clinically relevant information in the diagnostic evaluation of a patient.

M1B2
USING VIRTUAL TELEPATHOLOGY TECHNOLOGY TO TRAIN PATHOLOGY RESIDENTS

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We assessed eye movements of medical students, pathology residents, and pathologists examining virtual telepathology slides to determine if pathologists scan in definable ways that can be used to train novices on digital viewing. Readers are quickly attracted to regions of interest on virtual slides containing diagnostic information. There was a significant ($F = 36.063$, $p <$

0.0001) effect due to experience: pathologists generated the fewest saccades followed by residents, then students. There was a significant difference in saccade velocity ($F = 29.898$, $p < 0.0001$): the pathologist with the most experience had slower velocities than the other two pathologists. For saccade length there was a significant difference ($F = 54.761$, $p < 0.0001$): pathologists had the longest saccades followed by residents and students. For saccade distance there was a significant difference ($F = 11.975$, $p < 0.0001$): residents had significantly longer saccade lengths than pathologists or students. Pathologists spent significantly less time scanning virtual slides than residents or students, but had relatively prolonged saccades ($p < 0.0001$). Eye movement studies of scan-paths may be useful for developing eye movement profiles for individuals and for understanding the difference in performances between novices and experts viewing telepathology slides on digital displays.

M1B3

PATHOLOGIST COGNITIVE FACTORS MAY IMPACT TELEPATHOLOGY ACCEPTANCE AND PRACTICE INTEGRATION

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Despite studies describing pathologists'self-reported satisfaction with and acceptance of telepathology for use in day-to-day practice, widespread implementation is absent. Anectodal clinical observations support the idea that pathologist comfort level with use of telepathology is an important factor affecting implementation, with junior pathologists demonstrating higher comfort levels than experienced senior pathologists.

In order to test the hypothesis that a linear correlation exists between pathologist comfort level and experience level while interpreting cases composed of conventional glass slides compared to whole slide images (WSI), five subjects completed a self-administered, written questionnaire for each of 90 cases, indicating their assessment of case complexity and level of diagnostic confidence on ordinal scales and their diagnosis. Experience ranged from 12 years in practice to recently board certified in sub-specialty training.

Significant negative correlations existed between experience and case complexity and between case complexity and diagnostic confidence ($p = 0.01$). The mean complexity rating for cases examined solely by WSI tended to be higher for experienced pathologists.

These findings support a possible significant role for previously unexamined cognitive factors in pathologist acceptance of telepathology applications and their ultimate integration into practice.

M1C HOME TELEHEALTH FOR DIABETES MANAGEMENT

M1C1

TELEMEDICINE APPLICATIONS IN DIABETES DISEASE MANAGEMENT: A SYSTEMATIC REVIEW

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This study reviews the state of the art telemedicine applications in the management of Type I and Type II diabetes mellitus among children, adult, the elderly, and the pregnant population. The review focused on telemedicine interventions applying educational, diabetes self-management, and case anagement or diabetes home-healthcare programs to reflect on the practical value of telemedicine in diabetes management.

A systematic search of publications indexed by the National Library of Medicine's (NLM) PubMed database was performed using the search terms: telemedicine and diabetes to include all NLM publication types in English, without any date limits. Retrieved documents beyond the described review scope were excluded.

Majority of the studies reported improvement or significant changes in the efficacy of diabetes self-management, especially in glucose and HbA(1c) levels control. The most commonly applied technologies included self-reporting of iological data/meal patterns via telemedicine software, telephone, or web-based system, real time patient data for clinical decision support, medication dosage change, and for feedback to patients. The small sample sizes and short durations (3–6 months) of many of these studies may post concern over study reliability. The range of clinical efficacies reported was discussed in the light of practical implications to public health.

M1C2

HOME-BASED PROGAMS FOR MANAGEMENT OF DIABETES AND CONGESTIVE HEART FAILURE

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Using the 1982 current National Long Term Care Survey (NLTCS) data and the linked Centers for Medicare and Medicaid (CMS) historical billings file, this presentation will summarize the results obtained from studying NLTCS participants with chronic disease diagnoses of diabetes and congestive heart failure, their activities related to self-management of these conditions, and the use of acute care services by these participants.

Over a 15 year period of time NLTCS has collected data which includes variables on perceived health status, residence in the community, home health visits, hospitalization, physician visits, chronic conditions, level of daily activities, and nutritional patterns. This information, when analyzed in conjunction with the CMS historical billing data base for the same participants, provides correlations between a person's health status, health utilization patterns, cost of Medicare/Medicaid reimbursed services, and the rational for supporting telehealth.

The purpose of this paper will be to present data that will enhance our understanding of the relationship between disease management, health status in a community setting, and the utilization of healthcare resources supporting home telehealth self-management.

M1C3

COMPUTER-ASSISTED DECISION SUPPORT (CADS) FOR PRIMARY CARE OF DIABETES

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Explosive growth in the number of therapies for DM makes it extremely difficult for PCM's to maintain familiarity with available options and algorithms. A CADS system using data from memory meters, current medications, and clinical practice guidelines would be expected to improve quality of care. We have developed a CADS system prototype which automatically interprets glucose profiles, prioritizes problem areas, and recommends changes in existing treatments. Therapeutic algorithms were developed by a focus group of endocrinologists and PCM's interpreting blood glucose patterns from patients with diabetes. The CADS system receives input from: (1) An on-line patient

module in which glucose data are uploaded, and medication history, schedule for glucose monitoring, and meal times are verified. Patients have access to graphical and statistical displays but not interpretations or recommendations; (2) A customizable administrator module which includes formulary information, a set of regimens and rules for warnings; (3) A customizable provider module which sets treatment goals, target glucose ranges, and glucose monitoring schedules. This module displays the data analysis and recommended changes in treatment. The CADS system has been integrated into an existing web-site compatible with all glucose meters (www.HealthSentry.net). Processes for further development, testing, clinical trials, and implementation will be presented.

M1D USING TECHNOLOGY FOR TELEMEDICINE PROGRAMS

M1D1
USING TECHNOLOGY TO BUILD AN EARLY INTERVENTION COMMUNITY OF PRACTICE

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The University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, NC

Telecommunications and internet-based resources can play an integral role in creating a community of practice among professional serving the early intervention community. This presentation describes how an academic rehabilitation program has combined with eleven service agencies serving children with special needs in Wake County, North Carolina to establish an interdisciplinary telehealth network.

This network combines the collaborative expertise of its participants through a website, listserv, and electronic newsletter. Real-time video conferencing units housed at each service agency have improved the quality of, and increased access to specialized services for young children with disabilities, their families, and those who serve them.

Since December 2005, twenty video clinics, seven video consults, and ten networking/professional development sessions have been conducted involving children, parents, therapists, physicians, and early intervention personnel—offering a coordination of care unavailable through traditional service delivery models. Listserv postings and electronic newsletters serve as communication tools to share best practice models, new research in pediatric rehabilitation and care, and programmatic updates.

This presentation will discuss the definition of a community of practice, technical and practical challenges to establishing and maintaining this network, lessons learned from the project, and its potential applications for statewide and national early intervention models.

M1D2
TELECOMMUTING TO VIRTUALLY MANAGE A TELEMEDICINE PROGRAM USING ADVANCED COMMUNICATIONS

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Driscoll Children's Hospital, Corpus Christi, TX

Driscoll Children's Hospital located in Corpus Christi, Texas, supports telemedicine clinical consultative services and a distance education network using high speed networks and advanced diagnostic tools. The hospital has forged new territory by hiring its first truly virtual employee to manage this 33 county International Telemedicine network. The program director lives over 1600 miles away in North Carolina and manages the day to day operations via a consumer level broadband cable connection in the home. A video conference system, fax, phone, and web portal are used to support this telecommute. While telemarketing, freelance writing, and computer programming are obvious fits for telecommuting, managing people, technologies, and building virtual relationships within a clinical environment has been a true test for developing and maintaining a successful telehealth program in South Texas and Mexico. This unique telecommute model is over two years into operation and has been deemed a success by all parties.

This session will cover the technology, benefits, and inherent challenges associated with virtually managing a telemedicine program in a rural and large geographic area which crosses a US border into Mexico.

M1D3
TECHNICAL INNOVATION IN THE CREATION OF CANADA'S LARGEST TELEMEDICINE NETWORK

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Ontario Telemedicine Network, Toronto, Canada

Ontario's Telehealth organizations have recently undergone a major transformation. CareConnect, North Network and Video Care have merged into a single entity thereby creating the largest, integrated Telemedicine network in Canada. The new organization, called Ontario Telemedicine Network (OTN), now serves 12 million people spread over 1 million square kilometers. OTN's technical team now manages more than 700 videoconferencing end-points supporting over 30,000 clinical encounters and 6,000 multipoint/gateway sessions annually.

To meet the challenges of integrating three independent networks and of scaling to these large volumes, OTN engaged in a year-long planning and implementation program. Privacy and manageability targets were address by standardizing on a VPN-over-MPLS network. Reliability and security requirements were addressed by centralizing core IT assets in a data centre and by introducing dual-redundancy to key service components. Telemedicine scheduling software was upgraded to enhance performance and key features were introduced to allow thousands of end-users to self-schedule clinical, educational and administrative events. Finally, end-user technical service was enhanced by the adoption of elements of the ITIL framework and the creation of a geographically dispersed, but logically centralized Technical Service Desk.

Achieving the business objectives of the merger would have been impossible without state-of-the-art technical infrastructure. This presentation will detail the major challenges, will overview the resulting service architecture and will relate the lessons learned in the process.

M1E CROSS BORDER PEDIATRIC TELEMEDICINE

M1E1
DEVELOPMENT AND MAINTENANCE OF AN INTERNATIONAL TELEMEDICINE PEDIATRIC PROGRAM—UPDATE

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This paper will present in detail, the 4 year development of an international pediatric telemedicine network between South Texas, Mexico and several other countries. Our hospital is the only Regional, Pediatric Tertiary Care Hospital in South Texas.

Geography and shared cultural roots have played a strategic

role early on in establishing this network initially for distance learning and Grand Rounds; however a strong marketing plan has propelled it forward to now involve physician and patient consultations, nursing education and even job interviews.

The network consists of videoconferencing systems with plug-ins over ISDN, the Internet, and Internet 2 with bridging from our hospital. Connectivity is to state children's hospitals as well as other teaching hospitals in Northern and Central Mexico. We have also supported remote consultations via satellite and videophone for specific projects.

Currently, this project is supported by private funding and government grants. A thorough discussion of pitfalls, lessons learned, funding and sustainability will be presented.

M1E2

INTERNATIONAL TELEMEDICINE: DEVELOPING A MODEL FOR A GLOBAL PEDIATRIC PRACTICE

Craig Sable, MD, FACC, Molly Reyna, BA, Oussama El-Baba, MHA, Gerard Martin, MD, FACC
Children's National Medical Center, Washington, DC

Children's National Medical Center (CNMC) receives numerous in-patient referrals and second opinion requests from international hospitals every year. We report a model to enhance international referral services and assess the financial sustainability of a global pediatric practice.

CNMC has established clinical referral relationships with approximately 30 countries around the globe. Referrals include remote patient assessment, second-opinion cases, physician consultation and transport to Washington, DC for inpatient surgical services. Historically, these services were provided through exchange of information via phone, fax, mail, and through care provided onsite at the referral hospital. In our new model, telemedicine links were established in 5 referral centers in 5 different countries. Requested services include cardiology, neuro-oncology, and pre and post-surgical consultation.

Telemedicine interaction includes live video conferencing and electronic patient data transfer. Telemedicine is offered as an enhancement to current services, and has increased our second-opinion cases while leading to better management of our surgical transfer patients. We measure physician and parent satisfaction, and increased revenue as a result of telemedicine.

M1E3

TELE-EDUCATION IN NORTH AFRICA: U.S./MOROCCO PARTNERSHIP FOR CHILDREN'S HEALTH

Molly Reyna, BA,[1] Craig Sable, MD, FACC,[1] Najia Hajjaj-Hassouni, MD,[2] Nezha Mouane, MD,[3] Philip Hopkins[1]
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Millions of children in the developing world die or become disabled each year from preventable diseases and their complications. Lack of access to basic health education and training is at the forefront of this problem.

Children's National Medical Center (CNMC) in Washington, DC partnered with the Rabat Faculty of Medicine and Pharmacy and the Hôpital d'Enfants Rabat, to establish an international pediatric tele-education network. Funded by the Mosaic Foundation in 2005, the two-year project focuses on improving health education, technology and healthcare staffing, critical components to improve the level of care available in the region. Network links established between Washington, DC, Rabat and Casablanca enable live lectures, archived and streamed content, and patient data transfer. To-date, we have successfully captured 50+ pediatric board review videos with PowerPoint presentation and translated the content into French, which is the preferred language for education in Morocco. Requested topics include nutrition, gastroenterology, cardiac care, and mother-child health.

Physicians and technical staff have created an effective partnership, and continue to develop technical infrastructure and educational offerings. Project outcome measurements include: improved access to health information, decrease in provider isolation, and children with critical diagnoses have improved outcomes.

M1F DESKTOP TOOLS

M1F1

MODELING OF CONTENT-BASED IMAGE RETRIEVAL TOOLS FOR DERMATOPATHOLOGY APPLICATIONS: "DIAMOND" SOFTWARE

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We have recognized significant opportunity to create transformational diagnostics support for medical imaging utilizing Intel's Diamond software. It allows for efficient and rapid searching of large image sets for features that would help create knowledge out of image features "locked away" in digital imaging archives in dermatopathology. Diamond's storage architecture for "early discard" in interactive searches makes possible for the real time interrogation of virtual slides and other digital images of diagnostic biopsies utilized in the detection of biopsies of pigmented lesions. Creating open source toolkits that would allow for the efficient searching of these images for the purpose of computer assisted diagnostics would significantly improve the quality of care delivered.

Herein we present early data revealing the feasibility of such an application, with detailed workflow analysis and potential applications and deployment strategies. Although virtual slides promise to deliver new level of care in digital pathology, it is important to outline that today, an application is defined by ease of use and speed of acceptance.

We have conducted study investigating the needs and ideal interface characteristics for application of interactive computer-assisted diagnosis (ICAD) tools in dermatopathology. We also examine potential applications of this interface in diagnosis, education and quality assurance.

M1F2

DATA VISUALIZATION AUTHORING AND DISPLAY TOOLS FOR PATIENT DATA REVIEW

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Current clinical information systems typically present patient data by the source of the data and require the clinician to individually request and mentally integrate this data to discern patterns that span data sources. This requirement places unnecessary cognitive burdens on the clinicians and makes patient data review more difficult and time-consuming. This presentation will describe the Intelligent Patient Data Review Assistant (IPDRA), a web-based, intelligent user interface that enables clinicians to

visualize interactive, high-density graphical reports, or views, of clinically-meaningful subsets of the patient's history. For example, views could display data relevant to medical problems, body systems, or demographic groups relevant to the patient. This system uses a data visualization library, called DataMontage, that displays information-dense collections of timelines, time-series graphs, and time-stamped notes. This presentation will describe the software's capabilities and their application to prototype an initial set of views for diabetes, hypertension, and the cardiac system. We will discuss various methods for designing views based on clinician input and on standard clinical guidelines. We will also discuss data visualization features added to support interactive exploratory analysis, and wizard-based authoring tools designed to enable rapid view specification by clinicians.

M1F3

EVALUATION OF DESKTOP SHARING TO SUPPLEMENT HEALTHCARE EDUCATIONAL VIDEOCONFERENCES

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Image quality is essential for effective videoconferencing. Poor image quality occurs when multiple images are viewed simultaneously at low resolutions. However, communication during educational sessions is facilitated by the concurrent viewing of both participants and presentations. We wished to determine whether using a desktop sharing application for slide transmission would reliably improve image quality, and enhance participants' perceptions of educational videoconferences.

A desktop sharing application was selected (Bridgit™) and evaluated over twelve weeks. Subjects (n = 20) were gastroenterologists from three Canadian hospitals attending established, weekly, discursive, videoconferences. High resolution pathology, endoscopy and other medical images were simultaneously viewed using Bridgit™. Data was collected primarily through a self-report questionnaire designed for the study.

1) Quality - 91% of participants rated Videoconference and Desktop image synchronousness as very good/excellent. 84.3% detected no distorted slides. 76.9% detected no disconnections. 2) Access - Attendance throughout the pilot was greater at the remote sites (58.2%). 3) Acceptability – 97% of participants preferred desktop augmented videoconference over non-augmented events. 4) Cost - Startup costs were negligible at participating hospitals.

This study strongly suggests that the use of desktop sharing to supplement videoconferencing is a technically reliable intervention that enhances healthcare collaborative education sessions.

M2A REMOTE ROBOTICS AND SIMULATIONS—SESSION 1

M2A1

TELE-TRAUMA PARTICIPANT IMPROVES TRAUMA TEAM PERFORMANCE ON SIMULATED TRAUMA SCENARIOS

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Victims of trauma in rural areas are nearly twice as likely to die of those injuries than patients with similar injuries in urban areas. The low volume of seriously injured patients in rural areas and subsequent lack of experience by emergency practitioners may contribute to this discrepancy. The goal of this study is to show how simulations of trauma scenarios with and without a trauma center emergency attending physician (TCEAP) tele-trauma participant may increase experience and show possible areas of improvement in rural trauma team performance.

Eleven emergency medicine residents participated in 2 trauma scenarios each using the SimMan® Human Patient Simulator with and without a TCEAP participating in the resuscitation through synchronous videoconferencing supported in the trauma room by a wireless roll-about unit (Veraview/HealthCare Technologies). Trauma team performance was scored using the method of Holcomb (2002) based on 41 performance indicators in 5 categories of ATLS guidelines.

Trauma team performance scores improved with TCEAP participation vs. without (44.24 vs. 39.02) while timed performance indicators were equivalent.

A model of tele-trauma scenarios using a Human Patient Simulator can be used to show potential trauma team performance benefits for severely injured patients in a rural setting.

M2A2

INTEGRATING MOBILE ROBOTIC TECHNOLOGY FOR A TELE-STROKE APPLICATION: SUCCESSES AND CHALLENGES

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Johns Hopkins Medicine, Baltimore, MD

The State of Maryland has begun to consider legislation mandating that all patients presenting with symptoms of an acute stroke be treated at a designated 'Stroke Center'. As of September, 2006, only 3 centers in the state have reached that designation.

Johns Hopkins Medicine has implemented a tele-stroke program in an effort to meet the growing demand of this specialty service, particularly at its affiliated primary care hospital Howard County General Hospital, as well as alleviate some of the resource pressures that currently faces its own Stroke Team. Johns Hopkins Medicine recognizes that integrating technology to provide remote services and meet the demand is the most efficient and effective.

In August, Johns Hopkins Medicine became one of the first stroke centers in the country to apply mobile robotic technology to manage acute strokes in the Emergency Room. This technology was first approached with skepticism, but its flexibility in the Emergency Room environment allowed it to be an appropriate solution.

This presentation will describe the technology implemented, the internal and external challenges in acceptance and deployment, and the business case and model being implemented at regional community hospitals, as well as at the Hopkins International affiliates.

M2B HUMAN FACTORS—APPLICATIONS FOR DISTANCE MEDICAL EDUCATION

M2B1

MOTIVATIONAL TELEHEALTH MODEL FOR THE MANAGEMENT OF CHRONIC DISEASES

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Life Supporting Technologies - Universidad Politécnica de Madrid, Madrid, Spain

Prevention of chronic diseases and compliance with treatments are big issues that need to be solved if we want systems to progress accordingly to policy plans and with a modern society.

Personalized prevention information provides users and their environment with tools to manage their healthcare and chronic conditions with staying out of the healthcare loop. Education and empowerment of users are fundamental to provide them with a supportive environment and tools that allow them to respond and react to situations that can be handled with basic training of users. Hence the number of unnecessary medical calls to doctors can be dramatically reduced.

We have implemented a model able to provide tailored information that allows individuals manage their care plan and answer relevant questions from home. In order to build the system, we followed a methodology based on information tailoring and collaboration with healthcare professionals to map a medical intervention. The model provides personalized information according to the stage of both healthcare and technology attitude. To test the model, an e-health tool was developed and evaluated.

This tool is regarded as a potential use of ICT for a paradigm change in the promotion of healthcare. It's currently being deployed in two pilots and the healthcare community and professionals who have tested it and argue it could be developed to satisfy other primary prevention initiatives (i.e. care during pregnancy, infectious disease prevention, injuries, etc).

M2B2
HELPING PROVIDERS ADOPT NEW SYSTEMS FASTER: COMPARISON OF TRAINING MODELS

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Lack of user adoption is cited as the primary cause of 70% of failed enterprise application projects.

One of the nation's largest providers of outpatient surgery, diagnostic imaging and rehabilitative healthcare services, operating facilities nationwide purchased an enterprise radiology application. Their challenge was to develop an effective and efficient certification process for over 1,500 employees in 91 locations.

Three training models were utilized: traditional training (TT) included 4–12 hours of passive demonstration at offsite location, onsite certification training (OC), and onsite certification plus online simulations (OC+S). Certification of a facility was defined as each employee, based upon their role, being fluent in the subject application- a dramatic shift from traditional training models.

The length of time to reach proficiency was compared among the three groups. The average time to proficiency in the TT group was 40 working days, in the OC group was 10 working days, and in the OC+S group was 5 working days.

Onsite certification is feasible, dramatically reduces the cycle time to proficiency for each employee based upon role, and delivers a fully functioning facility utilizing the system within the designed workflow. This technique should be further investigated to overcome the challenges of poor adoption.

M2C TELEHOSPICE CASE STUDIES

M2C1
A VIDEOPHONE INTERVENTION WITH IN-HOSPICE CAREGIVERS: CLINICAL OUTCOMES

Debra Parker-Oliver, MSW, PhD,[1] George Demiris, PhD,[2] Brian Hensel, PhD[1]
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The purpose of this study was to test the usefulness of videophones as a communication tool in hospice for caregivers. The underlying hypotheses are that videophones are a feasible tool for service delivery and allow for the potential development of an effective low cost intervention tool that can decrease anxiety of caregivers, and improve their quality of life. Measures included the State Trait Anxiety Inventory (STAI), and the Caregiver Quality of Life Index – Revised (CQLI-R). Caregiver perceptions and technological feasibility were assessed using observations and selected caregiver interviews. A total of 19 caregivers and their patients were recruited. Seven caregivers were female and twelve were male. The average age of caregivers enrolled in the study was 69.8 years. Findings indicate that the anxiety score significantly decreased ($p < 0.05$) for participants after experiencing the intervention. Differences in quality of life scores are not statistically significant. Overall, caregivers perceived the videophones as useful and as a communication tool that provided ease of mind. This pilot study demonstrates that the use of videophones in hospice care is feasible and promising as a tool that can enhance communication and reduce anxiety. The study lays the groundwork for clinical trials that will investigate the clinical outcomes resulting from interventions using telehospice technologies.

M2C2
REDUCING CAREGIVER AND FAMILY BURDENS THROUGH TELEHOSPICE CARE

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The mid-Michigan telehospice venture is a research project designed to install POTS-based videophones in patient homes to improve the quality of care while reducing burdens on healthcare providers and family members. Researchers hypothesize that improved patient communication and access will reduce burdened feelings among healthcare workers and families, and that increased contact with various caregivers will improve patient satisfaction with hospice care.

In addition, the project served to train healthcare providers—doctors, nurses, and counselors—and volunteers within a large regional health system to prepare them for future applications of telemedicine.

Data point out that patients enjoy using the videophone equipment and appreciate the augmented access to their care providers. Once they have gained a level of comfort with the technology, healthcare workers reported favorable impressions of the equipment when used for regular contact and scheduling visits. In addition, the videophones increased the amount of information able to be collected during regularly planned daily calls to home hospice patients.

Future research could examine the benefits of instituting a similar system as broadband connections become more prevalent in developed as well as rural environments.

M2D TELEMEDICINE IN INDIA: THE ROLE OF THE INDIAN SPACE RESEARCH ORGANIZATION

M2D1
INDIAN TELEMEDICINE PROGRAM: MARCHING TOWARD TRANSFORMING NATIONAL HEALTHCARE DELIVERY SYSTEM

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Indian Space Research Organisation (ISRO), Bangalore, India

Providing healthcare to over one billion people spread over 3.2 million sq km is a daunting task for a developing country like India with 75% of the population living in rural and inaccessible areas.

Indian Telemedicine programme primarily spearheaded by ISRO and supplemented by other government, private and Trust agencies is aimed at augmenting the healthcare delivery system of the country to take the benefits of modern medical care to the grass-

roots of the society. How such an accepted application and utilisation are made possible and what are the directions for a successful management of such programs from concept to completion? What is the outcome of the programme and where is it poised to go?

ISRO demonstrated the efficacy, utility and ease of operation to several stake-holders through proof of concept technology demonstration pilot projects in several states. ISRO's thrust in the programme focuses on providing technology & connectivity for (a) tele-consultation (b) continuing medical education (c) mobile telehealth (d) disaster management support. Technology development and utilisation and efforts.

The SATcom network presently consists of 165 Patient Ends connected to 35 Speciality Ends with more than 100,000 Tele-consultations and few life saving instances. More than 70% of the patients surveyed have revealed a direct Cost Saving to the tune of 81%, in addition to the savings/relief in terms of the reduced travel and thus, the mental and physical strain avoided.

Indian Telemedicine initiative is poised for a national implementation by the health ministry by formulating policies and framework for bringing telemedicine into the mainstream of healthcare delivery system. The paper discusses the model set by Indian Space Agency detailing the efforts in innovative procedures, administration, technical, managerial and financial aspects of the programme.

M2D2

NATIONAL TELEMEDICINE/E-HEALTH GRID: TOWARD IMPROVING HEALTHCARE DELIVERY IN INDIA

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[1]Indian Space Research Organisation, Bangalore, India; [2]Ministry of Health and Family Welfare, New Delhi, India

It is a daunting task to provide healthcare to over one billion people of India spread over 3.2 million sq.km., with 75% of India's population living in rural areas and 75% of doctors practicing in urban areas. Indian Telemedicine programme primarily spearheaded by Indian Space Research Organisation (ISRO) has made significant impact in the formation of a National Task Force (NTF) by the government with the objective of evolving a National Telemedicine Grid (NTG) and the e-Health policy framework in the country.

The NTG conceived by a technical working group to channelise the health information database and interconnect the Islands of Skills (specialists, administrators, managers) with the Mainland of Needs (the patients, the beneficiaries).

The NTG is configured into: (a) Telemedicine/e-health network connecting around 600 district hospitals, 50 speciality hospitals, 100 medical colleges and training institutions and (b) an e-Health Web Portal as a repository of information by the Health Ministry. The NTG is to be configured predominantly with the SatCom connectivity with wireless technologies and the state of the art digital systems.

The concept of NTG is slated for implementation by the Ministry of Health & Family Welfare (MoH&FW) during the coming years. The paper discusses the various aspects considered by the technical working group and the suggested configuration of the Indian NTGand its implementation aspects.

M2E LEGAL AND FINANCIAL ISSUES FACING TELEMEDICINE

M2E1

NATIONAL TELEHEALTH RESOURCE CENTER ON LEGAL AND REGULATORY ISSUES

Robert J. Waters, JD, Jackie Eder-Van Hook, MS, Joseph Tracy, MS, Rob Sprang, MS

Center for Telehealth & E-Health Law, Washington, DC

This 1-hour session will introduce the National Telehealth Resource Center on Legal & Regulatory Issues. It will be an opportunity to describe the new Center, goals, and timelines. It will also solicit input from the attendees about the type of information they might seek from a National Telehealth Resource Center.

M2E2

LICENSURE PORTABILITY INITIATIVES IN NURSING

Kristin A. Hellquist, BA, MS, Kevin Kenward, PhD

National Council of State Boards of Nursing, Chicago, IL

NCSBN began work with the member boards of nursing on the idea of nurse licensure portability in the 1990s. To-date, 23 states are a member of the Nurse Licensure Compact (NLC) and six years worth of experience has taught boards of nursing about portability of licensure issues. NCSBN worked with the Gallup Organization on a formal evaluation of the NLC in 2006, and has perspectives to share from NLC members and non-members and nurse themselves on this portability of nurse licensure initiative.

This evaluation affirmed several important facts about benefits of the NLC: (a) The members of the NLC found tremendous value in belonging to the NLC, citing increased collaboration among regulators, and a true benefit to the publics they serve. (b) Nurses overwhelmingly supported the idea of all states belonging to the NLC. (c) Increasing mobility by nurses, which gave better access to nurses in times of telehealth, disaster or other needs. (d) Increasing the speed that nurses can be hired and allowing for rapid licensure verification. Additionally, the evaluation highlighted opportunities for improvement regarding the NLC: (a) Boards of Nursing (BoNs) wanted more direct information from the Nurse Licensure Compact Administrators (NLCA) regarding the operations, administration and the costs associated with joining and maintaining NLC-membership. (b) BoNs want detailed information surrounding discipline, investigations and data sharing issues. (c) Call for increased education of BoN staff, licensed nurses and other stakeholders regarding the NLC and its operation was also a recurring comment in the evaluation. A survey finding correlated to this request was that 50% of surveyed nurses erroneously thought they were part of the NLC, even though they did not reside in a NLC state.

This presentation will allow the telehealth community to hear directly from NCSBN related to licensure portability and its future.

M2F ASSESSING INTERNET TOOLS FOR CARDIAC PATIENTS

M2F1

KANSAS CITY CARDIOMYOPATHY QUESTIONNAIRE IN WEB-MANAGED CONGESTIVE HEART FAILURE PATIENTS

Abul Kashem, MD, PhD, Marie Droogan, RN, William P. Santamore, PhD, Carol J. Homko, RN, PhD, Joyce W. Wald, DO, Philip Berger, BS, Alfred A. Bove, MD, PhD

Abul Kashem, Philadelphia, PA

Improving health-related quality of life (HRQL) is a primary goal in the treatment of patients with congestive heart failure (CHF), yet few studies have explored correlates of HRQL among CHF patients using a Web-based Telemedicine System. We report on the association of demographic and pathophysiologic measures, social-cognitive measures, and environmental variables with HRQL as measured by the Kansas City Cardiomyopathy Questionnaire (KCCQ) for patients with chronic heart failure (CHF).

Data were obtained from the baseline interview and electronic medical records of 44 patients, 50 years of age and older who were enrolled during the first 12 months of a Web-based

Telemedicine CHF disease management study. Mean age was 53.2; 72.2% were male; 38.9% were black; and the mean New York Heart Association class was 2.3. KCCQ measures of symptom stability trended lower in control patients when compared with web-communicated patients (C-28.1%; Web-32.0%; $p = 0.12$). Overall quality of life dropped in both group and the fall was greater in the control group (16.3% vs. 2.2%; $p = 0.02$). Overall clinical summary was improved in the web-communicated patients (Δ0.64% vs. 3.47%; $p = 0.01$).

Quality of life measurement by KCCQ in heart failure shows some benefit of a telemedicine disease management communication system.

M2F2
INTERNET TELEMEDICINE SYSTEM COMPLIANCE AMONG INNER CITY PATIENTS WITH CVD RISK FACTORS

Michele M. Masucci, PhD,[1] Caroline Guigar, MA,[1] William P. Santamore, PhD,[2] Carol Homko, PhD,[2] Alfred A. Bove, MD, PhD[2]
[1]Information Technology and Society Research Group, Temple University, Philadelphia, PA; [2]Temple Telemedicine Research Center, Temple University, Philadelphia, PA

This paper analyzes compliance patterns among inner-city patients using an Internet telemedicine system to manage risk factors for CVD. The patient population included 79% African-Americans, 7 % Hispanics, 49% females; 66% unemployed and 49% with annual incomes under $15,000 – all had 10% or greater CVD risk (Framingham 10 year risk score). An analysis of the first 91 days of compliance shows that 82% used the system at least once, and 57% met or exceeded the recommended weekly use of the system. Average training scores based on a 5 point Likert scale for 14 basic computer skills and use of the Internet telemedicine system were positively correlated ($r = .28$) with the number of times the Internet telemedicine system was used. Little variation in non-compliance was found among men and women; however, high compliance (defined as using the system more than the recommended once-per-week) was stronger among men (12%) than women (4%), even though nearly 30 percent of both scored 4 or higher averages for 14 basic computer skills. We conclude that training is critical for mitigating digital divide barriers impacting system use among inner-city patients, and that more attention needs to be paid to the circumstances shaping compliance among women.

M3A REMOTE ROBOTICS AND SIMULATIONS—SESSION 2

M3A1
DESIGN OF A ROBOTIC HIFU SYSTEM FOR BATTLEFIELD TRAUMA CARE

Jason Wheeler, MS,[1] Stephen P. Buerger, PhD,[1] Ralf Seip, PhD,[2] Narendra T. Sanghvi, MS,[2] Ronald Marchessault, Jr., MBA[3]
[1]Sandia National Laboratories, Albuquerque, NM; [2]Focus Surgery, Inc., Indianapolis, IN; [3]U.S. Army Medical Research & Materiel Command, Telemedicine and Advanced Technology Research Center (TATRC), Fort Detrick, MD

A remotely-operated system for cauterizing internal and external wounds could save lives in battlefield trauma care and disaster response. A robotic High Intensity Focused Ultrasound (HIFU) system for vessel cauterization was designed for this purpose. The system consists of a robotic manipulator, a detachable actuated end-effector housing a HIFU applicator and imaging transducer, and a HIFU therapy planning and control strategy, and is designed to be compatible with the Army's Critical Systems for Trauma and Transport (CSTAT). Robotic design of such systems is challenging because safe and intimate physical interaction with humans is required, the environment is uncontrolled, and position must be accurately controlled relative to the wound location. An intrinsically-backdrivable commercial manipulator was selected, permitting safe human contact. The manipulator places (and later retrieves) the end-effector in the appropriate location on the patient. The end-effector attaches to the patient using a suction mechanism and precisely servos the HIFU applicator and imaging array during diagnosis and treatment, which are performed under local or remote control using ultrasound imaging, Doppler, and video feedback. The applicator is capable of cauterizing vessels from the surface to a depth of 70 mm. Design is complete and prototype development continues in a Phase II effort.

M3A2
INTEGRATION OF SERPENTINE MANIPULATORS TO A LIFE SUPPORT FOR TRAUMA AND TRANSPORT UNIT

Sylvain Cardin, PhD,[1,2] Anthony Kolb,[1] Michael Schwerin,[1] Benjamin Brown,[1] Troy Turner,[1,2] Gary Gilbert, PhD,[1,2] Howie Choset, PhD[1]
[1]U.S. Army Medical Research & Materiel Command, Telemedicine and Advanced Technology Research Center (TATRC), Fort Detrick, MD; [2]Carnegie Mellon University, Pittsburgh, PA

An earlier study conducted by Carnegie Mellon University in collaboration with the Telemedicine and Advance Technology Research Center (TATRC) explored opportunities to further advance the Life Support for Trauma and Transport (LSTAT) to a next generation through the addition of interfaces to advanced medical technologies, including robotics, information systems, sensors and other medical devices. A key finding and recommendation was to augment LSTAT with robotic manipulators.

Here we present the integration of a light-duty serpentine manipulator that can position a camera and physiologic sensors enabling observation and detailed inspection of a patient by a remote physician. With minor modifications to its control system and an end-effector that allows it to pick up other tools, the same robot arm can also provide additional functionality, acting as a modular component to the LSTAT. Possible tools that could be use by the manipulator include ultrasound probe, needle guide, antiseptic and antibiotic sprays and high intensity focused ultrasound. In case of hemorrhagic patient, for example, this new device will allow rapid remote intervention if necessary. The integration of this new modular serpentine/LSTAT device to our robotic patient recovery trauma pod program will improve the chance of saving life in the battle field.

M3A3
THE TRAUMA POD: A TELE-OPERATED SURGERY SYSTEM

Pablo Garcia,[1] Mark Noakes,[3] Chetan Kapoor,[4] Tim Ganous,[1] Greg Elbert,[2] Michael Treat,[6] Jacob Rosen,[1] Matt Hanson,[1] Joe Manak,[1] Chris Hasser[5]
[1]SRI International, Menlo Park, CA; [2]General Dynamics Robotic Systems, Westminster, MA; [3]Oak Ridge National Labs, Oak Ridge, TN; [4]University of Texas, Austin, TX; [5]Intutitive Surgical, Sunnyvale, CA; [6]Robotic Surgical Technologies, New York, NY

The purpose of this research is to develop a rapidly deployable system, the Trauma Pod, that can perform surgical interventions, tele-operated by a remote surgeon, upon casualties who may otherwise die of blood loss or lose limbs before reaching treatment.

We have prototyped a system capable of operating on a patient phantom through tele-operation and supported by semi-autonomous manipulators that perform the functions of the scrub nurse and the circulating nurse. The system demonstrates the feasibility of performing a surgical procedure with no humans in the operating room. The speed of the nursing tasks involved,

such as tool changes or supplies deliveries, is comparable or faster than that of humans. Tracking and counting of the supplies is performed automatically.

The use of robotics in the operating room has been limited to a surgical robot. Some of the support functions, such as the circulating nurse and the scrub nurse, can be automated to avoid the need for humans in the operating room. This capability can minimize the need for deployment of medical personnel to high-risk situations or act as a force multiplier to increase patient throughput using existing surgeon and nursing resources.

M3B GAINING CLINICIAN ACCEPTANCE OF TELEMEDICINE AND RELATED SERVICES

M3B1
MAKING PHYSICIAN-TO-PHYSICIAN COMMUNICATIONS EASY WITH NEW ICTS

Giselle Ricur, MD, María G. Batiz, IT Eng, Roberto Zaldivar, MD, Hugo Micarelli, Matías A. Valdivia, SA, Luis A. Arcuri, DBA
Instituto Zaldivar, Mendoza, Argentina

This presentation reports on the use of new applications over IP that have impacted on the way physicians work and communicate with each other regardless of their geographical location.

In order to facilitate instant communication (audio-video) between the attending and consulting physicians at the different Institutional sites, the use of video network cameras, remote computer access software (RCAS) and VoIP telephony was implemented. The slit lamps were fitted with dynamic IP video cameras, and the MPEG-4 images were projected onto the PC's screen. The RCAS enabled both the attending and consulting physician to have complete control of the PC and see the still-images or video, regardless of their location. Videoconferencing capability was assured by VoIP freeware. Therefore, real-time consultations could take place on-demand, avoiding unnecessary patient or physician transfer between rooms, floors or buildings.

These applications have empowered our eye care basically by enhancing the efficiency and productivity of our daily work. The fact that these tools run over IP has also helped bring down the operational costs. Therefore, they have enabled us to continue providing high quality eye care services for our patients, regardless of the geographic or time barriers of both physicians and patients.

M3B2
ASSESSING THE DECISION TO UTILIZE TELEMEDICINE: THE REFERRING CLINICIAN'S PERSPECTIVE

Ana Maria Lopez, MD, MPH, FACP,[1] Claudia L. Chavez, BS, BA,[2] Elizabeth Krupinski, PhD,[1,2] Ronald Weinstein, MD[1,2]
[1]*Arizona Telemedicine Program, Tucson, AZ;* [2]*University of Arizona, Tucson, AZ*

The Arizona Telemedicine Program (ATP) is a large multidisciplinary telemedicine program housed in the southwest. The Program has served as a resource for both adult and pediatric specialty consultative services. Although some of these sites have utilized telemedicine for nearly 10 years, how the decision is made to refer the patient to telemedicine consultation is not well understood.

We hypothesize that experience with telemedicine is likely correlated with increased utilization. In addition, other factors that may influence this decision include concern regarding reimbursement, clinical time pressures, and lack of comfort with the technology.

The ATP recently initiated a web-based survey of their users. Users were randomly selected to receive an e-mail invitation to participate in an IRB approved self-administered survey. Participants were asked to describe their exposure to and experience with telemedicine as well as their interest in teleconsultations and perceived benefit.

Demographic data and responses were immediately entered into a database. Data were analyzed with standard statistical correlations. Models were created to enhance our understanding of the decision-making process.

This presentation will discuss the models developed and their impact on future telemedicine work in the communities served.

M3B3
HYPERTENSION ONLINE MANAGEMENT: IDENTIFYING KEY FACTORS FOR PHYSICIAN ADOPTION

Alice J. Watson, MBChB, MRCP,[2,3] Alastair G. Bell, BMChB, MRCP, MBA,[1] Joseph Kvedar, MD[1,3]
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Managing elements of hypertension online offers the potential to deliver both higher quality and more efficient care. Technologies already exist to facilitate patient self-monitoring, secure email communication with providers and online risk assessment. Physician reluctance, however, has stalled widespread adoption of these tools. We carried out an online survey of 53 physicians and a series of 10 in-depth interviews to identify critical factors required for successful implementation of e-health services.

Current usage of online tools was very variable. Although 50% of physicians surveyed used email to communicate with patients, patient demand generally drove this activity. While physicians identified many aspects of hypertension care amenable to online management they argued that certain aspects of management needed to be performed in clinic. The majority believed home readings would not replace the need for clinic blood pressure measurement. 70% were prepared to adjust a drug dose, but only 30% were willing to initiate a new drug, using online tools. Key requirements for adoption of e-health services included: demonstration of equivalent clinical outcomes; some level of reimbursement for online care; and integration with existing electronic medical records. Physicians raised a number of concerns, including security, medico-legal liability and volume of patient communication.

M3C TELEREHABILITATION IN THE HOME

M3C1
ST. VINCENT'S TELEHOME HEALTH OUTCOMES FOR HEART FAILURE PATIENTS

Pamela Whitten, PhD,[1] Alicia Bergman, MA,[2] Mary Ann Meese, RN,[3] Karin Bridwell, MSN,[3] Kim Jule, MHA[3]
[1]*Michigan State University, East Lansing, MI;* [2]*Purdue University, West Lafayette, IN;* [3]*St. Vincents Home Health, Indianapolis, IN*

In expanding its existing telemedicine activities, St. Vincent Health System of Indiana partnered with the Purdue Regenstrief Center for Healthcare Engineering to develop, implement, and evaluate telehome care services for patients who have been treated and released from the heart failure (HF) unit or prescribed home health and have an HF primary diagnosis.

The hypotheses tested in this project included telemedicine patients evidencing (1) improved quality of patient care, (2) reduced length of stay and/or re-admissions (3) reduced cost of care. In addition, the project tested descriptive research questions, including the impact of telemedicine on market segmentation, communication with referring providers, and system us-

ability. Numerous data collection methods were utilized including pre and post surveys (e.g., SF-12, MLHFQ, OASIS items), interviews, and cost analyses.

Data from the participants (n = 50) indicated that there was a positive trend in patient care and outcomes for the telehome care patients. Data from cost outcomes indicated more mixed results due to new resource requirements for telehome health. Patient and provider perceptions proved to be positive as is consistent with general trends. However, data also emerged that contradicted traditional assumptions and could impact theory as well as practice.

M3C2

A CASE FOR ENHANCED MONITORING CAPABILITY IN HOME HEALTH SETTINGS

Donald K. Shaw, PT, PhD,[1] Beverly L. Newman,[1] Paige M. Sarchet, OTR,[2] Jing Mitchell, PT[2]
[1]Texas State University, San Marcos, TX; [2]Beyond Faith Homecare and Rehabilitation, Lubbock, TX

Physical therapists in hospital settings have immediate access to code carts, physicians, monitors and emergency services in cardiopulmonary arrest situations. The same is not true for physical therapists in home health settings. Emergency medical services are frequently distant from patients' homes. Electrocardiographic (ECG) monitors are not readily available with most therapists insufficiently trained to properly interpret ECG rhythm strips.

The Telehealth Program team at Texas State University-San Marcos was contacted to provide real time patient ECG surveillance for home health therapists working in the Lubbock, Texas area. A screening algorithm was designed to identify patients at elevated sudden death risk with a plan subsequently implemented to mainstream these individuals into a distance monitoring program. Four patients participated in the program; each patient having a complicated medical history. No cardiopulmonary complications were encountered, however, frequent changes in therapy protocol were required based on ECG and vital sign data.

We recommend all therapists working with high risk patients have an automated external defibrillator and portable ECG monitor immediately available. We further recommend these therapists be trained and regularly tested in ECG rhythm interpretation. Alternatively, we suggest the use of telehealth monitoring services when such training is not available.

M3C3

TELEHEALTH HOME EXERCISE/DISEASE MANAGEMENT FOR HEART FAILURE: A PILOT STUDY

Jill M. Winters, PhD, RN,[1] Mary Ann Papp, DO, FACC,[2] Susan Cashin, PhD,[3] Heather Seubert, BSN, RN[1]
[1]Marquette University, Milwaukee, WI; [2]Medical College of Wisconsin, Milwaukee, WI; [3]University of Wisconsin, Milwaukee, WI

Heart failure affects approximately 5 million Americans, it is the leading cause of death in the United States, and it is the single most costly healthcare challenge. The purpose of this prospective 2-group experimental study was to compare effects of a 12-week telehealth home exercise rehabilitation and disease management program with usual treatment. It was hypothesized that experimental participants would have greater improvements in functional performance, psychological well-being, and quality of life than those in the control group. Thirty-six subjects with Class II or III HF were enrolled. Subjects in both the experimental and control groups underwent submaximal exercise testing and were provided with an exercise prescription. Experimental subjects received a recumbent stationary bike, Polar heart rate monitors, exercise logs, and telemonitoring equipment. Daily monitoring of heart rate (HR), blood pressure (BP), oxygenation (SPO2), and weight were conducted for those in the experimental group, in order to insure that they are safe to exercise and assist in disease management. Regularly scheduled televisits were held with experimental subjects providing telecoaching and telesupport. Preliminary findings provide empirical evidence for the efficacy and effectiveness of this telehealth based home exercise program for persons with moderate heart failure. Participant satisfaction has been high.

M3D FEDERAL PROGRAM REPORTS

M3D1

AN UPDATE ON THE FCC'S UNIVERSAL SERVICE RURAL HEALTHCARE SUPPORT PROGRAM

William L. England, PhD, JD, PE, Daniel H. Johnson, MA
Universal Service Administrative Company, Washington, DC

The Federal Communications Commission's Universal Service program supports electronic communications for eligible rural healthcare providers, as provided by the Telecommunications Act of 1996. Since 1998, this program has committed over $175 million to over 3,450 healthcare providers. This presentation will give an update on current program issues including eligibility, service coverage, the application process, best practices to insure full funding and the $100 million of new funding to be made available under the FCC's Rural HealthCare Pilot Project. The presentation will also report and discuss program statistics including geographic analysis of program participation by state.

M3D2

FEDERAL TELEHEALTH PROGRAM PERFORMANCE EVALUATION: THE ROLE OF OMB

Dena S. Puskin, ScD
Office for the Advancement of Telehealth, Rockville, MD

Federal health programs are under increasing pressure to demonstrate their contributions to improving the health of Americans. The Office of Management and Budget (OMB) evaluates all programs and makes their evaluation available on the web at Expectmore.gov. This process has had a profound effect on how federal health programs are managed and evaluated. Of particular importance has been the emphasis on improved performance measurement, especially related to health outcomes. This session will discuss the impact of this process on one program, the Telehealth Network Grant Program, and its implications for other Federal Telehealth Programs.

M3E REMOTE PATIENT TRACKING TECHNOLOGY

M3E1

POTENTIAL APPLICATIONS OF RFID TECHNOLOGY IN MEDICINE

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Office of High Performance Computing and Communication Technology, Bethesda, MD

Radio Frequency Identification (RFID) wireless data technology has enormous potential use in medical care. We conducted experiments on possible applications in patient care and medical record tracking, medication delivery, and patient specimen identification. With RFID technology, an electronic tag can store patients' information, diagnosis, treatment, and other ancillary information. These can be accessed instantly within the medical treatment facility. Paper-based records could also be tagged with corresponding information. This will allow easy location within the hospital anytime. Tagged medicine containers can assist

nursing care personnel in the timely and accurate delivery of medication that may reduce human errors. These can be done through patient-specific tags in medication containers and handheld RFID readers. RFID tags on specimens could provide accurate patient identification that can follow the patient from admission, surgery and pathology laboratory that may minimize specimen mix-ups. These applications were developed in accordance with the FDA's recommendations for implantable RFID medical devices by addressing issues of confidentiality, integrity, availability and accountability. RFID tags will only contain encrypted patient information, and only authorized RFID readers can read and display patient information. We expect that RFID will find extensive use in hospitals, healthcare centers and centers for elderly care in the future.

M3E2
TRAUMA PATIENT TRACKING SYSTEM

William J. Bergeron,[1] Thomas F. Budinger, MD, PhD,[2] Jonathan S. Maltz, PhD,[2] Qiyu Peng, PhD[2]
[1]Triton Systems, Inc, Chelmsford, MA; [2]Lawrence Berkeley National Lab, Berkeley, CA

The development of a Trauma Patient Tracking System (TPTS) is currently funded to create a logistical tool for mass causality and disaster events. This system is designed to locate and track trauma patients during pre-hospital care, provide accurate positioning in both urban and rural environments, provide basic life status monitoring, and communicate this information in a timely manner to rescue, medical, and command personnel.

The TPTS includes a patient tag incorporating a combination GPS and RF module, a storage memory chip, a life status monitor, and an additional biosensor interface. The tags communicate via RF with emergency vehicle mounted or in hospital relay stations which in turn routes the data though any available Internet gateway. The patient data is then routed to our web based mapping engine or as raw data into other tracking or monitoring systems.

The system is designed to be adaptive to changing technology and is infrastructure non-specific. The technologies of positioning, short range RF, broadband wireless, biomonitoring, and tracking are all evolving at a rapid pace and are being adopted ad-hoc both commercially and publicly. These varying technologies must be incorporable into the core TPTS to ensure the ability for widespread use. The basic system design, with minor modifications, can also extend to in-hospital or in-home patient monitoring, clinical trial monitoring, or out patient tracking.

M3F REMOTE ICUs

M3F1
IMPROVING ACCESS TO CRITICAL CARE DECISION MAKING WITH THE VIRTUAL CRITICAL CARE UNIT (VICCU)

Monique Murphy, RN, BNurs, MHM,[1] Stuart Stapleton, MBBS, FACEM,[1] Patrick Cregan, FRACS,[1] Laurie Wilson, PhD[2]
[1]Sydney West Area Health Service, Penrith, Australia; [2]CSIRO, Epping, Australia

There are many small isolated hospitals across Australia lacking critical care specialists. A solution using ultra broadband was established as a pilot project between the Area Health Service in collaboration with CSIRO to improve access to these services at the Blue Mountains Hospital (BMH). The resulting Virtual Critical Care Unit (ViCCU®) aimed to provide rapid access to specialist level decision support to clinicians at a peripheral hospital by way of "telepresence".

Immediate benefits were noted upon implementation of the ViCCU® in the ED at BMH, with staff having access to specialist emergency medical consultation 16 hrs per day, 7 days a week. The project was evaluated over an 18 month multi-method, before and after study, incorporating qualitative and quantitative data collection in 350 critically ill patients. Statistically significant changes were found in patterns of patient separations with less local admissions and more transfers of critically ill patients and a significant increase in the rate of discharges for minor trauma patients. Structured interviews with clinicians reported that the use of ViCCU® allowed them to increase the decision support they provided to clinicians at BMH.

ViCCU® provides new and improved opportunities by which clinicians can remotely communicate about patient management.

M3F2
TELEMEDICINE SUPPORT FOR THE RURAL-BASED INTENSIVE CARE UNIT PATIENT

Patricia Herr, RN, Mary E. DeVany, Marilyn Dahler-Penticoff, RN
Avera Health System, Sioux Falls, SD

Remote electronic monitoring of intensive care unit patients improves the care received within the Avera system by decreasing predicted mortality and reducing predicted ICU length of stay. The Avera facilities and partner facilities participating in this telehealth project receive around-the-clock active remote monitoring services provided by intensivists and critical care nurses, while the on-site physician and bedside team at each facility remains in charge of their patient's care. The Avera Health system was the first in the nation to implement remote intensive care monitoring in Critical Access Hospitals.

This presentation will discuss the development and implementation of this telehealth application across the Avera Health system. Data from recent outcome studies will demonstrate significant improvements achieved such as: 1) hospital mortalities 40% below predicted (based on APACHE III severity classification system) for ICU patients, 2) reduction of 30% in the predicted ICU length of stay time and 3) other related results such as decreased ventilator days and lower average blood glucose results.

The Avera Health system has proven that it is feasible for remote intensive monitoring to be provided in small rural facilities as well as the larger urban hospitals, positively impacting the quality of care received in all communities served.

T1A RESEARCH AND EVALUATION OF TELEHEALTH PROGRAMS

T1A1
THE ROLE OF RESEARCH AND EVALUATION IN TELEHEALTH PROGRAMS

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In spite of considerable positive evidence accumulated over two decades, telehealth programs continue to be in the position of having to prove their value. Telehealth programs must incorporate evaluation strategies into program design, and also continue to perform research on the applicability of telehealth to different situations. Research provides the opportunity to assess the potential impact of telehealth in clinical or educational settings. Evaluations enable managers to determine whether a telehealth program is accomplishing its targeted goals and objectives. This session will provide examples of both evaluation and research. A randomized controlled trial will be described, comparing face-to-face Pediatric Advanced Life Support (PALS) instruction with instruction delivered via telehealth. The research project includes a comparative analysis of student cognitive, psychomotor skill

performance, and confidence immediately following the class and after 12 months. A program evaluation will also be described, assessing the performance of a continuing education program for rural emergency medical services personnel. This evaluation uses qualitative and quantitative data to determine student satisfaction, as well as an assessment of knowledge development using pre- and posttests. Detail on research and evaluation methods will be provided, along with a discussion of how to integrate these methods seamlessly into telehealth programs.

T1A2

A SYSTEMATIC REVIEW OF RESEARCH METHODOLOGY IN TELEMEDICINE STUDIES

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Recent decades have seen increasing levels of investment and utilization of telemedicine to enable the delivery of clinical services, educational events, and administrative activities. In order to understand the basis for inconclusive results in the field of telemedicine, this study sought to conduct a thorough assessment of actual methodological issues within the peer-reviewed literature of this field.

A systematic review of relevant databases was conducted to arrive at a sample of 1,615 telemedicine articles published between 1990-2005. These articles were coded and analyzed to assess a range of theoretical and methodological variables.

Studies commonly report the objectives (96%) but rarely state research questions or hypotheses (11%). Data indicate that a minority of studies (5%) make use of theory. Randomized studies are limited to 11% where patients were the subjects and 4% where providers were the subject. There is a wide range in the number of subjects employed, yet the vast majority of studies contain sample sizes under 100. Only 26% of the studies reported a time frame.

Telemedicine as a field suffers from a dearth of theory and rigor in reporting methodological details in articles.

T1B INNOVATIONS IN REMOTE PEDIATRIC CARE

T1B1

PROACTIVE DISEASE MANAGEMENT IN THE 21ST CENTURY

Lori Balch,[1] Stephen Ponder, MD, CDE,[1] Kevin Hopkins, MD, FACS,[1] Kevin McMahon[2]
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The Alcance Health Outcomes Project (AHOP) uses intelligent medical devices to automatically transmit patient blood glucose data in near real-time to assess, intervene and improve glycemic control and reduce hospitalizations in low socio-economic children with diabetes mellitus. Completion of a successful pilot-test has prepared Driscoll Children's Hospital and its rural health center partners to fully implement tele-monitoring for diabetes on a regional basis.

The opportunity to implement a more passive method of diabetes telemedicine through automated monitoring and the use of assistive analysis technologies for the timely delivery of relevant education is where AHOP is leading the path toward a new standard of remote care. Additionally, due to the availability of truly remote wireless connectivity and long-life battery powered communications devices provided by our partner, Diabetech, there are new possibilities in terms of telemedicine style delivery when there is no electricity and no telecommunications facilities. Therefore, while this system is located in the midst of one of the largest economies in the world, the State of Texas, the technology is completely transferable to the third world where there are similar conditions without electricity and telecommunications facilities.

This presentation will discuss DCH's use of innovative telemedicine technologies to improve health outcomes in South Texas.

T1B2

NEONATAL TELE-ECHOCARDIOGRAPHY IN THE NICU

Ana Maria Lopez, MD, MPH, FACP, Richard Donnerstein, MD, Daniella Lax, MD, Phyllis D. Webster, BA, Ronald S. Weinstein, MD
Arizona Telemedicine Program, University of Arizona, Tucson, AZ

Congenital cardiac abnormalities can range in severity from mild and of low clinical significance to severe with immediate life-threatening risk. Early identification and differentiation of the potential abnormality is linked to improved clinical outcomes. Standard of care in remote communities when faced with a potential cardiac abnormality relies on clinical judgment and experience. Although echocardiography is often the diagnostic study that defines the congenital abnormality and although a remote community may have access to local echocardiography technology, lack of onsite clinical expertise to interpret the study results in diagnostic delays which may result in adverse outcomes for the neonate. Faced with a potential cardiac abnormality, the clinician's choice is to transfer the patient to a tertiary care facility for care or to record and ship the echocardiogram to the tertiary care center for diagnostic review. Both options are clouded by the uncertainty of the diagnosis and may potentially result in unnecessary transfer for a mild condition or delay in transfer for an unrecognized condition. In this presentation, we will present a summary of our experience with demographics, diagnoses, cost estimates and satisfaction (patient/family and provider: referring/consulting) outcomes.

T1C HOME TELEHEALTH FOR MANAGING CONGESTIVE HEART FAILURE

T1C1

TELEREHABILITATION OF HIGH RISK PATIENTS IN HOME HEALTH SETTINGS

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The purpose of the present study was to evaluate a new telerehabilitation system designed to assist therapists working with high risk home-bound patients.

Three female home health patients with a history of cardiopulmonary disease and a mean age of 76.6 years participated in the study.

High risk was defined as a function of guidelines provided by both the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation. Home rehabilitation sessions were directed by an occupational therapist located in Lubbock, Texas. Real time voice and ECG monitoring were provided by physical therapists located at Texas State University-San Marcos, San Marcos, Texas. Distance between sites was approximately 420 miles. The occupational therapist implemented the plan of care; monitoring physical therapists provided continuous feedback regarding physiologic responses to exercise. Subjective data related to system function and objective data regarding patient responses were obtained.

There was no loss of voice or ECG signals during therapy sessions. The occupational therapist appreciated the added patient surveillance. Subjects reported being less fearful secondary to additional monitoring. No cardiac complications were encountered.

The telerehabilitation system appears to be efficacious in facilitating safe exercise for high risk patients.

T1C2
TELEREHABILITATION: EXPANDING ACCESS TO WHEELCHAIR PROVISION AND SERVICE DELIVERY

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The need for wheeled mobility devices is increasing as our population is aging and surviving trauma and disease. The availability of practitioners with specific expertise in this area is limited, especially in rural areas. People are isolated from rehabilitation services due to geography or physical limitations whereby large distances mean long travel times increasing costs and other burdens. Telerehabilitation (TR) is a tool that can alleviate the challenges of rural service delivery as it uses videoconferencing technologies to establish a secure interaction between individuals to share and manage data for the delivery of rehabilitation services. The purpose of this project is to determine the effectiveness of using a TR consultation model for procuring an appropriate wheeled mobility and seating device measured by the Functioning Everyday with a Wheelchair and Functioning Everyday with a Wheelchair - Capacity outcome measurement tools with assistance from a Remote Wheelchair Selection software program. Through the use of a repeated measures study design there will be two groups, a control and experimental, of 50 participants. Steps taken to develop the protocols for a Telerehabilitation service delivery model and standards of practice for the evaluation will be described.

T1D MEDICAL SENSOR TECHNOLOGIES

T1D1
NON-INVASIVE MEDICAL SENSOR SYSTEM (NIMS)

Scott T. Shaw, MSEE,[1] COL Roy E. Maday (Retired), MSc,[1] Andrew J. LaRow, MSEE,[1] James F. Forren, MSEE,[1] William E. Schoenborn, BSc,[1] Gary L. Gibian, PhD,[1] Tommy Morris, BSc[2]
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NIMS is a sensor system that digitally captures, records, and analyzes lung and heart sounds to support physiological status monitoring and combat casualty care. NIMS is unique in incorporating the above plus ECG, temperature, activity, orientation, and ballistic impact detection into one light-weight, wearable, sensor suite suitable for field use. Phase I developed algorithms, and built and tested a flexible platform for evaluation, including a 3-axis accelerometer, on-board data storage, and Bluetooth radio data transmission, including digital ECG waveforms. We are collaborating with two Army institutes and Foster-Miller, Inc. in this research. Tests compared NIMS output against recognized medical monitors, using animal and human subjects. Agreement was excellent for heart rate and good for respiration. Results will be discussed. Phase II will extend the radio range, continue algorithm development for the remaining sensors, and conduct testing in operational environments. By wirelessly downloading recorded data such as heart rate and respiration histories to USAMRMC/TATRC's Battlefield Medical Information System-Telemedicine (BMIST), NIMS will aid assessment of battlefield casualties. NIMS will provide real-time monitoring and maintain a digital record of critical body functions, alerts, and diagnostic indicators. [This work was supported by the U.S. Army Medical Research and Materiel Command (USAMRMC) under Contract No. W81XWH-05-C-0102.]

T1D2
ANOMALOUS ACTIVITY DETECTION FOR EARLY WARNING BIOSURVEILLANCE SYSTEMS

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In this work we present an algorithm that performs detection of anomalous activity patterns in public health system databases. Such patterns are potentially indicative of unknown bioevents for which reliable a priori knowledge may not exist (e.g. zoonotic influenza outbreaks, biological and chemical weapons attacks). Our approach is to transform incoming observation data, using transformations that are locally invariant with respect to reasonable dilations in time, in order to detect anomalous patterns by comparison with historical data. We use un-supervised machine learning to construct prototypical activity signals, against which newly observed activity signals are then measured for significant deviation. Activity signals are computed by periodic application of an appropriate activation function on clusters formed through agglomerative clustering of newly sampled observation data. Clustering is performed in a vector space spanned by a basis obtained via singular value decomposition (SVD) of training data. Anomalous activity is detected by monitoring changes in cluster trajectories over time. We demonstrate the potential of this approach by using it to analyze both simulated and real-world data.

T1E REMOTE MEDICAL IMAGING

T1E1
ACCIDENT OR THE POTENTIAL OF SAVING LIVES WITH REMOTE ULTRASOUND TECHNOLOGY

Bonne Farberow, RN, CCRA, CCRP
University of Pennsylvania and Clinical Care Experts, Inc., Shamong, NJ

There is a national emphasis on disease management, technology in the home and increased remote telemedicine. There needs to be an equivalent or should there be a higher emphasis on early screening and intervention to significantly increase quality of life, decrease patient risks and significant healthcare economic impact. Remote ultrasound technology has been implemented and tested under Investigational Review Board approval and obtained FDA clearance to market. The initial findings have been significant and the case studies that follow will share interesting results not only on patients though on the staff providing the training.

T1E2
ALL-PURPOSE TELEMEDICINE DISPLAYS: CAN WE USE COLOR FOR TELERADIOLOGY?

Elizabeth A. Krupinski, PhD, Hans Roehrig, PhD, Jiahua Fan, PhD
University of Arizona, Tucson, AZ

We evaluated the possibility of using a high-performance color display used for telemedicine applications for dual use in teleradiology. It was compared to two monochrome displays – one of comparable luminance and one higher. Six radiologists viewed 50 DR chest images (grayscale) once on each display. Eye posi-

tion was recorded on a subset of images. There was no statistically significant difference in diagnostic performance as a function of monitor ($F = 1.176$, $p = 0.3127$), although there was a trend towards the monochrome 450 cd/m2 being better than the monochrome 250 cd/m2, which was better than the color. There were no statistically significant differences in viewing time ($F = 1.478$, $p = 0.2298$). Dwell times for true and false positive decisions were shortest for high luminance monochrome, longer for low luminance monochrome, and longest for low luminance color. Dwells for false negatives were longest for the high luminance monochrome, shorter for the low luminance monochrome, and shortest for the low luminance color. True negative dwells were not different. High luminance monochrome displays are still optimal for teleradiology, but lower luminance monochrome and color displays such as those used in general telemedicine are sufficiently advanced to be used as all-purpose telemedicine displays.

T1F TELENURSING

T1F1
STREAMLINING THE TELEMEDICINE CONSULTATION PROCESS: ADVANCED PRACTICE NURSE AS FACILITATOR

Rosalyn Perkins, APN, Curtis Lowery, MD, Tina Benton, BSN, RN, Shannon Barringer, CGC, Rachel Ott, BA
University of Arkansas for Medical Sciences, Little Rock, AR

Advanced Practice Nurses (APN) play an integral role in the facilitation of high-risk obstetrical telemedicine clinics serving rural Arkansas, at which increasing numbers of patients seek telemedicine consultation. As assessed through telemedicine, the APN facilitator provides a thorough report to the provider on the patient's medical history and present obstetrical condition. The APN's documentation of pertinent clinical information such as Level II ultrasound findings, recommendations, and future management plans enables the MFM specialist to move with ease from patient to patient, thus increasing the number of high-risk patients receiving consultation. The APN directs the virtual clinic room utilized by providers, assisting with camera and volume manipulation to enhance the telemedicine experience for the provider and patient. Since the integration of APN facilitation in telemedicine consultation, the University of Arkansas for Medical Sciences has witnessed a marked increase in the number of telemedicine consultations conducted. In 2002, only 174 telemedicine consultations were conducted, whereas in 2005, 548 consultations were conducted, as attributed to the implementation of a high-risk pregnancy telemedicine program relying on regular APN facilitation. Virtual high-risk obstetrical clinics facilitated by an APN can enhance provider availability to an increased number of patients by streamlining the telemedicine consultation process.

T1F2
E-MENTORING: A MEANS OF PROVIDING PROFESSIONAL SUPPORT TO HEALTH PROFESSIONALS

Sarah Stewart, MA, Bsc (Hons), RN, RM
University of Queensland, Brisbane, Australia

E-mentoring is a strategy has been developed for supporting health practitioners which overcomes the barriers of geographical isolation and scarcity of suitable mentors. This paper describes a pilot study in which one New Zealand midwife mentored two graduates using a secure store-and-forward email system. Details of mentoring interactions were collected from emails and analysed according to recurrent patterns and themes. The mentor and mentees were also asked about their satisfaction with e-mentoring.

The themes of the email interactions were: story telling, critical reflection, sharing of advice and information, discussion of professional issues. All participants valued the flexibility of electronic communication. The mentees enjoyed being able to communicate with a mentor who was living in a different locale. The distance made the mentees feel safe to disclose because there was a degree of anonymity. The mentor was concerned that she would offend when asking critical questions because there was no body language to alert her to how the questions were being received. However, the mentees did not see it as a problem. All participants valued the experience and are continuing with the e-mentoring. This pilot study has shown that e-mentoring is a feasible option for health professionals and warrants further investigation.

T2A PAYING FOR TELEMEDICINE SERVICES

T2A1
MORNINGSIDE MINISTRIES: AN EMPLOYER-PAID PROGRAM FOR UNINSURED EMPLOYEES

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The University of Texas Medical Branch Electronic Health Network, Galveston, TX

Morningside Ministries, a not-for-profit senior-care organization that provides a services through four residential campus sites, partnered with AT&T Communications and the University of Texas at Galveston to offer live videoconferencing telemedicine to its employees and their families, resulting in decreased absenteeism and tardiness. The program provides care to employees who choose not to participate in Morningside's regular health insurance program. Staff are able to see physicians for minor conditions without leaving work for extended periods. The results of year one, including patient demographics and diagnoses, financials, and satisfaction evaluations, will be presented. Details of the continuing program where employees pay a monthly fee via payroll deduction with a copay with each visit will be reviewed. The program provides valuable insights into patient and employer acceptance and economics of telemedicine when it is provided independent of third-party reimbursement.

T2A2
THE CURRENT STATE OF PRIVATE PAYER REIMBURSEMENT FOR TELEMEDICINE

Lorraine Buis, MSI, Pamela Whitten, PhD
Michigan State University, East Lansing, MI

Telemedicine has garnered significant attention as a solution to cost and access challenges facing healthcare. Yet, utilization rates have not reached their full potential. One major barrier to the adoption of telemedicine is the lack of universal reimbursement from private payers. This investigation sought to capture a current picture of private reimbursement for telemedicine services in the US and was a follow-up to a 2003 survey conducted by the American Telemedicine Association and AMD Telemedicine.

Representatives from 64 organizations were recruited to participate in a phone survey between September and November 2005. Descriptive statistics were employed for data analysis.

Data indicate that the US is progressing toward expanded private reimbursement for telemedicine with 57% of our sample receiving reimbursement for telemedicine services (up 4% from 2003). In addition, 81% of those who receive private pay reported no differences between reimbursement for telemedicine as compared to traditional face-to-face consults. Of those who receive private pay, data indicated that telemedicine programs are submitting approximately 40% of consults for private reimbursement on average.

While this investigation suggests small improvements in private payer reimbursement, the change appears to lag behind a pace needed to optimize telemedicine deployment.

T2A3

BARRIERS TO IMPLEMENTING COMMUNICATION-CENTERED CARE WHEN INSURANCE PAYS

Alan W. Dappen, MD
DOCTOkR Family Medicine, Vienna, VA

This talk developed after 4 years experience working as a family doctor in a medical practice with a business model where all patients have open and continuous telecommunication (or email) access with their doctor. More than 50% of problems can be resolved without needing an office visit while the rest are seen in the office. This experience has lead to insights in the unique perspectives between the doctor, patient, insurance company and employer. There are many intuitive advantages telemedicine services could bring to American healthcare. Understanding the unique perspectives of doctors, patients, employers, and insurance companies while exploring unexamined assumptions for each player is critical if one is to tackle the the many barriers to broadly adopting telemedicine as a routine part of healthcare.

T2A4

CHALLENGES WITH TRANSLATING MEDICAID POLICY INTO PRACTICE

Norbert E. Belz, MHSA, RHIA, Ryan J. Spaulding, PhD
Kansas University Medical Center, Kansas City, KS

The recent ATA white paper, "Medical Assistance and Telehealth: An Evolving Partnership", gives an action plan for obtaining reimbursement from State Medical Assistance programs. This presentation will describe one state's experience translating Medicaid policy into practice and will provide guidance for other states developing and implementing such a policy. Kansas University (KU) Center for TeleMedicine has served as a liaison among Kansas Medicaid and the clinical departments for billing administration and reimbursement implementation over the last two years. The groups collaborated to develop detailed protocols that were then tailored to the telemedicine providers across specialties. Some elements are unique to telemedicine such as use of the GT modifier for specified telemedicine codes. Other concerns mirror face-to-face challenges, particularly related to coverage for telemental health services within carve outs. Telemedicine providers expressed concerns ranging from tracking productivity to addressing the needs of patients with little or no insurance coverage. The presenter will describe protocol development for gathering and transmitting information, including intake information, copies of insurance cards, and co-pays/deductibles at diverse distant sites (schools, community mental health centers, rural hospitals, and other sites). Finally, the presenter will summarize the role of third-party reimbursement in Kansas' planning for long-term sustainability of telemedicine services.

T2B ASSESSMENTS OF TELEONCOLOGY SERVICES

T2B1

A COST ANALYSIS OF PRACTICING ONCOLOGY VIA TELEMEDICINE

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The University of Kansas Medical Center (KUMC) has offered oncology services via interactive tele-video (ITV) to patients in rural Kansas since 1995. To date, three cost-tracking studies have been completed to determine expenses associated with the tele-oncology practice. For the most recent analysis, Hays Medical Center (HMC) and KUMC expenses were monitored for oncology services rendered via telemedicine to determine the costs of the practice during fiscal year 2005 (FY05). Expenses for the tele-oncology practice on the KUMC side totaled $22,848, with $7,331 attributed to technology-related costs and $15,517 attributed to practice-related costs. For HMC, $5,803 in technology-related costs and $30,430 in practice-related costs totaled $36,233 in expenses. At 235 tele-oncology consults and a combined total expense of $59,081 between KUMC and HMC, the analysis resulted in an average cost of $251 per consult during FY05. Compared to prior studies, this shows a substantial reduction in costs related to the practice of telemedicine, illustrating that cost is no longer a barrier to providing tele-oncology services in Kansas. Further, results from the FY05 cost analysis suggest that the Kansas tele-oncology project is continuing to sustain itself. Telemedicine has proven itself to be a cost-efficient alternative to offering regular outreach clinics.

T2B2

E-CLINIC: A VIABLE OPTION FOR COMPLEX AMBULATORY ONCOLOGY NURSING CARE

Sharon McGonigle, RN, MScN, Brendan Purdy, RN, MN(c), Janice Wright, RN, ACNP, MS, Peter G. Rossos, MD, FRCP
University Health Network, Toronto, Canada

Nurse clinicians at large Allogeneic Blood and Stem Cell Program (ABSCP) sought to determine whether Telehealth videoconferencing could be successfully embedded into the post transplant care pathway to facilitate complex symptom management of geographically remote patients.

Nurse clinicians introduced Telehealth in their ambulatory clinic as a pilot project in 2005. Patients were selected based upon complexity of symptoms, therapeutic plan and geographical remoteness. Their progress was monitored via videoconferencing for up to 12 months with a goal of improving symptom management through partnered supportive care in their home communities.

Telehealth has contributed to the following positive outcomes. (1) Improved assessment of remote patient health status permitting tailoring of clinical interventions. (2) Enhanced monitoring capability for mucositis management with high-resolution cameras. (3) Increased activity tolerance and improved role function through improved treatment compliance. (4) Reduced personal expenditure, commuting time, and a sense of rural isolation through improved access to care for patients in their home communities.

Nurse clinicians successfully integrated Telehealth into clinical practice as a viable option for complex symptom management and enhanced treatment compliance for geographically remote transplant patients. Nurse-sensitive patient outcomes, rural partnerships in care, and planned program expansion will be discussed.

T2C HOME TELEHEALTH APPLICATIONS

T2C1

ENHANCED WOUND CARE MANAGEMENT UTILIZING INFORMATION TECHNOLOGY

Gina Litzinger, RN, MSN,[1] Therese Rossman, RN, MA, CPHQ,[2] Barbara Demuth, RN, MSN[1]
[1]*Saint Francis University, Center of Excellence for Remote and Medically Under-Served, Loretto, PA;* [2]*University of Pittsburgh Medical Center, Lee Region, Johnstown, PA*

Today, the chronic wounds of 5 million patients in the US account for $2.8 billion dollars in healthcare expenditures. Further

adding to the problem is the shortage of Wound Ostomy Continence (WOC) Nurses needed to properly monitor these wounds to achieve healing. These substantial costs and shortages of trained professionals have encouraged the home health community to evaluate techniques and processes being used to properly monitor and manage chronic wounds. In an effort to improve wound care management and off-set the WOC nurse shortage, the Center of Excellence for Remote and Medically Under-Served Areas, (CERMUSA), partnered with the University of Pittsburgh Medical Center Lee Regional Community Nursing Service in a descriptive evaluative research study to investigate the benefits associated with integrating technology and home healthcare to improve wound management. To date, nurses have conducted 468 virtual visits, saving 1,338 hours of time and reducing costs by $25,208.

T2C2

VALUE (VIRTUAL ASSISTED LIVING UMBRELLA FOR THE ELDERLY) USER PERCEPTIONS

Stanley M. Finkelstein, PhD,[1] Sandra J. Potthoff, PhD,[1] Teresa LeMire, MSN,[2] Kristi Valley, LPN,[3] Linda Dahle,[2] Edward Ratner, MD,[1] Stuart M. Speedie, PhD[1]

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VALUE utilizes broadband connectivity, videoconferencing, physiological monitoring and a web-based service portal to extend the time that frail elderly can remain living independently instead of moving into assisted living or nursing home facilities. Subjects' perceptions of VALUE before and after 60 days in the study were assessed using the Telemedicine Perception Questionnaire (TMPQ). Eighty-three subjects (43 controls, 40 interventions) completed the TMPQ at both times. Controls were exposed to home telehealth and VALUE through the recruitment video, discussion with program nurses, or the media. In addition to this exposure, the intervention group used the VALUE program for 60 days before completing the follow-up TMPQ. Both groups had similar baseline scores (control = 62.23, intervention = 61.30, $p = 0.538$) showing a similar level of attitudes to such technology. At 60 day follow-up, the intervention group scores (64.53, $p < 0.001$) were statistically significantly more positive towards technology compared to their baseline and to the 60 day scores for the controls (57.79, $p < 0.001$). The largest gains were for items relating to ease of use, improving general health, and cost. Thus hands-on experience with home telehealth technology improves user perception and suggests the importance of such exposure to the successful use of programs like VALUE in the future.

T2C3

ACCURACY OF BLOOD PRESSURE MEASUREMENTS TRANSMITTED THROUGH A TELEMEDICINE SYSTEM

William P. Santamore, PhD,[1] Carol Homko, PhD,[1] Philip Berger,[1] Abul Kashem, MD, PhD,[1] Timothy R. McConnell, PhD,[2] Francis Menapace, MD,[2] Alfred A. Bove, MD, PhD[1]

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In underserved populations, inadequate surveillance and treatment allows hypertension to persist until actual cardiovascular events occur. Thus, we developed an Internet-based Telemedicine System to address hypertension. To minimize cost, we tested if subjects could accurately measure their blood pressure (BP) using home manometer and enter BP values into Telemedicine system.

Inner city and rural subjects (N = 464; 42% African-American or Hispanic) with 10% or greater cardiovascular disease risk were randomized to controls or telemedicine. Subjects received a home manometer with memory. During study visits, BP meters were downloaded and recorded BP (R) compared to telemedicine transmitted BP (T).

Telemedicine group averaged 105.6 ± 16.7 BP data transmissions. Telemedicine BP was similar to meter recorded BP (T: systolic / diastolic BP 133.4 ± 11.1 / 77.5 ± 6.8 mmHg, and R: 136.4 ± 11.9.4 / 79.7 ± 7.5 mmHg). Percent error was < 1% for both systolic (−0.02 ± 0.04%) and diastolic (−0.03 ± 0.04%) BP. Lastly, telemedicine BP values were similar to office (O) BP values systolic and diastolic BP (T: 133.4 ± 11.1 / 77.5 ± 6.8 mmHg, and O: 136.3 ± 20.5 / 78.1 ± 10.5 mmHg).

In underserved populations, this inexpensive approach, patients using a home manometer and entering these BP values into a telemedicine system, provided accurate BP data, which can facilitate clinical management.

T2C4

VIRTUAL VISITS IN GENERAL MEDICINE

Ronald F. Dixon, MD, MA,[1,3] James Stahl, MD, MPH[2]

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The objective of this study is to examine the feasibility, effectiveness and acceptability of a virtual visit (patient-physician real time encounter using webcamera technology) in comparison to a face-to-face office visit in the general medical setting. Specific aims include: 1) to compare the physician's ability to diagnose and treat patients in both settings, 2) to identify gaps in diagnostic or therapeutic capability, and 3) to examine patient and physician satisfaction with both modalities.

Twenty-five patients have taken part in the study to date. Descriptive statistical analysis with two tailed t-tests and ANOVA were performed. Preliminary results suggest that both patients and physicians find the virtual visit a useful alternative to the traditional visit for many medical conditions. There were no significant differences in patient satisfaction between the modalities. Physical exam effectiveness was significantly diminished in the virtual visit modality, but diagnosis and therapeutic effectiveness was not. Both patients and physicians felt comfortable with the technology.

This has enormous implications for general medical care in a cost escalating environment. While limiting patients' economic and opportunity costs associated with physician visits is beneficial, eliminating these visits from an office setting may decrease overhead costs. Further research is ongoing to investigate generalizability of these findings.

T2D HUMAN FACTORS: NEW FINDINGS FOR TELEMEDICINE

T2D1

NEWLY RELEASED NATIONAL HEALTH LITERACY DATA AND IMPLICATIONS FOR TELEMEDICINE

Christine A. Paulsen, PhD, Mark Kutner, PhD

American Institutes for Research, Concord, MA

This paper discusses the newly released results from the 2003 National Assessment of Adult Literacy (NAAL). Based on a nationally representative sample of over 19,000 American adults age 16 and over, the NAAL is the first national assessment to measure health literacy—the ability to use literacy skills to read and understand written health-related information. We found many patients may not fully understand their care instructions, prescription information, or medical consent forms. The majority of adults (53%) had Intermediate health literacy, while 22% had Basic and 14% had Below Basic health literacy. Among adults

who received Medicare or Medicaid, 27% and 30%, respectively, had Below Basic health literacy. This paper includes other significant findings related to age, ethnicity and education level. We discuss implications for home telehealth providers, researchers and developers—especially professionals who treat individuals from populations at-risk for low health literacy. Clearly, health literacy needs to be considered when developing materials for patients. This is always true in medicine, but is especially true in cases where patients are dealing with health information in the privacy and isolation of their own homes and not in a medical setting where they can more readily seek help for their questions.

T2D2

TELEPSYCHIATRY: COSTS, BENEFITS, AND PROVIDER JOB SATISFACTION

Ming Ying Chu-Weininger, PhD, MBA, MPH, MSLIS, EdS, FRIPH, Ignacio Valdes, MD, MS, Kim Dunn, MD, PhD
School of Health Information Sciences, University of Texas-Houston, Houston, TX

This study examined video-telephone conference technologies at two mental-health institutions for assessing patient admission, related costs, observed benefits, and provider and staff job satisfactions. In summer 2006, tele-mental Likert-scale items were adapted for the provider, and staff, job satisfaction surveys. Six qualitative interviews provided information on related costs and observed benefits. Spearman correlations, descriptive and qualitative analyses were performed.

Variables associated with provider job satisfaction included: 'the system requires no traveling to hospitals saves time', 'telemedicine is an adequate means to evaluate patients for admission', 'telemedicine increases productivity', and 'telemedicine is a poor use of my skills' (reversed score) (rho values ranged 0.834 to 0.968, $p < .001$ to $<.003$). Varied technologies and cost structures observed.

The "low cost" technologies applied at the two institutions were associated with provider and staff job satisfactions. Clinical efficiency and effectiveness variables were associated with provider job satisfaction. Telemedicine was associated with provider and staff productivity. It saved providers time and cost in traveling to the hospital, which helped night-shift provider recruitment and retention. Telemedicine also helped retain patients who would otherwise be gone because of the waiting time. Results and lessons learned have implications for future telepsychiatry investment and protocol development.

T2D3

ASSESSING EFFECTIVENESS OF TELEMEDICINE STRATEGIES FOR SELF-MANAGEMENT OF HYPERTENSION

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Hypertension is a growing healthcare concern in the United States and abroad. Self-monitoring of blood pressure is accurate and clinically efficacious. Developing effective means by which to educate patients and engage them in their care has great potential to improve clinical outcomes.

We hypothesized that combining blood pressure self-monitoring with an Internet-based program offering targeted messaging and reminders would improve patient engagement. We conducted a series of focus groups to assess patient interest in the use of communications technologies to facilitate hypertension self-management.

Several interesting themes emerged from these discussions. Patient satisfaction with current care varied widely. However, despite the inconveniences associated with office visits, patients were reluctant to substitute these for online visits. Patients were keen to receive personalized feedback and tips on hypertension management, along with access to their blood pressure readings. Patients reported previous positive experiences with emailing their doctor or using a self-monitoring device. The most receptive group appeared to be those recently diagnosed with hypertension.

These results indicate significant willingness on the part of patients with hypertension to take a more active role in the management of their disease and help direct development of effective telemedicine services.

T2D4

EFFECT OF TELEMEDICINE ON DIAGNOSIS AND TREATMENT BY TELECONSULTANTS' CHARACTERISTICS

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This study examined the effect of telemedicine on diagnosis and treatment by the teleconsultant's specialty, practice setting, type of employment, years and training in telemedicine, and reason for using telemedicine. A post-consultation survey was conducted during 1998–2006 (n = 1,449 consultations) in the University of Arkansas for Medical Sciences' Rural Hospital Telehealth Project. There were 61 consultants, who conducted 1–464 consultations each. The teleconsultants established a diagnosis in 121 (27%) consultations and 29 consultants reported a change in the diagnosis. The consultants established a treatment plan in 219 (52%) consultations and 100 consultants reported a change in the treatment plan. Dermatologists ($p < 0.001$); teleconsultants who practiced in an academic medical center ($p < 0.001$), outpatient clinic ($p = 0.001$), and private office ($p = 0.029$) were significantly more likely to establish a diagnosis. Dermatologists were significantly more likely to change the diagnosis ($p = 0.005$). Dermatologists ($p = 0.03$) and teleconsultants who practiced in an outpatient clinic ($p = 0.02$) were significantly more likely to establish a treatment plan. Teleconsultants who were self-employed ($p = 0.012$) were significantly more likely to change the treatment plan. The findings suggest that teleconsultants' characteristics can affect diagnosis and treatment in telemedicine.

T2E MEDICAL TECHNOLOGY INNOVATIONS

T2E1

"SMART" OVER-GROUND BODY-WEIGHT SUPPORT GAIT TRAINING SYSTEM

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In the rehabilitation of many neurological and physical injuries (e.g. stroke, traumatic brain injury, amputation), individuals often exhibit highly unstable walking patterns and limited endurance, making it difficult to safely conduct gait training. Much research has been devoted to body-weight supported treadmill training, with findings suggesting gains similar to or greater than conventional gait training. Unfortunately there is a gap in technologies for transitioning patients from training on a treadmill to gait training in real-world settings. To address this problem, we are developing an overhead rail-based system that uses motors and dynamic actuators to allow individuals of different weight and walking ability to safely practice over-ground gait training. The main benefit is that it will allow therapists to train

patients early in recovery in a safe, controlled manner. The system has extensive control and performance tracking features to allow therapists to modulate training activities (e.g. safe walking speed, body-weight support) and monitor patient recovery and progress. Several prototypes of the system are being designed, each able to accommodate persons up to 250 pounds in weight, provide up to 100 percent body weight support, and allow for obstacle avoidance and assistive technology (e.g. cane, crutches, wheelchair) during ambulation.

T2E2

ARMY COMBAT CASUALTY CARE COLLABORATIVE ROBOTICS AND TELEROBOTICS RESEARCH

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Force protection of military first responders is complicated by current troop deployments that involve highly visible, politically sensitive combat in urban terrain. Over several years, the TATRC has orchestrated collaboration among several DoD agencies, universities, and private industry, in order to create a collaborative, multi-mission, robot team with a medical component aimed at locating, assessing, treating, rescuing and protecting battlefield casualties under hostile conditions. A prototype marsupial robotic casualty evacuation system was exhibited at previous ATA meetings. Research is now underway on of a modular self-contained patient transport pod which can be mounted on a multipurpose unmanned ground vehicle for casualty evacuation. Other TATRC projects are intended to bring telerobotic casualty examination and care to the battlefield; these include integration of robotic arms with the Life Support for Trauma and Transport (LSTAT) litter for remote patient assessment and treatment via such noninvasive technologies as acoustic cauterization of hemorrhage via High Intensity Focused Ultrasound (HIFU). Work continues on a dynamically balanced bipod android Battlefield Extraction Assist Robot (BEAR) which is capable of rescuing a 350 pound casualty from within buildings and up and down stairs. A new DoD SBIR sponsored project is aimed at electronic collaboration between Unmanned Aerial Vehicles (UAVs) and military medical first responders to utilize UAVs to bring sophisticated medical equipment, such as the LSTAT, directly to troops engaged in combat. Other TATRC robotic research involves, among other technologies, Raman and Laser Induced Spectrometry (LIBS) to detect and identify chemical and biological warfare agents and explosives commonly found in Improvised Explosive Devices (IED). Research focuses on sensor selection and integration as well as electronic command and control messaging via the Joint Architecture for Unmanned Systems (JAUS) to include sensors and telemedicine payloads. Here we describe ongoing projects and emerging technologies.

T2E3

REMED-D: PUTTING TOGETHER THE AUTOMATED CASUALTY CARE PUZZLE

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The Robotic Emergency Medicine and Danger Detection (REMeD-D) prototype vehicle was developed using a variety of pre-existing components to test one method of automated casualty extraction. The purpose of the project was to test the ability to modify and unite the disparate components into a single workable system able to be controlled remotely or operated autonomously, based on software conforming to the Joint Architecture for Unmanned Systems (JAUS) operating system architecture. The project succeeded in blending Packbots from iRobot, a patient extraction device developed by Foster-Miller, a roboticized John Deere Gator utility vehicle, and software systems and engineering from Applied Perception into a unified system. The REMeD-D system is capable of extracting a simulated casualty at a distance from the human operator, as well as providing far forward reconnaissance using remote chemical and nuclear sensors, and an array of broad spectrum cameras. Further testing of the system's reconnaissance capabilities is anticipated in the next round of research.

T2E4

TELEMEDICINE APPLICATION IN A LUNAR MEDICAL CONTINGENCY SIMULATION

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Current NASA plans place emphasis on planetary exploration requiring long duration missions. This study was conducted to explore mechanisms for telemedicine during a simulated medical evacuation scenario at Devon Island, Canadian Arctic.

During simulated exploration and limb injury physiological data were recorded continuously with a customized non-invasive device (VPack). Data was archived in a backend database with custom software converting text values to graphic interface for remote viewing. These data packets were transmitted wirelessly to telemedicine hub (Tandberg) which transmitted via Ku band satellite communication to remote locations in Houston, Montreal, and France for real-time data sharing. Examination and transmission of simulated injuries was conducted using hand-held ultrasound.

Data transmission was successfully achieved during simulation with distant parties viewing data trend in real time. Satellite linkage provided sufficient bandwidth for data streaming as well as audio and video. Real-time communication to multiple centers provided biomedical data to consultants at remote site for input on medical diagnosis and treatment plan.

This study confirms the capability for graphic data streaming for visual trending following continuous monitoring of vital signs in an extreme environment. Wireless networks effectively relayed data to a hub with satellite linkage for conveyance to remote consultants.

T2F EMERGENCY TELEMENTAL HEALTH

T2F1

EMERGENCY MANAGEMENT GUIDELINES FOR TELEPSYCHIATRY

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Telepsychiatry, in the form of live-interactive videoconferencing, is an emerging application for emergency psychiatric assessment

and treatment, can improve the quality and quantity of mental health services, particularly for rural, remote and isolated populations. Despite the potential of emergency telepsychiatry, the literature has been fairly limited in this area. This presentation reviews the common administrative, legal/ethical and clinical issues that arise in emergency telepsychiatry. An initial set of guidelines for emergency telepsychiatry is presented to generate further discussion to assist those who are considering establishing general telepsychiatry and/or emergency telepsychiatry services. The practices and techniques of emergency telepsychiatry are relatively new and require further examination, modification and refinement so that they may be fully utilized within comprehensive mental health service systems.

T2F2

TELEMENTAL HEALTH IN THE EMERGENCY ROOM

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The purpose of this paper is to examine the role of telemental health in expediting the evaluation, treatment and discharge of psychiatric patients in an Emergency Room (ER). The evaluation, treatment and proper discharge of psychiatric patients is often problematic for ER staff as these patients require specialized psychiatric intervention beyond the ER staff's training. This often results in patients receiving minimum, if any, psychiatric intervention until they can be discharged to an in-patient facility or until the patient is stable enough to be discharged.

This paper will examine data concerning the length of stay for psychiatric patients in the ER both prior to the implementation of the telemental health program and post implementation of the telemental health program. We will also attempt to examine the quality of care provided the patient by a psychiatrist using telemental health equipment versus a mental health professional (technician) using traditional face-to-face. This will be done by examining the appropriateness of the treatment and discharge plans of patients both prior to and after the implementation of the telemental health program. Additionally, we will attempt to provide anecdotal data on the impact on the ER staff following implementation of the telemental health program.

T2F3

DISASTER PSYCHIATRY: SURGE CAPACITY VIDEOCONFERENCING PROJECT

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Sheppard Pratt Health System, Baltimore, MD

Natural and manmade disasters in recent years, and the emphasis on individual and local preparedness and response to disasters by the Federal Government, prompted Sheppard Pratt Health System to consider alternative ways to improve disaster response in its mental health system. Sheppard Pratt Hospital, in collaboration with five community hospitals and three community mental health centers, established a mechanism that may be used for psychiatric surge capacity throughout six Maryland jurisdictions in the event of a mass casualty or shelter-in-place incident. Through a Health Resources and Services Administration special projects grant, the network facilities installed encryption enabled, internet protocol (IP) compatible, video teleconferencing equipment. Disaster network psychiatrists and mental health management personnel received training in the history, technology, literature, nuances and conduct of telebehavioral services. The goal of the project was to create a decentralized network of psychiatrist that could assist each other via IP video teleconferencing, where communications are available, following a local disaster. Disaster video teleconferencing protocols were developed collaboratively and distributed throughout the network. Annual drills are incorporated to ensure equipment, personnel and protocols are maintained in a state of readiness.

T2F4

MENTAL HEALTH IN DISASTER RESPONSE—THE KATRINA EFFECT

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[1]Global Mental Health Network, McLean; [2]Vanderbilt University, National Center for Emergency Preparedness, Nashville, TN

This paper will examine the role of mental health in response to disasters. The response to Hurricane Katrina will be used as a model. What have the consequences of Hurricane Katrina taught us about the role of mental health in preparing for and responding to victims of disasters? What was the impact of Hurricane Katrina on the mental health of victims? What were the predominant mental health problems that were identified? How were these problems evaluated and treated? Are we uncovering new data about the duration of problems caused by exposure to disasters? If so, what does this mean for planning? Was telemental health a component of the mental health response? If not, might it have made a difference?

This paper aims to show that mental health is a major consideration in the planning for the medical response to disasters. Further, it aims to show that mental health problems caused by exposure to disasters tend to be more chronic than had been previously thought. Lastly, but importantly, it aims to show that a properly designed telemental health program could greatly assist in the immediate response to a disaster and be of great value in providing ongoing care.

T3A EMERGENCY TRAUMA APPLICATIONS

T3A1

ONSITE INTENSIVE CARE USING RAPID TELEMEDICINE RESPONSE IN A HUMANITARIAN CRISIS

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This paper reviews a project proposal regarding the rapid response utilizing spaced based telemedicine in disaster management, in backdrop of October, 2005 earthquake in Pakistan where immediate access was restricted due to geographical location and environmental factors. Beginning with victim localization, life algorithm and field intensive care camps up to provision of on-site intensive care units connected to key hospitals for expertise are included in the chain of the rapid telemedicine response. This project envisages such a novel method and evaluation to achieve objectives of rapid telemedicine response in humanitarian crisis. The project addresses the most important but most difficult aspect of emergency medicine; intensive care of critically injured patients.

The project will integrate a prototype series of small and lightweight modular clinics with its assorted intensive care medical equipment with telemedicine wares, being transported through any means of surface/air in order to dispatch these mobile intensive care clinics into the area of humanitarian crisis from the specialist hospital through telemedicine. The project partners include important organizations, and institutes from Norway and Pakistan. The solution will make specialised medical services available in crisis areas within 12 hours in the regional distances of 1000 km.

T3A2

ASSESSING PROVIDER ACCEPTANCE OF AN EXPANDED TELEER NETWORK

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Trauma consultations with rural hospital providers have been shown to be a cost-effective means to improve patient care by minimizing unnecessary transfers. Yet, significant barriers exist in obtaining provider buy-in to establish consultation networks. Two Level II trauma centers in Spokane, Washington have expanded a network serving 12 rural hospital emergency departments. The "TeleER" network benefits from streamlined communications through a jointly operated one-call triage center and the ability of a regional air transport service to participate in 3-way video calls between sending and receiving facilities. The network also benefits from a shared regional database providing electronic medical records and imaging capabilities.

This presentation will focus on provider perceptions of the success and utility of the network. The project evaluation has the following primary goals: (a) Assess the effectiveness of video consultations in reducing unnecessary patient transfers and positive effects of enhanced care on patient outcomes; (b) Evaluate provider satisfaction through the use of advanced videoconferencing systems and assess the value of simultaneous access to shared electronic data and images; and (c) Improve videoconferencing utilization by providing additional areas of focus in adult, pediatric, and wound care consultations for rural providers

T3A3

TELEMAP: AN INTEGRAL TOOL FOR VICTIMS OF ANTIPERSONAL MINES

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Landmines and no detonated ammunition is a big problem in zones that are or had been under armed conflict around the world. One additional situation is that most of the victims of this type of weapons are civilians, usually poor and scarce access to integral health services. Colombia has been ranked as the country with more victims by this type of weapons in the last years. An integral solution is necessary to mitigate the impact derived from this type of conditions in the public health. We present the project TeleMAP as a proposal to face this public health problem. TeleMAP is composed of different elements that incorporate technologies of information and communication (TIC) in a broad spectrum. Some of the project components that use TIC as principal axis are "Education for Prevention," that is a community centered virtual education schema; "Be Prepared," as an structure to train first responders and technical personnel in a blended educational environment of virtual education and skills development with simulators; and "Response and Action," pre hospital care and first response with telemedicine support that continues until rehabilitation. We show how the symbiosis University – Government – Private Sector is worthy and necessary, as well as, different strategies that can be used to minimize cost of implementation and operation and make this type of projects in developing countries.

T3A4

LET THE "LITTLE BROTHER" WATCH "BIG BROTHER": HOW TO IMPROVE UTILIZATION OF A TELETRAUMA NETWORK

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The University of Vermont, Fletcher Allen Healthcare has a teletrauma program that has been operational for the past six years. We have previously reported that utilization of the teletrauma system results in improved outcomes and a significant reduction in the time to transfer to a level I trauma center. Yet, the number of teletrauma consultations has diminished significantly and steadily over the past 36 months.

Our hypothesis is that there is an increasingly prevalent view that the trauma center represents 'Big Brother'. To address this concern, we recently linked our trauma resuscitation room to our teletrauma network. Upon arrival of a critically ill trauma transfer, we now 'connect' to the originating medical center. This offers the rural provider the opportunity to observe and interact with us during our trauma resuscitations.

Since implementing this change in routine, we have observed an immediate increase in the utilization of the teletrauma system. One of our centers has obtained its first teletrauma consultation in over 5 years. We conclude that allowing the rural medical provider to observe and interact with the providers at the level I trauma center helps to foster a collaborative spirit and mitigate the fear that 'Big Brother' is watching.

T3B TELEMEDICINE PROGRAMS: CASE STUDIES

T3B1

EXPANDING SERVICES OF A RURAL SCHOOL-BASED TELEMEDICINE CLINIC

Don McBeath, BA, Debbie Voyles, MBA, Claudia Cortez, BS

Texas Tech University Health Sciences Center, Lubbock, TX

The first school-based telemedicine project in Texas was initiated by Texas Tech University Health Science Center in the Panhandle community of Hart in 1998. The project is now expanding to provide more than medical care such as nutrition counseling and remote dentistry exams.

Hart, Texas is a rural farming community of 1,100 people located 70 miles northwest of Lubbock, Texas. It a medically underserved area and the school nurse is the only resident medical personnel. The first expansion of services beyond primary care was in the spring of 2006 with nutrition counseling via telemedicine to help address the growing obesity problem. There are only 366 students in grades 1-12 and the school nurse estimates one-third are over weight.

Five students participated in bi-monthly clinics with the nutrition counselor via telemedicine from 70 miles away. Sessions involved recording the weight, discussions of diet and life style, and recommendations for the next month. During the first semester, weight decrease was minimal; however, the numbers indicated a slowing of previous weight increase. When most of the participants returned to school from summer vacation, their usual summer weight gains were minimal. The results are considered positive.

Also under development is a teledentistry exam project.

T3B2

ANALYSIS OF RESPONSES TO 25,000 EVALUATION QUESTIONS FROM STORE-AND-FORWARD TELEHEALTH

Stewart Ferguson, PhD, Chris Patricoski, MD, Darren Coolidge, Nathan Hogge

Alaska Native Tribal Health Consortium, Anchorage, AK

Providers using the Alaska Federal HealthCare Access Network (AFHCAN) are asked a single question when creating or re-

sponding to a store-and-forward telemedicine case – resulting in more than 25,000 responses to date. A total of 17,930 responses to 10 different questions have been obtained from providers creating cases, and 8,657 responses have been obtained from a single question posed to consultants.

Providers that created cases respond to a Likert scale to rate responses on patient satisfaction, patient education, job satisfaction, access to care, quality of care, and ease of use. The results indicate a statistical significant high level of agreement that 64% of cases played a role in educating the patient. (N = 1,713), 77% of cases help make the provider's job more fun. (N = 1,897), 79% of cases improve patient satisfaction (N = 1,615), 86% of cases improve the quality of care for the patient (N = 1,681), and 89% of cases help providers communicate with a doctor (N = 1,606). These responses are relatively invariant over time, but have interesting correlations to other factors including equipment usage.

Providers that consult on cases report the number of cases that prevent patient travel has changed significantly during the last 4 years, growing from 20% and is now flattened at 60% while the cases that cause travel has always remained at 7% of all cases (n = 8,657).

T3B3
WEST ISLE: A MUNICIPALLY FUNDED TELEMEDICINE CLINIC WITH PATIENT PAY

Glenn G. Hammack, OD, MSHI, FAAO, Oscar W. Boultinghouse, MD, FACEP, Joe Carranza
University of Texas Medical Branch Electronic Health Network, Galveston, TX

UTMB, in partnership with City of Jamaica Beach and Galveston County Health District, created and implemented West Isle Telemed (WIT), as a solution to weekend medical care on Galveston Island's West End. From 10 a.m. to 2 p.m. every weekend at the Jamaica Beach City Hall Public Services Building, patients sought treatment for basic medical needs such as colds and flu, jellyfish stings, minor burns, rashes, earache and any other basic medical need. A clinic visit cost $50—cash, check or charge. No insurance charges were made. Assisted by a paramedic, the physician examimed patients remotely using a telemedicine cart equipped with medical devices and a video screen for face-to-face, real time consultation. The system allowed the doctor to deliver diagnoses and to prescribe medications. Faced with no other options and the very real need for non-emergent medical care, area municipal leaders felt West Isle Telemed provided high-quality, low cost basic medical care to the West End during its busiest season. A complete program review will be provided, including technologies used, an abstract of patients seen by demographics and diagnoses, and finances of the project. The program provided valuable insights into public acceptance of telemedicine service as an out-of-pocket expense.

T3B4
BRIDGING THE "DIGITAL DIVIDE" IN RURAL AREAS: OUTREACH AND TRAINING

Elizabeth Brooks, MS, Jay H. Shore, MD, MPH, Rhonda Dick, MS
University of Colorado at Denver and Health Sciences Center, Aurora, CO

This presentation will provide an overview of the Native Telehealth Outreach and Technical Assistance Program (NTOTAP), which is run by the University of Colorado at Denver and Health Sciences Center. NTOTAP is a unique undertaking by the University that is designed to bring modern telecommunications technology to populations that often do not have access to such applications.

Working directly with lay members of tribal communities (e.g., village health aides, community health representatives) NTOTAP transfers technical knowledge and skills to American Indian communities by providing intensive, in-person and remote-based multimedia training. At the culmination of such training, participants have developed unique technology-based health applications from which community members can directly benefit. Examples of such projects include home-based computer monitoring for diabetes self-management, tribal cable television health screening, and interactive CD-ROM guides concerning at-risk youth suicide behavior.

The knowledge shared in this presentation demonstrates one program's attempt to bridge the large gaps in geography and culture that impede tribal communities' access to heath care. By sharing the experiences of an established community-based training program, attendees are provided with a foundation and guidelines for creating similar projects.

T3C USING THE INTERNET FOR DIABETES MANAGEMENT

T3C1
PATIENT SATISFACTION WITH INTERNET-BASED DIABETES MANAGEMENT IN NATIVE AMERICAN COMMUNITIES

Betty A. Levine, MS,[1] Pamela Angelus, RN, MSN,[1] Jaci McCormack,[2] Donna Johnson, RN,[3] Donna Carvalho, RN,[4] Donna Palakiko, RN,[5] Ming-Jye Hu, MS,[1] Seong K. Mun, PhD[1]
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According to the CDC 12.8% of American Indians and Alaska Natives receiving healthcare from the IHS have been diagnosed with diabetes compared to 5% of the total American population. While the percentage of people using computers and the Internet has grown, the number of American Indian users has grown at a much slower pace. Our goal has been to measure user satisfaction with an Internet-based diabetes management program (IDMP), MyCareTeam, that has been implemented in Native American Communities and modified for cultural appropriateness.

Participants were recruited from the health clinics serving three Native American Communities. Patients with diabetes were enrolled if they were >18, had no co-existing severe medical conditions, and had an HbA1c >7. Satisfaction surveys were administered two–four weeks after their first use of the system and again eight–ten weeks later.

Sixty-nine patients have been enrolled to date across all three sites. Fifty-seven transmitted their glucose readings and forty-eight have logged into the system and reviewed their clinical data. Forty-two (61%) are women. The average baseline HbA1c for all participants was 8.8%. Approximately fifty baseline surveys were administered and thirty follow-up surveys. Results of the satisfaction surveys will be presented at the meeting.

T3C2
AN INTERNET-BASED PROGRAM FOR MANAGING DIABETES IN PREGNANCY

Pamela Angelus, RN, MSN,[1] Jennifer O'Brien, MD,[2] Farzaneh Sabi, MD,[2] Rita Driggers, MD,[2] Cherrel Christian, RN, CDE,[3] Seong K. Mun, PhD,[1] Betty A. Levine, MS[1]
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Pregnant women with diabetes are at risk for poor outcomes. Tight glycemic control can decrease this risk. To exercise this control, patients check their blood sugar frequently and telephone this information, typically bi-weekly, to a nurse who records the

blood sugar readings (BSR) and makes recommendations. Our objective was to evaluate the efficacy of a secure Internet-based diabetes management program (IDMP) in this population.

Women with preexisting or gestational diabetes were recruited from prenatal clinics. After enrollment, participants were taught to upload their BSR electronically to the IDMP. Care providers reviewed the readings and messaged with the participants via the IDMP. Participants had access to their own BSR, medications lists and educational materials on the IDMP.

Data from the first twenty-five participants was analyzed. Twenty (80%) were compliant with entering BSR (Group A); five were not (Group B). A total of 4640 BSR were entered by Group A with 1% being below, 57% within, and 42% above the desired range (60–120). Mean birth weight was higher in Group B than A (3387 vs. 2980gm, $p = 0.29$) with macrosomia rate approaching significance (60% vs 20%, $p = 0.07$).

These results suggest that the IDMP may be an effective alternative to frequent office visits and telephone consults when managing pregnancies complicated by gestational or pregestational diabetes.

T3C3
MONITORING INNER CITY WOMEN WITH GESTATIONAL DIABETES VIA THE INTERNET

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Temple University School of Medicine, Philadelphia, PA

Frequent surveillance has been shown to improve outcomes in gestational diabetes mellitus (GDM). Such surveillance is often less accessible to indigent women. We hypothesized that an internet-based diabetes telemedicine system would enhance communication between women and their providers and empower them to take a more active role in their diabetes care.

GDM women were randomized to usual care (UC) ($n = 25$) or to telemedicine (TM) ($n = 32$). Women monitored their blood glucose levels 4×/day. TM transmitted this data via the Internet while UC maintained paper logs. Diabetes self-efficacy (DSE) was assessed using the Diabetes Empowerment Scale. 53% of TM had computers prior to study enrollment; 15 women were provided free computers and Internet access. 78% of TM utilized the system sending 21.8 ± 16.9 sets of daily data. Use did not correlate with age, number of children, computer ownership or treatment. UC and TM achieved comparable glucose control and outcomes. TM demonstrated increased DSE than UC; managing the psychological aspects of diabetes (4.5 ± 0.5 vs. 4.0 ± 0.6; $p = 0.04$) and assessing dissatisfaction and readiness to change (4.3 ± 0.5 vs. 3.9 ± 0.5; $p = 0.04$).

An Internet-based telemedicine system increased DSE among inner city women and enhanced communication.

T3D TELEMEDICINE APPLICATIONS IN DEVELOPING NATIONS

T3D1
CELL PHONE-BASED TELEMEDICINE NETWORK IN VIETNAM

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The Remote Interaction, Consultation and Epidemiology (RICE) system is a cellular phone-based electronic medical record designed to facilitate remote medical consultation, epidemiological surveillance and access to medical knowledge to regions of the world without access to computers or the internet. Medical resources – particularly expertise – are scarce in rural areas, and the morbidity associated with the transport of patients to major medical facilities is significant. Our system will allow physicians to communicate with one another anywhere within the far – and growing – reach of cellular technology. The pilot system will connect physicians at the National Hospital of Pediatrics on Hanoi, Vietnam with the Thai Nguyen Medical University and surrounding clinics. Notably, the region is also a hot zone for globally-significant emerging infectious diseases like SARS and Avian Flu, so our system will also include electronic epidemiological surveillance. The technical constraints of cellular phone handsets and bandwidth require a re-thinking of the traditional medical record and the way in which physicians interact with patient information. The project is currently funded by Microsoft Corporation, and the principal investigators are affiliated with the Thayer School of Engineering at Dartmouth College, however our team of researchers hail from all over the world so that our own design process imitates the distributed workflow we hope to facilitate in our users.

T3D2
ROLE OF SATELLITE COMMUNICATIONS IN TELEMEDICINE DURING AN EARTHQUAKE IN PAKISTAN

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Telemedicine applications have been successfully demonstrated during disaster situations. This study highlights role of Satellite communications in October 2005 earthquake of Pakistan.

International Telecommunications Union (ITU) provided to Government of Pakistan Satellite modems during the earthquake of October 2005. Telemedicine & E-health training center Holy Family hospital, Rawalpindi set up mobile Telemedicine units in NWFP Province and Azad Kashmir. These were the worst hit areas by the earthquake. Remote telemedicine mobile set ups were stationed at Shohal Najaf field hospital Balakot NWFP, Hattian Bala and Muzzaffarabad in Azad Kashmir. Equipment used was an IBM notebook, Inmarsat Satellite IP modem, webcam and digital camera

This is a unique experience of role of Mobile Telemedicine Units in the wake of disasters. Results of experience at Balakot -a study of 28 patients are included in this study who presented at the Shohal Najaf field hospital. All these patients were provided with Teleconsultations and the referred cases were sent to the tertiary hospitals after doing a basic workup.

This experience of complementing Emergency relief work with mobile Telemedicine units is extremely valuable and can easily be replicated and deployed on urgent basis in wake of disasters.

T3D3
SUB-SAHARAN AFRICA: IS TELEMEDICINE A VIABLE SOLUTION?

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Sub-Saharan Africa faces the triple burden of disease, HIV/AIDS, TB, and malaria. Despite this, its population is expected to double by 2050. Currently, it does not have enough doctors, with 31 of 48 countries having fewer than 10 doctors per 100,000 people. The WHO sees telemedicine as a potential solution; but telemedicine comes at a cost. Sub-Saharan Africa does not have the money to purchase international services; 25 countries spend less than US$10 per capita per annum on health. Telecommunication costs are prohibitive with the total cost of 20

hours of internet access a month averaging US$54.80 compared to US$15 in America. A thirty minute ISDN videoconference at 128 kbs-1 averages US$48.60. Despite this many African countries are embracing the concept of telemedicine; perhaps without necessarily understanding the cost implications. Will African countries be able to develop national telemedicine services or are they going to be dependent on international, humanitarian goodwill? Several successful international initiatives have been running for several years, like the RAFT project, iPath and the Swinfen Trust, and the proposed Pan-African Network may assist. It would appear however that new financial and administrative models need to be developed for telemedicine to fulfill its promise in sub-Saharan Africa.

T3E OCULAR TELEHEALTH—NEW RESEARCH FINDINGS

T3E1
IMPACT OF FIELD SELECTION IN NONMYDRIATIC RETINAL IMAGING FOR DIABETIC RETINOPATHY IN THE JOSLIN VISION NETWORK

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The American Telemedicine Association (ATA) Telehealth Practice Recommendations for Diabetic Retinopathy (DR) identifies four categories of telemedicine care for DR. The Joslin Vision Network (JVN) is a category 3 program validated to allow disease diagnosis and management to match dilated retinal examination by retinal specialists. JVN retinal imaging protocol includes three 45-degree nonmydriatic (NM) stereoscopic fields (NM-1—centered between the optic disc and the macula, NM-2—along the superior temporal vascular arcade, and NM-3—nasal and slightly inferior to the optic disc).

This program uses retrospective case review and sample case reports to demonstrate the value of JVN fields NM-2 and NM-3 to identify lesions of DR and other retinal lesions that would not be visible on NM-1 alone, thereby preventing the JVN from providing category 3 diabetic retinopathy care and from identifying nondiabetes-related retinal findings. JVN protocol of three clearly defined fields contributes to accurate diagnosis of level of DR (category 3), allows fuller identification of nondiabetes-related findings, and allows more precise category 1 (presence vs. absence of DR) or category 2 (sight-threatening vs. no sight-threatening DR) programs as desired.

T3E2
EVALUATION OF JPEG AND JPEG 2000 IMAGE COMPRESSION ON THE FIDELITY OF TELEMEDICINE DIGITAL RETINAL IMAGERY

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The need for multiple digital color images for telemedicine remote evaluation of diabetic retinopathy can require significant computer storage and high transmission speeds. Joint Photographic Experts Group Compression (JPEG) algorithms are widely used techniques to lower computer file storage and speed transmission requirements, though potentially at some "lossy" degradation to image fidelity. Both JPEG & JPEG 2000 allow selection of compression from a range of quality factor options. This study correlates image fidelity of JPEG and JPEG 2000's range of quality factors.

One hundred fifty-one 3008 × 2000 pixel diabetic retinal images were compressed using JPEG and JPEG 2000 algorithms. Each image was compressed using a quality factor of 100%, 95%, 85%, 80%, 65%, 50% and 1%. Just noticeable differences (JNDs) between compressed images were measured and compared to uncompressed images using Color JND-Metrix computational observer software.

Image fidelity between 0.1 and 0.01 JND was achieved with quality factors above 70% using either JPEG or JPEG 2000. At the same quality factor, JPEG 2000 achieved higher compression ratios than JPEG. The highest image fidelity was produced with JPEG 2000 at 100% and JPEG at 90%, achieving a compression ratio of 37:1 and 28:1 respectively.

JPEG and JPEG 2000 can both preserve image fidelity but JPEG 2000 achieves a higher compression ratio.

T3E3
MOBILE RETINAL SCREENING: SAVING THE EYES OF YOUR PATIENTS

Nina M. Antoniotti, RN, BS, MBA, PhD
Marshfield Clinic TeleHealth Network, Marshfield, WI

Mobile Retinal Screening is a tool that can save the sight of many persons at risk for early blindness. Fourteen million Americans have diabetes, but many don't know it. Having diabetes puts a person at 25 times greater risk and is the #1 cause of blindness among working-age Americans. Blindness and visual impairment from most eye diseases and disorders can be reduced with early detection and treatment. The problem is access to and identification of need for screening fundus photographs. Mobile retinal screening is a lifesaver for more than 5.3 million Americans age 18 and older living with the affects of diabetic retinopathy. This presentation highlights Marshfield Clinic TeleHealth Network's Mobile Retinal Screening project, covering the technology used, integration with existing electronic imaging and records systems, and the eipidemilogic findings of the patients who were screened. Technology selection, operational planning, marketing, collaboration with quality improvement and outcomes programs, and actual processes of screening will be covered. Demographics of the patient populations screened over a one-year pilot period will be discussed. Participants will leave the presentation with information on how to plan for and operationalize a mobile retinal screening program.

T3E4
OPHTHALMIC SIMULATION FOR MEDICAL TRAINING

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The continual increase in speed and capability of personal computer technology and the optical engineering software combine to provide a practical and powerful tool for optical simulation. Detailed optical eye modeling is possible when the measured corneal topography, wavefront aberration, and biometric data are accessible. These models can assist ocular surgical planning, and in designing of personalized intraocular lens, spectacles, and contact lens. Here, we utilize personalized modeling in computer simulations to predict clinical measurements. Using personalized eye models of normal, ametropia and keratoconus patients, optical ray tracing and image analysis were performed to achieve realistic visualization of retinoscopy, photorefraction, and fluorescein measurements. Snellen chart patient vision is also simulated. The simulation results of keratoconus, tear film deficiency,

and ametropic eyes were validated with comparison to clinical measurements of equivalent optical conditions. This technique of ophthalmic simulations with personalized eye models provides an effective tool for medical training without additional testing on real patients.

T3F NETWORK DESIGN AND MANAGEMENT

T3F1
MULTI-VIEW VIDEO SYNTHESIS FOR SECURE AND SYNCHRONOUS INTERNET TRANSMISSION IN TELEMEDICINE

Renbin Peng, MS, Robert J. Sclabassi, MD, PhD, Qiang Liu, PhD, Mingui Sun, PhD
University of Pittsburgh, Pittsburgh, PA

Using multiple cameras, or a camera array, in telemedicine has many advantages. Physicians at a remote site can choose among a number of available viewpoints to reduce occlusion for best observation. By using image processing algorithms, arbitrary view points within an allowable field defined by the camera array can be computationally generated. Although multi-camera recording is very useful, coding correlated multiple video streams separately results in considerable waste of bandwidth, difficulty in synchronizing multiple video streams, and insecure transmission if encryption algorithms, which may have side-effects of reduced transmission and computational performance, are not utilized. We present a simple method to pre-process multi-view video frames by combining them into a single synthesized video stream in the transformed domain to facilitate video coding. Our method provides high coding efficiency, perfect synchronization among data streams, and improved protection of video contents.

T3F2
WAN MANAGEMENT FOR TELEHEALTH

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Utah Telehealth Network/University of Utah, Salt Lake City, UT

The line distinguishing telehealth from traditional healthcare is blurring. Telehealth's primary driver used to be just ISDN-based videoconferencing. Now, most health applications require some form of IT management-often with off-site vendor access. In the state of Utah, telehealth has evolved beyond ISDN-based videoconferencing to become the full internet service provider (ISP) for many healthcare facilities.

The presentation will use Utah Telehealth Network (UTN) as a suggested (emphasizing that it is not the only) model. UTN is a state-funded, ISP for a consortium of independent healthcare providers. UTN's services include management of an IP-based WAN private network with 24/7/365 help service, security, videoconferencing, and bridging. UTN's infrastructure and consulting pools its members' IT resources. It centralizes management of their networks so that they streamline their budgets.

The presentation will outline the infrastructure and personnel necessary for supporting telehealth infrastructure in this scope. It includes models and costs for three areas: (1) Network design and equipment management; (2) IT security with HIPAA considerations; and (3) Working relationships between consortium members and UTN's staffing.

T3F3
MULTIMEDIA TELEMEDICAL TRANSMISSION SYSTEM WITH FLEXIBLE ARCHITECTURE AND ROBUST PERFORMANCE

Mingui Sun, PhD,[1] Qiang Liu, PhD,[1] Renbin Peng, MS,[1] Jian Xu, MS,[1] Ronald Marchessault, MBA,[2] Gary Gilbert, PhD,[2] Robert J. Sclabassi, MD, PhD[1]
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In many telemedical applications, diagnostic data in multiple forms, such as video from several cameras, different types of diagnostic images, and audio signals, are involved. Efficient and synchronized transmission of multimedia data through an imperfect Internet connection is currently a difficult problem. In the past several years we have been investigating this problem to support tele-monitoring and tele-diagnostic applications. A novel multimedia data transmission system has been developed which is suitable in applications where a small delay in data transmission is acceptable. This system utilizes an efficient video coding algorithm in which the moving and idle regions within video frames are transmitted using different frame rates. To gain flexibility and synchronization, we segment each form of the acquired data into a predefined length and tag them using the time provided by the international standard. In order to reduce the effect of bandwidth jitter in the Internet and preserve the quality of data characterized with fast variation in data rates, the segmented data are downloaded automatically and asynchronously from the remote site as soon as they become available at the transmission site. The received data are then re-assembled for display and presentation. When compared to the current systems based on multi-channel data streaming, our system is not only more robust and flexible, but also more suitable for data archiving and computer database management.

T4A TELESURGERY

T4A1
FOLLOW-UP OF EARTHQUAKE VICTIMS IN A REMOTE HOSPITAL USING TELEMEDICINE

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Telemedicine applications have been successfully demonstrated during disaster situations. This study was local experience of monitoring earthquake patients remotely at step down hospital.

This descriptive study was conducted at surgical unit II holy family hospital Rawalpindi and District head quarter hospital Attock. The objectives of the study were to evaluate the role of telemedicine in the follow up of trauma patients remotely and assessment of missed injuries. All the patients treated initially at RMC and allied hospitals were later shifted to step down hospital where their progress was monitored through telemedicine.

Total stay at the hospital for these patients was 36 days, with a mean of 6 days in tertiary care and 30 days in step down hospital. Missed injuries were detected in seven patients. In 23% of patients additional diagnostic studies were advised by the panel of consultants with change in diagnosis in 17% of patients. In 45% of patients additional follow-up treatment was advised. There was no mortality in the group.

Telemedicine applications can be safely utilized to decrease the burden on tertiary care hospitals and upgrade remote hospitals during the days of disaster.

T4A2
TELESURGERY: WHAT ARE THE POSSIBILITIES?

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University of Cincinnati Center for Surgical Innovation, Cincinnati, OH

The integration of telecommunications, robotic systems, and information technologies are enhancing medical care of patients.

This evolution is particularly promising in telesurgery. Over the past several years, researchers at the University of Cincinnati's Advanced Center for Telemedicine and Surgical Innovation have collaborated with government (US Army TATRC, DARPA, NASA), industry (SRI, Intuitive Surgical, Haivision), and academia (University of Washington, WRAMC, and Johns Hopkins) to improve surgical care at a distance. Initially, our focus was on telementoring surgeons at distant sites. Recently, our research team performed the world's first telerobotic surgery using the da Vinci Surgical System over the Internet as well as the first use of the University of Washington's surgical robot over a wireless telecommunication link. In the second project, remote surgery was conducted in the high desert in California using an unmanned airborne vehicle to provide the telecommunication link. Through ongoing TATRC and NASA-funded telesurgery research in such projects as NEEMO 12, we continue to develop telesurgery systems that will improve the access to and quality of surgical care regardless of patient location.

T4A3

DESIGN OF TELECONSULTATION SYSTEM FOR WEB-BASED SURGICAL MEDICAL RECORD

Vladimir Lavrentyev, MD, MBA,[1] Azhar Rafiq, MD, MBA,[1] Francisco Tamariz, MD,[1] Cosmin Boanca, BSc,[1] Evgeniy Flerov, MD,[2] Irinel Popescu, MD, FACS,[3] Daniel Onisor,[3] Ronald Merrell, MD, FACS[1]

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This study evaluated real-time teleconsultation from the operating room (OR) to remote consultants in Russian Research Center of Surgery, Moscow, Russia and Fundeni Clinical Hospital, Bucharest, Romania. A multimedia electronic surgical record was posted to a local web-site where consultants could navigate the surgical procedure allowing for collegial interaction in real time. The customized surgical digital record called Surgical Data Collection Integrated Storage and Retrieval System (SdCISRS) was referenced to a master clock and included patient data; video from 4 cameras, voice transcribed deconstructed steps and still images. Data entry was achieved with use of foot pedals. The consultant could follow the steps on the web interface in real time. All patients were consented for videoconferencing and no patient identification revealed. Distant consultants did identify a specific anatomical landmark from the digital record and confirm the identification of this structure. Total of 15 procedures were studied with no connectivity interruption or dropped signal with bandwidth greater than 1 Mbps. Consultants spent an average of 6 minutes to review an average 35 minute of surgical record to identify the recurrent laryngeal nerve (n = 25). This study demonstrates the capability for real-time synchronized teleconsultation with a digital surgical record to share surgical practice.

T4A4

COST ANALYSIS OF TELE-NEUROSURGERY

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The Walter Reed Army Medical Center, Washington DC, deployed a tele-neurosurgery service in January of 2006. This service has subsequently delivered 2000 outpatient visits and has performed over 100 surgical procedures. This study was designed to compare the cost of delivery of care of tele-neurosurgery versus the cost of care of existing mechanisms of care delivery (hereafter referred to as TRADITIONAL CARE). Traditional care CPT stratified cost data from 2005 was compared to CPT stratified cost data from the tele-neurosurgery service of 2006. This allowed measurement of inpatient and outpatient hospital efficiencies. Tele-neurosurgery delivered substantial cost efficacy over traditional care in both inpatient and outpatient settings. Outpatient comparison revealed lower cost per patient visit and lower cost per each studied principal diagnosis classification. Inpatient (surgical) comparison revealed lower cost per each admission and length-of-stay.

T4B PERSPECTIVES ON INTEGRATING TELEMEDICINE AND ELECTRONIC RECORDS

T4B1

THE ROLE OF PROVIDER PERCEPTIONS IN A MIDWESTERN EMR DEPLOYMENT

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This study sought to examine cultural barriers that may explain the success and failure of EMRs. Successful EMR implementations are of interest to telemedicine researchers as they provide an IT infrastructure on which many telemedicine applications can be built.

This investigation sought to understand individual and organizational issues that may effect perceptions regarding EMRs by providers using an EMR system at Michigan State University (MSU). Participants completed a 144-item survey and descriptive statistics were employed for data analyses.

Data indicated that providers reported mixed results regarding perceptions of the EMR at MSU. More than 45% of respondents reported they consider the MSU EMR system a bad choice. Yet, these same providers reported high levels of satisfaction across multiple aspects of system usability. Demographic variables did not emerge as highly correlated with perceptions of the EMR system at MSU. However, positive perceptions about EMRs in general were highly correlated with positive perceptions of the EMR system at MSU.

Because results indicate that perceptions of the impacts of EMRs in general are more often correlated with perceptions of a specific EMR implementation than demographic variables, health organizations should focus their energies on EMR education and training.

T4B2

TELEHEALTH AND EMRS: A CASE EXAMPLE OF INTEGRATION OF ELECTRONIC SYSTEMS AND TELEHEALTH

Nina M. Antoniotti, RN, BS, MBA, PhD

Marshfield Clinic TeleHealth Network, Marshfield, WI

Marshfield Clinic (MC) is a non-profit, physician service organization located in northcentral Wisconsin, one of the largest private group medical practice in Wisconsin and in the United States, has 740 physicians representing 86 different medical specialties in 40 regional and rural centers. MC has one of the most sophisticated electronic medical records in the country, integrating the combined medical record, laboratory, radiology, digital imaging, scans, and tests, digital dictation, Dashboard, and provider tools such as wireless tablets, Medication Manager, e-prescribing, electronic billing and coding. All other patient care, HIT, and financial processes are automated. In addition, integrated into the clinical system is a data warehouse function, which allow comprehensive crystal reporting on all patient care activities. Marshfield Clinic TeleHealth Network technologies are fully integrated into all sites and across all networks, which have access to most if not all of the electronic support systems. This presentation will be a case study on Marshfield Clinic's elec-

tronic systems and how TeleHealth integrates those systems into practice. Specific examples will be shown regarding technology setup and physician office based TeleHealth clinical workstations. This presentation allows the participant to see a fully electronically integrated TeleHealth system with HIT.

T4B3

AN INTEGRATED TELEREHABILITATION INFRASTRUCTURE TO SUPPORT SPEECH-LANGUAGE THERAPY

Andi Saptono, MS, Bambang Parmanto, PhD
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We present an implementation of a Personal Health Record (PHR) system in a telerehabilitation setting. The goal of the system is to track the rehabilitation progress and monitor personal health information. The telerehabilitation infrastructure provides a multimodal communication channel (email, web, and videoconference) between patients/consumers and therapists. The system is also capable of capturing, storing and handling multimodal types of data (digital documents, images, and video). The system provides a therapist with more complete information about the consumer by integrating personal and clinical data. The information, organized in a longitudinal fashion, allows consumers to view their health history over time. Our implementation of the system supports speech-language therapy for children with disorders of communication. The system allows therapists to remotely assess the children's ability, dedication, and interest in performing therapy exercises at home. The system also allows parents to track the progress of the therapy, communicate with the therapists, and monitor their child's health history. This approach not only provides the therapist with information to adjust the therapy to better suit the needs and interests of the particular child, but also provides the parents with more knowledge about their child's therapy progression.

T4B4

FROM ISOLATION TO INTEGRATION: TELEHEALTH AND THE ELECTRONIC HEALTH RECORD AT THE POINT OF CARE

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University Health Network, Toronto, Canada

Information and communication technologies (ICTs) offer the promise of improving healthcare by facilitating clinician access to patient information. Consequently, integrating Telehealth videoconferencing with the electronic health record (EHR) should enhance clinical decision making at the point of care, and positively influence clinicians' adoption of Telehealth.

At a major Canadian academic health sciences center, the Organ Transplant Tracking Record (OTTR) is the main database for solid organ transplant patients. In 2005, OTTR was successfully interfaced with the hospitals' information system (Mysis/CPR). This interface permitted immediate clinician access to a wide-ranging transplant EHR, thereby facilitating a more comprehensive Telehealth consultation.

The synergy of linking Telehealth with the EHR is demonstrated through: (1) Timely access to comprehensive patient records resulting in better informed clinical decision-making. (2) Enhanced access to informed, specialized transplant care for both remote patients and care providers. (3) Sharing of the EHR between community partnerships fosters continuity of care augmented through Telehealth consultations.

Seamless integration of Telehealth with EHRs supports complex patient-centered care. The ability to access comprehensive data at the point of care improves efficiency for managing transplant patients at distance, strengthens partnerships across the care continuum, and encourages the adoption of Telehealth.

T4C MANAGING HOME TELEHEALTH PROGRAMS

T4C1

TELEHEALTH SUCCESS: FORMING PARTNERSHIPS

Sandra L. Tokey, RN, MS
UPMC/Jefferson Regional Home Health LP, Seven Fields, PA

The success of a Telehealth project is largely dependent on the ability to form partnerships particularly with affiliated hospitals and third party payors. The ability to reduce the number of readmissions to the hospital and unnecessary visits to the Emergency Department is a win-win situation for home health, hospitals and third party payors.

With an initial commitment to purchase and deploy 50 monitors for Heart Failure patients, UPMC/Jefferson Regional Home Health LP gathered statistics demonstrating daily oversight through telemonitoring and providing early and prompt intervention did indeed reduce readmissions to the hospital. For this population, the average readmissions rate was 5.2% compared to the national average of 20%.

With this data in hand, meetings were scheduled with UPMC Health Plan and Highmark Blue Cross/Blue Shield. We were able to present proposals showing that Telemonitoring, in conjunction with a strong Heart Failure program, could reduce costly readmissions to the hospital saving insurance companies money. Both companies committed funding to purchase 50 additional monitors - 25 UPMC Health Plan and 25 Highmark Blue Cross/Blue Shield. The monitors are for the exclusive use of their patients with a diagnosis of heart failure. Both projects are presently underway and data is being collected.

T4C2

E-HEALTH PROGRAMS: THE NEED TO DEVELOP A SUSTAINMENT MODEL

Suzanne Paone, BS, MBA, Linda Siminario, RN, PhD, Michael Kistler, BA, MA
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Information technology in the medical arena (eHealth) enables the extension of services in the areas of prevention and disease management through the use of portals, online secured patient communities and automated disease management telephony. Proof of concept projects in this area demonstrate improvements in both physiologic parameters as well as improvements in disease management compliance, and these programs show great potential for military healthcare applications. One significant barrier related to the expansion of eHealth services is the lack of technology, process and procedural models to support sustainable payer-based reimbursement for services. Furthermore, while the industry focuses on "eVisits" reimbursement for online physician visits, services like diabetes and nutrition education are not the focus of current sustainability models in the health information system market place. This work provides a framework for the advancement of non-physician professional services which is applicable to any automated eHealth environment in either the private or public sector. It supports standards for technology, processes, and policies that are needed to create sustainability models for eHealth in provider communities, or in the case of the military, the potential for sustainability models.

T4C3

COMMUNITY TELEHEALTH NETWORK: REDUCING HEALTH DISPARITIES IN NORTHEASTERN NORTH CAROLINA

Bonnie Britton, RN, MSN, April Hoggard, RN
Roanoke Chowan Community Health Center, Ahoskie, NC

This presentation will highlight an innovative and sustainable

telemonitoring network implemented in rural northeast North Carolina to eliminate healthcare disparities. The goal of the network is to eliminate healthcare disparities by substantially increasing access to care, incorporating evidenced based telehealth interventions into current case management initiatives, expanding telehealth interventions into the home, community, and schools, providing health education, and decreasing healthcare costs which can positively impact state policy and reimbursement.

First, the presenter will discuss healthcare disparities and the need for a new model of care. Next, the presenter will discuss the tiered monitoring network, including in-home telemonitoring in individuals' homes, telehealth kiosks in multiple community locations and in-home vital sign monitoring. Finally, an in-depth discussion and analysis of clinical and financial outcomes will be presented. This presentation will highlight how this model levels the economic playing field by placing affordable healthcare in communities and homes; thus patients, rich or poor, rural or urban, have equal access to healthcare information and early detection and intervention.

T4C4
OPTIMUM DESIGN OF REMOTE PATIENT MONITORING SYSTEMS
Tanja M. Bratan, MSc, Malcolm Clarke, PhD
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Remote patient monitoring (RPM) has not become integrated into mainstream healthcare, despite its proven benefits. We sought to determine reasons that might hinder successful integration and mainstreaming. We chose to investigate the set-up of all current and recent RPM projects in the UK in order to determine patient care pathway, and identify roles and clinical processes. From comparison we define an optimum design. This was compared against a small number of US and one Spanish RPM projects.

A case study approach was adopted, and twenty-seven interviews with clinical, managerial and technical staff from the projects were conducted, in addition to an extensive literature review. Integration was greater for RPM systems that are based in the same setting where patients receive their usual care, and that are built upon established collaborations between healthcare professionals. For projects managing chronic disease, this was ideally in primary care. For projects managing high dependency, such as early discharge from hospital, patients are ideally monitored by the consultant who managed them during their hospital stay in the initial stages, but regular long-term management should be carried out by primary care. Depending on its purpose, an RPM system should therefore be based where it best fits existing roles of healthcare organisations.

The better use an RPM system makes of existing pathways and collaborations, the greater its integration into the healthcare system.

T4D PEDIATRIC TELEMENTAL HEALTH

T4D1
AN INTEGRATED TELEHEALTH INTERVENTION FOR YOUTH DEPRESSION
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Since 1998, TeleKidcare has bridged the gap between high healthcare need and poor access using school-based telemedicine. In 2005–2006 alone, KUMC behavioral health providers completed over 600 school-based consults. Depression and depressive symptoms were present in three-quarters of these TeleKidcare behavioral consultations and students presenting to TeleKidcare clinic had often suffered with depressive symptoms for months or years before referral. The presenters will describe leveraging TeleKidcare's relationship in order to better identify depressed youth in the school setting. The presenters will describe the integration of three technologies—distance education, internet, and telemedicine strategies—in order to address youth depression. Distance education, including web archiving, is used not only to train telemedicine nurses, but also to disseminate depression information across school districts. The internet website Connected Kansas Kids puts depression within the context of other chronic illnesses and provides user-friendly information about depression. Finally, the multidisciplinary TeleKidcare clinic provides state-of-the-art treatment via telemedicine and anticipates treating 100 new children with depression in the 2006–2007 schoolyear. Evidence-based treatments over telemedicine include medication and cognitive-behavioral therapies. The presenters will summarize the synergistic effect of integrating training and treatment through technology and will look toward integrating future applications including electronic health records.

T4D2
THE PEDIATRIC BEHAVIORAL TELEHEALTH CLINIC: PROCESS AND OUTCOMES
Jodi Polaha, PhD
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In a review of the literature in telepsychiatry from 1965-2001, Hilty, Luo, Morache, Marcelo, and Nesbitt (2002) described a wide variety of reported uses including the assessment and treatment of attention-deficit hyperactivity disorder and behavior therapy for children with disruptive behavior. To date, however, no studies have detailed patient demographic, treatment process, and satisfaction or outcome data regarding such a service. The current study examined those variables in the context of the Pediatric Behavioral Telehealth Clinic, a service designed to address the needs of rural families with concerns about their child's developmental, behavioral, or emotional well-being. In rural Nebraska this kind of innovative programming has particular promise. A total of 45 families participated in this clinic during its first 18 months. In addition to demographic characteristics of the sample (including distance from telehealth and other providers), process data to be presented include the presenting concern and severity scores on behavior rating scales, number of sessions attended/missed, technology-related setbacks and other caveats. In addition, satisfaction/outcome ratings (for 53% of the sample) at three months post-treatment will be presented. Taken together, these data provide early descriptive information on the pragmatics of such a services as well as preliminary outcomes. Future directions for controlled studies will be discussed.

T4D3
THE VERMONT CHILD TELEPSYCHIATRY PROGRAM: TEACHING PATIENT CARE AND RESEARCH
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The chronic and absolute shortage of child psychiatrists in the United States is even more severe in rural areas. We describe the results of our Department of Transportation (DOT) funded Vermont TeleChildPsychiatry Project. We describe our research program which consists of pre and post visit quantitative and qualitative responses from patients, their families, and their case managers on 25 children seen at three of the most rural mental heatlh centers in Vermont. In addition, we present data on our Telemedicine teaching hours aimed at assisting in the development

of assessment skills in non-child psychiatrists in these areas. Lastly we describe advances in computerized assessment of children and families using the telemedicine platform. Results: Children, their parents, and case managers in three rural community mental health centers who do not have access to child psychiatrist uniformly reported excellent acceptance using both quantitative and qualitative measures. Data include timed saved, money saved, access, and quality of interaction. In addition, participants in the telemdicine teaching hours reported outstanding acceptance of the value of low distance learning. Lastly, we present videography of our exportable telemedicine modules (rooms crafted from felt) to allow a more child friendly atmosphere for the consultation.

T4D4

TRAINEE PERCEPTIONS OF IMPLEMENTING NATIONAL ADHD GUIDELINES IN TELEKIDCARE CLINICS

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Pediatricians have become gatekeepers in the evaluation and treatment of attention deficit/hyperactivity disorder (ADHD), with primary care diagnosis for children with ADHD increased threefold over the last five years (Hoagwood et al., 2000). To assist pediatricians in meeting growing clinical demand, the American Academy of Pediatrics published best-practice guidelines for ADHD management (AAP, 2000). Little is known about the feasibility of using these guidelines in the telemedicine setting. The researchers will present findings from an ongoing evaluation of compliance with AAP guidelines through school-based TeleKidcare clinics. The project will report overall satisfaction across providers/trainees, parents, and school personnel in the 2006–2007 school year. The presentation will focus on findings related to approximately 40 pediatric trainees participating across 100 clinical consultations. Consenting trainees complete online pre/post telemedicine rotation surveys. Initial results indicate modest improvements in pre-post knowledge about ADHD and gains in self-efficacy with the telemedicine technology and intention to use the technology in practice. In open-ended questions, pediatrics trainees report benefit of community experience via telemedicine, particularly collaborating with the school nurses. The trainee feedback will be used to generate a more structured telemedicine vignette-based questionnaire. The feedback will also be used for quality improvement of the TeleKidcare ADHD rotation.

T4E MANAGING AN OCULAR TELEHEALTH PROGRAM

T4E1

FACTORS INFLUENCING UTILIZATION OF A DIABETIC RETINOPATHY ASSESSMENT PROGRAM

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The objective of this study was to evaluate utilization of a diabetic retinopathy assessment program and to assess factors which influence its use.

The DigiScope is a validated telemedicine system designed for diabetic retinopathy assessment in the primary care setting. It is based on a semi-automated fundus camera and transmission of data to a reading center for interpretation and determination of the need for ophthalmic referral. Only diabetic patients who have not had an eye examination in the previous year are imaged. Factors influencing utilization of the system were evaluated.

Between July 1 and December 31, 2005, the DigiScope system was in place at 88 sites. 5,044 patients were imaged. The number of patients imaged at each site ranged from 9 to 177. Factors associated with increased utilization included large diabetic population, involvement in quality healthcare initiatives, positive economic return, and integrated patient workflow. Factors associated with poor utilization included poor ancillary staff acceptance, poor office integration, and poor economic return.

Utilization of the DigiScope diabetic retinopathy assessment program varies significantly between sites. Identification of factors associated with both high and low utilization may allow for more appropriate implementation to achieve maximal impact on overall diabetic retinopathy assessment rates.

T4E2

IMPLEMENTATION AND ACCEPTANCE OF TELEOPHTHALMOLOGY FOR RETINAL SCREENING IN CLINICS

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Diabetes is growing in epidemic proportions; more than 20 million in the US are diabetic. Nearly half of people with diabetes have some degree of diabetic retinopathy. The longer the duration of diabetes, the more likely it is that they will develop diabetic retinopathy, which remains the most common cause of blindness. Diabetic retinopathy must be detected and treated early, before symptoms develop. Through Congressional funding, the University of Pittsburgh Medical Center (UPMC) developed a process for packaging and transporting digital retinal images with patient data from the site of acquisition to specialists at remote locations who grade the images and provide follow-up consultation with patients as needed. Retinal screenings were established in both community and clinical settings. Patient participation in community settings (i.e., health fairs) went quite well. Clinics were a challenge with very few people participating. The evaluation team used surveys, focus groups and interviews to identify participation issues in the clinic environment. Their results prompted interventions with nursing staff, medical assistants, and physicians that promoted retinal screenings. Findings and recommendations will be presented that may support efforts to overcome the challenges of providing adequate screening and care to diabetic patients.

T4E3

INTEGRATION OF OCULAR TELEMEDICINE IN A COMMUNITY HEALTH CENTER

Lloyd M. Aiello, MD,[1,2] Paula DeVitt, RN,[3] Greg Lopez,[3] Michael Seligson, MD,[3] Kristen Hock, BS,[1] Nigel Timothy, MD,[1,2] Sharon Eagan, OD,[1] Jerry Cavallerano, OD, PhD[1,2]
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La Familia Medical Center (LFMC) is a community health center in Santa Fe, NM, providing comprehensive medical, dental, and health education services since 1972 with special emphasis on underserved persons. In April 2005 LFMC incorporated the Joslin Vision Network Diabetes Eye Care Program (JVN) as part of their diabetes service. Retinal images were acquired according to JVN protocol, transmitted to Joslin Diabetes Center for grading by certified readers, and a treatment plan recommendation was returned to the patient care coordinator at LFMC.

Of the 258 patients imaged, 151 (58.5%) were women and age ranged from 13 to 80 years (mean 49 years; median 49 years). Duration of diabetes ranged from newly diagnosed to 46 years (mean 7 years; median 5 years). Of the 516 eyes imaged, 343 (66.5%) had no diabetic retinopathy (DR), 91 (17.6%) had mild-moderate nonproliferative DR (NPDR), 9 (1.7%) had severe-very

severe NPDR, 10 (1.9%) had proliferative DR, and 16 (3.1%) had quiescent DR; 47 eyes (9.1%) were ungradable for DR. Additionally, 17 eyes (3.3%) had diabetic macular edema.

Retinal evaluation using the JVN at LFMC provides a means to evaluate DR in a community health center providing care for underserved persons.

T4E4
EFFECT OF DIGITAL IMAGE RESOLUTION AND DISPLAY MODE ON VISIBILITY OF DIABETIC RETINOPATHY MICROANEURYSM

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Successful telemedicine evaluation of diabetic retinopathy is partially related to sensitivity and cost. Microaneurysms are tiny lesions ranging from 25–125 microns and are one of diabetic retinopathy's most telltale lesions.

Sets of 34–62 micron and 57–85 micron microaneurysms were studied and diagnostic performance of 3008 × 2000, 1088 × 723 and 800 × 531 pixel resolution images compared. Computer-generated microaneurysms were added to lesion free images for a sufficiently large image database. Three retina ophthalmologists reviewed resolution sets of 150 light pigment and 150 dark pigment images on the same 19-inch CRT monitor at 1600 × 1200 using a fit-to-screen display mode. 3008 × 2000 images were also reviewed in their native 1:1 resolution.

There was no difference in ROC Az performance as a function of fundus pigment across all resolutions ($F = 0$, $p = 0.999$). The performance of identifying smaller microaneuryms was lower than larger lesions (62.45% and 83.77% respectively, $F = 25.591$, $p < 0.001$). Identifying microaneuryms at 3008 × 2000 using fit-to-screen was harder than 3008 × 2000 images displayed in their native 1:1 resolution (69.35% versus 83.64%). There was similar performance in identifying microaneurysms across all resolutions viewed fit-to-screen though lower than 3008 × 2000 images at native resolution ($< 80\%$, $p < 0.05$).

3008 × 2000 digital resolution images displayed at 1:1 resolution provides better performance in identifying diabetic retinopathy.

T4F TELECOMMUNICATIONS FOR MOBILE AND DISASTER MANAGEMENT

T4F1
MOBILE WIRELESS VIDEO TRANSFER SYSTEM (MWVTS) FOR DISASTER MANAGEMENT

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A major challenge for disaster management is real-time situational awareness. We tested MWVTS transmission of at scene videos through a wireless WAN to a remote EOC during a National Disaster Medical System Functional Exercise (NDMS-FX). Live field video (close-ups and the focused field view) were captured by the MWVTS and transmitted through a secured multi-channel (3G-EV-DO, GPRS) wireless network to a server. Remote viewers at the EOC accessed the live or stored images through secured wireless tablet PCs. Six experts at the EOC (3-physicians, one-military, and two-EMS personnel) completed image evaluations on a 1-5 (worst to best) Likert Scale. Results: 22,419 real-time mobile video images (320x240) comprising 168,003,396 bytes were transferred over 247.7 minutes (average 11.3 kbps and 1.51 fps). Mobile video image uses and scores (mean values) were: situational awareness of FX = 4.7, video images usefully for patient triage = 4.3, for Incident Commander = 4.0, in combination with FX radio communication = 4.7, for declaring a patient dead = 2.7.

Video imagery from MWVTS improved EOC situational awareness. The images provided a useful training and debriefing record of FX. The institutional firewall configuration was a barrier for rapid system deployment. Funded by TATRC-DoD-W81XWH-05-2-0081.

T4F2
A RIGOROUS TECHNICAL FRAMEWORK FOR VIDEO COMMUNICATIONS FOR MOBILE TELEHEALTH

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Live video is frequently an essential component of remote patient assessment. In mobile settings, available bandwidth is often insufficient to transmit in real time the data necessary for image portrayal with resolution sufficient for clinical evaluation and diagnosis. However, the portion of the image that the clinician must see clearly, the Region of Interest (ROI), is often a small portion of the total image. The value of paying special attention to the ROI in the visual scene has emerged as a consistent theme in clinical scenarios. Our research addresses the definition and tracking of ROI, typically in a semiautomatic mode with periodic manual resets, and the unequal compression of ROI and non-ROI areas. Of particular importance is the development of an elastic video compression algorithm that responds to all inputs of relevance, including communication network rsources and application needs defined by medical experts. Current results suggest a gain on the order of 4:1 in terms of the minimum network resources needed to provide a specified quality of medical information to the remote physician. Research currently focused on the assessment of acute respiratory distress in children also examines the scientific, technical, and user-acceptance dimensions of the ROI methodology in mobile settings.

T4F3
RAPID DEPLOYABLE VIDEO DISTRIBUTION SYSTEM (VDS) FOR REAL-TME DISASTER MANAGEMENT

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Effective real-time situational awareness and communication is critical in disaster response. We report a rapid, wireless deployable real-time VDS for instant delivery of multi-channel live video to a remote emergency operation center (EOC) during a National Disaster Medical System Functional Exercise (NDMS-FX).

During the NDMS-FX, 16-VDS cameras were strategically placed to provide maximal coverage on the reception, patient triage, staging and transportation areas. VDS captured 16-videos at a rate of 16 images-per-second with wireless transfers to the remote EOC. The viewer at the EOC could select any combination of the 16 images based on the field situation. Six experts at EOC (3-physicians, one-military, 2-EMS personnel) completed real-time image evaluations on a 1–5 (worst to best) Likert Scale.

A total of 130 minutes of video were captured and wirelessly reviewed in real-time at the EOC. End-to-end delay was less than 4 seconds. Video images: provided additional information: 4.0; enlarged images aided the viewer: 3.5; FX situational awareness increased: 4.5.

Live video imagery from the entire FX site greatly improved EOC situational awareness. Developments in the FX could be tracked and the triage status immediately determined. The institutional firewall configuration may be a barrier for future rapid deployments.

T4F4

IT AND TELECOM DEPARTMENTS ON WHEELS: THE MOBILE COMMUNICATIONS PLATFORM

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The Mobile Communications Platform (MCP), is a vehicular solution that provides both telecommunications capabilities and a range of modular mission-specific tools that can be delivered and used at mass casualty scenes, remote clinic sites, or wherever a temporary broadband "footprint" is required. A modular telemedicine cart, based on a CERMUSA design for use in rural hospitals constitutes this vehicle's primary payload. The MCP can also serve as a fielded "command and control" center for emergency responders. Built on a Hummer H1 chassis, the MCP's design accommodates both civilian and military transportation infrastructures and permits access even in challenging remote terrain. A satellite communications connection provides up to 1.2 mbps of bandwidth that can be used for video conferencing, computer networking, voice over IP (VoIP) telephones, and other IP-based applications. An 802.11b wireless system and integrated hardwire routing system provides support for a robust on-scene WLAN, which allows improved communications between incident responders and superior situational awareness for command staff, both on scene and "behind the lines". Multiple tests and demonstrations have shown the potential of the vehicle.

The modular design also allows for a graceful evolution as new and improved telecommunications and telehealth technologies become available.

T5A NEW TECHNIQUES FOR REMOTE CRITICAL CARE

T5A1

TECHNICAL EVALUATION OF A BROADBAND TELEMEDICINE APPLICATION FOR CRITICAL CARE

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Australia has a shortage of specialists in critical care, a common problem for countries with small population to land mass ratios. The Virtual Critical Care Unit (ViCCU®) was developed by CSIRO in collaboration with Sydney West Area Health Service to provide the Emergency Department of a small district hospital, Blue Mountains Hospital (BMH), direct access to specialist services from a major tertiary hospital, Nepean Hospital (NH), using broadband.

A user-centered, participatory design approach was adopted in this 'designed for purpose' application to ensure ease of use - essential in stressful critical care environments.

ViCCU® was piloted between BMH and NH from December 2003 to December 2005. Fifty clinicians participated in a usability and technical evaluation. Clinicians from both hospitals expressed high levels of satisfaction with the design, ease of use, media quality and reliability. Over half, 53%, of the clinicians from BMH considered using ViCCU® 'the same' as a specialist being there in person and 19% 'better' or 'much better'.

Critical to ViCCU®'s success (it has progressed from pilot to routine use) was the high media quality afforded by broadband, consideration of usability and human factors, and the constant, close involvement of clinicians in its design and implementation.

T5A2

INTEGRATING CROSS-CULTURAL INDIGENOUS AND WESTERN HEALING WITH MODERN TECHNOLOGY

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Indigenous healers around the world have used non-traditional practices and techniques for centuries that, though poorly understood by western physicians, clearly have a role in the well-being and healing of their patients. Slowly, some of these same practices are gaining popularity in western society. In 2004, the National Center for Complementary and Alternative Medicine (NCCAM) reported survey results that 62 percent of respondents used complementary and alternative medicine in 2002.

This paper looks at the integration of cross-cultural healing practices between the US and Ecuador. Plastic Surgeons and Physicians from the US and Ecuador working with indigenous and alternative healers from both countries have established protocols for pre and post-operative management of children with cleft lips and palates in Ecuador's Amazon region. Telemedicine, in the form of videoconferencing is used to augment the entire process from pre-operative evaluations to post operative treatments which incorporate both western and indigenous healing practices. Both patient to physician and peer to peer healer consultations are used extensively. Reciprocal presentations by healers in both countries are also used to foster a better understanding and respect of each other's culture and techniques.

Surveys report a high level of satisfaction and a low complication rate.

T5A3

TELEMEDICINE FOR PRE- AND POST-OPERATIVE EVALUATION OF ELECTIVE SURGICAL PATIENTS OF REMOTE CENTERS

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This descriptive study was conducted at surgical unit II holy family hospital Rawalpindi (tertiary care hospital) and Tehsil head quarter Pindi Gheb (remote center). The objectives of the study were to evaluate the role of telemedicine in pre and Post operative assessment of patients at remote location without the need to travel to tertiary care center. 36 patients are included in this study.

The average number of visits for pre operative assessment at

tertiary care hospital for patients from remote areas is 11. This number reduced to just one with prior Teleconsultations. Time lapse between first appearance at remote site and consultant advice was reduced to 4 days from 15 days. Post operative stay at holy family hospital came down to 4 days from 15 days. Follow up visits were reduced to 1 as compared to 4 visits. There were no unnecessary referrals with use of telemedicine as compared to 4 cases which could have been managed at remote center without the need of surgical intervention. No complications were observed in the patients evaluated through telemedicine.

Telemedicine may reduce the time required on site for pre operative planning and may provide reliable post operative surveillance thus improving the efficiency of surgery services.

T5A4

TELEMEDICINE IN RURAL PEDIATRIC CRITICAL CARE

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Telemedicine consultations can serve to facilitate the initiation of life-sustaining therapies for critically ill children who present to rural hospitals. In this first report of such use, the Division of Pediatric Critical Care of Vermont Children's Hospital has provided 23 Telemedicine consults for critically ill children at 10 outlying rural hospitals. Diagnoses have included sepsis, diabetic ketoacidosis, respiratory failure, status asthmaticus and status epilepticus, among others. Critical Care interventions have included recommendations for critical medication, fluid and electrolyte management decisions, and supervision of procedures including endotracheal intubation, initiation of mechanical ventilation, and central venous catheter placement. Using a standardized Telemedicine Evaluation Form, Consulting Providers reported that the quality of the patient's healthcare was improved (78%), the consult could not have been performed as well by telephone (85%) and the provider to provider communication was good or very good (90%). For the referring providers, 100% felt that the consult improved the quality of the patient's healthcare, 50% felt the consult could not have been performed as well by telephone and 100% felt that the provider to provider communication was very good. Telemedicine is a powerful tool that can deliver Pediatric critical care expertise to the bedside of critically ill children who present to rural hospitals.

T5B TELEMEDICINE OPERATIONS: RECENT RESEARCH

T5B1

TYING TELEHEALTH TO QUALITY: WHERE IS YOUR CHASM?

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Marshfield Clinic TeleHealth Network, Marshfield, WI

When the Institute of Medicine calls for a 'sweeping redesign of the American HealthCare system', do you think of TeleHealth? Have you thought of how TeleHealth/Telemedicine might bridge the quality gap? This presentation focuses on the link between TeleHealth/telemedicine strategies and the six quality indicators of safety, timeliness, patient-centered, efficient, effective, and equitable. All current healthcare discussions, from providers to patients to payers, are centering around quality indicators. TeleHealth/telemedicine can improve an organization's readiness to address the IOM's quality indicators, improve its efficiency, and gain an advantage in the pay-for-performance systems. A focus on current TeleHealth/telemedicine strategies that address the quality indicators will include EMRs, CPOEs, on-line tools, remote monitoring, and interactive consultations and their role in promoting quality initiatives in organizations. As the quality focus becomes a larger part of the strategic plan of an organization, TeleHealth/ telemedicine needs to be at the planning table. Real life examples of TeleHealth/telemedicine driven quality and evaluation of outcomes will be reviewed. The key to linking TeleHealth/telemedicine strategies to evidence-based practice will be presented so that the participant will leave the workshop with ideas to implement in their organization.

T5B2

COMPARISON OF PATIENT TRAVEL PATTERNS IN THREE HEALTHCARE MARKETS

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Center for Information Technology Leadership, Boston, MA

Telemedicine applications provide the most patient care and economic advantages when the cost of travel between patients and healthcare providers is the greatest. Whereas previous analysis have examined the distribution of patient and provider locations at the population level, this study examines the distribution of patient travel at the healthcare encounter level to more accurately reflect actual patient travel burden.

Here we present an analysis of actual patient to provider travel distances in three different geographic markets using Geographic Information System (GIS) software. All markets involve academic medical centers with large patient populations (over 100,000 visits per year). One market is in the Midwest and serves a primarily disadvantaged urban population. One market is in the South-Central US and serves a large rural population. One market is in the Northeast and is a nation-wide referral center.

Analyses in the three markets, based on zip codes of patients and their healthcare providers, show significant differences in patient travel burden between the three markets. Since travel cost is an important determinant of telemedicine value, this type of analysis is important to any healthcare institution implementing telemedicine applications so they can understand the unique characteristics of their market.

T5B3

AN ANALYSIS OF PROVIDERS' TIME AND OUTCOMES IN TELEHEALTH

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Alaska Native Tribal Health Consortium, Anchorage, AK

AFHCAN has introduced a systematic method to capture the time required by all providers to both create and respond to store-and-forward telehealth systems and to link that data with other evaluative measures. Data has been captured from more than 3,000 telehealth cases conducted at 12 pilot sites from July 2005 to August 2006. Mean time to create a case was 7–8 minutes for the first 4 months, and fell over a period of 3 months to a (now) constant time of 5–6 minutes. The amount of time spent creating a case varies significantly with the clinical problems addressed, the medical peripherals used to capture patient data (e.g. ECG – 12min), the type of provider (e.g. audiologist – 20–28 min), and the specialty to which the case is sent.

All Alaska systems are being upgrade to this new system, with the expectation that more than 18 different specialties will be tracked by September 2006 and more than 10,000 cases and 700 providers' cases will be tracked annually.

It has become clear that to promote the use of store and forward telemedicine, a payment schedule is needed to reimburse providers who create and send cases. This data is a first step toward placing a value on the time and effort spent by providers, and to correlate this data with provider attitudes on telehealth, satisfaction, patient education, and health outcomes.

T5C CROSS-BORDER TELEMEDICINE PROGRAMS

T5C1
CROSS-CULTURAL TELEMEDICINE APPROACH TO EPIDEMIC DIABETES: MODEL FOR DEVELOPING NATIONS

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The shift from infectious to noncommunicable disease in the developing world ranks among the greatest public health challenges of the twenty-first century. Diabetes prevalence is rapidly rising. By 2025, 228 million people with diabetes will live in developing nations, 76% of the worldwide total. The World Health Organization has called the epidemic a global priority.

Operation Village Health is an email-based telemedicine program that allows US-based physicians to support health providers in remote Cambodia. Since 2001, 700 cases have been completed and show decreased duration of complaints among villagers. We hypothesize that cross-cultural, email-based telemedicine holds significant potential for improving management of diabetes in undeveloped regions like remote Cambodia.

Results of retrospective case review of 196 visits by 86 patients, January 2005–May 2006, are presented. One hundred sixty eight (86%) visits addressed chronic diseases; 48 visits (24%) were made by 15 diabetic patients (17%). Key informant interviews provide valuable insight into local diabetes knowledge, attitudes, practices, and beliefs. Contributing factors, management, and response are examined. Findings support cross-cultural, email-based telemedicine as a means to facilitate diabetes management in remote regions and guide discussion of strategies for prevention, care, education, and application of this model to similar underserved areas in Africa and developing nations.

T5C2
TELECONSULTATION IN PERU FOR CHILDREN AND ADULTS WITH DEVELOPMENTAL DISABILITIES

Georgina Peacock, MD, MPH,[1] Liliana Mayo, PhD,[3] Matt Reese, PhD,[2] Louann Rinner, MSEd, OTR/D,[2] Matt Braun, MA, CCC-SLP,[2] Ryan Spaulding, PhD[2]

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The developmental pediatrician will describe the first teleconsultation service between a center serving 450 children and adults with developmental disabilities in Peru and an academic medical center in the US. Children do not have access to developmental medical services in Peru and children with mental retardation or autism can receive sub-standard care due to lack of understanding about their disabilities. The service is unique in offering team-to-team international telemedicine consultation for evaluation and intervention of developmental disabilities including autism, developmental delay and mental retardation. The ongoing clinic anticipates serving at least ten families in 2006–2007 across diagnoses in collaboration with the support services offered through the Centro Ann Sullivan del Peru (CASP) school. The program collaborated with KU Center for TeleMedicine in selecting technology feasible across the two countries and for ongoing problem solving concerning connectivity. She will explain telemedicine clinic development including technology, cost, and protocol development and explain how the clinic has evolved. Typical consultations address confirmation or reevaluation of diagnosis, treatment planning for education and other needs, and behavior management strategies. Satisfaction across families and CASP staff will be presented as well as impact on University of Kansas Medical Center trainees participating in the international consultations.

T5C3
BUILDING AN INTERNATIONAL TELEHEALTH PROGRAM: OVERCOMING BARRIERS INTERNALLY AND EXTERNALLY

Alexander Nason, MBA, MHA

Johns Hopkins Medicine International, Baltimore, MD

Johns Hopkins laboratories, classrooms and clinical units are centers of learning for thousands of physicians, students and health professionals. Johns Hopkins Medicine International (JHI) works with international institutions, physicians and leaders to fulfill their needs for education and training in their particular area of expertise by utilizing the subject matter experts from one of the United States' premier academic institutions.

Since 2001, JHI has taken steps to fulfilling this goal through the uses of both 'hi-tech' and 'low-tech' telecommunications and telemedicine technologies. With the changes in the world at that time, JHI felt it was critical to remain local in a community without physically being present. It is the philosophy of the JHI telehealth program that that the ability to influence many is more powerful than treating one. JHI and the Hopkins Office of Telemedicine have supported several international initiatives of knowledge sharing through video conferencing and e-learning formats. And while successful, all programs, regardless of location, socio-economic status and culture, are faced with its pitfalls and challenges.

This presentation will outline the successes of the JHI telehealth programs (video education programs, telemedicine consultations), the results of our successes and the pitfalls we regularly run into when establishing these programs.

T5C4
PACIFIC ISLAND HEALTHCARE PROJECT (PIHCP): THE FIRST 15 YEARS

COL Donald A. Person, MD[1,2,3]

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TAMC has provided tertiary medical care to indigenous peoples of the US Associated Pacific Islands (USAPIs), since it opened. The PIHCP was initiated 15 years ago for the purpose of enhancing Graduate Medical Education (GME) at TAMC and providing definitive care to underserved Pacific Islanders. The USAPIs include 3 US Flag Territories (American Samoa, Guam, and Commonwealth of Northern Marianas) and 3 Freely Associated States; including Republic of the Marshalls Islands, Federated States of Micronesia (Chuuk, Kosrae, Pohnpei, Yap) and Republic of Palau. Five time zones, an International Date Line, and more than 5,000 miles separate them from Hawaii. Because of this, referrals were problematic. Communication was by letter, facsimile, long distance telephone, and even diplomatic pouch. With the accessibility of the Internet, a simple store-and-forward program (Cold Fusion web application) was developed to link the UASPIs with the PIHCP.

This has resulted in hundreds of consultations (>3000); enhanced by photographs, EKGs, X-rays, ultrasound images, histopathologic images, video clips, and more recently, CT scans. More than 5,000 Pacific Islanders have been cared for in person at TAMC or remotely. The humanitarian benefit has been incalculable and the program has resulted in more than 50 publications to the benefit of GME.

T5D TELEMENTAL HEALTH

T5D1
EXAMINING TELEMENTAL HEALTH PROGRAMMATIC OUTCOMES AMONG AMERICAN INDIAN VETERANS

Elizabeth Brooks, MS, Jay H. Shore, MD, MPH
University of Colorado at Denver and Health Sciences Center, Aurora, CO

This presentation will review the effectiveness of telemental health in American Indian communities. The research will be pursued through a retrospective chart review examining a specific telemental health program that provides treatment for American Indian veterans with PTSD. Data will be presented from two sources; administrative data and medical records. The administrative data includes information on the costs of these clinics - including staff, technology, and administration - as well as data on clinic statistics (e.g., number of clinic visits). Medical records contain patient service use and outcome information.

The product of this research has the potential improve telepsychiatry care provided to American Indian veterans in rural communities as well as the larger American Indian veteran population seeking mental healthcare treatment. The findings will allow us to examine the effectiveness of these telemental health programs and determine their impact on patient health. The information will help provide guidance to those developing telepsychiatry programs and policies among American Indians and rural populations.

T5D2
CROSS-CULTURAL STORE-AND-FORWARD TELEPSYCHIATRY

Peter M. Yellowlees, MD,[1] Don Hilty, MD,[1] Alberto Odor, MD,[1] Barb Johnston, MSN[2]
[1]*University of California, Davis Health System, Sacramento, CA;* [2]*California Telemedicine and eHealth Center, Sacramento, CA*

The aim of this pilot project is to evaluate the validity of Store and Forward Telepsychiatry (SFTP) for undertaking English and Spanish psychiatric assessments in rural Californian patients. If this project is successful it will demonstrate an alternative method of psychiatric service provision for mobile rural non-English speaking agricultural workers who at present have little access to conventional face-to-face or Telepsychiatry mental health services.

Despite the success of real time telepsychiatry, it has not been used as widely as might have been predicted. One way of overcoming some of the barriers to synchronous telepsychiatry is the use of store and forward telepsychiatry. This enables each consulting psychiatrist to give an opinion on a patient in about half of the time that such an opinion presently takes in a face-to-face or synchronous telepsychiatry appointment, and does not require simultaneous scheduling of both patient and psychiatrist. It should therefore ultimately be a cheaper and more accessible process for patients.

This presentation will give an overview of this two-year research project, will demonstrate the store and forward telepsychiatry software we are using and the clinical process, and will present early results.

T5D3
INCREASING ACCESS TO EVIDENCE-BASED MENTAL HEALTH SERVICES THROUGH TECHNOLOGY

Lisa J. Roberts, PhD
Viterion Telehealthcare, LLC, Bellevue, WA

Ronald F. Levant, past President of the American Psychological Association described an APA initiative based on "promoting healthcare for the whole person." This statement highlights the acceptance of the need to provide integrated services. There is also continued emphasis on applying three pillars of evidence-based practice: 1) research evidence, 2) clinician expertise, and 3) patient preferences, values and culture in a reformed healthcare system in which healthcare providers team up to treat the whole person. Technology is a mechanism that can be used to support the pillars of evidence-based practice, integrating services for both physical and psychological health. The first goal of this presentation is to describe innovative applications of home telehealth technology for individuals with co-occurring medical and psychiatric disorders, including multiple sclerosis, depression and posttraumatic stress disorder. Not only do these populations have tremendous health services needs, but also they often have difficulty accessing services due to insufficient resources (transportation, time, urban and rural obstacles), insufficient providers (especially for specialty services), and limited functioning due to their health conditions. The second goal is to provide an overview of the state of the home telehealth literature for co-occurring disorders.

T5D4
SCREENING FOR DEPRESSION WITH HOME MONITORING TECHNOLOGY

Carolyn L. Turvey, PhD
University of Iowa, Iowa City, IA

This study will present data on the development of a comorbid chronic illness home monitoring program that includes a screen for depression. Chronic illness, not acute illness, is becoming the most prevalent medical presentation in late-life. Illness management models and home monitoring have developed in response to the challenges of caring for chronic illness. We have integrated depression management into a standard heart failure illness management program.

Patients participated in an interactive voice recording (IVR) home monitoring program for heart failure that included daily assessments of heart failure status and weekly screening for depression using either the PHQ-9 or the Koenig Brief Depression Scale for Medical Patients. Patients' report on IVR was compared with their responses to a nurse telephone interview. These validation assessments occurred in a counterbalanced format either just before or after completion of the depression screens. In addition, the depression screen was implemented in a local community outreach program.

Agreement between IVR administered depression screen and the nurse interview was very high. Intra-class correlation coefficients were above 0.80 for both measures. In addition, nurse administered SCID depression module confirmed that the IVR PHQ was accurately designating probability of major depression. Feasibility was demonstrated by implementation of the screen in a community setting with high participation and completion of the depression screen.

Standard measures of depression administered by IVR are valid and can be used to determine depression status of patients in chronic illness management programs.

T5E INNOVATIONS IN DISTANCE LEARNING

T5E1
DELIVERY OF MEDICAL EDUCATION AND CONSULTATION TO PHYSICIANS IN IRAQ

Craig Sable, MD, FACC,[1] Molly Reyna, BA,[1] Gary Selnow, PhD,[2] Neal Cohen, MD,[3] Charlotte Ferretti, RN, EdD[4]
[1]*Children's National Medical Center, Washington, DC;* [2]*Wired International, San Francisco, CA;* [3]*University of California San Francisco, San Francisco, CA;* [4]*San Francisco State University, San Francisco, CA*

Many obstacles prevent physicians from delivering quality, state-of-the-art medical care during times of war. Distance learning and teleconsultation can supplement education and provide critical support.

Physicians and technical staff at Children's National Medical Center; the University of California, San Francisco; San Francisco State University, under the leadership of Wired International, collaborated to provide real-time medical lectures and patient consultations at medical centers in four Iraqi cities (Baghdad, Erbil, Basra, and Mosul). Hospitals in each Iraqi city connect via a satellite link; the U.S. centers connect through IP and ISDN. Satellite time is supported by funds raised by WiRED from the U.S. Government and private foundations.

Live lectures on a wide variety of topics included pediatric topics: cardiology, emergency medicine, diarrhea, nephrotic syndrome; and adult medicine topics: Acute Renal Failure, Cardiothoracic surgery and pain management. Physicians in Iraq were highly receptive to the collegial interaction with physicians in the United States. Security conditions in Iraq effected attendance, which ranged from over 100 physicians to fewer than ten.

Physicians practicing medicine in times of war face enormous obstacles. Telemedicine and distance learning can support these courageous individuals.

T5E2

PLAY2TRAIN©: A GENERIC LARGE-SCALE VIRTUAL ENVIRONMENT FOR EMERGENCY PREPAREDNESS TRAINING

Rameshsharma Ramloll, BTech, PhD, Jaishree Beedasy, PhD, Neill Piland, DrPH, Beth Hudnall Stamm, PhD, Annette Phillipp, PhD, Babara Cunningham, MPA, MBA
Idaho State University, Institute of Rural Health, Pocatello, ID

Play2Train© (www.play2train.org) is a virtual training space in the large scale massive multiplayer platform, SecondLife (www.secondlife.com), designed to support Strategic National Stockpile (SNS), Simple Triage Rapid Transportation (START), Risk Communication, Incident Command System (ICS) Training and Syndromic Surveillance training. Play2Train implements one of the distance learning methodologies proposed by the Idaho Bioterrorism Awareness and Preparedness Program funded by the Human Resources and Services Administration (HRSA). Currently, this virtual environment comprises a detailed virtual town and hospital. The design of this virtual environment is influenced by dioramas frequently used by emergency services to support traditional tabletop exercises. Play2Train© provides opportunities for interstate and interagency training through interactive role-playing in a common shared virtual environment accessible through local computers connected to the Internet. Training activities are captured for debriefing purposes and the captured content can be re-used for emergency preparedness educational machinima. We will present videos of recorded sessions to illustrate the suitability of Play2Train© for virtualizing tabletop exercises. In addition, we will present our approach for using simulations of diseases, e.g. smallpox, to provide a more engaging learning environment for healthcare providers requiring syndromic surveillance training.

T5E3

LINKING PUBLIC EDUCATION AND HEALTHCARE WITH A TELEHEALTH PROGRAM

Kathleen G. Davis, BSE, MSEd, PhD candidate,[1,2,3] Ryan Spaulding, PhD,[1] David Cook, PhD[4]
[1]The Kansas University Center for Telemedicine and Telehealth (KUCTT), Kansas City, KS; [2]The University of Kansas Medical Center Pediatric Department, Kansas City, KS; [3]USD #500 Kansas City Kansas Public School District, Kansas City, KS; External Affairs, [4]The University of Kansas, Kansas City, KS

A healthcare provider shortage is a major factor in the expansion of telemedicine services. The scarcity of providers is mirrored by the lack of available healthcare training resources in rural/isolated areas. A young person's choice to pursue a health career is often precipitated by an encounter with a respected healthcare professional. Many rural areas, already experiencing provider shortages, may not have a variety of healthcare professionals in practice. Therefore, rural students have limited opportunity for exposure to healthcare professions and interesting health topics. Connected Kansas Kids (CKK), a technology-supported project of the Kansas University Center for Telemedicine and Telehealth (KUCTT), has developed an interactive telehealth information program to provide information to rural students in grades K-12. Two series of presentations are offered over ITV and as archived webcasts: 1) Health careers and 2) Topics of interest in healthcare. Physicians, nurses, therapists, basic scientists and other healthcare professionals offer an exciting team-based perspective and present evidence-based healthcare strategies to young students. The presentation will outline the development of this project, including forging collaborations between healthcare and education professionals, identifying needs of students and educators, and technology's role in linking the worlds of education and healthcare.

T5F TECHNOLOGY INNOVATIONS FOR CLINICAL APPLICATIONS

T5F1

UTILIZING A RURAL BROADBAND WI-FI NETWORK FOR DIABETES TELEMEDICINE SERVICES

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A broadband Wi-Fi Network established as a U.S. Department of Homeland Security project for first responders along a rural Interstate highway was utilized to provide clinical and educational diabetes services to a diabetes patients in a community previously served by a Mobile Clinic Program connected via POTS. Nutrition counseling, podiatry clinical consultations and diabetes education classes in Spanish were provided via real time interactive video as part of the Arizona Diabetes Virtual Center of Excellence (ADVICE) utilizing the Arizona Telemedicine Program network.

Clinicians, promotoras and patients who had previously experienced clinical and educational diabetes services using POTS technology expressed great satisfaction over the improved audio and video quality of the broadband Wi-Fi connection. Participating clinicians and promotoras had greater control in operating the IP video equipment and the Wi-Fi connections were more stable than POTS. Additionally, by utilizing the broadband connection instead of the limited point-to-point POTS connection this rural site now has access to all subspecialty consultation and educational services available from multiple providers on the Arizona Telemedicine Program network.

Broadband Wi-Fi networks are an effective means to deliver high quality clinical and educational diabetes services to rural areas where other telecommunications infrastructure is not available.

T5F2

TECHNOLOGY CONSIDERATIONS TO REACH 100% COUNTRYWIDE TELE-ELECTROCARDIOGRAPHY COVERAGE: THE CHILEAN EXPERIENCE

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The Chilean Government has passed a new law called "AUGE" (Universal Access With Explicit Guarantee) that ensures medical attention of 40 diseases in a predetermined period of time. One of them, Myocardial Infarction (MI) must be diagnosed and treated immediately. i.e., every patient suspected having an MI should have an EKG taken in less than 15 minutes, and interpreted by a cardiologist, regardless the location.

This has forced the Ministry to extend the coverage of ECG interpretation and eventual remote medical guidance, to more than 390 primary care places. With its 4,000 Kms long territory, high ruralty, uneven distribution of physicians and a lack of expertise on the ECG interpretation, this was a huge challenge. The only answer: Telemedicine

To make possible the coverage of the system to the most isolated places, it was necessary to implement a hybrid mix of devices, some capable of transtelephonic analog transmissions and others digital (Internet). After one year of running with their original software platforms, a self-developed platform called PIT (Integrated Platform of Telemedicine) was ready to provide a web-based solution that solved operational issues; a non-precedent centralized electronic database; the network allows to perform a central coordination with rescue ambulances and the derivation hospitals; a uniform measurement tool and diagnostic codes; and patients' records security and international health standards as HL7 are strictly followed.

After two years and more than 200,000 ECG performed we can conclude that the system validates the usage of Telemedicine for the public health sector and is a good example of a joint effort of public administration and private enterprise.

T5F3

TELEMED: A TELE-HEALTH CASE STUDY BASED ON ULTRASOUND IMAGES

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The growth of fast wired and wireless internet communication (including via satellite) in Brazil and the recent advance of image compression methods allowed rapid teleconsultation based on medical images. At the present time, one of the challenging problems in telemedicine is the real-time teleconsultation in case of emergency. In this paper, the ongoing Telemed Project in the State of Rio Grande do Sul (based on DICOM ultrasound images) is described and the preliminarily results acquired during two years of operation (more than 400 teleconsultations) are presented. As an example, up to 10 cases were registered as emergency in a health prevention program due to the quickly on-line pathology identification, and the patient sent to a specialized hospital. In addition, we describe its extension in Pará State, located in the very remote Amazon region, through a satellite communication based on AmerHis technology (developed by European Space Agency), which assures dedicated 8Mbits/sec on each uplink and downlink. The platform, used for medical teleconsultations, is able to perform both on-line (in a pseudo real-time) and off-line image-based teleconsultations over the Internet connection. Finally, a financial cost-benefit analysis of this telemedicine model is described and its benefit as a distance education for the remote doctor.