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### Third Intensive Balkan Telemedicine and e-health seminar

This report represents a summary of the International Virtual e-Hospital’s effort in coordinating and conducting the Third Intensive Balkan Telemedicine and e-Health Seminar on February 6-7, 2009 in Skopje, Macedonia. The seminar, which was cosponsored by the Ministry of Health of Macedonia, was attended by 289 individuals from the countries of Macedonia, Albania, Kosova, and Serbia. The international faculty included experts from the U.S. and Europe. Participants and special guests included 4 individuals from Bondsteel U.S. Army Base in Kosova; the Minister of Health, the Deputy Chief of Mission, U.S. Embassy, Macedonia; representatives from the U.S. Department of State; and representatives from US Agency for International Development (USAID). Telemedicine in this region has taken a strong foothold and the Minister announced plans to fully embrace telemedicine as component of the health system in Macedonia with linkages to other Balkan countries in the region.

### Subject Terms
Telemedicine, extreme environments, healthcare disparity, training, international collaboration
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EXECUTIVE SUMMARY

The region, which consists of the countries of Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Kosova, Macedonia, Montenegro, and Serbia, takes its name from the mountain range, the Balkans. The Balkans, a Turkish word for ‘chain of wooded mountains’, covers an area of 700,000 km² region in South Eastern Europe and is home to over 55 million inhabitants. A decade of war and ethnic fighting in the 1990’s destroyed the medical systems in place, creating a desperate need to rebuild a modern healthcare infrastructure. Telemedicine has been shown to be an effective tool in this regard.

The adoption of telemedicine in the Balkans is firmly underway. Since its inception in 2001, the International Virtual e-Hospital (IVeH) has promoted the design, growth and implementation of telemedicine in a variety of developing countries across the globe. Successful implementation of telemedicine in any region is based on a number of factors, each of great importance. However, one that is key is the education and training of community leadership. Over the past several years, the IVeH has held intensive seminars in the region to promote the application of telemedicine as an effective tool in healthcare modernization. This includes the First Intensive Balkan Telemedicine and e-Health Seminar in Prishtina, Kosova (2002) and the Second Intensive Balkan Telemedicine and e-Health Seminar in Tirana, Albania (2007). Recently the third installment of these seminars was held in Skopje, Macedonia (February 2009). These three seminars have provided a fertile foundation for telemedicine to emerge as a significant tool in enhancing healthcare in this region. Each has broadened the understanding of the immense capability that telemedicine can offer and has acted as a catalyst for the development of telemedicine in the region. The Republic of Macedonia is the latest country to invest in telemedicine, having a formal commitment from the Ministry of Health to establish a national telemedicine effort.

This report represents a summary of the IVeH’s effort in coordinating and conducting the Third Intensive Balkan Telemedicine and e-Health Seminar on February 6-7, 2009 in Skopje, Macedonia. The seminar, which was cosponsored by the Ministry of Health of Macedonia, was attended by 289 individuals from the countries of Macedonia, Albania, Kosova, and Serbia. The international faculty included experts from the U.S. and Europe. Participants and special quests included 4 individuals from Bondsteel U.S. Army Base in Kosova; the Minister of Health, the Deputy Chief of Mission, U.S. Embassy, Macedonia; representatives from the U.S. Department of State; and representatives from US Agency for International Development (USAID). Telemedicine in this region has taken a strong foothold and the Minister announced plans to fully embrace telemedicine as component of the health system in Macedonia with linkages to other Balkan countries in the region.
BACKGROUND

Over the past several years, the concept of telemedicine in the Balkans has emerged as a key element in healthcare reform in the region. In the aftermath of the Balkans war in the mid 1990s, the energy and fortitude of a number of individuals helped establish the Kosova Foundation for Medical Development and would eventually become the International Virtual e-Hospital (IVeH), a nonprofit organization focused on developing telemedicine systems for healthcare delivery in developing countries around the world (www.iveh.org).

As a result of a continuous presence and the activities of the IVeH during the past eight years, the Telemedicine Program of Kosova (TPK) has grown from a virtual concept, envisioned by Dr. Rifat Latifi at the final health conference of the G8 Meeting in Berlin in 2000, to a nationwide telemedicine program consisting of the ultra modern Telemedicine Center of Kosova (TCK), located in the University Clinical Center of Kosova (UCCK) in Prishtina. The TCK is linked to six Regional Telemedicine Centers (RTC) in the Kosovar cities of Gjilan, Prizren, Gjakove, Peje, Mitrovice and the town of Skenderaj. The TCK has also created linkages to a number of academic institutions across Europe, the United States (U.S.), South America and other countries. The IVeH in partnership with the University of Arizona Telemedicine Program (ATP) is completing a three year program “Improving Healthcare in the Balkans Using Telemedicine, Advanced Technologies, and Cultural Exchange Program as a Platform” in which 48 future telemedicine leaders from the Balkans traveled to the U.S. for three weeks of intense training in telemedicine, e-health and electronic libraries. This training and professional advancement continues through virtual educational programs conducted on a weekly basis. Students from Kosova, Albania, Macedonia, and Montenegro have participated in this training. TCK has a number of active educational programs that involves institutions from around the world. In addition, the medical staff at the TCK has been linked to the medical personnel at the U.S. Army base at Bondsteel, Kosova for medical grand rounds.

In October 2002, the First Intensive Balkan Telemedicine and e-Health Seminar was held in Prishtina, Kosova. This subsequently resulted in the establishment of the TPK, thus starting telemedicine in the Balkans. This first seminar attracted over 400 participants and speakers representing 21 countries from around the world who have established telemedicine efforts in developing countries. This seminar and the first phase of the TPK were funded by European Agency for Reconstruction.

In 2006, the IVeH obtained a grant from U.S. Department of State’s Bureau of Educational and Cultural Affairs (BECA) to implement a three-year project called “Improving Healthcare in the Balkans Using Telemedicine, Advanced Technologies and Cultural Exchange Program as a Platform”. This program was aimed at improving healthcare delivery in the Balkans and to make this region part of the global health collaboration. This program has developed a powerful international medical educational network in the Balkans for further collaboration and regional development. As part of these activities, and with additional support from U.S. Agency for International Development in Albania (USAID/Albania) and the U. S. Army’s Telemedicine and Advanced Technology Research
Center (TATRC), the Second Intensive Balkan Telemedicine and e-Health Seminar was organized in Tirana, Albania, October 21-23, 2007. This event was a great success, winning broad support from leaders in the field of health and an endorsement from the Prime Minister, Professor and Physician, Dr. Sali Berisha. Interest on the part of the Ministry of Health and directors of key hospitals in Albania has energized the government and the community to develop an Integrated Telemedicine and e-Health Program across all of Albania.

PROJECT DESCRIPTION

As momentum has been built on previous successes, IVeH partnered with TATRC, the Macedonian Ministry of Health, U.S. Department of State, Polycom, and others to conduct a third seminar in Skopje, Macedonia. Macedonia is like many developing countries, it suffers from a lack of resources for the health sector. What resources there are tend to concentrate in the larger cities, particularly the capital, which leaves regional healthcare facilities poorly equipped and staffed to handle anything but the most basic care. The Third Intensive Balkan Telemedicine and e-Health Seminar was organized and held in Skopje, Macedonia, February 6-7, 2009. The Minister of Health, Dr. Bujar Osmani as well as the leaders on the University, the Dean of Medical School and many leaders of medical associations in Macedonia fully endorsed the concept and stated their commitment to embrace the concepts of telemedicine. The Ministry of health has made telemedicine a priority, projecting to complete the first phase of a national telemedicine program by the end of 2009.

The completion of the telemedicine program in Macedonia as in Kosova, Albania, and other countries, will create an integrated modern telemedicine and e-health educational network. Creation, development, and management of the technical infrastructure, medical and technical leadership, as well as policy and procedures, will provide a solid foundation for new innovation in healthcare in Macedonia. This program will foster new opportunities for partnerships between medical institutions and individual experts from Macedonia, the Balkans and renowned institutions in the U.S., Europe and other countries worldwide. It is expected that implementation of this telemedicine program in Macedonia will reduce the cost of healthcare and the efficiency at which the healthcare system operates, including reducing unnecessary patient transfers from regional hospitals to the major university hospitals or even international hospitals. This will have a profound effect on the limited healthcare budget of Macedonia.

Furthermore, this program will have a huge impact on continuing medical education for all healthcare providers. Hospital educators can utilize the system to broadcast educational lectures, conferences, and seminars to doctors, nurses, and other medical staff in regional centers, saving time, money, and resources that would be incurred traveling to these events.

METHODS

The IVeH organized the seminar with the Ministry of Health in Skopje, Macedonia. A conference grant was requested from TATRC. In addition, financial support from the Ministry of Health and Polycom was provided. Other non financial sponsors included the
State Department BECA, the American Telemedicine Association (ATA), International Society for Telemedicine and e-Health (ISfTeH) and USAID. The financial support from Ministry provided organization and coordination of all in country (Macedonia) expenses, including the meeting space, invitation of all participants and other meeting support.

The course directors, Rifat Latifi, MD and Charles R. Doarn, MBA were guided by co-program chairs, including Ronald C. Merrell, MD, Ronald Poropatich, MD, and Ronald Weinstein. Kadri Haxhihamza, MD, Macedonia’s National Telemedicine Coordinator led the local organizing committee in Skopje. An international faculty (see Table 1) was invited to submit abstracts, which defined their assigned talks. All abstracts and presentations are appended to this report as Appendix C and D. Each participant was provided a program with this material included.

The meeting was organized to cover a wide range of topics and was scheduled for two full days. The agenda is in Appendix B.

The venue for the meeting was a centrally-located hotel in the city of Skopje, Macedonia.

The IVeH coordinated invitations to representatives of the U. S. Army base at Bondsteel, Kosovo, the State Department, the U.S. Embassy, and USAID.

**Table 1. Seminar’s International Faculty**

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>Organization</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gail Barker, PhD</td>
<td>University of Arizona, Arizona Telemedicine Program</td>
<td>USA</td>
</tr>
<tr>
<td>Charles R Doarn, MBA</td>
<td>University of Cincinnati / IVeH</td>
<td>USA</td>
</tr>
<tr>
<td>Georgi Graschew, PhD</td>
<td>Charité University of Medicine</td>
<td>Germany</td>
</tr>
<tr>
<td>Elizabeth Krupinski, PhD</td>
<td>University of Arizona, Arizona Telemedicine Program</td>
<td>USA</td>
</tr>
<tr>
<td>David Lam, MD</td>
<td>U.S. Army – TATRC</td>
<td>USA / Belgium</td>
</tr>
<tr>
<td>Rifat Latifi, MD</td>
<td>University of Arizona / IVeH</td>
<td>USA / Kosova</td>
</tr>
<tr>
<td>Frank Livelyn</td>
<td>Med e Tel</td>
<td>Luxemburg</td>
</tr>
<tr>
<td>Ronald C. Merrell, MD</td>
<td>Virginia Commonwealth University</td>
<td>USA</td>
</tr>
<tr>
<td>Steinar Pederson, MD</td>
<td>Norwegian Centre for Telemedicine</td>
<td>Norway</td>
</tr>
<tr>
<td>Ronald Poropatich, MD</td>
<td>U.S. Army – TATRC</td>
<td>USA</td>
</tr>
<tr>
<td>Andrew Watson, MD, MLitt</td>
<td>University of Pittsburgh</td>
<td>USA</td>
</tr>
<tr>
<td>Ronald Weinstein, MD</td>
<td>University of Arizona, Arizona Telemedicine Program</td>
<td>USA</td>
</tr>
</tbody>
</table>

**Previous Work**

This seminar is the third such event in the Balkans; the first being in Prishtina, Kosovo in 2002 and the second in Tirana, Albania in 2007. Each of these seminars resulted in the following publications.


In addition, the faculty have a well known track record on teaching telemedicine around the world.

**SYMPOSIUM SUMMARY**

Seminar Summary

The seminar was held in a hotel conference site in the city center of Skopje along the Vardun River. The meeting was attended by a wide variety of individuals with diverse backgrounds ranging from medicine, government, psychiatry, law, and technology. The total number of attendees was 289, representing the countries of Macedonia, Kosova, Albania, and Serbia. The breakdown of the attendees included 252 physicians, 12 nurses, two psychologists, two lawyers (one a retired member of the supreme court of Macedonia), one member of the Macedonian Parliament; three information technology (IT) professionals; one from USAID, 15 medical students, and two journalist/producers from Macedonian television.

There were also participants from the U.S. Army Base at Bondsteel in Kosova. These included COL Linda C. Shackelford, MC, USA (RES), LTC Lisa M. Breitenbach, MC USA (RES), and their respective drivers. The Deputy Chief of Mission of the U.S Embassy in Skopje, Mr. Thomas Navrtil, was a key note speaker. He was accompanied by Ms. Amy Storrow, Assistant Public Affairs Officer. USAID-Albania personnel William C Hansen, Executive Officer and Dr. Zhaneta Shatri, Health Specialist attended. Ms. Christine Miner, Managing Director, Professional and Cultural Exchanges, BECA, U.S. Department of State attended the meeting. Ms. Miner is managing director of the IVeH project in the Balkans.

The faculty included individuals from the U.S. and Europe (Table 1). Some faculty participated via video-teleconferencing. The faculty also included the current and two previous presidents of the American Telemedicine Association (ATA). Dr. Rifat Latifi and Mr. Charles Doarn served as seminar directors. The faculty is shown in Figure 1.
All lectures were given in English, with interpretation in both the Macedonian and Albanian languages.

**Day 1**

Mrs. Sevdije Metaj, a news anchor for Macedonian Television, served as the master of ceremony. The meeting started with remarks from the Macedonian Minister of Health, Dr. Bujar Osmani and Mr. Thomas Navratil and the Scientific Chairman of the Seminar Dr. Rifat Latifi. Their remarks, which appear below, endorsed strongly the concept of telemedicine in Macedonia and in the Balkans. They stated that a telemedicine network in Macedonia and throughout the region would have a significant impact on the delivery of healthcare, stressing that cross border collaborations would build bridges for the future of the region.

Dr. Osmani publicly announced a commitment on behalf of the Macedonian Ministry of Health to initiate and complete the first phase of telemedicine implementation by the end of 2009.

**Remarks from the Macedonian Minister of Health**

Distinguished colleagues,

Ladies and gentleman,

Respected media representatives,

It is my exceptional honor and pleasure to greet you on the start of Third Intensive Balkan Telemedicine and e-health Seminar. The great interest shown for this seminar is real confirmation of the fact that we are on the right path concerning implementation of up-to-date principals and practice of telemedicine and e-health in the Republic of Macedonia.

This Seminar is organized as partnership between Ministry of Health of Republic of Macedonia and International Virtual e-Hospital. This is only a part of the global strategy of the Government
of the Republic of Macedonia and its’ Ministry of Health aimed at development of informatics technology and bringing up to date the electronic infrastructure of our healthcare system.

Technical and technological advance is important segment of the reforms in healthcare system so it is of crucial importance for our country to stay in line with latest technologies which, as we are all aware, are advancing on daily basis.

Today, at this seminar, the possibilities of connection with telemedicine centers in the region, Europe and U.S. will be demonstrated, during which we will see practically how does “distant medical consultation” looks like. This will be demonstrated by our speakers, top experts in telemedicine and in their fields, both clinical and non-clinical.

I would like to stress that using Internet and satellite communications we will be able to provide medical care in places where, at the moment, we don’t have specialist care facility. In one word, telemedicine will make possible specialist treatment for the patients that are far from this kind of facility (and care) so that, without this technology, they would not be able to get specialist treatment and care.

Telemedicine also provides other possibilities such as use of expertise from foreign specialists. Connections with partner hospitals in Europe and U.S. will provide us with the opportunity of using their capacities for the improvement of our healthcare.

We must not forget the possibility of widening and deepening the work of so called electronic library, through which our medical doctors and students will be able to benefit from electronic libraries of the most eminent Universities in Europe and U.S. Searching through medical databases, which is part of our Medical Faculty now, will be elevated on higher level with a possibility that allows every healthcare professional to connect to medical databases of Universities in Europe and U.S.

In a second phase of this project, until the end of this year, interconnection of six regional hospitals throughout Macedonia (Kumanovo, Tetovo, Struga, Shtip, Bitola and Strumica) with a Center in Skopje is expected to happen. Ultimately, this means that a patient in Bitola, for example, would have on disposition consultation of specialists and sub specialists at home and abroad.

We must not forget the education component of telemedicine: when the regional telemedicine network will be established it will make it possible to attend presentations of best medical and non medical professionals from these centers. In this way, in the comfort of their cabinets, workplaces even of their homes, our colleagues will be able to attend lessons of eminent world experts, to share experiences and ask questions. This way knowledge and skills of our colleagues would increase because, as we all know-“knowledge is power”.

At the end, I would like to express my deepest gratitude to Dr. Rifat Latifi who made it possible for this project to be implemented in Macedonia, as it was implemented in Kosova and Albania in the past and as it will hopefully be implemented in Montenegro in near future, where the next Seminar is planned. His work is an example of how cooperation between medical capacities in our region should be intensified.

I hope that this seminar is only the first step towards successful establishment of telemedicine in our country. This will help our country maintain the title of country that is developing parallel regional and global cooperation, as well as developing a modern healthcare system which will be patient centered.

Thank you!

Bujar Osmani, MD, Minister of Health, Republic of Macedonia
Remarks from the Deputy Chief of Mission, U.S. Embassy Skopje, Macedonia

Good Morning! I am honored to welcome you to the third Balkan Telemedicine and e-Health Seminar.

I want to thank all who have worked so hard on this project, especially Dr. Latifi.

Over the past two and a half years the U.S. Department of State, through the Educational and Cultural Affairs Bureau, has been pleased to support the International Virtual e-Hospital Foundation project to bring telemedicine to the Balkans.

As part of the project over 45 medical professionals, including doctors, nurses and telemedicine specialists, have traveled to Alaska and Arizona for exchanges that have provided an opportunity for Americans, Kosovars, Montenegrins, Albanians and Macedonians to share their professional expertise, experiences and cultures with each other.

Two recent participants from Macedonia, Dr. Gjeorgi Damjanovski, a radiologist, and Dr. Kadri Haxhiamza A, a psychiatrist, participated in this program and brought their knowledge here to Macedonia. Dr. Haxhiamza has become a leader in the field of telemedicine, joining the rest of the Balkan participants who participated in the program in Alaska and Arizona. He has become the National Coordinator of Telemedicine and e-Health in Macedonia and is the chair of the local organizing committee for this event. This is just one example of how the exchange program is making a difference in creating leadership for telemedicine in the Balkans.

This project and seminar bring attention to how telemedicine and advanced technologies can reach across borders to make electronic libraries and the latest medical practices available to every healthcare provider.

The creation of a telemedicine network will have significant impact for Macedonia and the region, where the patient will become a true and full partner in his or her care and where these technologies will bring healthcare to every citizen no matter where they live.

More and more I have noticed that cross-border collaborations are innovative ways to solve problems, especially for small countries with scarce resources. In March, the Macedonian American Alumni Association will host a cross-border workshop on disaster preparedness and emergency response, in cooperation with alumni of U.S. government-sponsored programs from Slovenia.

We talk often about building bridges of mutual understanding, of person-to-person “coffee diplomacy.” These cross border projects build such bridges both by virtual means and in person, and they save lives. They are the future.

Thank you for participating in this conference, and I hope you have a productive and stimulating experience today.

Thomas J. Navratil, Deputy Chief of Mission, Embassy of the United States of America, Skopje, Macedonia

Remarks from the Seminar Chairman

Dear Friends,

On behalf of the organizing committee, welcome to the Third Intensive Balkan Telemedicine and e-Health Seminar in the beautiful city of Skopje, Macedonia. The Third Intensive Balkan Telemedicine and e-Health Seminar is being organized by the IVeH in collaboration with the Ministry of Health of Macedonia and our partners. This is a significant step forward in the process of establishing the regional Balkan Telemedicine and e-Health Network that will bring
people, countries, and medical systems closer as we strive to improve healthcare in the region.

This seminar is dedicated to practical clinical applications and evidence-based outcomes of current technologies, principles, practices, and applications of telemedicine and e-health. It is designed as an advanced seminar to prepare future leaders of telemedicine and e-health and to impact the medical profession by changing the standards of clinical practice using an integrated and multidisciplinary approach.

This intensive seminar is part of the scheduled activities of IVeH as implementation of the thee-year project: “Improving Healthcare in the Balkans Using Telemedicine, Advanced Technologies and Cultural Exchange Program as a Platform”, funded by the U.S. Department of State Bureau of Educational and Cultural Affairs.

The speakers for this year’s seminar have been selected from the best in the world and represent true authorities in their fields. They come from various backgrounds of clinical, research, technical, administrative, as well as global strategic and organizational expertise.

The previous two Balkan intensive telemedicine seminars have resulted in the creation of the country-wide and now renowned telemedicine program in the Republic of Kosovo (www.teledeks.org) and initiation of the implementation of an integrated telemedicine and e-health program in Albania. The proceedings of the seminar in Kosovo were published as a book “Establishing Telemedicine in Developing Countries: From Inception to Implementation”, (IOS Press, Amsterdam, 2004), while the proceedings from Albania seminar were published in the Telemedicine and e-Health Journal (http://www.liebertonline.com/toc/tmj/14/1).

I would like to express my appreciation and thanks to everyone who helped make this seminar possible. In particular, I wish to thank the Minister of Health of Republic of Macedonia, Dr. Bujar Osmani, for his leadership and vision in supporting this seminar as a pioneering event in establishing telemedicine and e-health in Macedonia and for hosting this event. Also, I want to thank the local organizing committee, led by Dr. Kadri Haxhihamza, the National Telemedicine Coordinator of Macedonia, for making this seminar possible. Special thanks to Ms. Chris Miner and the Bureau of Educational and Cultural Exchange of the State Department and the Telemedicine and the U.S. Army’s Advanced Technology Research Center in Fort Detrick, Maryland, and Dr. Ronald Poropatich, for supporting our efforts in the Balkans. Finally I wish to thank my co-chairs, Mr. Charles R. Doarn, Dr. Ronald Merrell, Dr. Ronald Poropatich, and Dr. Ronald Weinstein for their help in every aspect of the program, as well as the countless number of volunteers of the IVeH. In particular I want to thank all the speakers of the Third Balkan Telemedicine and e-Health Seminar for making this event a first class international telemedicine and e-health seminar. Special thanks to Polycom for their support as well as the engineers and experts from the Telemedicine Program of Kosova, led by Dr. Ismet Lecaj and Mr. Flamur Bektishi, for their leadership and expertise.

It is my hope that this Seminar in Macedonia will act as a catalyst for the adoption of advanced technologies and will establish the basis for the implementation of telemedicine in Macedonia as part of a regional telemedicine project. Personally, I see this as an incredible step for Macedonia and the modernization of its healthcare system. Thank you.

Rifat Latifi, MD, FACS, Program Chairman Professor of Surgery, University of Arizona, Tucson, Arizona, President and Chairman, IVeH

Prior to the scientific portion of the seminar, a press conference was held, where a number of regional news organizations questioned the Minister of Health, Dr. Osmani and the seminar director, Dr. Latifi, regarding the seminar and the impact of this technology on
healthcare in the region. Throughout the seminar, there was continuous and very positive media coverage.

The talks were broken up into four sessions where the faculty introduced the basics of telemedicine, technology, education, and research in telemedicine, telemedicine for trauma, emergency, and disaster management, and the new horizons in telemedicine. The sessions followed the agenda in Appendix A. These presentations generated lively discussion between the participants and faculty.

One of the showcases of the conference was the linking of a small hospital in Tetova, Macedonia to the conference hall in Skopje to illustrate the capabilities and benefits of telemedicine. A case presentation was made by the remote physician, which included comments made by physicians in the conference hall. The connection between the two sites was accomplished using a Polycom HDX9000 and HDX4000 units (Polycom, Pleasanton, CA) and a connection between the two sites of 512 kilobits per second (Kbps). Additionally, the seminar presentations and lectures were streamed live on the Internet via 10 megabits per second (Mbps) fiber optic connection using Polycom RSS2000 recording and streaming server which transmitted images from Polycom VSX7000 and two professional High Definition (HD) Sony Handycam Camcorders. All these devices were linked together to broadcast video from different angles. An additional connection with Guy’s and St. Thomas Hospitals in London, England was initiated using a Polycom gateway in Germany. This gateway was used to interconnect Internet Protocol (IP)-based connection with Integrated Services Digital Network (ISDN) connection at the hospital in London.

**Day 2**

The second day of the seminar was filled with lectures on clinical telemedicine applications and the management of telemedicine in developing countries. It closed with two key presentations on the business aspects of telemedicine and strategies for sustainability. Several presentations were given by live video conference and the last two presenters, Dr. Weinstein and Dr. Barker, from the Arizona Telemedicine Program were simultaneously connected from two different locations, allowing them both to present, watch, and comment on each other’s talks.

There was an awards ceremony at the conclusion of the seminar where each participant received a certificate of attendance from the Minister of Health and IVeH.

**PROJECT DELIVERABLES**

This seminar has resulted in several deliverables that compliment this report.

1) Renewed interest of military medical personnel from Bondsteel U.S. Army Base working with the Telemedicine Center in Kosova in grand rounds and other educational venues

2) The meeting summary and all abstracts are being published in the *Telemedicine and e-Health Journal*


3) A commitment by the Minister of Health of Macedonia to pursue the implementation of telemedicine across the region

4) Further resolve for the US AID in Albania to support a growing e-health strategy not only in Albania but across the Balkan’s region.

**FINANCIAL SUMMARY**

The funding provided to IVeH to support this meeting through the TATRC grant of $29,426 was used to cover the cost of faculty travel to and from Skopje, Macedonia, faculty honoraria, printing of course booklets, and miscellaneous administrative functions. All grant dollars were spent in accordance to the approved budget as submitted.

**SUMMARY**

The Third Intensive Balkan Telemedicine and e-Health Seminar, organized by the IVeH, was held on February 6-7, 2009 in Skopje, Macedonia. As with the previous two seminars, the idea was to introduce telemedicine in a robust way to healthcare personnel, politicians, and the public and to draft an action plan for the implementation of a national telemedicine program. This technique has become effective in establishing telemedicine in the region and could serve as a good strategy for other developing countries. It was attended by international faculty and participants from the region. All participants were engaged in the presentations and discussion, which sparked effective dialogue and interest in learning what telemedicine can offer for the region. The seminar was a tremendous success and participants were introduced to the principles and practices of telemedicine and e-health from an outstanding faculty through a series of lectures, videoconferences, and live demonstrations. This seminar has set the stage for an evolutionary change in healthcare for Macedonia as part of the Balkan telemedicine program.
APPENDICES
**Appendix A**

**Acronyms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ATA</td>
<td>American Telemedicine Association</td>
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<tr>
<td>ATP</td>
<td>Arizona Telemedicine Program</td>
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<td>BECA</td>
<td>Bureau of Education and Cultural Affairs</td>
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<td>HD</td>
<td>High Definition</td>
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<td>ISDN</td>
<td>Integrates Services Digital Network</td>
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<td>IStTeH</td>
<td>International Society for Telemedicine and eHealth</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>IVeH</td>
<td>International Virtual e-Hospital</td>
</tr>
<tr>
<td>Kbps</td>
<td>Kilobits per second</td>
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<tr>
<td>RTC</td>
<td>Regional Telemedicine Centers</td>
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<tr>
<td>TATRC</td>
<td>Telemedicine and Advanced Technology Research Center</td>
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<tr>
<td>TCK</td>
<td>Telemedicine Center of Kosova</td>
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<tr>
<td>TPK</td>
<td>Telemedicine Program of Kosova</td>
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<td>UCCK</td>
<td>University Clinical Center of Kosova</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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# Appendix B

## Third Intensive Balkan Telemedicine and e-Health Seminar

**Current Principles and Practices of Telemedicine and e-Health Clinical Applications and Evidence-Based Outcomes**

**Program Agenda**

### Day 1, February 6, 2009

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8:00-08:30</td>
<td>Registration</td>
</tr>
<tr>
<td>8:30-09:30</td>
<td>Welcoming Remarks</td>
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<tr>
<td></td>
<td>Dr. Bujar Osmani, Minister of Health of Macedonia</td>
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<tr>
<td></td>
<td>Prof. Rifat Latifi, Program Chair, and other Distinguished Guests</td>
</tr>
<tr>
<td><strong>Session:</strong></td>
<td>Introduction to Basics of Telemedicine, e-Health, and the Modern Electronic Library</td>
</tr>
<tr>
<td><strong>Moderators:</strong></td>
<td>Steinar Pedersen, Remzi Izairi</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>Telemedicine and e-Health in Modern Medical Practice: Arizona Program as a Model - Keynote - Rifat Latifi</td>
</tr>
<tr>
<td>10:00-10:30</td>
<td>Requirements for Successful Telemedicine Consultation and Telemedicine Program - Keynote - Charles Doarn</td>
</tr>
<tr>
<td>10:30-10:45</td>
<td>Coffee Break</td>
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<tr>
<td><strong>Session:</strong></td>
<td>Technology, Education and Research</td>
</tr>
<tr>
<td><strong>Moderators:</strong></td>
<td>Georgi Graschew, Kadri Haxhiamza</td>
</tr>
<tr>
<td>10:45-11:00</td>
<td>Current Technologies - Charles Doarn</td>
</tr>
<tr>
<td>11:00-11:30</td>
<td>Telepresence, Telementoring and Continuous Educational Programs - Andrew Watson - Via Video</td>
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<tr>
<td>11:30-12:00</td>
<td>Telemedicine and Research Aspect: Need for Continuous Improvement - Steinar Pedersen</td>
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<tr>
<td>12:00-13:30</td>
<td>Lunch</td>
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<tr>
<td><strong>Session:</strong></td>
<td>Telemedicine for Trauma, Emergencies and Disaster Management</td>
</tr>
<tr>
<td><strong>Moderators:</strong></td>
<td>David Lam, Vladimir Popovski</td>
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<tr>
<td>13:30-14:00</td>
<td>Telemedicine and Telepresence for Trauma and Emergency Management - Rifat Latifi</td>
</tr>
<tr>
<td>14:00-14:30</td>
<td>Military Telemedicine and e-Health from the Battlefield: Lessons for Civilians - Ronald Poropatich</td>
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<tr>
<td>14:30-15:00</td>
<td>Telemedicine in Disaster Management - Ronald C. Merrell - Via Video</td>
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<tr>
<td>Time</td>
<td>Session</td>
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<tr>
<td>15:00-15:15</td>
<td>Break</td>
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<tr>
<td>15:15-15:45</td>
<td>New Horizons of Telemedicine</td>
</tr>
<tr>
<td>15:45-16:15</td>
<td>Telemedicine in Disaster Management</td>
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<tr>
<td>16:15-16:45</td>
<td>Sessions in Review</td>
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**Day 2, February 7, 2009**

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<tr>
<th>Time</th>
<th>Session</th>
<th>Moderator(s)</th>
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<tbody>
<tr>
<td>8:30-09:00</td>
<td>Registration</td>
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<tr>
<td>09:00-09:45</td>
<td>Telemedicine in Clinical Applications</td>
<td>Steinar Pedersen, Emilia Pemova</td>
</tr>
<tr>
<td>09:45-10:30</td>
<td>Telepresence and Telesurgery</td>
<td>Georgi Graschew</td>
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<tr>
<td>10:30-10:45</td>
<td>Break</td>
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<tr>
<td>10:45-11:15</td>
<td>New Horizons</td>
<td>Charles Doarn, Gjorgji Damjanovski</td>
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<tr>
<td>11:15-11:45</td>
<td>Globalization of Telemedicine: The Grass Root Approach</td>
<td>Frank Lievens</td>
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<tr>
<td>11:45-13:00</td>
<td>Lunch</td>
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<tr>
<td>13:00-13:30</td>
<td>Chronic Diseases and Telemedicine</td>
<td>Rifat Latifi, Vladimir Borazonov</td>
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<tr>
<td>13:30-14:00</td>
<td>Telemedicine in Chronic Diseases and Diabetes</td>
<td>Steinar Pedersen</td>
</tr>
<tr>
<td>14:00-14:30</td>
<td>Telemedicine for Home Health</td>
<td>Andrew Watson - Via Video</td>
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<tr>
<td>14:45-15:00</td>
<td>Teleradiology and Telepathology</td>
<td>Elizabeth Krupinski - Via Video</td>
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<tr>
<td>15:00-15:15</td>
<td>Break</td>
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<tr>
<td>15:15-15:45</td>
<td>Establishing Telemedicine in Developing Countries</td>
<td>Charles Doarn, Lulzim Agai</td>
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<td></td>
<td>The Business Aspects of Telemedicine and e-Health</td>
<td>Gail Barker - Via Video</td>
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<tr>
<td>Time</td>
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<tr>
<td>15:45-16:30</td>
<td>Strategies for Institutionalizing and Achieving Long Term Sustainability of Telemedicine and Telehealth Programs and Services - Ronald Weinstein - Via Video</td>
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<tr>
<td>16:30-17:00</td>
<td>Development of Telemedicine Network and Activities in the Region: The Do’s and Don’ts When Establishing Telemedicine Programs - Rifat Latifi</td>
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<tr>
<td>17:00 –17:30</td>
<td>Closing Ceremony and Awarding of Certificates</td>
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<tr>
<td>17:30– 18:30</td>
<td>Adjourn</td>
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Appendix C

Abstracts
Telemedicine and e-Health in Modern Medical Practice: Arizona Program as a Model
Rifat Latifi, MD, FACS1,2, Ronald Weinstein, MD1,2, Ana Maria Lopez, MD1,2, Gail Barker, PhD1,2, and Charles R. Doarn, MBA3,4
1University of Arizona, 2Arizona Telemedicine Program, Tucson, Arizona; 3Center for Surgical Innovation, Department of Surgery, University of Cincinnati, Cincinnati, Ohio; and 4International Virtual e-Hospital Foundation, Anchorage, Alaska

Telemedicine and telehealth development has brought hope to developing countries and the most remote areas around the world. There has been an incredible journey from the early days of telemedicine implementation via rudimentary technologies to today’s advanced technologies, including advances in telecommunications, super computers, diagnostic imaging, robotics, voice activated machines, and remote controls that have changed hospitals and operating room theaters around the western world. Essentially, geography and distance have become abstract nouns and are meaningless in modern times. At the same time, the world equilibrium has not followed the punctuation of an industrial world directed by the broad bandwidth, although this gap is getting smaller and smaller every day. The patient has become an educated and informed consumer who questions the decisions of the practitioner and demands explanations and evidence-based medical approaches. The physician's expertise is validated through the Internet and other forms and the patient insists on care that is up to current world standards. In this environment, what we call today telemedicine and e-health has become a necessity and not a luxury or marketing tool for large medical corporations. Every aspect of clinical medicine has room for telemedicine applications. The Arizona Telemedicine Program (ATP) has become a world premier program that integrates multiple partners and technologies to improve access to specialized medical care throughout the State of Arizona through the use of telemedicine technologies such as digital imaging and real-time video conferencing. Currently, ATP is providing medical services via both real-time and store-and-forward technologies in over twenty communities. The program is a real model not only for developed countries, the innovative programs in clinical telemedicine, dedicated network creation, business model, and partnerships with universities, industry, and political leadership, makes the program unique and affordable model for developing countries. Bridges built by the ATP between state agencies, local governments and legislative bodies are fostering a high level of awareness of the importance of telemedicine and e-health to achieving the state's healthcare goals. The program also serves as a platform upon which the state's only College of Medicine can demonstrate its value to exceptionally broad constituencies throughout Arizona and the nation as a clinical research center, a tertiary care facility, and as an educational institution.

Requirements for Successful Telemedicine Consultation and Telemedicine Program
Charles R. Doarn, MBA1,2, Rifat Latifi, MD, FACS2,3
1Center for Surgical Innovation, Department of Surgery, University of Cincinnati, Cincinnati, Ohio; 2International Virtual e-Hospital, Anchorage, Alaska; and 3University of Arizona, Tucson, Arizona

The goal of a telemedicine program must be to provide access to quality healthcare when barriers to service such as geography or distance exist. A successful telemedicine program requires a number of key components to be in place. First there must be an unmet need. This could be gauged as a lack of clinical expertise at the patient location or it could be a desire to implement a more cost effective strategy in addressing health needs. The second and most critical step is to conduct a needs assessment. This critical step provides a review of the clinical need; identifies the technology and communications capabilities and challenges; provides a strong platform for implementation; and a needs assessment outlines a process from which to proceed. During this step, one should include as many disciplines as well as political and local leadership support. The needs assessment will also identify who the consultants are and what clinical disciplines they are interested in supporting. Systems, which exist throughout the world, have demonstrated the usability and efficacy of second opinion or distant healthcare management through telemedicine. A local champion must be identified and he/she must provide vision and leadership and build trust in a system or service. The third key step must include a business model. Such a model implies that revenue will flow for services provided between the clinician and the patient. This payment model may be based on insurance reimbursement or the payer maybe the patient. In any case, a program must add value. A fourth component for a successful telemedicine program is a reliable telecommunication infrastructure. The fifth requirement to ensure sustainability is political acceptance and support of the program and the transparency of the program. The telemedicine program should become an integral part of clinical practice of a personal healthcare provider, an institution, or country. The sixth step is integration of multiple, clinical disciplines and collaboration with local universities, medical schools and other
institutions. The seventh and final step is continuous evaluation of the programs and publications of such evaluations. While each of these aforementioned steps is important, there must be acceptance by the providers and patients alike, otherwise it will not be successful.

Current Technologies
Charles R. Doarn, MBA\textsuperscript{1,2}, Rifat Latifi, MD\textsuperscript{2,3}
\textsuperscript{1}Center for Surgical Innovation, Department of Surgery, University of Cincinnati, Cincinnati, Ohio; \textsuperscript{2}International Virtual e-Hospital, Anchorage, Alaska; \textsuperscript{3}University of Arizona, Tucson, Arizona

The advent of telemedicine was made possible by technology. Technology and its unabated growth throughout the 20\textsuperscript{th} century provided fundamental changes in everything we do in human society. From travel to food production, to communications, the sociology of the human existence has changed more in the last twenty years than at any time in all of human history. Today, you can carry a small device in your hand and talk to someone in another part of the world; you can send an instant message between two culturally diverse places and communicate a thought or an idea; you can operate on someone in another country; you can get instantaneous news on events as they are happening; or you can walk on the surface of the moon. The very way we learn is not the same as it has been for generations. This has been made possible by the technological revolution in telecommunications, information technology, sensors, and a whole host of other disciplines. New social tools such as MySpace, FaceBook, Twitter, YouTube, etc. provide a profound change in how we communicate. Letters sent by post are now replaced with instant messaging (IM) and short message service (SMS). Terms like Worldwide Interoperability for Microwave Access (WIMAX), broadband, 4G, iPhone, and Voice Over Internet Protocol (VOIP) are now commonplace in the connection of people-to-people in healthcare. Technologies in robotics, sensors, and imaging, provide fundamental change in the approach to diagnosis, treatment and management of disease. Current technologies being deployed in telemedicine are key to understanding what and how this growing field can add value to health across the globe. What kind of technologies one decides to use, depends on many factors. The standardization of technologies is narrowing the gap between different products and fulfilling the key principle in telemedicine: seamless communication between the patient and healthcare provider, while ensuring security, HIPAA compliance and reproducibility of such connectivity.

Telepresence, Telementoring and Continuous Educational Programs
Andrew R. Watson, MD, MLitt
Department of Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania

The face of surgical education has changed forever. Limitations on work hours to 80 per week may become more stringent with the recent Institute of Medicine report. Experiential time that was the bastion of a resident’s education is being limited. Concerns have arisen about a graduating resident’s experience and ability to practice independently. Physicians will be monitored for complications and outcomes, which will increase the pressure on recent graduates or surgeons looking to learn new skill sets.

Efforts are underway to ensure graduates of residency are well trained, such as the Surgical Council on Resident Education. Furthermore, major advances in technology are enabling integration of laparoscopic operating rooms. These laparoscopic suites represent the leading edge of surgical telementoring.

The creation of a surgical telementoring network will be critical for the future of surgery. Such networks will enable physicians to communicate between locations with full audio / visual interfaces in conjunction with telestration. This process must include real-time data such as vital signs, radiology, and live video of surgery. A remote physician can help mentor and guide key steps or prevent complications during surgery.

The technology behind a fusion of data for a telementoring network requires cooperation between hospital administration, laparoscopic vendors, and hospital IT developers. Open standards and an open-source internet backbone within a hospital are critical for the success of telementoring.

Surgical telementoring represents the future of transitioning surgical residents into their practice. It will also enable remote cooperation between surgeons regardless of location within or between hospitals or while at home. A complex technological infrastructure is critical and will require broad-based cooperation with the healthcare IT enterprise.
Telemedicine and Research Aspect: Need for Continuous Improvement
Steinar Pederson, MD
Norwegian Centre for Telemedicine, University Hospital of Northern Norway, Tromsø, Norway

The Tromsø Telemedicine Laboratory (TTL) was established in 2006 as a Centre for Research-based Innovation (SFI). The centre combines human caring with new technologies, in order to provide better healthcare and reduce the increasing burden on the healthcare system.

The Research Council of Norway's Programme of Centres for Research-based Innovation is intended to build up or strengthen Norwegian research communities that work in close interaction with innovative business and industry. The objective is to support long-term research that promotes innovation and competitiveness in the business sector.

The TTL is a centre for research and innovation in the field of advanced telemedicine and e-health systems for chronic, age, and lifestyle related diseases. In TTL, we focus on sensor-based systems for vital signs and surveillance (SBS), extended decision-support (EDS) and computer-supported cooperative work (CSCW).

Research at TTL will cover subjects such as how new “smart sensors” and personal terminals can be adapted to the steadily growing group of people with chronic diseases. These systems will be wireless and invisibly integrated with computer-based extended decision support. One of the objectives is to reduce the pressure on the health service. For elderly people or chronically ill patients, this may improve quality of life through better control and follow-up of their own illness.

The centre aims at supplying the healthcare industry with viable and sustainable technologies that will promote global health, wellness, and disease management by facilitating technological advances in the collection, processing, and sharing of medical information. These will generate new products and services within telemedicine and e-health.

Some TTL projects will be presented.

Telemedicine and Telepresence for Trauma and Emergency Management
Rifat Latifi, MD, FACS,1,2 George Hadeed, MPH1, Charles R. Doarn, MBA2,3
1University of Arizona, Tucson, Arizona; 2International Virtual e-Hospital, Anchorage, Alaska; and 3Center for Surgical Innovation, Department of Surgery, University of Cincinnati, Cincinnati, Ohio

Despite being relatively new, the concept of teletrauma and telepresence is evolving and is being integrated into modern care of trauma and surgical patients. Recent technological developments have made possible telemicine application in the management of trauma and emergency care, especially in remote and isolated communities. As such, telemicine for trauma and emergency management is emerging as a new frontier in telemedicine and is becoming an integral part of the modern practice of trauma care. The biggest benefit of teletrauma and teleresuscitation is the transformation of the concept of the “golden hour” into the “golden minute” which facilitates the rapid stabilization of the patient and safe transport to the trauma center when indicated. The University Medical Center and the Arizona Telemedicine Program (ATP) in Tucson, Arizona has one functional teletrauma and emergency telemedicine program and one ad-hoc program, the mobile telemedicine program. The Southern Arizona Telemedicine and Telepresence (SATT) program is an inter-hospital telemedicine program, while the Tucson ER-Link is a link between pre-hospital and emergency room system. Both programs are built upon the world-renowned ATP and the technical infrastructure of the city of Tucson. These two programs represent examples of integrated and collaborative community approaches to solving the lack of trauma and emergency care issue in the region. These networks will not only be used by trauma, but also by all other medical disciplines, and as such have become an example of innovation and dedication to medical care in Tucson.

The first “teletrauma” case managed over the telemedicine trauma program was an 18-month old child who was the only survivor of a car crash with three fatalities. Using the teletrauma system, the child was quickly resuscitated and transferred to a level I facility within minutes of arriving in the emergency room where she made a full recovery from her injuries. The success of this case and the SATT pilot project led to the development of a regional teletrauma program serving close to 1.5 million people. The telepresence of the trauma surgeon, through teletrauma, has infused confidence among local doctors and communities.
being used to identify knowledge gaps between healthcare providers and address the need for instituting new outreach and educational programs.

The acceptance of the program by trauma surgeons, referring physicians, nurses, and other providers, as well as patients, has been excellent thus far. Other clinical specialties are making preparations and creating protocols to utilize the system as well. As technology becomes friendlier and cheaper, the concept of teletrauma, telepresence, and teleresuscitation are evolving into key telemedicine applications which are being integrated into modern care of trauma and surgical patients.

Military Telemedicine and e-Health from the Battlefield: Lessons for Civilians
COL, Ronald Poropatich, MC and David Lam, MD, MPH
Telemedicine and Advanced Technology Research Center, United States Army Medical Research Medical Center, Ft. Detrick, Maryland

Telemedicine support for forward deployed Army Combat Support Hospitals in Iraq and Afghanistan was initiated in 2004. Current capabilities have evolved from simple email to sophisticated medical equipment monitoring. Clinical reach-back consultation for 19 medical specialties is accomplished with a low cost electronic mail system and includes digital image attachments. As of 1 January 2009, over 4900 non-radiology consults were completed with dermatology (52%), infectious disease (9%) and ophthalmology (5%) comprising the top 3 medical specialties. This same capability will be offered to deployed NATO forces in Afghanistan commencing 1 Feb 2009, on a 6-12 month interim basis. A new application deployed in 2008 – remote medical maintenance – has been deployed to 6 sites in Iraq and includes monitoring of 10 CT scanners and medical devices (blood analyzers). It provides uninterrupted monitoring and software maintenance over the Internet thereby reducing equipment down time. Funding for establishing dedicated bandwidth for deployed medical facilities in Iraq was also initiated in late 2008 and provides the capability to transmit large data files – CT scans (300 MB size), more rapidly thereby improving remote consultation. This same network will be utilized for establishing a telesurgical mentoring program from one facility in Iraq with reach-back consultation to the U.S. for assistance from surgical specialists mentoring a general surgeon through sophisticated trauma surgery. All these applications are low cost and easily implemented in civilian programs that are resource constrained.

Telemedicine in Disaster Management
Ronald Merrell, MD, FACS
Virginia Commonwealth University, Richmond, Virginia

Disaster whether natural or human in origin, disrupts services critical to medical care while increasing demand. Infrastructure may be destroyed or strained and relief must usually come from a distance. This situation seems to beg for augmentation of health services through telecommunications and therefore telemedicine. Electronic satellite communication may be able to predict or assess disaster as in hurricane or war events. Telemedicine can use the immediate application of satellite links to provide logistics and decision support for disaster managers and for medical practitioners as well. However, telemedicine has played its most important role thus far in remote assessment and reconstruction because there is not a coherent plan for telemedicine application in the immediate disaster event. Such utilization requires prior training, pre-placement of some equipment and a clear role for telemedicine in the planning and implementation of disaster plans. There are excellent examples of telemedicine opportunities and failures reported. Armenia was an early example of the role to be played in reconstruction and Katrina Hurricane and the Pakistan Earthquake offered excellent examples of the potential of telemedicine in very early response. Although disaster almost always means loss of ground telecommunications and cellular systems are either destroyed or fail by saturation, satellite is reliable and available. Mobile WiMax may be useful to reach a nearby area of intact telecommunications or satellite may only need to bounce to a nearby area of integrity rather than many thousands of kilometers. There is a telecommunication solution for almost any contingency and it is the incumbent upon the telemedicine community to create, test and deploy successful systems. Continued dialogue with disaster managers is need supported by publication of applicable experiences.
Telemedicine Networking: The Science and Logistics
Georgi Graschew, PhD
Surgical Research Unit OP 2000, Max-Delbrueck-Center for Molecular Medicine and Charité University of Medicine, Berlin, Germany

Over the past several years, OP 2000 has implemented various satellite-based networks for telemedicine support especially real-time interactive telemedicine applications and online intraoperative, interactive multipoint consultations via satellite link for the connected clinics during patient treatment. Examples include EMISPHER, MEDASHIP, DELTASS, GALENOS network applications in the fields of e-learning and distance training, teleconsultation, telementoring, etc. Such networks contribute to the improvement of the quality of medical care, to the cost-effective use of medical resources and to quick and reliable decisions. The high-end interactive video communication system WinVicos enables real-time telemedical applications like teleconsultation and second opinion and offers a superior image quality at a moderate transmission bandwidth of 0.5-1 Mbps. Not only video and audio connections can be provided, but also interactive manipulations can be performed remotely.

Implementation of emerging information and communication technologies into healthcare have lead to the e-Health era, characterised by new ways of healthcare delivery through a broad range of teleservices. However, to fulfil the promise of e-health and telemedicine, namely ubiquitous access to high-level healthcare for everyone, anytime, anywhere (so-called u-health), it requires a real integration of the various platforms and services into virtual hospitals.

Telemedicine in Disaster Management - The Military Perspective
David M. Lam, MD, MPH
University of Maryland Medical School, National Study Center for Trauma and Emergency Medical Systems, Baltimore Maryland, and U.S. Army Telemedicine and Advanced Technology Research Center Ft. Detrick, Maryland

One of the most commonly-cited uses for telemedicine found in the literature is that of use in disaster relief. However, a careful review of the literature demonstrates little real analysis of the utility of the modality in various disasters. The literature usually is favorable, but it is very difficult to tease out actual case reports in which the use of telemedicine altered case management and many of these reports appear to be enthusiastic anecdotes by telemedicine advocates rather than a careful analysis of benefits.

This presentation will depict the current military view of the utility of telemedicine during a disaster, and may vary somewhat from the views of civil experts. This presentation will describe the use of Telemedicine by a U.S. Army hospital during the 2005-2006 Pakistan earthquake relief operation, in the late acute and early recovery phases, which has documented patient results as a result of the use of telemedicine. The telemedicine augmentation support to the 212th MASH was fully operational and well-accepted by the medical staff. Though only used in the recovery phase, telemedicine was felt to be of primary use during the early phases of the deployment, when the medical staff was learning about diseases endemic to the disaster area, or when dealing with diseases new to the practitioners, rather than in dealing with acute or subacute trauma. During this early phase, telemedicine consultation was used regularly, and was felt to be of significant assistance. This level of use peaked quickly, and by the end of the deployment, when the practitioners were more familiar with the endemic problems of the area, was felt to be needed only occasionally. Telemedicine usage was felt to have been of benefit in arranging some evacuations or transfers, though perhaps the primary benefit of the telemedicine/Comms capability was the general communication support it was able to provide the hospital and its staff.

Clinical Telemedicine
Charles R. Doarn, MBA\textsuperscript{1,2}, Rifat Latifi, MD\textsuperscript{2,3}
\textsuperscript{1}Center for Surgical Innovation, University of Cincinnati, Cincinnati, Ohio; \textsuperscript{2}International Virtual e-Hospital, Anchorage, Alaska; and \textsuperscript{3}University of Arizona, Tucson, Arizona

The ability to link patients with their providers or expertise not resident where the patient is has provided profound changes in healthcare. From its earliest application, telemedicine has been applied to communicate
medically-relevant issues between a remote patient and healthcare provider. This linkage has been enabled by radio, telephone, satellite, Internet and a number of other communication modalities. All clinical disciplines in medicine can utilize and integrate telemedicine in practice. Over the past two decades, a plethora of research has been undertaken that has aptly demonstrated the efficacy and importance of such integration. Images of pathology, radiology, and photography can be easily transmitted. Data from monitoring devices and sensors can be easily acquired and shared at a distance. Patients in one location can be operated on by a surgeon in another location. The application of telemedicine can be applied in all clinical areas with simple tools. A digital camera and an e-mail account can serve as the simplest approach. More complex systems must be installed to facilitate surgical intervention. Clinical telemedicine can be simple or complex. It has been shown to be a significant adjunct to the delivery of healthcare services by overcoming barriers of distance and time. In world that is becoming more interleaved and with an impending shortage of healthcare providers, telemedicine is a significant tool. Every clinical discipline from pre-anesthesia consultation to robotic surgery and emergency consultation for major trauma or for injuries from war zones is amenable to telemedicine applications. Some of the most common clinical forms of telemedicine included teleradiology, teledermatology, telepsychiatry, telecardiology, telepathology and home healthcare. In addition, many other clinical disciplines are being developed using new and advanced technologies with great success.

Telepresence and Telesurgery
Georgi Graschew, PhD
Surgical Research Unit OP 2000, Max-Delbrueck-Center for Molecular Medicine and Charité University of Medicine, Berlin, Germany

The surgical-oncological workplace 2020 represents trend-setting telesurgical technology by the use of a high-tech system configuration on the basis of linked application-specific modules. The further design, implementation, validation and optimization of the workplace 2020 in which the various clinically required modalities are to be integrated is an important component for peri-operative research. This medical workplace 2020 shall provide the users with all required information at the right time and place and most important in optimally processed form. Important for a workplace 2020 is an integration of the following aspects: high-resolution (HD) and stereoscopic visualization; interactive real-time video communication with remote control of medical devices for telementoring, telesupervision and distributed collaborative work; virtual reality simulations with tracked visualization and haptic feedback; optimized user interfaces for intraoperative use, etc. By a modular design of the workplace 2020 the various functional groups in the daily clinical routine gain a tailored access to all required medical information, video communication, simulation, etc.

For collaboration the following methods of telepresence are used: interactive remote control of the volume rendering software, remote and local control of the pathological microscope, surgical microscope, stereoscopic camera integrated in the operating light, shared video mouse, etc. Examples show that without such an environment modern IT-based technologies will be isolated and cannot be used routinely and intuitively.

Globalization of Telemedicine: The Grass Root Approach
Frank Lievens1,2, Marlina Jordanova, MD, PhD3,4
1International Society for Telemedicine & eHealth, Switzerland; 2Med-e-Tel, Grimbergen, Belgium; 3Med-e-Tel, Bulgaria; and 4Solar-Terrestrial Influences Institute, Bulgarian Academy of Sciences, Sofia, Bulgaria

Starting with recalling the century long history since first successful telemedicine experiments in 1905, the presentation reveals the “grass root” development of e-health, i.e. in most cases ideas, projects, technologies and products were developed and implemented from the bottom up rather than from the top down.

Understanding that e-health strategic goal is patient care and healthcare delivery the presentation summarizes several main e-health issues:

- What are e-health promises and what e-Health offers today? Practical examples of systems, devices, smart solutions are presented answering the questions: Show me what? Where? How? And supporting the movement towards citizens centered healthcare are listed.
- How e-Health support optimization of patients’ care? Optimizing healthcare as: access to services; increased available types of services; timely and controlled care; cost effectiveness and investment return, etc., are outlined.
Who are the key international e-health players? The importance of improved and continuous cooperation and coordination is emphasized.

Finally, attention is focused on the necessity always to be aware about what is globally going on through international networking initiatives! Two leading initiatives are presented:

- The International Society for Telemedicine and e-Health (ISfTeH) (www.isft.net), a not-for profit organization, international representative body of national and international Telemedicine and e-Health organizations, dedicated to broadly promoting telemedicine, telecare, telehealth, e-Health around the world. ISfTeH supports the start up of National Associations or Societies and facilitates their international contacts; disseminates knowledge, information and experience and provides access to recognized e-Health experts.

- Med-e-Tel (The International e-Health, Telemedicine and Health ICT Forum for Education, Networking and Business, http://www.medetel.eu), a highly specialized event bringing together suppliers of equipments, service providers, buyers, healthcare professionals, scientists, decision and policy makers from all over the world, a forum where state-of-the-art products, ideas, projects are presented and discussed, a nesting place for new cooperation and partnerships.

From Nanotechnology to Clinical Applications: The Future of Telemedicine
Georgi Graschew, PhD
Surgical Research Unit OP 2000, Max-Delbrueck-Center for Molecular Medicine and Charité, University Medicine, Berlin, Germany

During the last several years, numerous different telemedicine projects, aiming to bridge the digital divide in healthcare area, have shown the need for further integration of different telemedical systems. Therefore, the creation of a Virtual Hospital (VH) is proposed that aims at accelerating the integration of the various telemedical services and technological platforms developed by different organizations at different sites. The methodologies for the VH are medical-needs-driven instead of technology-driven. Through the integration of different telemedical solutions in one platform many medical services can be supported and isolated “island”-solutions are avoided. The technologies of the VH, like satellite and terrestrial links, Grid technologies, etc., will be implemented as a transparent layer, so that the various user groups can use the services such as expert advice, e-learning, etc. without knowledge of the technological details and constraints.

Modules for miniaturization, computerization and molecularization of medicine are proposed and should be integrated into Virtual Hospitals. Classically in medicine only disease symptoms could be diagnosed and treated. In future molecular diagnosis, molecular imaging and molecular therapy could enable preventive and personalized medicine.

Molecular imaging combines modern methods of molecular and cell biology with recent technologies for non-invasive imaging. For this endogenous and exogenous molecules and drugs are used as contrasting agent. Imaging of processes in live environment on cellular and molecular level is an important step in understanding of the relevant physiological and patho-physiological processes and for the improvement of tumour diagnosis and therapy. Examples of molecular imaging are the development of instruments for multimodal imaging, detection of multi-photon fluorescence and imaging of nanoparticles in live biological environments.

Induced by advances in biology, medicine and engineering an increasing number of patient-related vital data are available for the medical doctor. This constantly increasing supply of data and information make the use of innovative information technology necessary.

Telemedicine in Chronic Diseases and Diabetes
Steinar Pederson, MD
Norwegian Centre for Telemedicine, University Hospital of Northern Norway, Tromsø, Norway

Structural changes in the healthcare system have resulted in hospitalized patients being transferred to out-patient clinics, general practitioners and home-based services at the same time as hospital beds have been changed into patient’s hotel, district medical centers, and even into “My home as a hospital”. To support these changes several new telemedicine services have been developed, especially in the area of chronic diseases.
Examples are diabetes, or the type 1 and type 2 diabetes. The project presented here show a combination of personal sensors measure parameters relevant for the chronic conditions. The measurements are monitored and integrated over time, and are used to monitor the lifestyle status and compare the status to the targets for the individual.

**Telemedicine in private homes** is the use of computer systems to monitor and control clients in the home-based caring-service. Through monitoring equipment, alarm functions, medical equipment, etc., it is possible to prolong the period a patient can safely stay at home, and thus both reduce the costs for the municipality and increase the patient’s quality of life. Reduced costs may also imply that more people can receive help from home-based caring service. One application of this technology is the home-based caring-service.

Patient self-testing or self-management may provide the greatest degree of decentralization. Adding computerized decision support system (CDSS) will be useful and helpful. Patient analyses himself with his own blood using self-testing equipment. The measured INR-value will be sent directly to the thrombosis service at the hospital or primary healthcare. At the hospital or primary care, a physician at the thrombosis service with the help of CDSS can respond with a new dose.

**Telemedicine in Extreme Conditions – From the Deserts of Arizona, to the Depths of Space, to the Vast Amazon Jungle**

Rifat Latifi, MD, FACS1,2,3, Mateja de Leonni Stanonik, MD, PhD1,4, George Hadeed, MPH1, Charles R. Doarn, MBA3,5, and Ronald S. Weinstein, MD2

1Department of Surgery and 2Arizona Telemedicine Program, Arizona Health Sciences Center, Tucson, Arizona; 3International Virtual e Hospital, Anchorage, Alaska; 4George Washington University, Department of Neurology, Washington DC; and 5Center for Surgical Innovation, Department of Surgery, University of Cincinnati, Cincinnati, Ohio

The application of telemedicine in extreme, remote, and isolated conditions has become more common. There have been applications in post war countries (Kosova), extreme heat (Arizona), extreme cold (Alaska), human exploration of space, and even adventure expeditions such as the Amazon Swim Expedition (ASE). Extreme conditions can also be found in places outside of the perceived definition of the term, such as utilizing telemedicine in ambulances in most critical situations, including stroke or heart attack. Innovative programs are setting new frontiers in telemedicine pushing the envelope by conceiving testing and developing new technologies that make such lifesaving applications possible. In order to provide telemedicine in extreme conditions one needs a team of specialists, different and redundant technologies as well as the sense of adventure and ability to adapt to the new and ever changing conditions. One such example is the ASE led by Martin Strel, Guinness world record holder in ultra marathon swimming. Over 66 day, he successfully swam the entire length of the Amazon River, starting at Atalaya, Peru and ending in Belem, Brazil, at the mouth of Atlantic Ocean. Providing telemedicine support during the expedition was logical but difficult, as the expedition would have to pass through some of the most remote, dangerous, and yet beautiful yet mostly unknown territory. Telemedicine had never been reported to support such an expedition in such extreme conditions. The Amazon Virtual Medical Team (AVMT) was created to accomplish this task as well as to support the ASE. The AVMT consisted of trauma and general surgeons, infectious and tropical disease specialists, a dermatologist, vascular surgeon, ophthalmologist, exercise physiologist, psychiatrists, pathologists, and technical personnel that established satellite connectivity 24/7 for the duration of the expedition. The AVMT was led by the director, Rifat Latifi, MD, and by the team physician, Mateja de Leonni Stanonik, MD, who was on board the boat for the duration of the mission. The medical team was contacted through e-mail and telephone, live video consultation using Skype™, and store-and-forward techniques via portable satellite link. The objectives of the AVMT were to ensure safety of Martin Strel and his team, including the executive team, film makers, journalists, crew, and others guests at any given time as well as to promote telemedicine and e-health in the region. This and others examples clearly demonstrate that the application of telemedicine is possible with careful planning and organization, even in the most extreme and difficult of conditions.
Changes in medicine are being driven by financial pressure. Payers are looking for ways to reduce the cost of providing healthcare. Healthcare providers are developing new ways to facilitate the transition to home and to reduce readmissions that will not be reimbursed. Chronic diseases represent 75% of healthcare dollar expenditure and 70% of deaths. Chronic diseases result in costly and frequent readmissions. Telemedicine is enabling monitoring of patients at home. A medical device library is being created by industry that includes technology to monitor patient information such as vital signs, pills taken, and blood glucose levels. A wireless aggregating device transmits this data to a healthcare facility which both monitors and processes this data. Providers react to and store the data as part of the patient’s healthcare record. This process enables healthcare decision-making at home that may prevent readmissions and unrecognized progression of chronic diseases.

Major technical limitations to telemedicine in home care remain. Broadband communication and a coherent medical device library pose significant problems for industry. Likewise, rules-based algorithms are necessary to prioritize and filter information to prevent inundation of raw data to the physician.

Well designed, robust home care monitoring via telemedicine coupled with tertiary care center support leads to significant changes in the pattern of a chronic disease such as congestive heart failure. Such successes need to be translated to other chronic diseases and discharged patients. Financial modeling showing less readmissions will be necessary to justify up-front capital costs to establish homecare networks.

Teleradiology and Telepathology
Elizabeth A. Krupinski, PhD
Department of Radiology, Arizona Health Sciences Center, Tucson, Arizona

Teleradiology and telepathology are the most mature clinical applications in telemedicine today. In many ways these applications guided the development and technology used in many telemedicine applications being used today. These applications have been particularly successful in telemedicine not only because of the technology but because they have been readily reimbursable – creating the foundation for many telemedicine programs to build upon. This talk will review some of the basic technological aspects being used in both of these applications as well as the more clinical aspects using the Arizona Telemedicine Program’s activities as an example. To date this program has completed over 850,000 teleradiology consultations and over 4,000 telepathology consultations. In particular, the application area will focus on a unique bundling of telemedicine applications to provide breast care to patients, starting with telemammography for detection and diagnosis, telepathology for biopsy confirmation of disease, and finally teleoncology for initiating the treatment and care process. The goal of this advanced use of technologies for breast care is to reduce significantly the time it takes to treat women with breast cancer, as well as those without, in order to improve outcomes and reduce the psychological and emotional trauma often incurred with long waiting times for appointments and results.

The Business Aspects of Telemedicine and e-Health
Gail Barker, PhD
Administration and Finance, Arizona Telemedicine Program, Phoenix, Arizona

In developing a sustainable telemedicine program, basic business principles must be considered. Understanding why a telemedicine program is being initiated and how it fits into the mission of an organization are the first steps in analyzing the business aspects of any new program or initiative, including telemedicine. Potential revenue sources must be reviewed; these include contracts and grants, organizational support, philanthropy, patient collections and user fees. Each of these funding sources has its own set of challenges so expense reductions, improved access to services, user convenience, expanded network use and/or a perceived added value are also reasons to initiate a telemedicine program. Reviewing the types of expenses both fixed and variable, one time and recurring, direct and indirect, at all sites, help organizations determine how the program will sustain itself over time. Finally, reviewing some of the strategies used and lessons learned from successful telemedicine programs can help a new program avoid costly mistakes.
Telehealth programs are complex and challenging to manage. Relatively few organizations have developed sustainable, multi-organization, multi-specialty telemedicine programs although many organizations have contemplated creating such entities. There are a number of barriers to the development of sustainable telemedicine and telehealth programs. First, relatively few organizations have the employees with the full set of skills needed to create and manage a multi-specialty telemedicine program. Telemedicine programs housed within a single healthcare delivery system have advantages over multi-organization telemedicine programs. Developing a shared vision among multiple organizations is a daunting task, especially when some of the organizations are otherwise competitors in the market place. Developing shared visions is complex process but is essential for long term success. Staffing requirements of telemedicine and telehealth programs may be met by sharing existent resources, hiring additional personnel, and or outsourcing activities. Business models, such as the Application Service Provider (ASP) model created by the Arizona Telemedicine Program, are designed to provide staffing flexibility by offering a combination of in-house and out-sourced services, depending on the needs of the individual participating healthcare organizations. The planning process should include goal setting and the periodic updating of the program’s vision and mission statements. There can be additional special issues for multi-organization telemedicine and telehealth programs. For example, authority management within a multi-organization system will generally require the use of innovative approaches customized to the needs of the consortium. Inter-institutional relations, external to the telemedicine program, may introduce additional issues when competing healthcare organizations are utilizing shared resources. Branding issues are preferably addressed during the initial planning of a multi-organization telemedicine and telehealth program. Ideally, public policy regarding telemedicine and telehealth will be consistent with the promotion and implementation of a new telemedicine program. A cornerstone for building a new telemedicine program is careful planning and then ongoing assessment of the program on a regular basis.

Serious telemedicine and e-health activities in the Balkans started with the creation of the Telemedicine Program of Kosova in 2002. Since then, this program has become a model for many developing countries around the world, and a catalyst for modernization of medical systems, particularly in countries coming out of war and other disasters. Experience in Kosova and other countries has demonstrated that investment in good telecommunications and electronic information technology between regional hospitals and the hub hospital which can ultimately improve the quality of care offered at regional hospitals significantly without high levels of continuous investment and without highly specialized medical staff in the regions. In addition to telemedicine for clinical services, e-health can improve the exchange of information, improving the administration of medical records. Finally electronic libraries can improve continuing medical education by providing access to the latest publications in medicine. The new initiative of International Virtual e-Hospital (IVeH) Foundation in collaborations with political and medical leadership of the region is to create a region-wide telemedicine and e-health network that will bring together healthcare providers and medical educators of countries in the region in order to establish standards of care and maintain scientific knowledge in the region. This network will, without doubt, bring people and countries in the region closer to each other as they develop a true partnership in caring for sick and injured and share medical knowledge. Lessons learned during the establishment of telemedicine in the Balkans have become tools in establishing telemedicine and e-health programs in other developing countries. What we have learned is not only what to do, but what not to do. Using techniques of initiate, build,
operate, and transfer, the IVEH continues to establish telemedicine and e-health programs in the region and beyond that comprise of four important elements: 1) Establishment of telemedicine and e-health infrastructure, network and communications; 2) Education programs and creation of human capacities to ensure sustainability; 3) Electronic library network and contents; and 4) Policies and procedures on regional and international collaborations and exchange. Each of these phases is an integral element of the overall process of establishing telemedicine and e-health programs.
Appendix D

Presentations
Telemedicine and E-health in Modern Medical Practice: Arizona Telemedicine Program As a Model

Rifat Latifi, MD, FACS
Professor of Clinical Surgery
Vice Chairman, International Relations
Department of Surgery, University of Arizona, Tucson, AZ
Associate Director of Arizona Telemedicine Program, Teleurgery and International Affairs
President, International Virtual e-Hospital Foundation
Director, Telemedicine Program of Kosova

Third Balkan Telemedicine Seminar

• To develop champions amongst health care workers that will carry this process and will make telemedicine and technologies an integral part of our practice, dreams and goals serving the injured and sick patients and improving the education process

The IVEH Mission

Creation and establishment of self-sustainable telemedicine and e-health programs around the world and to rebuild medical systems in the developing world, using telemedicine, advanced technologies, and cultural exchanges and collaboration as a platform.

Our Goal

Training and education of healthcare providers of developing countries in the use, adoption, practice, and implementation of telemedicine, e-health and electronic libraries in order to narrow the gap created by the digital divide and healthcare imbalance.

How we are doing it?:

(Building Blocks)

• Establishment of Telemedicine and e-health infrastructure, network and communications
• Education programs and creation of human capacities to ensure sustainability
• Electronic library network and contents
• Regional and International collaborations and cultural exchange
Disseminating Telemedicine and e-health in the Developing World

Initiate- Build- Operate- Transfer

The way we see it: Telemedicine and e-Health

Non disruptive Convergence

Economical

New Equal Partners

Virtual Participation

What we do:

Change the delivery of existing medical care

Bring together new coalition of partners with innovative boundaries and clear vision

Create a modern and efficient medical system that will prevent morbidity and death, and improve lives

We Demand

A new generation of leaders with different intellectual capital and a new direction

Global and not focused on self limited projects, or driven by institutional and/or national interest

Universal Thinking and Actions

We Create New Healthcare Leadership

• Multi-dimensional
• Have a passion to change the world
• Not afraid to disturb the status quo
• Willing to share the knowledge among nations and the world
• View technology as the enabler of change, but not a sole answer itself

What strive to:

• Promote integration of inter-disciplinary health care strategies
• Address the inequalities and digital divide of health care world wide
• Encourage cooperation between nations
• Create higher standards and demands better care for all
• Encourage and demand evidence based medical practice
Telemedicine: Historical notes

• 1900 - telephone was introduced
• 1914 – WWI radio communications
• 1920 – Haukeland Hospital in Norway uses radio links with ships
• 1924 – Radio News prediction
• 1929 – Television introduced

Historical notes

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<table>
<thead>
<tr>
<th>Telemedicine Notes</th>
<th>Historical Notes</th>
</tr>
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| • 1955 - Nebraska Psychiatric Institute began using closed circuit television  
• 1964 - Institute connected with another hospital and Telemedicine was born | • In 1967 the Massachusetts General Hospital established a microwave connection with Logan Airport and began medical consultation for travelers |

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<th>Historical Notes</th>
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| • Monitoring the status of cosmonauts and astronauts required telemetry  
• The first traveler was Yuri Gagarin in 1961 and his vital signs reported by the new technology of telemetry | • From 1972 to 1975 NASA supported a demonstration project in Arizona called Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC) using microwave transmission connecting a mobile health unit to a public health hospital for consultations |

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| • In 1974 NASA established the basic requirements for video quality declaring acceptable 200 lines or a rate of 10 frames per second the minimal configuration  
• Today: 1 M frames per second High-speed Video Camera and its application  
  (Journal of Imaging Society of Japan 2005) | • The ALASKA ATS-6 program in 1971 linked 26 sites in Alaska by satellite for the purpose of medical support. |
Telemedicine Notes

Earthquakes and other disasters...

Telemedicine for trauma...

Friendship Airport Disaster Exercise 1978

**Purpose** - Dr. R. Adams Cowley
- Implement Regional Disaster Plan
- Test Actual EMS Response
- Enact Coordinated Triage to Multiple Facilities
- Determine Feasibility of On-Scene Image Transmission and its Role in Triage and Transport

Friendship Airport Disaster Exercise

Exercise Conditions
- Simulated Airplane Crash
- 72 Casualties
- Activation of Regional Disaster Plan
- On-Scene Command Station
- Triage/Transport

Slides Courtesy of Professor Kim Maul
Transoceanic cholecystectomy: operation Lindbergh

- A laparoscopic cholecystectomy performed from New York in Strasbourg, France Sep 9, 2001
- Conclusion: Distance is meaningless

Robotic Surgery

- Accomplishment—there were not possible before
- Dexterity enhanced
- Computer assisted
- Image guided

Amazon swim Telemedicine Expedition 2007
With all these results...

Medicine did not follow other industries

- Other industries have harnessed advanced information technologies, to the benefit of consumers
- Air travel system
- Banking system

New Medicine With Old Tools

- Medicine still operates primarily with paper based records.
- We doctors and nurses have to manage 21st century medical technology and complex medical information with 19th century tools.
- Medical professionals are the best and brightest in the world, and we need to set the standard for the world.
- It is a testament to our skills that we are able to achieve high-quality care in this antiquated system.

The Solution:

Health Information Technology

Health information technologies

- Electronic medical records, computerized ordering of prescriptions and other medical tests, clinical decision support tools, and secure exchange of authorized information – improve quality, reduce medical errors, and prevent deaths.
One Dramatic Example:

- Virtual Intensive Care Unit (VISICU)
- One Intensivist Cares For Many Intensive Care Units
- Reduced Mortality
- Increased Productivity
- Evidence Based Medicine Practice

Other Examples

- New patient do not have to enter their personal information, allergies, medications, or medical history, since it is already available.
- A parent, who previously had to carry the child’s medical records and x-rays in a large box when seeing a new physician, can now keep the most important medical history on a keychain, or simply authorize the new physician to retrieve the information electronically from previous health care providers.

Great examples

- Teleradiology
- Laboratory
- Telepharmacy

Other Examples

- Arriving at an emergency room, a senior with a chronic illness and memory difficulties authorizes her physicians to access her medical information from a recent hospitalization at another hospital – thus avoiding a potentially fatal drug interaction between the planned treatment and the patient’s current medications.
- Three patients with unusual sudden-onset fever and cough that would not individually be reported, show up at separate emergency rooms, and the trend is instantly reported to public health officials, who alert authorities of a possible disease outbreak or bioterror attack.
But There Is a Requirement

Broadband With High-speed Internet

Broadband Internet for Every One

- Promoting Innovation and Economic Security through Broadband Technology
- Making broadband access tax-free will lower the cost to consumers
- Working to enable the rollout of new broadband technologies.
- The Federal Government must do its part to remove hurdles that slow the deployment of broadband.

Broadband with high-speed Internet

- Improve the Nation’s economic productivity and offer life-enhancing applications, such as distance learning, remote medical diagnostics, and the ability to work from home more effectively
- Broadband technology will enhance our Nation’s economic competitiveness and will help improve education and health care for all Americans

Important Facts about Broadband:

- Broadband is high-speed Internet access.
- Broadband in the United States is “always-on,” allowing a computer to remain connected to the Internet 24 hours a day.
- Distance learning, remote medical procedures, interactive web teleconferencing, and real-time video and audio all require Internet speeds beyond what traditional dial-up service can offer.

Telemedicine...

the practice of health care delivery, diagnosis, consultation and treatment and the transfer of medical data through interactive audio, video or data communications that occur in the physical presence of the patient, including audio or video communications sent to a health care provider for diagnostic or treatment consultation.

ARS 36-3061

“Western Governors are committed to improving access to and quality of health care for people living in the rural west.”

Western Governors’ Association
Telemedicine Action Report - 1995
Western Governors’ Association
Telemedicine Action Report - 1995

Barriers

- Infrastructure Planning & Development
- Telecommunications Regulation
- Reimbursement for Telemedicine Services
- Licensure & Credentialing
- Medical Malpractice Liability
- Confidentiality

Founders of The Arizona Telemedicine Program
1996
John J. Lee

Arizona Telemedicine Program
Today

170+ Sites
- Urban & rural hospitals
- Native American healthcare
- Prisons & jails
- Community health centers
- Schools
- Distance learning affiliates
- International Sites

Arizona Telemedicine Council

14
Clinical Telemedicine

Teleradiology
Over 650,000 Cases

Telepsychiatry

Teledermatology

Multi-specialty Multimedia Store & Forward

Digital Cameras
Canon PowerShot 600
Canon PowerShot S3 IS
The Gap...

...between imagination and accomplishment

...has never been smaller.

Current Challenges...

1. Dream
2. Ambition
3. Creativity
4. Determination
5. Passion
6. Serendipity

SO WHAT WE NEED:

- A plan
- A business plan
- A team
- Funding
- Make part of the practice
- Do not do it by yourself only
- Justify it to everyone that asks
- Make it all inclusive but
- You are the champion

Conclusions

- Analyze your situation
- Be critical but fair
- Find a solution
- Be visionary
- Strive to be the best in the world
- Technology is the solution
- Adopt it, spread it, help develop it

Lets Get To Work

“Never give up on a dream just because the time it will take to accomplish it. The time will pass anyway.”

Summary

- E-health education has a real potential in all aspect of health education
- Establishes higher standards for medical education, CME
- Preferred choice dissemination of existing knowledge
Requirements for Successful Telemedicine Consultation and Telemedicine Program

Third Balkan Telemedicine and e-Health Seminar
Current Principles and Practices of Telemedicine and e-Health
Clinical Applications and Evidence-Based Outcomes
February 6-7, 2009
Skopje, Republic of Macedonia

Charles R. Doarn, MBA
Executive Director, IVeH
Executive Director
Center for Surgical Innovation
Deputy Director
Advanced Center for Telemedicine and Surgical Innovation (US Army – Funded)
Associate Professor of Surgery and Biomedical Engineering
Department of Surgery
University of Cincinnati College of Medicine
Special Assistant to the Chief Health and Medical Office, NASA Headquarters, Washington, DC (NASA – Funded)
Executive Director, Telehealth Video Resources Center (Ohio Board of Regents – Funded)
Administrative Director, Minimally Invasive Medical Technologies Center (NSF – Funded)
Editor-in-Chief, Telemedicine and e-Health Journal

Requirements for Successful Telemedicine Consultation and Telemedicine Program

- Unmet Need
- Leadership
- Ability
- Capability
- Financial
- Societal
- Technical
  - Devices
  - Robust/reliable Comm
- Legal
- Cultural
- PROCESS!

Challenges and Opportunities

- Various branches of government
  - Executive Branch
  - Congress / Parliament
  - Agencies
  - Councils
- Departments / Ministries
- State / Provincial / Community
- Based on their need(s) and responsibilities

Stakeholders and Policy Makers

- Educators
- Payors
- Patients
- Providers (all levels)
- Administrators
- You and Me
Requirements for Successful Telemedicine Consultation and Telemedicine Program

Barriers
- Distance/Geography
- Financial
- Technical capabilities/ availability
- Technology
- Culture
- Language
- Policy

Barriers
- Legislative
- Access
- Socioeconomic/political
- Willingness to Change
- Acceptance
- Education / Training

Challenges
- No immediate access to definitive medical care
- Distance
- Limited communications (time and rate)
- Resources
- Cultural diversity
- Autonomy

Challenges
- Outcomes research
- Technological standards
- Clinical standards
- Evidence-based Medicine
- Quality of service
- Limited bandwidth
- Security

Issues
- Privacy
- Confidentiality of information
- Reimbursement
- Sustainability
- Credentialing
- Liability
- Return on investment (ROI)
- Acceptance

Privacy, Confidentiality, and Security
- Impact of technology
- Protection under the law
- Hippocratic Oath??
Requirements for Successful Telemedicine Consultation and Telemedicine Program

Payment Policies
- Government (CMS – Socialized models)
- Fee-for-service
- Bundled payment methods
- Capitation payment
- Fears and concerns – rising costs across the board
- Teleradiology and telepathology are reimbursed

Legal
- Legislative
- Licensing
  - Who, Where
- Reimbursement
- Clinical responsibility apportioned

Legislative
- Licensing
- Reimbursement
- Clinical responsibility apportioned

Needs and Requirements Assessment
- Interact with leadership
- Interact with care providers (all levels)
- Interact with vendors – determine what is available
- Identify your funding source

Identify a champion
- Identify and document a process
- Get everyone involved
- Keep it simple
- Identify your market
- Collect data – outcomes - is it really working and is it beneficial?

Remote
- Extreme
- Multilingual
- Multicultural
- International

Charles R. Doarn, MBA
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Current Technologies

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Current Technologies

Change!
Where is my IPOD?
Where is my cell phone?
What do you mean I need HDTV?
I only have dial up!
Everything that needs to be invented has already been invented!
Fetch the doctor!

Current Technologies

Major Change!
Monaural Stethoscope (Rene Theophile Hyacinthe Laennec – 1816)
X-ray (1895, Wilhelm Conrad Röntgen)
**Current Technologies**

Electricity!

**Current Technologies**

Standard Teaching Practices!

---

"It is not the strongest who survive, nor the most intelligent, but those most responsive to change."

– Charles Darwin

---

Sometimes change is hard to overcome, accept, …..

---

Differing responses to scientific discovery by various sectors
"Imagination is more important than knowledge"  

Microelectrical mechanical systems (MEMS) Needles  
Views of fluid channel  
The MEMS needle can fit inside of a 30 gauge commercial needle  
Silicon needle is sharper and smoother

Current Technologies  
Technology helps us understand more!  
◆ Asbestos related disease  
  • “Asbestos is a group of naturally occurring, heat-resistant fibrous silicates”  
◆ Dust  
  – Coal  
  – Talc  
  – Cigarette Smoke

Current Technologies  
Technology provides more!  
◆ Better diagnosis (Dx)  
◆ Better treatment (Tx)  
◆ Better pharmaceutical (Rx)  
◆ Better life  
◆ Better access /distribution  
◆ Are there issues that make this not look so good??  
  – Cost  
  – Privacy

Current Technologies  
Fully integrated systems – components!  
Sputnik 2 – 1957  
Second satellite sent into orbit
Current Technologies

Magnetic anastamosis

Current Technologies

Virtual Reality and Simulation

Current Technologies

Virtual Reality

Trauma Pod

The Operating Room of the Future
Projected presence and robotic assistance

Current Technologies

VTC

Sensors and Interfaces

Virtual Reality

Miniature Monitors

Biocomputation

Wireless Monitoring

Portable Devices

Noninvasive Monitoring

Displays

Smart Materials – Wearable Computers
Current Technologies

Add or View Files & Images

- Pick and File Images & Data Files
- Categorize Files
- Capture Screen Images
- Capture / Play Image Clips
- Capture / Play Audio Files
- Scan and File Documents

Current Technologies

ViTel Net’s Image Tools

- Leveling
- Measure Line
- Measure Angle
- Measure Area
- Annotate Text
- Annotate Voice
- Magnification
- Mouse Zoom
- Rectangle Zoom
- Rotate – Flip
- Print & Save Image

Current Technologies

ViTel Net’s Video Conferencing

- Initiate Video Conference
- Capture Video Images
- Control Local Camera
- Control Remote Camera
- Real-Time Vital Signs
- Capture Vital Signs
- Picture-in-Picture

Current Technologies

Review Vital Signs

Current Technologies

The success of e-Health depends on teamwork between all actors involved, between all of us!

Charles R. Doarn, MBA
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Telementoring in Surgery
Andrew R. Watson, MD, MLitt
Skopje, Macedonia
Department of Surgery
Center for Telehealth
February 6-7, 2009
UNIVERSITY OF PITTSBURGH MEDICAL CENTER

Telementoring
• Mentoring other surgeons remotely
• Using real-time data, 2-way video communication
  – real-time assistance with patient-care
• Example: MVA 100 miles away, in a storm,
  transport is 2 hours by ground, helicopters
  grounded - GCS 8, hypotensive, being transfused
• Physician recruitment / retention

Why do this in surgery?
• Field of surgery is challenged
  – work hour restrictions - training limited
  – increased specialization (less comfort outside your area)
  – rural / under-served areas - physician shortage
• Physician recruitment becoming a challenge
• Legal implications of errors
• Outcomes studies / public awareness
• ED coverage for sub-specialties an expense for hospitals

Why do this in trauma?
• Acuity of decision making
  – ATLS - protocol driven, rapid progression of decision
  making, certification
• Traumas are not concentrated in an area
• Transfer of trauma - time of highest risk, if possible
  at all
• Expense of transfer / effect of transfer on local
  hospital
• Complexity of decision-making with multi-system

Why do this in trauma?
• An avoidable adverse outcome in a trauma bay or
  trauma OR
  – higher cost of care
  – increased length of stay
  – medical-legal exposure
  – post-surgical complications
    – patient, physician, hospital all “suffer”
• How much will physician ratings be a factor??
**Telemororing Examples**

- Urology
- Neurosurgery - endo-nasal surgery (UPMC)
- Remote robotic surgery
- Laparoscopic rooms are limited versions of this

**Supporting Technology**

- Trauma bay
- Operating room
- Clinic
- ICU

**Telestration**

- draw on one screen - seen on other remote screens
- instantaneous (low latency)
- low bandwidth
- must be easy to use
- critical for telementoring - especially in OR

**Internet Connectivity**

- Internal backbone
  - UPMC ALU
  - video transport
  - QoS
  - firewall / NAT
- WAN / "internet"
- Remote site bandwidth
- HIPAA

**Technical Outcome Metrics**

- Jitter
- Pixelation
- Ease of connection
- Loss of connection
- Latency
  - 250 milliseconds

**Data Sent to Mentor - Real Time**

- medical device library
  - vital signs
  - stethoscope
- real time data
  - CT / US (FAST) / PACS
  - EMR
  - medication
  - labs
- decision support / real-time
Example

- GSW, rural hospital, patient unstable
- transport by EMS
  - local ED contacts tertiary center hospital
  - video-teleconference to trauma bay started
  - remote surgeon (mentor) starts discussion with local surgeon
- patient arrives
  - remote surgeon watched vital signs, x-rays, communicates with local surgeon - guides resuscitation

Example

- patient goes to operating room
  - remote surgeon then connects to operating room
  - has 2-way live teleconferencing
  - can see view of overhead light camera
  - guides local surgeon through damage control operation
- patient in ICU
  - 2 surgeons communicate via teleconferencing
  - remote surgeon re-examines patient
  - patient is transferred to tertiary hospital

Operating Rooms - Laparoscopy

- laparoscopic vendors are trending to a "closed" OR solution
  - not scalable, not integrated
  - expensive to maintain
  - little real integration beyond their own ORs
  - limited feature set

- good for limited use, not adequate for telementoring

UPMC

UPMC OR Example

- patient goes to operating room
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UPMC

Data Sent to Mentor - Real Time

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Benefits from Telementoring

- Length of stay
- Quality and cost of healthcare
- Comfort of rural physicians in stabilizing and managing complex care
- Patient preference is to stay local
- Cost of transferring patients (especially sick)
- Medical legal ramifications
- Benefit to local hospital to keep patients

UPMC
### Implications of Telementoring

- Right for the patients -- right for the doctors
- Augment / bridge surgical education
- You can rely upon help when you need it
- Physician recruitment / retention
- Up-front investment / enterprise business case

**UPMC**
Telemedicine and Research Aspect: Need for Continuous Improvement

Steinar Pedersen

Norwegian Centre for Telemedicine
- Established in 1992
- Centre of excellence in telemedicine
- Research & Development
- WHO collaborating centre
- Centre for research-based innovation

My allegation I
- Telemedicine is not a new way of treating diseases
- Telemedicine is a new way of sharing medical information

My allegation II
- The traditional, well-known scientifically methodology in medicine are not always transferable to telemedicine
  - Evidence-based
  - Randomized controlled trials
  - Double blind/cross over
  - Significance

My allegation III
- Most of the improvements in our everyday life based upon ICT would not have taken place if scientific methodology should have been applied
  - Internet
  - E-mail
  - SMS
### EU-projects

<table>
<thead>
<tr>
<th>Project name</th>
<th>Coordinator</th>
<th>Project type</th>
<th>NUTS code</th>
<th>Subjekt total/NET</th>
<th>Description</th>
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<tbody>
<tr>
<td>eHealth Trends</td>
<td>IST</td>
<td>IST</td>
<td>FP7</td>
<td>€535,000 (532,800)</td>
<td>Research</td>
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<td>Cogisant</td>
<td>Telefinna, Spain</td>
<td>FP7</td>
<td>FP7</td>
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<td>100% Reimbursement</td>
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<td>Product development</td>
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<td>MedCom, DK</td>
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<td>FP7/100</td>
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<td>Esky</td>
<td>MedCom, DK</td>
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<td>€1,800,000/€1,800,000</td>
<td>50% Reimbursement</td>
<td></td>
</tr>
</tbody>
</table>

### Norwegian health net

- Helse Nord
- Helse Midt
- Helse vest
- Helse Øst
- Helse Sør

### Telenmedicine

- Radiology
- Pathology
- Obstetrics and gynaecology
- Dermatology
- Cardiology
- Psychiatry
- Endoscopic surgery
- Ophthalmology
- Distant teaching
- Orthopedics

### Born with broadband

- Patient and midwife
Teleradiology

xRay results

• 1999, 98 neurosurgical patients
  - 93% of the patients improved their treatment because of teleradiology
  - 34% avoided transportation
  - 42% had major changes in their treatment locally
  - 13% had transportation initiated
• Since 1999 the numbers of consultations have increased by 10

eRadiology - Rbay

Baltic eHealth

Denmark

Estonia

Tallinn

Lithuania

Vilnius

Funen

[Map images showing connections between the locations listed.]
www.helsekompetanse.no
A learning gateway

- Compiles all information and offers within net based health education in Norway

http://www.helsekompetanse.no

Educating norwegian medical students abroad

- 100 medical students in:
  - UK
  - Ireland
  - Germany
  - Malta
  - Australia
  - Poland
  - Hungary, Denmark
  - Netherlands, Brasil and Balticum

Nasjonalt tilbud

120 temaforelæsninger - år 2006

- Eldreomsorg
- Ergoterapi
- Ernæringsfysiologi
- Fysioterapi
- Psykiatri
- Spisestyrelser
- Sykepleie
- Læring og mestring
- Dialyse
- Psykososialt team for flyktninger etc.

Koordinering, opplæring, teknisk og pedagogisk bidrag.
Palestine project

- Establish a Palestinian health network between hospitals in
  - Jerusalem
  - Ramallah
  - Bethlehem
  - Gaza City
- Rehabilitation

Has Norway been successful in the use of ICT in the health care system?

- **YES** - If we are talking of digitizing the past
- **No** - If we are talking about:
  - Integration between EPR system
  - Electronic communications between the EPR
  - Organizational improvement based upon the implementation of ICT in health care environment

Some trends

- Open source
  - The fight against the existing systems
  - The voluntary work going on in the global village
- The world of the media
  - Entertainment
  - Newspapers
- The education world
  - Access to teaching
  - Access to professional journals

Will professional knowledge be designed exclusively for the professionals?
Will professional knowledge also be designed for the ordinary people?

Why produce knowledge for ordinary people?

- Is the people a challenge or a resource?
  - 94 % correct
  - Or 6 % wrong

The world of the media

- Will Web-TV outstrip ordinary TV?
- Explosion of internet-only program will make the conventional TV bird swept
  - 49 % (16-59) have Google News as the primary news source
  - YouTube 60 mill (90 % - 18.0 % once a day)
  - Journ.com 400+ visuals and 20 000 shows on demand
  - advertisement money follow the viewers
- The sale of CD has decreased with 19 % last year
- Paper-based newspapers vs net newspapers

Q29: The most natural method of finding information when doing homework
“Free” access to journals

PRESS RELEASE

2017 Mentor Jobs Diversity and Inclusion with Low-Cost Access to World's Medical Literature

HINARI program life-saving access initiative

Geneva, May 12, 2017 — HINARI, a joint initiative of the World Health Organization, the International Development Research Centre (IDRC) and the World Bank, is launching a major new pilot program aimed at improving access to world-class scientific literature. The HINARI program is a life-saving access initiative that provides free access to scientific literature for researchers in low- and middle-income countries. The program has been launched in response to the growing demand for scientific literature in these countries, and will provide researchers with access to over 160 scientific journals. The program will be available from May 15, 2017, and will be open to all researchers in low- and middle-income countries.

The Open Information Science Journal

The Open Information Science Journal is an open-access, online journal that publishes research on open information science, a field that examines how open information systems can be used to improve society. The journal is indexed by Google Scholar and aims to provide a platform for researchers to share their work with the wider community.

Real free access to knowledge

Poding, Gaming, Buying, Blogging, Wiking, YouTubing, Facebooking...

Shared decision making

Transparency

Blogging and emailing

- Who is most important?
The minute clinic
Pocket dermatoscopes

Practical and accurate

ABCD

Computer aided diagnostics
- Mathematical and statistical quantification of the diagnostic process
- Detection and differentiation systems

Example

Results
The SNOW project

John Snow's solution in 1854: Remove the pump handle!

The outbreak of giardiasis in Bergen

Source: Preben Advent, M.D.
Thank you for your attention!

www.telemed.no
Telemedicine and Telepresence for Trauma and Emergency Management: Arizona Experience

Rifat Latifi, MD, FACS
Professor of Surgery, Vice Chairman, International Relations
Department of Surgery, University of Arizona, Tucson, AZ
Associate Director of Arizona Telemedicine Program,
Telesurgery and International Affairs
President, International Virtual e-Hospital Foundation
Director, Telemedicine Program of Kosova

Telemedicine and Telepresence for Trauma and Emergency Management: Arizona Experience

George Hadeed, MPH¹, Charles R. Doarn, MBA²³

¹University of Arizona, Tucson, Arizona, ²International Virtual e-Hospital, Anchorage, Alaska; and ³Center for Surgical Innovation, Department of Surgery, University of Cincinnati, Cincinnati, Ohio

2009

UMC, Tucson, Arizona

Wild West 1800

Tucson, Arizona, 1881 - The Wild West

- The President of the University of Arizona shot in the abdomen in Tucson
- Surgeon, Dr. Goodfellow called from Tombstone, 75 miles south east Arizona
- Using train and Buggy - Eight hours later he came to Tucson, a bit late, one may say
- The president of the University of Arizona died on the operating table
That was then. ...
I-10 rollover, series of collisions injure 18 illegal immigrants in minivan
Tucson, Arizona 07.25.2008

The Mechanism of Injuries has changed a bit!

2008

- Injured patients in any Southern Arizona town with a hospital, can be seen within minutes by a trauma surgeon from Tucson

170+ Sites

- Urban & rural hospitals
- Native American healthcare
- Prisons & jails
- Community health centers
- Schools
- Distance learning affiliates
- International Sites

Another rollover involving illegal immigrants
Eighteen people were injured Thursday morning — and five remain in critical condition — in a series of collisions involving a vehicle carrying illegal immigrants. It's the first multiple-vehicle rollover involving illegal immigrants since April, when seven were killed and several more were critically injured in a head-on crash on U.S. Highway 80.

Injured patients in any Southern Arizona town with a hospital, can be seen within minutes by a trauma surgeon from Tucson

The Arizona Telemedicine Program

Today

170+ Sites

- Urban & rural hospitals
- Native American healthcare
- Prisons & jails
- Community health centers
- Schools
- Distance learning affiliates
- International Sites

International Programs

- India
- Mexico
- Peru & Brazil
- Pakistan
- Philippines
- Indonesia
- Australia
- USA

The Mechanism of Injuries has changed a bit!
Arizona Telemedicine Programs

- Elective Telemedicine Program
- Inter-hospital telemedicine and telepresence and network - SATT
- Digital ambulances and monitored patient transport - ER-Tucson link
- Deployable mobile telemedicine systems - Disasters, medical missions (www.amazonswim.com)

Already established:

Intervene in the first “Golden Hour”…

Desperation hour!

How can we change the desperation hour?

Answer

1. Personal involvement
   - Get out of current comfort zone
   - Technological advances
   - Distance education
2. Community involvement
Have expertise of trauma centers available and accessible to small hospital ERs in rural regions 24 hours, a day seven days a week through Virtual Trauma Presence...

Rural Trauma Care

- Low volume “centers”
- Limited experience
- Staff: “revolving door”
- Lack of trauma, emergency care CME
- Lack of specialist (trauma surgeon, neurosurgeon, vascular surgeon, orthopedic surgeon…critical care)

Results:

“Patients involved in MVC in rural America have twice the rate of mortality with those in an urban settings with the same ISS”

JAMA 2000;284

Intervene in the “Golden” minutes?

Southern Arizona Telepresence and Teletrauma Program
13 months Pilot Project of Southern Arizona Telepresence and Teletrauma Program 11/04-01/06

Case Presentation
- 18 months old female brought to SAMC ER in Douglas, AZ, three hours after motor vehicle crash with three fatalities
- In coma with severe head injury
- Right tib-fib fracture, left femur fracture
- Hypoxic (saturation in the 70s), hypotensive (SBP in the 50s), severe acidosis (Base deficit 9.0, anemic (hemoglobin 5.8)
- No IV access

Interventions
- Intubate the patient
- Able to evaluate chest raising after intubation
- Reposition the ET tube from the right main bronchus
- Assessed the CXR
- Sedate, paralyze the patient
- Obtain femoral vein/arterial access
- Aggressively resuscitate with lactated ringer
- Obtain a blood gas, CBC
- Blood transfusion, antibiotics
- Suction the ET tube
- Place the orogastric tube to decompress stomach

Advise:
Pull the ET tube back, decompress the stomach...
Results:
Clinical Improvement
Better SBP Improvement of Saturation

Initial Chest x-ray of the patient managed by telemedicine 11/21/2004

Patient at the UMC Trauma center being attended by trauma team
Patient with empyema left chest

GSW to left neck with expanding hematoma

Necrotizing Soft Tissue Infection

"I WILL BE THERE ..."
SATT Pilot Project 11/04-1/06

- 21 patients
- 5 life savings interventions
- 14 accepted for transfer
- 1 unable to accept
- 5 unnecessary transfers prevented:
  - 3 Treated in Douglas
  - 2 discharged home
Early Resuscitation

- Can be done via telemedicine and will save lives!
- Creativity and commitment by Trauma Centers to render care to its population!
- Telemedicine network and expertise

Questions that we resolved:

- Is acceptable by referring hospitals?
- Is acceptable by trauma and emergency docs?
- “The big brother is watching concept”

Teletrauma Network

Remote Site Command and Control Center

Router

PostMaster and File Server

Expansion of SATT

Current Status of SATT August 08
Teletrauma Program: Real Effects

- Able to intervene early
- Reduce morbidity
- Reduce mortality
- Potential for significant savings
- Preventing unnecessary transfers
- Patient satisfaction
- Healthcare workers satisfaction

Potential Savings per Patient

<table>
<thead>
<tr>
<th></th>
<th>Douglas</th>
<th>Nogales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Evac</td>
<td>$20,104</td>
<td>$17,929</td>
</tr>
<tr>
<td>LifeLine</td>
<td>$15,450</td>
<td>$12,825</td>
</tr>
<tr>
<td>LifeNet</td>
<td>$20,935</td>
<td>$17,470</td>
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<tr>
<td>Ground Transports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>$2,360.41</td>
<td>$1,644.91</td>
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<tr>
<td>Douglas</td>
<td>$1,480.78</td>
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<tr>
<td>Nogales</td>
<td>$3,137.04</td>
<td>$2,237.63</td>
</tr>
<tr>
<td><strong>Total Savings</strong></td>
<td>$20,935</td>
<td>$17,470</td>
</tr>
</tbody>
</table>

Source: Arizona Department of Health Services
“There are no more excuses for any trauma or critically ill patient to die in any emergency room just because there was no trauma surgeon or critical care specialist available on site to help with the resuscitation. There is no longer excuse for that. Telemedicine will significantly reduce trauma and critical illness related preventable deaths”

R Latifi, MD, 2006

NEW DEVELOPMENT
Trauma Physician's Call Room, UMC
Equipped with Telemedicine Unit

August 5, 2008

Two lives, one story
Then and Now

Da Vinci Robotic Surgery
Waiting and collecting dust

Thank you
“Military Telemedicine & e-Health from the Battlefield: Lessons for Civilians”

Third Intensive Balkan Telemedicine & e-Health Seminar

COL Ron Poropatich, MD & Dr. David Lam, MD
Telemedicine & Advanced Technology Research Center (TATRC)
US Army Medical Research & Materiel Command (USAMRMC)
Fort Detrick, MD
6 February 2009

Topics
• E-mail Tele-consultation
• Dedicated bandwidth for deployed medical units
• Tele-medical maintenance
• Tele-surgical mentoring

AKO Tele-Consultation

Background
U.S. Army E-mail Teleconsultation program (initiated April 2004)

- Email based system with JPEG image attachments – no patient identifying information; no patient privacy violations
- Utilizes theater providers’ personal digital camera & routine Internet email access
- U.S. based medical specialists answer tele-consults 24x7
- Response time: ~ 5 hours (average for more than 4900 consults)
- Strong favorable response from deployed providers

AKO Tele-consultation Program Summary

- 19 specialties with contact groups
- 4,922 teleconsultations (Apr 04 to 31 Dec 08 – 58 months)
- 68 known evacuations prevented
- 183 known evacuations facilitated following consultant’s recommendation
- 1,349 different referring health care professionals
- 669 teleconsultations on non-US patients
- Average Reply Time 5 hr 7 min

19 Current U.S. Army Tele-Consultation
Clinical Specialties

Burns-Trauma
Dermatology
Internal Medicine
Neurology
Ophthalmology
Preventive Medicine
Toxicology
Orthopedics
Laboratory Medicine
Dental

Cardiology
Infectious Diseases
Nephrology
Occupational Medicine
Pediatrics
Rheumatology
Urology
Traumatic Brain Injury (TBI)

The views and opinions expressed in this presentation are those of the authors and do not reflect official policy or position of the U.S. Government
**U.S. Army Tele-Consultation**

**Program Summary for Deployed Forces**

April 2004 to 31 December 2008

<table>
<thead>
<tr>
<th>By Specialty</th>
<th>By Location</th>
<th>By Patient Branch</th>
</tr>
</thead>
<tbody>
<tr>
<td>52% Dermatology</td>
<td>68% Iraq</td>
<td>53% Army</td>
</tr>
<tr>
<td>9% Infectious Diseases</td>
<td>11% Afghanistan</td>
<td>12% Marine Corps</td>
</tr>
<tr>
<td>5% Ophthalmology</td>
<td>4% Kuwait</td>
<td>10% Non-Combatant</td>
</tr>
<tr>
<td>34% Other Specialties</td>
<td>3% US Navy afloat</td>
<td>9% Air Force</td>
</tr>
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</table>

N = 4922 consults

---

**Offer to NATO Forces in Afghanistan**

- **Aim:** As a proof of concept, USA is offering this clinical capability at no charge to NATO/Pf forces deployed in Afghanistan on an interim basis. Currently, consultants in 19 clinical specialties are available (does not include radiology support).
- **Objective:** An approved MOU/MOA & Technical Arrangement has been developed and staffed nationally and within NATO. It is felt to be legally satisfactory.
- **Status:** Deployment of this capability is occurring 1-17 Feb 2009 in Afghanistan to 20 NATO sites.

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**Medical Telemaintenance Initiative: Remote Diagnostic Access (RDA)**

National Maintenance Program (NMP)
US Army Medical Materiel Agency, Fort Detrick
CWS Kim Pham-Cieliesz
Elizabeth Poole, GDIT

---

**Remote Diagnostic Access (RDA) Overview**

- **Physician’s capability to utilize real time telemedicine for patient diagnosis is now supported with real time medical maintenance, repair and sustainment**
- **The RDA medical maintenance concept will:**
  - Use Information Technology (IT) resources already established in theater
  - Enable Biomedical Equipment Specialist (BES) operations to deliver greater independence, management, support and oversight
- **Provide “Operational Status” reports to Commanders and Decision Makers**
- **RDA maximizes report automation and use of “virtual engineers”**

---

**Dermatology**

**Dermatologist’s Recommendation / Dx:**

This lesion looks suspicious and I think money on this one bearing a Malignant Melanoma, probably arising out of a mole. This one has all the classic: Asymmetry, irregular Borders, varied Colors, large Diameter, and uneven Elevation. It looks like it has been there a bit longer than 6 months.

At any rate, he needs to see a Surgeon ASAP. The next week or two, sooner if possible. To be complete, include in your referral note to the Surgeon, Patient’s history of blistering sunburns, any past use of tanning beds, any new mole growths, any other growths that you notice going up in Florida, level at least, etc. On a complete exam (including all genitalia), a careful history of race, and looking for other suspicious lesions that you can start the Surgeon to. Also, do aulpcheck exam. If the patient has palpable lymph nodes in the cervical or axillary, it is more worrisome.

Try not to alarm the patient too much at this point. The prognosis is dependent on the thickness of the melanoma and we don’t know that at this point. I would just tell the patient that you think the lesion may be a Melanoma, and that the prudent thing is to get him to a Surgeon who can remove it and read it to determine if it was a melanoma.

As for his unit commander, I would tell him that the soldier could be best to the unit for weeks or could be transferred back to the states, depending on several factors, yet to be determined.

---

**Joint Urgent Operational Need (JUON) for a Joint Medical Telemedicine Network (JMTN)**

**Problem Statement:** The insufficient availability of high-speed and on-demand Theater network services to transport medical images across the theater in a timely manner jeopardizes life-saving medical care.

**Scope:** Level III MTFs and select Level II facilities

**End State Objective:** A joint medical network:
- Providing on-demand transmission of medical images
- Enabling remote medical consultation for Level II facilities

**Background:** The need was identified in Aug 2007; the solution was approved in Feb 08. Partial implementation of the solution includes increased bandwidth, an upgrade to the LandSat I hub, and 3 new terminals each with a 2.4 meter dish, a 24W block-up converter (BUC), DSN VoIP, web accelerators, and a video teleconferencing suite

**Current Status:** Installation of the new terminals and upgrades to select legacy VSATs underway with an expected completion date of 23 Feb 09
Current RDA Network Topology - VSAT

RDA Status
- Connection to all 6 Army Combat Support Hospitals in Iraq established with RDA
- Total of 10 Computed Tomography (CT) scanners have access to remote support
- Remote users are Army personnel Subject Matter Experts (SMEs) and Philips Medical Technical Staff
- Future equipment planned to include Computed Radiography (CR) Deployable Teleradiology and laboratory devices (blood gas analyzers)

Real-Time Secure Access for Remote Users

For the Commander
- Real-time status reports and analysis
- Ability to make decisions based on accurate data within minutes
- Medical Maintenance Dashboard
- Statistical data for financial decisions and resource support analysis

For the Depot
- Real-time reports of system status
- Proactive monitoring to “act” not “react”
- Ability to access equipment remotely for repair
- Accurate inventory and identification of equipment
- Easy part and system shipment
- Software upgrades and system notifications to maintain configuration management

For Bio-maintenance
- Immediate technical support for equipment repair:
  - Asset Visibility and Tracking
  - Online training
  - Operational support
  - Technical troubleshooting guides
  - Immediate access to the Original Equipment Manufacturer (OEM)
  - Repair part tracking/status
  - Real time software updates
    - Notifications
    - Downloads
Technicians have to manually launch proprietary diagnostic software to check all medical equipment periodically…

**Medical Operations Center (MOC)**

- Centralize operational readiness to enhance medical treatment
- Provide instant crisis response time for medical equipment and operations
- Reduce complexity to support medical equipment:
  - Remote Diagnostic Access (RDA)
- Deliver real-time situational understanding and support for medical systems and operations:
  - Pro-Active Monitoring and Reports
  - Medical Maintenance “Dashboard”
- Provide “Army Total Asset Visibility” for medical equipment elements to include:
  - Complete inventory of all equipment, location and owner
  - Medical Maintenance Knowledge Management Database
  - Medical Operations Center to provide single command, control and expert support for the Biomedical Equipment Specialist (BES)

**Automation Servers**

Employing latest artificial intelligence (AI) technology and methodology, automation servers can replicate technician actions to proactive monitoring medical equipment daily.

**Routine Checks**

- Supports in-band and out-of-band methods

**Medical Equipment**

**Tele-mentoring for the Operating Room**

- R&D project funded by Army Medical Department
- Consortium of DOD/VA/Academia/Industry partners
- LTC Sloane Guy, MD is the clinical lead (CT Surgeon)
  - Deploying to Iraq in February 2009 as Chief of Surgery, 47th CSH
  - Plans to leverage increased bandwidth from JUON
  - R&D protocol pending approval
  - Surgical specialists in USA will be referring providers
- Goal - bringing Level I trauma care to the forward environment while reflecting the logistical reality that the military cannot have every specialty at every location

**The Need**

- General Surgeons in theater have to perform subspecialty procedures (craniotomies, bladder repairs, etc)
- Current telementoring systems are corporate teleconferencing systems which are not adequate for the operating room (i.e. large and proprietary)
- Current systems do not allow manipulating the image before transmission, or directly pointing to anatomical structures
**The Approach**

- Design a stream-lined and light weight system that allows remote manipulation of camera and laser pointer on remote site
- Develop open web-based interface which is platform independent
- Design system to meet needs of the surgeon

**Project Objective**

Develop proof-of-concept prototype and validate value through testing in animal models

**The System**

- Diagram showing system setup

**The Interface**

- Diagram showing interface layout
- Laboratory Development of Tele-Surgical Mentoring Device - strong clinical & engineering collaboration
Usability of Robotic Systems for Remote Surgical Telementoring

Alexander Q. Ereso, MD1, Pablo Garcia2, Elaine Tseng, MD3, Gregory P. Victorino1, MD FACS, LTC. T. Sloane Guy, MD3, 4

1East Bay Program - UCSF, 2SRI International, 3SFVA Medical Center - UCSF, 4US Army Medical Command

• Conclusion
  – Study demonstrates the feasibility of a mouse or pen/tablet interface controlling a robotic camera with attached laser pointer for surgical tele-mentoring.
  – Interface may allow surgical subspecialists to provide emergency peri-operative guidance to remotely located general surgeons.

Summary

• Remote consultation is actively providing mission & cost benefits for deployed U.S. forces
• Simple and inexpensive tele-consultation solutions exist that can easily be incorporated into civilian systems
• Bandwidth is the rate limiting resource for operational telehealth and an approved solution is being implemented in Iraq & Afghanistan
• Future application in Medical Equipment Repair hold great promise in improving remote health care
• A military Tele-Surgical network is being developed that will further support & advance remote care capabilities
Disaster
- Sudden disruption of services due to natural or human action
- Sudden expansion of demand for services by casualties
- Sudden loss of infrastructure even with services intact
- In all instances an abrupt imbalance between services and demand

Behold, the Earth
- Weather, acute
- Weather, chronic & trends
- Seismic
- War preparations
- Disaster prediction
- Disaster assessment
- Disaster decision supportlogistics, coordination

BEEP, BEEP, BEEP

Prediction
Hurricane Katrina

Marginally Predictable
Assessment
- Intensity
- Scope
- Resources
- Liabilities
- Telecom, just-in-time alerts

Decision Support
- Logistics
- Information management
- Command and control
- Telecommunications, information continuum
- Resource assignment

First Responder
- Power
- Sensors
- Telecommunications
- Information Management
- Assisted Autonomy

Kenya

Armenia
Information Portal and Manager

Communications

Regional Command and Control Center

Local Command Post

Internet cloud

Other Supporting Agencies

802.11 WiFi

Telemedicine and International Disaster Response
Medical Collaboration via Wireless: A Telemedicine Speccialist

Prehospital and Disaster Medicine 8(1):57-65, 1993

Telemedicine after Hurricane Katrina

Pakistan

Training
Telemedicine/e-health Training Center Rawalpindi

- USAID grant
- Curriculum web based, interactive and developed with MITAC
- Two week course trained 30 people
- Wide range of specialties and each trainee prepared a project in their area of interest
- Based upon a tentative network with two rural sites
Telemedicine in Earthquake Response

- Rapidly train 10 medical students
- Send them out to the relief clinic at ground zero with laptop, EHR, satellite phone and camera
- Start screening patients and interact with the relief groups.
- Directed patients down to the Rawalpindi Medical College. Overall 6000 patients were transferred
- Conduct telemedicine consults at one clinic with faculty at Holy Family Hospital, Rawalpindi
Overall damages by Telemedicine team in Tehsil Balakot

<table>
<thead>
<tr>
<th>Area</th>
<th>Deaths</th>
<th>Injuries</th>
<th>Damaged Houses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>Balakot</td>
<td>4539</td>
<td>4303</td>
<td>2730</td>
</tr>
</tbody>
</table>
### Table 1: Frequency and bandwidth comparison for various telecommunication systems

<table>
<thead>
<tr>
<th>Technology</th>
<th>Frequency</th>
<th>Bandwidth</th>
<th>Power</th>
<th>Population Coverage</th>
<th>Cost</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF (Ham) Radio</td>
<td>1.8 MHz</td>
<td>100-400 Kbps</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>VHF Police</td>
<td>15-20 MHz</td>
<td>200-500 Kbps</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>UHF Police</td>
<td>20-35 MHz</td>
<td>400-1500 Kbps</td>
<td>+++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Cellular (Analog)</td>
<td>0.7-1.8 GHz</td>
<td>2400-9600 bps</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Cellular (Digital)</td>
<td>1.7-1.8 GHz</td>
<td>2400-9600 bps</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>LEOS Satellite</td>
<td>1.5-1.7 GHz</td>
<td>2400-9600 bps</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Geosynchronous Satellite (Inmarsat)</td>
<td>1.5-1.7 GHz</td>
<td>64 Kbps</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Wireless Ethernet (3rd generation)</td>
<td>2.5 GHz</td>
<td>11-100+ Mbps</td>
<td>++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:** The data in the table is not fully visible in the image. It seems to compare various aspects of telecommunication systems, including frequency bands, bandwidths, power, population coverage, cost, and issues. The systems listed include HF (Ham) Radio, VHF Police, UHF Police, Cellular (Analog), Cellular (Digital), LEOS Satellite, Geosynchronous Satellite, and Wireless Ethernet. Each system is evaluated based on the aspects listed.

### Conclusions

- Telemedicine is routinely supported by terrestrial telephony and Internet in areas that are developed and intact.
- With disruption of services in disaster routine telecommunications are typically an early casualty. Cellular systems are especially vulnerable.
- Disaster can reduce any community to the dependent and vulnerable state otherwise associated with the developing world.
- Disaster communications based upon radio are reliable and have worked for 50 years.
- The amount of information needed to support medicine cannot be transmitted by HF radio.
- A robust, well practiced satellite system can replace the information void otherwise associated with disaster.
- Prior training and prepositioning of telecommunications can make telemedicine an immediate and reliable adjunct to disaster management.
First impression: GREAT! TMED changes the way we do business and saves lives. (Especially in reports from the early TMED use in the 1980s, 1990s)

- Mostly anecdotal individual case reports, with limited analysis on a systemic basis—limited number of cases in which it altered care
- Most reports emphasise simple utilisation, not beneficial utilisation
- Not useful in all phases of a disaster
- Some have said, "If you need TMED in the acute phases of a disaster, you have deployed the wrong physicians"

Telemedicine Definition

“The use of advanced telecommunication technologies to exchange health information and provide health care services across geographic, time, social, and cultural barriers.”

NATO STANAG 2517

The Experience of One U.S. Army Hospital in an Earthquake Zone—Pakistan 2005

- 8 Oct 2005 -- A devastating 7.6 Richter scale earthquake with an epicenter located 30 km NW of Muzaffarabad, Pakistan; Resulting widespread destruction led to more than 85,000 deaths
- The MASH and SMART Team were deployed on 18 October 2005 to Muzaffarabad to provide humanitarian assistance to the people of this region following this event.

Earthquake

- 8 Oct 2005 -- A devastating 7.6 Richter scale earthquake with an epicenter located 30 km NW of Muzaffarabad, Pakistan; Resulting widespread destruction led to more than 85,000 deaths
- The MASH and SMART Team were deployed on 18 October 2005 to Muzaffarabad to provide humanitarian assistance to the people of this region following this event.
**212th Mission**

TF 212th MASH provided far forward resuscitative and surgical care, hospitalization, out-patient services, preventive medicine services, and medical outreach in support of Operation Lifeline, Disaster Assistance Center, Pakistan. In addition, served as Area Commander for all military forces in Muzaffarabad area focusing on administrative, logistical, and force protection matters.

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**SMART Team Mission**

1. Providing initial on-scene incident assessment.
2. Task organizing and calling forward additional tailored teams, supplies and equipment.
3. Providing basic man-portable communications equipment sufficient to communicate intra- and inter-team and to home base station.
4. Providing technical expertise and man-portable telemedicine equipment sufficient to install, operate and maintain a rudimentary emergency teleconsultation capability from a remote field site.

The Team’s equipment includes a 56/64 kbps satellite terminal that is capable of making telephone calls or establishing a low speed Internet connection.

---

**Medical Capabilities**

- Emergency Medicine & Advanced Trauma Life Support
- 2 Surgical Tables with the following Specialties:
  - General
  - Orthopedic
  - OB/GYN
  - Anesthesia
- Internal Medicine
- Primary Care (Family Practice, Pediatrics)
- 84 Bed Facility
- Preventive Medicine Services
- Command, Control, Communications, Computers & Information (C4I)

---

**Operational**

- Arrived Muzaffarabad Forward Operating Base (FOB) 24 Oct 05
- First patients seen within 6 hours
- Initial Operating Capability (IOC) established within 24 hours
  - First surgery performed 25 Oct 05
  - ICU beds filled on 25 Oct 05
- Immediately integrated into World Health Organization (WHO)
- & Pakistan Ministry of Health (MoH) relief management efforts

---

**Patient Visits**

Graph showing patient visits from different dates, with peaks on certain days.
Hospital Census

High Acuity Census

Complaint Categories

Outpatient

Inpatient

Telemedicine Consults

Current Telemedicine Applications

- Initial Urgent Evaluation Of Patients,
- Triage Decisions, And Transfer Arrangements;
- Management Of Acute Or Chronic Diseases Requiring A Specialist Not Available Locally;
- Supervision And Consultation For Primary Care Encounters Where A Physician Is Not Available;
- Extended Diagnostic Workup Or Short Term Management Of Self-limited Conditions;
- Routine Consultations;
- Transmission Of Diagnostic Images;
- Medical/surgical Follow-up;
- Transmission Of Medical Data
Utility of Telemedicine

- **Acute Phase** – not much use, except in the rare instance of a fully qualified surgeon who needs support from sub-specialists. Our deployed personnel are qualified to deal with acute and sub-acute trauma. Same for most NGOs.
- **Recovery Phase** – TMED was felt to be of primary use during the early phases of the deployment, when the medical staff was learning about diseases endemic to the disaster area, or when dealing with diseases new to the practitioners, rather than in dealing with acute or subacute trauma. Store and Forward is more useful than VTC.

Lessons Learned in Pakistan

- Telemedicine integrated into a deployed military hospital works well in a disaster setting, but is of limited utility.
- However, the disaster stage at which it is deployed will to a large extent determine usage.
- We gained no experience in the acute phase, due to arrival in the recovery phase of the disaster, though it appears that there will be little real use for TMED in the acute (surgical) phase, based on surgical patients seen immediately after arrival. Although Teleradiology was available late in the deployment, it was little used, as the Medical staff felt qualified to read the films they ordered.
- If well-trained and experienced medical personnel are deployed, the use of teleconsultation will be of immediate use in the recovery phase as clinicians encounter diseases or problems they are unfamiliar with. But this usage rapidly falls off as they gain experience with local conditions.
- General communications support provided by a TMED capability is probably at least as important as actual clinical support.

Lessons Learned for the Recovery Phase of a Disaster

- Most patients seen are relatively well, with acute minor illnesses and chronic diseases.
- Goal: work through/with local healthcare system, rather than create a western-style non-sustainable system.
- Primary care is critical – Combat surgical hospitals may not be the best things to send.

Phases of a Disaster

- **Acute** (24 hours to one week) – Patients with acute trauma/lifesaving requirements – medical emphasis is on trauma and surgery.
- **Recovery** (after one week) – Patients tend to be more chronic disease or “routine”. Medical emphasis is on primary care.
Conclusions

- TMED may help with efficient utilisation of resources, especially in the recovery phase.
- Volunteer
- Military
- TMED is a “nice to have” item, but there are few patients for whom it has proven a vital necessity, assuming you deploy well-trained and well-equipped facilities.
- If you deploy lower-capability facilities or personnel, it may prove able to compensate for the lacks.
- Real-time video teleconferencing (VTC) has not always been required nor useful.

Reference

Clinical Telemedicine

Third Balkan Telemedicine and e-Health Seminar
Current Principles and Practices of Telemedicine and e-Health
Clinical Applications and Evidence-Based Outcomes
February 6-7, 2009
Skopje, Republic of Macedonia

Clinical Telemedicine

Charles R. Doarn, MBA
Executive Director, IVETH
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Deputy Director
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Associate Professor of Surgery and Biomedical Engineering
Department of Surgery
University of Cincinnati College of Medicine
Special Assistant to the Chief Health and Medical Officer, NASA Headquarters, Washington, DC (NASA – Funded)
Executive Director, Telehealth Video Resources Center (Ohio Board of Regents - Funded)
Administrative Director, Minimally Invasive Medical Technologies Center (NSF – Funded)
Editor-in-Chief, Telemedicine and e-Health Journal

Clinical Telemedicine

Historical

Early Technology – Early Challenges

Einthoven EKG 1912
Clinical Telemedicine

Communications
Computer/Information technologies
- multimedia computers
- Internet
- World Wide Web
- artificial intelligence/decision support systems
- smart materials

Clinical Applications of Telemedicine

Telemedicine Technologies
Store-and-Forward
Real-Time Video

Clinical Telemedicine

- Radiology
- Pathology
- Primary Care
- Dermatology
- Psychiatry
- Disaster Response
- Extreme environments
- Medical tourism

- Home healthcare
- Patient Centric
- Surgical Care
- Medical Education
- Correctional Medicine
- Military
- Space

Clinical Telemedicine

Radiology
- Picture Archiving System – PACS
- Standards
- Digital Image Communications in Medicine (DICOM)
- Image Acquisition
- Compression
- Storage

- X-ray size 4K x 4K, 12 bits, 4 images per exam. Avg. Storage Requirement 128MB
Clinical Telemedicine

Pathology / Dermatology
- Imaging systems
- Standards
- Image Acquisition
- Compression
- Storage
- Transmission

Clinical Telemedicine

Disaster Response
- Natural Disasters
- Experience
- Spacebridge to Armenia

Clinical Telemedicine

Medical Education
- Web-based
- IP Tools and Methods
- International
- Distance learning

Clinical Telemedicine

Trauma / Ambulance

Clinical Telemedicine

Surgery

Clinical Telemedicine

Military
- Ships at sea
- Battlefield
- CONUS
- VA
Clinical Telemedicine

**SPACE FLIGHT ACTIVITIES**
- Medical Monitoring
- Health Maintenance
- Countermeasures

Clinical Telemedicine

**Extreme Environments**

Clinical Telemedicine

**War**
Telemedicine in humanitarian efforts - post war
- Changing needs
- Population base

Clinical Telemedicine

**Kosovo**
- Limited Resources
- Surgical Education
- Integration of information technology to benefit health care recovery

Clinical Telemedicine

**Ecuador**
- Remote Environments
- Mobile capabilities
- Pre-op / post-op screening
- Low Bandwidth
- EMR
- Validation

Clinical Telemedicine

**Home or Where ever you are**
**Clinical Telemedicine**

**Mobility in Healthcare**
- Mobile patient
- Mobile disease manager
- Mobile technology
- Mobile First Responder
- Mobile learner and consultant

---

**Operation Lindbergh**
- Trans Atlantic – dedicated com network
- Surgical removal of gall bladder
- Surgeon in New York – Patient in France
- Most missed story of 2001

**Canadian Telesurgery**
- 45 Mbps 144msec MPLS IP
- VPN + Zeus TS
- Hamilton - North Bay
- Laparoscopic Nissen Fundoplications

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**NASA Extreme Environment Mission Operations**

Great analog for space

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**NEEMO 12**
- Evaluation of University of Washington’s RAVEN robot
- Evaluation of SRI’s M7 enhanced robot
- Autonomous task operation – ultrasound
- TATRC funded
- NASA, NOAA, Army, Navy, Air Force – academia and industry

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**Clinical Telemedicine**

Charles R. Doarn, MBA

E-mail: charles.doarn@uc.edu

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**High Altitude Platforms for Mobile Robotic Telesurgery**
Globalization of Telemedicine: The Grass Root Approach

F. Lievens 1,2,3, M. Jordanova 4,5

1 Board Member and Secretary, International Society for Telemedicine & eHealth (ISfTeH), Switzerland
2 Board Member, World Academy of Biomedical Science and Technology (WABT), France
3 International Coordinator Med-e-Tel, Belgium, lievensf@skynet.be
4 Coordinator Educational Program Med-e-Tel, Bulgaria
5 Solar-Terrestrial Influences Institute, Bulgarian Academy of Sciences, Bulgaria, mjordan@bas.bg

WHAT IS eHEALTH

eHealth

- eHealth refers to the use of modern information and communication technologies to meet the needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers

- In a broader sense, eHealth is not only an application of technical achievements in healthcare, but it is also a state-of-mind, a way of thinking, an attitude, and a commitment for networking at all possible levels. eHealth is a global thinking plus the ambition to contribute to the improvement of health services at local, regional, continental and worldwide level by wide application of information and communication technology

Eysenbach G. J Med Internet Res 2001;3(2):e20 doi:10.2196/jmir.3.2.e20

HOW IT EMERGED

The Beginning

- 1905 – W. Einthoven – transmission of ECG signals via telephone
- 1920 – Morse code applications for distant consultations
- 1924 – The first exposition of Telecare
- 1950s – radiology image transfer and videophone experiments
- 1955 – Telepsychiatry: Nebraska Psychiatric Institute - closed-circuit television
- 1957 – Space medicine on the pipeline – Knowledge gained from the space programs facilitates medicine: programmable heart pacemakers, implantable drug administration systems, magnetic resonance imaging, computerized axial tomography
- Mid-1990s – worldwide explosion of telemedicine programs in nearly every area of healthcare
WHAT eHEALTH OFFERS

February 7, 2009
Third Balkan Telemedicine and eHealth Seminar, Skopje, Macedonia

Optimizing Healthcare System: Moving Towards Citizens Centered Healthcare

Traditional medicine – patients move upward, unchanged for 6000 years.
eHealth - direct universal access to globally spread specialists – www, IDTV

Universities
Regional hospitals
Local hospitals
GPs

TODAY

eHealth Applications Are Everywhere

and its ultimate beneficiary are the citizens

eHealth Promises

- Quick, timely high quality healthcare
- Affordable healthcare for all, everywhere, at any time
- Optimizing patient care
- Enhancing preventive care
- Protecting human rights
- Education – empowered citizens:
- Reduction of healthcare budgets:
- ...

Despite of that, the humanity is still far away from the world of cyber healthcare, from extensive application of technology for the benefit of all.

eHealth Applications Are Everywhere

Mobile health
eHealth
ePrescriptions
Tele-rehabilitation
Tele-consultations
Homecare
Tele-psychiatry
Tele-consultations
Tele-psychiatry
Tele-physiology

February 7, 2009
Third Balkan Telemedicine and eHealth Seminar, Skopje, Macedonia

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Third Balkan Telemedicine and eHealth Seminar, Skopje, Macedonia

February 7, 2009
Third Balkan Telemedicine and eHealth Seminar, Skopje, Macedonia
Tele-surgery Munich (1)

eHealth

Blood pressure meter and NFC-enabled mobile phone
VR Head-Mounted Device

eHealth

February 7, 2009
Third Balkan Telemedicine and eHealth Seminar, Skopje, Macedonia

13

eHealth: Return of Investment


To Summarize

- The development of eHealth is a “grass root” one, i.e. in most cases the ideas, projects, technologies, products were developed and implemented from the bottom up rather than from the top down

International Organizations & Institutions

WHO
- Regional office
- Major coordination role
- World Health Organization
- eHealth Unit
- eHealth Observatory
- Global eHealth Observatory

ITU
- Telecommunication issues
- Standardization role
- Cooperation with WHO

EU
- European Commission, Information Society and Media Directorate-General DG Informatics
- State aids and support schemes
- E-health Unit
- European Commission, Directorate-General Health and Consumer Protection
- National health insurance
- Major impact through its Framework Programs
- Another DG is taking up eHealth in its program – DG Enterprise and Industry
International Organizations & Institutions

- UNOOSA
  - Space issues
  - Peaceful applications of Outer Space
  - Action Team 6 Telehealth
  - Organization of workshops in all continents

- WAST/UNESCO
  - Educational, Scientific, Cultural and Communication issues

- NEPAD
  - New Economic Partnership for Africa's Development
  - Important driving force for eHealth implementation on the African continent
  - Etc.

But

Only WHO is fully dedicated to health issues
Other organizations deal with health issues amongst several other activities
Therefore WHO should have the ultimate coordinating responsibility

International Societies & Associations

- Telemedicine - Around Healthcare Professionals
- Informatics - Around IT Professionals
- Telecom - Around Telecommunication Professionals
- Management - Around Management Professionals
- Patients

More cooperation and coordination is vital!

The Role of International Organizations

- Mapping local, national & regional initiatives, capacities, impacts, outcomes
- Improved professional education and increasing awareness of professionals, decision makers and public
- Gap analyses
- Strengthening the capacity building and filling the gaps
- Healthcare liability across borders
- Facilitation of effective collaboration among different stakeholders
- Facilitating the implementation of eHealth worldwide
- Steps in solving reimbursement issues
- Solving standardization issues
- And many more ...

Interactivity and Networking Initiatives

Over the years, 2 main "Associative" structures were developed:
- Medical Informatics (Engineers and Computer specialists) in the '80s - IMIA (www.imia.org)
- Telemedicine (Health Care professionals) in the '90s - ISfTeH (www.isft.net)

Importance of improved and continuous cooperation and coordination

The International Society for Telemedicine & eHealth

http://www.isft.net

NGO in Official Relation with WHO
Mission Statement
The ISfTeH exists to facilitate the international dissemination of knowledge and experience in Telemedicine and eHealth and to provide access to recognized experts in the field worldwide.

Acting as
- Feeder for information and projects
- Coordinator between science, education and implementation
- Activator of networking and development

ISfTeH is the International representative body of National and other Associations, Institutions, Corporations, Individuals

In Partnership with WHO, ITU, UNOOSA, WABT/UNESCO
Liaising with other International Associations

ISfTeH exists to facilitate the International dissemination of knowledge and experience in Telemedicine and eHealth and to provide access to recognized experts in the field worldwide.

Students Membership Applications are most welcome!

A Working Committee “Students” has been started up within the ISfTeH to promote and follow-up specific eHealth activities amongst the student community worldwide.
Med-e-Tel

- Truly international with more than 50 countries attending
- Broadly educational with CME accreditation by the EACCME
- Extensive program with sessions and meetings on a wide variety of topics
- Versatile exhibition of products and services
- Focusing on practical experiences and results
- Supported by major international organizations
- Important media partnerships to reach a global audience
- The ultimate networking event in telemedicine and eHealth

Med-e-Tel 2008

- >170 presentations from 50 countries
- 43 media partners
- Exhibitors and presentations available at www.medetel.lu
- Highly evaluated by attendees

Accreditation

- Med-e-Tel provides many educational opportunities through its extensive program of presentations, panel discussions, workshops and satellite symposia
- Med-e-Tel 2008 was accredited by the European Accreditation Council for Continuing Medical Education (EACCME) to provide a maximum of 18 hours of European external CME credits for medical specialists
- EACCME credits are also recognized by the American Medical Association towards the Physician's Recognition Award (PRA)
- 83 medical doctors have already received CME credits at Med-e-Tel

Editions and Publications

Countries present in the preliminary program as per January 15, 2009

Next edition April 1-3, 2009!

Join us and do not forget to tell your friends!
Be open minded even if in the eyes of other this is unreasonable!

The reasonable man adapts himself to the world.
The unreasonable one persists in trying to adapt the world to himself.
Therefore, all progress depends on the unreasonable ones.

Bernard Shaw

THANK YOU!
Telemedicine in Chronic Diseases and Diabetes

Steinar Pedersen

Telenmedicine in routine operation
- Radiology
- Pathology
- Otorhinolaryngology
- Dermatology
- Cardiology
- Psychiatry
- Endoscopy
- Ophthalmology
- Distinct teaching
- Orthopedics

Patients and level of care
- Persons per month: 2 (1) University hospital, 3 (2) Local hospital
- Care level:
  - 150 General practitioners
  - 500 Self-care
  - 85 Symptoms, no treatment
  - 250 No symptoms
  - 1000 Risk population

Structural changes
- Hospitalized patients:
  - Out-patients’ clinic
    - General practitioner
    - Home based services
- Hospital beds:
  - Patients’ hotel
  - DMC
  - My home as a hospital

eHealth trends partners
- Norwegian Centre for Telemedicine, University Hospital of North Norway, Norway (NST)
- J. F. Nørregaard, Danish Council for Health Technology Assessment, Denmark (FNTK)
- Friedrich-Alexander-Universität Erlangen-Nürnberg, Institute for Health Informatics, Germany (MHH)
- Foundation for Research and Technology - Hellas, Greece (FORTH)
- Health Promotion State Agency, Latvia (HPPA)
- Windows Medical University, Poland (WUMM)
- Universidade de Aveiro, Portugal (UAV)
Use of the Internet for health purposes

- The study notes that the biggest obstacle to Information Age medicine, commonly referred to as telemedicine, is government and traditional insurance, which only reimburses for face-to-face consultations. Therefore, the most interesting developments in telemedicine are occurring outside traditional insurance, both by new medical services and by individual practitioners.

IBM: Healthcare 2015

- Healthcare delivery is overly focused on episodic acute care, it must shift and expand to include and embrace prevention and chronic condition management in order to respond to the merging environment.
- By 2016, we believe chronic patients will be empowered to take control of their diseases through IT-enabled management programs.
- Patients and their families, assisted by health informaticians, will replace doctors as the leaders in chronic care management.

Tele-Dialysis

- Control and follow-up of
- Remote visit, guiding and education

Arterial ulcers
Photography

Outpatient department at UNN

Teleorthopedy

Tromsø Telemedicine Laboratory

What it is all about

- To prevent healthy people to become sick
- To keep the sick people out of the health care institutions

Medical challenges

- 194 mill. with diabetes, increases to 330 mill. in 2025
  - In Norway: 240 000, USA: 20.8 mill.
- Poorly regulated blood glucose increases the chance for diabetic complications.
- Diabetic complications, in Norway: NOK 7 bill. / year
- WHO: The wave of elderly, increase in weight due to food/physical activity \( \rightarrow \) epidemic increase in Type 2 diabetes
The diabetes patients’ challenge

The concept
- Include no more than three parameters in order to minimize the complexity and to design an easy-to-use system.
- Providing users with a better overview of their disease-related habits, in a way that is "always" within i.e., their mobile phones.

I.e., Instead of paper diaries

The Self-Help Tool
- Evolved by involving real users, combining ICT, computer science, medical informatics, telemedicine and medicine.
- Utilizing mobile phones, wireless communication, and sensor systems.

Basis: mobile phones with touch-sensitive screen

The Few Touch application
- Blood glucose level
- Physical activity
- Nutrition habits
Parameter 1: Blood glucose

Parameter 2: Physical activity

Parameter 3: Nutrition habits

Goal setting
Paper 7: Epidemic Disease Indicator

Proposal of the concept:
Since BG increases due to infections
Can a repository of BG values be used for achieving indicators of infectious disease outbreaks?

Teke-Warf
- Patients with a risk of blood clot
- Warfarin decreases the prothrombin time
- Risk of blood clot and haemorrhage

Healthcare@home
- Elderly patients with COPD, diabetes or kidney failure
- 50% over 65 years don’t use PC – need for a simple interface
- Better individual follow-up

The self-help tool

 Possibly test setup of the TDDG system

Abnormal situation, 8 additional long-lasting instances over 16 panel/1 a day.
Group based training

- Started with an initial meeting at the hospital for the participants
- TV-meetings at home on a weekly basis

Individual following-up

- On a weekly basis (two part video conferencing)
- Personalized following-up

Thank you for your attention!

www.telemed.no
Telemedicine in Extreme Conditions

Rifat Latifi, MD, FACS
Professor of Surgery
Vice Chairman, International Relations
Department of Surgery, University of Arizona, Tucson, AZ
Associate Director of Arizona Telemedicine Program, Telesurgery and International Affairs
President, International Virtual e-Hospital Foundation
Director, Telemedicine Program of Kosova

TELEMEDICINE IN EXTREME CONDITIONS: What does it mean?

- Rendering medical care and education to people in extreme conditions such as remote and mountainous sites, areas affected by natural or man-made catastrophes, or simply in territories that do not have access to modern medical care
- One of the best applications of telemedicine, yet it represents one of the greatest challenges.
Project description: Arizona Telemedicine Program

Current Sites:
- Tuba City
- Ganado
- Flagstaff
- Cottonwood
- Winslow
- Payson
- Phoenix
- Springerville
- Whiteriver
- Safford
- Yuma
- Tucson
- Nogales
- Douglas
- Polacca
- Kingman
- Flagstaff
- NARBHA

Telemedicine Technologies

Store-and-Forward

Real-Time Video

60%  40%

Doctor’s Review

Real-Time Video Subsystem

Remote Camera Controller

Digital Stethoscope

Color Printer

Video Subsystem

VCR

AT&T Network Multiplexer

Biomedical Communications

Streaming Video Server

Biocom.Arizona.edu
• The Balkans....

Telecommunication building in Prishtina

UNIVERSITY LIBRARY IN PRISHTINA: GHOST BUILDING!

Welcome to the Final Conference

114
Telemedicine Project of Kosova:

• **Objective:**
  To become a catalyst of hope and technology!

• **Place:**
  Devastated country by war, neglect and bad management!

First Intensive Balkan Telemedicine Seminar, October 25-27, 2002
Live transmission of an operation from VCU to Kosova
Why Alaska needs telemedicine
- 1st in land mass
- 47th in road miles
  - 75% Alaskan communities unconnected by a road to a hospital. 25 of these have no airport.
- 48th in “doctors to residents” ratio
  - Vast majority located in Anchorage
  - Shortages in many specialties
  - 25% Alaskans (46% of Alaskan Natives) live in communities of less than 1000 people.
- 579 Community Health Aides in 200 villages provide nearly ½ million encounters each year.

AFHAN Project
- 43 autonomous organizations:
  - U.S. Army
  - U.S. Air Force (3 bases)
  - Veterans Administration
  - U.S. Coast Guard
  - Public Health Nursing
  - Native Health Corporations (36)
Key Concept: Multinode

- Any server that can browse out to the Internet can connect to all other servers that are part of the system - in a secure, robust, HIPAA compliant manner.

Highly extensible workflow capabilities

Create a Case

Send to User/Group

Review Case

Archive Case

Telemedicine Support to the Amazon Swim Expedition 2007

The Amazon Virtual Medical: Telemedicine to and from the Amazon Jungle
Amazon Jungle Telemedicine

Peru

www.amazonswim.com
The Amazon Swim Telemedicine

Setting Up Telemedicine Equipment on Cassiquirri

The Amazon Swim Telemedicine

Hypertension and Dehydration

Manaus Telemedicine Conference
Telemedicine Education for Future Projects

Hypertension and Dehydration
Telemedicine in the Jungle

- The Amazon River region with its vast territories, underdevelopment of medical system, plagued by varies diseases and medical needs, yet mysterious and beautiful, is a perfect example where providing medical care and medical education using telemedicine and advanced technologies will prove to be beneficial not only for this region, but for the rest of developing world.

Telemedicine in Extreme Conditions

- IT POSSIBLE
- IT IS VERY BENEFICIAL
- CHANGES LIVES
- NEED COMMITMENT
- TEAM EFFORTS
- CREATIVITY
Telemedicine: Homecare
Andrew R. Watson, MD, MLitt
Skopje, Macedonia
Department of Surgery
Center for Telehealth
February 6-7, 2009
UNIVERSITY OF PITTSBURGH MEDICAL CENTER

Perspective
- This is based on telemedicine in the United States
- Currently there is a tremendous focus on homecare
- We are seeing large corporations investigate this
- Home care will be a reality

Why now?
- Paradigm shift in technology
  - Portable devices
  - Bandwidth
  - Seeing this internationally (Voxiva)
- New possibilities / cost effective
- Hospital pressure – cost / quality
- Physician pressure - outcomes

Why trauma?
- Patients
  - Unexpected change
  - Older patients
  - Remote patients
- Discharge to home or rehab – faster than before
- Frequently have wounds
- Medication changes / new medication

Congestive heart failure model
- Chronic diseases – financially significant for US
- 200% increase in medication compliance
- Reduce 1 year hospital costs $25,000 to 12,000
- Reduce hospitalizations by 60%

Supporting technology - home
UPMC Hospitals
Supporting technology – home

UPMC Hospitals

Supporting technology – connectivity

- Home connectivity – capture / interface
  - Bluetooth
  - USB
- Internet
  - Broadband
  - Dial-up
- Hospital
  - Firewall / NAT

What aspects of trauma?

- Acute in-patient discharged to home
- Follow a patient from rehab to home
- Discuss care with a family in a remote location prior to a patient’s discharge
- Conduct research, follow medications, research

Trauma workflow model

- Set-up
  - Staff education
  - Technology support – help desk
- Discharge to home / rehab
- Information triage – nurse, coordinator, physician
  - Capture
  - Decision algorithm / rules processes
- Follow-up / communication
  - Phone
  - Video-teleconference

Special considerations

- Staff acceptance
- 24/7 Technology support – home, net, hospital
- Medical legal considerations
- Reimbursement
Corporate Interest

- Devices – need a device library
  - Intel
- Communication
  - Bluetooth / USB2
- Portability
  - Blackberry, Apple
- Network
  - FCC

Imagine

- Follow your most severely injured trauma patients at home, at rehab
- Ensure follow-up for remote patients
- Ensure medications, rehabilitation are successful at home
- Have clinical trials continue at home

Implications

- Telemedicine is expanding exponentially
- Home care is one of the leading topics
- Technology will continue to evolve – it is close
- Leaders such as Dr. Latifi are critical for this to be successful and need to be supported
Teleradiology & Telepathology
Elizabeth A. Krupinski, PhD
Arizona Telemedicine Program

Today’s PACS & Teleradiology
- Oldest established TM application
- Well integrated in numerous settings
- Facilitated by co-evolution PACS
- Few to no reimbursement issues
- Only interventional radiology currently less amenable to teleradiology applications
- Little/no differences between teleradiology & on-site radiology

Other Teleradiology Facilitators
- ACR–NEMA development DICOM
- Continual updates of DICOM
- Development of standards & practice guidelines that explicitly include teleradiology
  - http://medical.nema.org/
  - http://deckard.duhs.duke.edu/~samei/tg18.htm

Standards & Guidelines
Digital Radiography Image Quality: Image Acquisition
Mark E. Williams, PhD, Zachariah D. Engels, PhD, Keith J. Shreves, MD, William K. Freeman, II, MD, Zachariah D. Engels, PhD, Kimberly Ayers, MPhil, Margaret Wyant, RN, MT, J. Anthony Saltseth, PhD

Digital Radiography Image Quality: Image Processing and Display
Elizabeth A. Krupinski, PhD, Mark E. Williams, PhD, Zachariah D. Engels, PhD, Keith J. Shreves, MD, Kimberly Ayers, MPhil, Margaret Wyant, RN, MT, J. Anthony Saltseth, PhD, Sandra Ipark, RN, MT, J. Anthony Saltseth, PhD

Digital Mammography Image Quality: Image Display
Lindie Siegel, MD, Elizabeth Krupinski, PhD, Eileen Sweig, MD, Michael Flynn, PhD, Kathrine Andrulis, PhD, Brenda Erickson, MD, PhD, Jerry Thomas, MD, Alan O’Connor, MD, PhD, J. Anthony Saltseth, PhD, Ellis B. Miao, MD
**Standards & Guidelines**

**Practice Guideline for Digital Radiography**

ACR Practice Guideline for Radiologist Coverage of Imaging Performed in Hospital Emergency Departments

**Practice Guideline for Electronic Medical Information Privacy and Security**

ACR Technical Standard for Electronic Practice of Medical Imaging

Report of the ACR Task Force on International Teleradiology

**Display Optimization**

- Key is the human-computer interface
- Series of observer performance studies designed to optimize the digital reading room environment
- Performance metrics
  - Diagnostic accuracy (ROC)
  - Search efficiency (eye position)
  - Human Visual System Modeling

**Displays & Perception**

- Softcopy display parameters
  - Luminance
  - Calibration (tone scale)
  - Type of phosphor
  - CRT vs LCD
  - MTF
  - Viewing angle
  - Number of displays
  - Ambient lighting
  - Compression
  - Role of color

**Optimized Displays & Search**

- Total viewing time shorter
- Time to first hit shorter
- Total time on lesion shorter
- Fewer returns to lesion
- Total path length shorter
- Overall = more EFFICIENT

**TR Facilities**

- Hospital/MC
- Clinics
- Mobile van
- Mammography
- Dedicated
  - PET clinic
  - THH
  - UASA
- Public Health
- Battlefield
- Hand-held

**Univ AZ TR Site Additions**

- Graph showing existing vs added facilities from 1987 to 2008.
**TR Case Volume**

**Types of Cases**

**TR in 2008**
- Medical Imaging Consultants –> ?
  - Data acquisition & archiving
- RadWorks (GE) –> Siemens/Fuji
  - Viewing station
- 35% of department’s reading volume
- 25% department’s income
  - Reading only & reading + archiving
  - $/case & $/set volume

**Telemed Engine**
- 68% sites using AHSC hub for TM services use TR service
- TR typically 1st service requested
  - 79% of sites with TR use only TR
  - 21% started with TR & added services
- TR specialty with most volume

**Telemammography**
- Time from mammography to consult with oncologist ~ 28 days
  - Screening mammography
  - Diagnostic mammography
  - Biopsy
  - Pathology processing & report
  - Oncology consultation
- THIS IS TOO LONG!

**Even Worse in Rural**
- DS3 (45 Mbps) backbone
- ATM protocol
- T1 (1.5 Mbps) links
- 65 direct link sites
- ~ 85 with affiliated
- NARHBA
- DOC
- IHS
- RT & SF applications
- ~ 55 sub-specialties
- Teleradiology core app.

Telemammography
- Started in 2001 to rural sites
- 7/28 telerad sites send mammo
- Mostly use GE system
- Directly to TBC for reading
- Some archive some do not
- Contracts specify 30–45 min TAT
- > 26,000 telemammography

UltraClinic Model

Quick Processing
Milestone Medical Systems RHS-1-30
Vacuum Histoprocessor

Telepathology
DMetrixTM -40 Slide Scanner System

Telepathology
Timing Results

<table>
<thead>
<tr>
<th>Lab Process</th>
<th>Minutes</th>
</tr>
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<tbody>
<tr>
<td>Grossing</td>
<td>3</td>
</tr>
<tr>
<td>Tissue Processing</td>
<td>58</td>
</tr>
<tr>
<td>Embedding</td>
<td>13</td>
</tr>
<tr>
<td>Cutting</td>
<td>10</td>
</tr>
<tr>
<td>Stain/Dry/Coverslip</td>
<td>32</td>
</tr>
<tr>
<td>Scanning (2 Slides)</td>
<td>13</td>
</tr>
<tr>
<td>LM Interpretation</td>
<td>6</td>
</tr>
<tr>
<td>Telepathology</td>
<td>14</td>
</tr>
</tbody>
</table>

Teleoncology

- Telepathology report sent S&F to oncologist
- Oncologist connects RT videoconference to rural location
- Discuss pathology results
- If necessary discuss treatment options and plan of action

MI = prevention, detection, diagnosis, treatment & therapy

Acquisition & display technology continually changes

Clinician shortages are not easing

Rapidly expanding types & number images
- Multi-modality & fusion complimentary information sources is becoming common
- Anatomy & function gross & molecular levels
- Merging specialties

The Future of TR & PACS
Image Display, Analysis & Processing are key links in the imaging chain.

Need to present data to the clinician in the most efficient & informative manner.

Taking into account perceptual & cognitive capabilities of human observer.

Ultimate goal = facilitate decision-making process & enhance patient care.

Related goal = improve workflow & the reading environment.

The Future of TR & PACS

Stereo vs Traditional

- Az 0.85 to 0.94
- 23% increase TPs
- 105% increase calcs
- 46% decrease FPs

Capitalizing on Capabilities

Stereo vs Traditional

- Az 0.85 to 0.94
- 23% increase TPs
- 105% increase calcs
- 46% decrease FPs

Computer-Based Decision Aids

Alternative Technologies
### Physical Injuries
- Carpal tunnel syndrome
- Elbow & shoulder (cubital tunnel)
- Neck, back & shoulder strains
- Computer vision syndrome
  - Eye strain
  - Dry eyes
  - Glaucoma
  - Headaches
  - Corneal erosion and abrasions
  - Contact lens problems

### Subjective Fatigue

<table>
<thead>
<tr>
<th>Variable</th>
<th>How long correlation</th>
<th>How many correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blurred vision</td>
<td>R = 0.344 p = 0.0013</td>
<td>R = 0.422 p = 0.0015</td>
</tr>
<tr>
<td>Eyestrain</td>
<td>R = 0.429 p = 0.0012</td>
<td>R = 0.475 p = 0.0003</td>
</tr>
<tr>
<td>Difficulty focus</td>
<td>R = 0.384 p = 0.0042</td>
<td>R = 0.446 p = 0.0007</td>
</tr>
<tr>
<td>Headache</td>
<td>R = 0.235 p = 0.0899</td>
<td>R = 0.432 p = 0.0011</td>
</tr>
<tr>
<td>Neck strain</td>
<td>R = 0.384 p = 0.0042</td>
<td>R = 0.509 p = 0.0001</td>
</tr>
<tr>
<td>Shoulder strain</td>
<td>R = 0.250 p = 0.0711</td>
<td>R = 0.469 p = 0.0003</td>
</tr>
<tr>
<td>Back strain</td>
<td>R = 0.304 p = 0.0265</td>
<td>R = 0.424 p = 0.0014</td>
</tr>
<tr>
<td>General fatigue</td>
<td>R = 0.471 p = 0.0003</td>
<td>R = 0.642 p = 0.0001</td>
</tr>
</tbody>
</table>

### Conclusions
- TR has made a significant impact on patient care over the past 20 years
- Advances in technology will further change MI & interpretation of medical data by more clinicians
- Costs can increase & decrease
- Optimizing observer accuracy while maintaining efficiency & comfort are critical to continued success
THANK YOU!
The Business Aspects of Telemedicine and e-Health

Program Topics

1. Business Principles
2. Revenue Streams
   • Contracts and Grants
   • Parent Organization Support
   • Billing and Collection Activities
   • Service or User Fees
3. Expense Considerations
4. Lessons Learned

Introduction

• More than $1.55 Trillion is spent each year in the U.S. on health care
  ◦ 15–16% of GNP
• Medicine is big business!

Top 10 Reasons Businesses Fail

10. Lack of fundamental business skills
9. Complacency
8. No support team
7. Wrong location
6. Refusal to delegate
5. Poor hiring and management
4. Insufficient marketing
3. Poor understanding of customers
2. No written business plan
1. Not enough money

Business Principles

• You must know what the needs are, yours & your customers’
• Business must have a revenue stream to pay for expenses
• Expenses should not exceed revenue
• Ideally telemedicine must at least break even over time
• If not it must be “loss leader” – a program that is a highly valued part of an organization’s mission

Business Principles

• Economies of scale and shared services are important cost saving elements
• Understanding why an initiative is being proposed and ..... 
• ...that any new initiative must support the organization’s mission and strategic goals
### ATP Key Goals
1. **Improve access** to specialty care for underserved areas
2. **Provide cost-effective** healthcare alternatives for prison inmates
3. **Improve continuing education** for healthcare professionals
4. **Evaluate** telemedicine technology and assess its efficacy
5. **Establish a multi-site telemedicine program.**

### Business Principles
- Understanding what an organization values and how it fits into the overarching mission

### Valued Added:
1. New or expanded project line
2. Expense reduction or deterrent for unwanted business
3. Customer satisfaction
4. Improved public relations
5. New associations (affiliation with a prestigious organization)
6. Quality improvement
7. Competitive advantage
8. Overall improved “bottom line”

### Revenue Streams
- **Contracts and Grants**
  - Parent Organization Support and Philanthropy
  - Billing and Collection Activities
  - Service or User Fees

### Government Contracts and Grant Funding
- In the U.S there are many Government contract and grant funding opportunities
  - Usually the candidate needs to submit a sustainability plan to obtain funding
  - This ensures the project will continue at the end of the contract or grant period
Parent Organization Support and Philanthropy

- Some organizations or donors will fund the initiation of a new telemedicine program
- The support will probably be time-limited and a sustainability plan will need be developed

Billing and Collection Activities

Revenue from Patient Services

- Clinical needs identified
  - How to fill: Which technology?
  - Consulting versus ongoing treatment
  - Referring provider & patient expectations
  - Payment mechanism
    - Block time
    - Fee for Service
    - Protocol for uninsured or denied services
  - Paying for the network

Telemedicine Medical Billing in the U.S.

- Government Payers – Regulatory mandates apply
  - Medicare – Limited services, Real Time only, rural areas
  - Medicaid – State by state, Arizona covers almost all services
  - Tri-Care/Champus – Follows Medicare
  - Veterans Administration – Has its own system and uses telemedicine
- Private Insurance – variable
- Self Pay

Patient Billing & Collection Activities

- Patient billing and collections are generally not a good primary mechanism to pay for a telemedicine program…
  Unless
- It is a closed or capitated clinical environment where significant cost savings can be realized
Service or User Fees

- Allows the program to distribute fixed expenses
- For every minute the equipment and telecom lines sit idle, the program experiences lost opportunity
- Other uses for network:
  - Education
  - Administrative Meetings
  - Business activities, email
  - Support Groups

ATP Membership Model
(example of a telemedicine business model)

- Structured after an Application Service Provider (ASP) model
- ATP has initiated several partnerships with independent providers and agencies across the state
- Shared communications infrastructure results in economies of scale

Rationale

- Factors leading to the development of this membership model
  - Creation of a shared telemedicine/telehealth communications network
  - Requirement from state to develop a self-sustainable program for telemedicine
  - Requests from customers for different levels and types of services

Business Analysis

- We looked at ATP business from this viewpoint
  - Joining the ATP network was the “attraction”
  - Model needed to be flexible
  - Clients only purchased or provided services desired

- Result – a “layered” business model
  - Flexible fee schedule based on “needed” services
  - From turn key to consulting (only) services
  - Open to anyone in the state, but no “exclusivity”

Business Analysis

- We divided ATP services into four layers
  - Professional services (e.g. legal, clinical)
  - Operational services (e.g., business or technical operations)
  - Infrastructure services (ATP dedicated ATM network)
  - Vendor services (leased lines from telcos)

- Clients reside in the top layer to be supported by all layers
### Business Model

Application Service Provider Enterprise

- **Client Layer**
  - Professional Services Layer
  - Operational Services Layer
  - Infrastructure Services Layer
  - Vendor Services Layer

  *Membership based*

### Membership Benefits

- **Access to Statewide Broadband Network**
- **ATP Service Provider Status**
- **Free TM Training**
- **Continuing Medical Educ Program**

### ATP Benefits

- Statewide infrastructure for the Department of Corrections telemedicine program
- Development of major technology transfer program
- State of the art in e-healthcare
- Improved access to specialty medical care for rural population

### Other ATP Membership Benefits

- New healthcare partnerships in state
- Delivery of continuing education to rural health care providers and patient support groups
- College of Medicine viewed a statewide resource
- Economic development

### Expense Considerations

- Fixed and Variable Expenses
  - Personnel
  - Equipment and operations
  - Technology
  - Overhead

- Some expenses could fall into either category AND need to be considered for both the referring and receiving sites
**Expense Considerations**

**Personnel – all sites**

<table>
<thead>
<tr>
<th></th>
<th>Fixed</th>
<th>Variable</th>
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<tbody>
<tr>
<td>Medical director</td>
<td>X</td>
<td>(NP)*</td>
</tr>
<tr>
<td>Site coordinator</td>
<td>X</td>
<td>(NP)*</td>
</tr>
<tr>
<td>Other clinical</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Technical</td>
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<td>X</td>
</tr>
<tr>
<td>Administrative</td>
<td>X</td>
<td>X</td>
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</table>

*Not Preferred

**Equipment and operations – all sites**

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<thead>
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<th></th>
<th>Fixed</th>
<th>Variable</th>
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</thead>
<tbody>
<tr>
<td>Space cost</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Network equipment*</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Installation costs*</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>User end equipment*</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Transmission costs</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Supplies (clin,tech,ops)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Travel and training</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

* One time expense

**Expense Considerations**

**Technical and Maintenance – all sites**

<table>
<thead>
<tr>
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<th>Variable</th>
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<tbody>
<tr>
<td>Maintenance contracts</td>
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<td></td>
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<tr>
<td>Help Desk</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Equip refresh fund</td>
<td>X</td>
<td>(NP)</td>
</tr>
<tr>
<td>Other??</td>
<td></td>
<td></td>
</tr>
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</table>

**Overhead**

<table>
<thead>
<tr>
<th></th>
<th>Fixed</th>
<th>Variable</th>
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</thead>
<tbody>
<tr>
<td>Medical records</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Billing &amp; Collection</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Human Resources</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Contracting</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Legal and Compliance</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Malpractice</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Central Administration</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Other ??</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Considerations**

- Reduced transportation costs
- Improved access to clinical/specialty services
- Convenience, customers and providers
- Referring physicians learn from specialists
- Network availability for other services
  - (education, administration, clin conferences)
- Value added list

**Lessons Learned**
ATP Lessons Learned

- Understand organization and what is rewarded
- Make sure telemedicine program fits into organizational mission
- Have a written plan
  — Include sustainability
  — Set goals and timeline... yet
  — Understand everything will take longer than anticipated

ATP Lessons Learned

Start with a few key initial services

- Consider starting with a pilot
- Consider a few services with high volume or high need
- Implement easier services first
- Consider services with capacity
- Make sure TM service delivery is incorporated into normal workflow at all sites

ATP Lessons Learned

- Champions at all sites
- Understand staffing needs at all sites
- Recruit carefully
  — Define responsibilities
  — Written job descriptions
- Formalize affiliations (contracts)

THANK YOU
Strategies for Institutionalizing and Achieving Long Term Sustainability of Telemedicine and Telehealth Programs and Services

Components of Telemedicine Program

- Strategic Planning
- Facilities Design and Implementation
- Authority Management
- Practice Administration
- Health Care Services
- Risk Management
- Network Operations
- Financial and Business
- Legal and Regulatory
- Inter-institutional Relations
- Governmental Affairs
- Marketing and Public Relations

Planning Telemedicine Program

<table>
<thead>
<tr>
<th>Phase</th>
<th>Goal</th>
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<tbody>
<tr>
<td>1. Facilitator</td>
<td>Establishes outcome expectations</td>
</tr>
<tr>
<td>2. Consultant</td>
<td>Designs the program and list tasks</td>
</tr>
<tr>
<td>3. Recruitment</td>
<td>Leader, champion for the program</td>
</tr>
<tr>
<td>4. Planning &amp; Implementation</td>
<td>Move from concept thru start-up implementation</td>
</tr>
</tbody>
</table>
Planning

- Shared Visions
  - Priorities
  - Strategies
  - Action items
  - Implementations schedules

Planning

- Vision Matrix
  - Set 1 (groups)
  - Organization(s)
  - Management
  - Goals
  - Priorities
  - Strategies
  - Implementation

Planning

- Vision Matrix
  - Set 1 (groups)
  - Management
  - Goals
  - Priorities
  - Strategies
  - Implementation

Planning

- Vision Matrix
  - Set 1 (groups)
  - Management
  - Goals
  - Priorities
  - Strategies
  - Implementation

Planning

- Vision Matrix
  - Set 1 (groups)
  - Management
  - Goals
  - Priorities
  - Strategies
  - Implementation

Staffing

- Program Champion
  - Clear vision
  - Credible
  - Missionary zeal
  - Political acumen
  - Entrepreneurial
  - High energy
Telemedicine Staffing

- Program Managers
  - Experienced
  - Team players
  - Institutional support

Telemedicine Training

- Comprehensive Plan
  - Core competencies
  - Orientation / in-service
  - Team building
  - Outreach
  - Culture of the “virtual corporation”

Outcomes

- Measurements of Success
  - Meeting needs
  - Patient outcomes
  - User satisfaction
  - Provider satisfaction
  - Cost effectiveness
  - Clinical outcomes

Financial Performance

- Costs and Benefits
- Coding Issues
- Reimbursement
- Accounts Receivables
- Bad Debt
- Network Utilization

Long-Range Strategic Planning

- Assessment
- Goal setting
- Updated Vision

Thank you
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Development of Telemedicine Network in the Region: The Do's and Don'ts When you Establish Telemedicine and e-Health

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Telemedicine Program Is Not a Factory: It is Empire of Mind and Technology

• Project Leadership
• Local Leadership
• Design
• Multiple partners
• Prepare
• Predict Unpredicted Problems
• Predict Success and think Success
• Think Growth
• Add Content

• Work very closely with local governments, especially if working in another country.
• Identify local champions and work with them in close partnership

The Must Do’s

• Know your stuff- be an expert and be honest.
• Make sure you have the support and commitment of your institution and your family, as this will take you from your professional and family time. This is particularly important if telemedicine is not your main occupation.

The Must Do’s Continued

• Identify the goals and objectives of your program and stick to them, although you may have to be flexible.
• Perform the feasibility study and analysis of your geography of operation.
- Secure the space from where you will operate and identify the political and physical geography of the operation.
- Create the business model to ensure sustainability. Involve as many experts as possible when you create this.
- Secure the budget for at least 3-5 years- be as detailed as possible
- Think replenishing technology

The Must Do’s (Continued)
- Identify technical infrastructure and have a solid plan, but be ready to change if needed and as technology changes.
- Acquire state of the art equipment: do not compromise on quality- consult the technical experts what technology you should adopt.
- Ensure interoperability between your telemedicine and e-health project with long term goals for transforming health care information technology of the hospital, region or the country you are working in.
- Make your plan public. Publish it in the local paper. Ensure good public relations for the project.
- Use media whenever possible to educate the public about your project.
- Ensure continuous education of all the members of your team. This is the most valuable time and expense you will spend on the project.
- Maintain continuous international presence. Invite your expert friends to give talks and have them speak out in public about the program.
<table>
<thead>
<tr>
<th>The Must Do’s (Continued)</th>
<th>The Don’ts</th>
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<tbody>
<tr>
<td>• Report on the project collectively- when you write a paper on</td>
<td>• Make sure that every one on the project knows their job description</td>
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<tr>
<td>the project, make sure everyone’s name is on the paper.</td>
<td>and their obligation.</td>
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<tr>
<td>• Keep a close eye on the project and maintain line of</td>
<td>• Adapt, respect the local tradition, culture and environment, and be</td>
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<tr>
<td>accountability.</td>
<td>very sensitive to their tradition and culture.</td>
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<thead>
<tr>
<th>The Must Do’s (Continued)</th>
<th>The Don’ts</th>
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<tbody>
<tr>
<td>• Total transparency is crucial. Plan and spell out every</td>
<td>• Do not allow repeated mistakes- intervene early. Early interventions</td>
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<td>detail of the project- no secrets in your plan. Send a copy of</td>
<td>will prevent failure of the projects, especially if you picked the wrong</td>
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<td>your plan to every one involved.</td>
<td>team the first time. You should be able to change the team or members of</td>
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<td></td>
<td>the team. Do not be afraid to do that.</td>
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<td></td>
<td>• Do not abandon your private life and your family if you do you will</td>
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<td></td>
<td>lose everything else. Try to make them part of your project but do not</td>
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<td>pay any of them.</td>
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<th>The Don’ts Continued</th>
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<tr>
<td>• Do not promise things you will not be able to deliver</td>
<td>• Do not get discouraged; few things are destined to fail or go wrong.</td>
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<td>• Do not take sides in local politics- stay indifferent in</td>
<td>• Do not take part in anything that will compromise you and the project,</td>
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<td>local politics.</td>
<td>especially bribes and gifts that may be offered to you.</td>
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<td>• Do not sweat the small stuff- keep the big picture on your</td>
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<td>mind. This will help you overcome the difficulties with the</td>
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<td>project.</td>
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Conclusion: Prediction

- Balkan Telemedicine Network completed in 3-5 years
- We will all be talking to each other through telemedicine network
- The Balkan Telemedicine Society will have plenty of members (both national and individual)
- The Balkan Telemedicine will become a “how to learn telemedicine and e-health and will set new standards