

Operational Use of U.S. Army Telemedicine Information Systems in Iraq and Afghanistan – Considerations for NATO Operations

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ABSTRACT

An issue raised repeatedly with regards to teleconsultation, especially in disaster settings, is the effectiveness of such consultations across national boundaries. It has been postulated that technical, cultural, and training issues will be the major problems which can impede the successful use of multinational teleconsultation, in addition to language problems. The United States Army and NATO have established an agreement which allows deployed NATO forces in Afghanistan to make use of an already-deployed U.S. Army system for this purpose, and have clearly shown the successful utilization of such a system in a multinational setting. In this multinational setting, the system has thus been in use for over a year, and metrics on its success and acceptability have been collected, involving both patients and providers from multiple nations. The system involves U.S. consultants providing teleconsultation on individual patients to NATO practitioners in Afghanistan, and has been most successful in avoiding unnecessary evacuations, facilitation of needed evacuations, and return to duty of many patients. This article will discuss consult types, physician acceptance of the system, and some inherent problems in using such a system in a cross-cultural setting. Critical issues appear to be those of training of users, and ensuring that the training transfers to new practitioners upon personnel rotations. Quality of consultations and their acceptance have not been a problem. Drop-offs in usage noted in conjunction with routine personnel changes will be discussed, along with mechanisms implemented by NATO to ensure that this does not happen in the future. The acceptability and usability of the system have been such that one nation has requested the ability to use it in support of all its deployed forces, not only those in Afghanistan, thus clearly demonstrating the acceptance and desirability of the capability, in

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE
APR 2010

2. REPORT TYPE
N/A

3. DATES COVERED
-

4. TITLE AND SUBTITLE

Operational Use of U.S. Army Telemedicine Information Systems in Iraq and Afghanistan Considerations for NATO Operations

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

**US Army Medical Research and Materiel Command (USAMRMC)
Telemedicine and Advanced Technology Research Center (TATRC) Fort
Detrick, Maryland 21702 USA**

8. PERFORMING ORGANIZATION
REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT
NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

**See also ADA564622. Use of Advanced Technologies and New Procedures in Medical Field Operations
(Utilisation de technologies avancees et de procedures nouvelles dans les operations sanitaires).
RTO-MP-HFM-182**

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An issue raised repeatedly with regards to teleconsultation, especially in disaster settings, is the effectiveness of such consultations across national boundaries. It has been postulated that technical, cultural, and training issues will be the major problems which can impede the successful use of multinational teleconsultation, in addition to language problems. The United States Army and NATO have established an agreement which allows deployed NATO forces in Afghanistan to make use of an already-deployed U.S. Army system for this purpose, and have clearly shown the successful utilization of such a system in a multinational setting. In this multinational setting, the system has thus been in use for over a year, and metrics on its success and acceptability have been collected, involving both patients and providers from multiple nations. The system involves U.S. consultants providing teleconsultation on individual patients to NATO practitioners in Afghanistan, and has been most successful in avoiding unnecessary evacuations, facilitation of needed evacuations, and return to duty of many patients. This article will discuss consult types, physician acceptance of the system, and some inherent problems in using such a system in a cross-cultural setting. Critical issues appear to be those of training of users, and ensuring that the training transfers to new practitioners upon personnel rotations. Quality of consultations and their acceptance have not been a problem. Drop-offs in usage noted in conjunction with routine personnel changes will be discussed, along with mechanisms implemented by NATO to ensure that this does not happen in the future. The acceptability and usability of the system have been such that one nation has requested the ability to use it in support of all its deployed forces, not only those in Afghanistan, thus clearly demonstrating the acceptance and desirability of the capability, in spite of the current lack of use. This effort clearly demonstrates that teleconsultation can be effectively provided on a multinational basis, not only within one nation's forces, and this demonstration may provide a basis for extension of such a concept to other military or to disaster response situations.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

a. REPORT

unclassified

b. ABSTRACT

unclassified

c. THIS PAGE

unclassified

17. LIMITATION OF ABSTRACT

SAR

18. NUMBER OF PAGES

10

19a. NAME OF RESPONSIBLE PERSON

spite of the current lack of use. This effort clearly demonstrates that teleconsultation can be effectively provided on a multinational basis, not only within one nation's forces, and this demonstration may provide a basis for extension of such a concept to other military or to disaster response situations.

1.0 INTRODUCTION

Teleconsultation has become well-developed over the past 10-15 years, and has clearly proven its value in multiple settings, ranging from civilian-oriented peace-time health care, through disaster relief, and in combat zone use by various military forces (1-5). One of the issues recurrently raised is whether it can in fact be used effectively across national boundaries, with clinicians from one nation being provided advice and guidance by consultants from other nations. Most reported international utilization has involved personnel from associated organizations or the same organization, rather than providers from one nation and consultants from another. Others have reported on providers and consultants who may be from different nations, but who have had the opportunity to work together previously. In this paper, we report on a multinational experiment which has had two goals: 1) demonstrating that teleconsultation can successfully be used across multinational lines without previous relationships between those clinicians and consultants involved, and; 2) provision of actual clinical consultation in a combat environment. We also report on the problems which have arisen in this use of the technology, and some of the approaches currently being used to resolve them.

2.0 U.S. ARMY THEATER TELE-CONSULT PROGRAM

In April 2004, the U. S. Army Medical Department approved the use of the U. S. Army electronic mail (e-mail) system known as Army Knowledge On-line (AKO) for tele-dermatology consultations from deployed providers in Iraq, Kuwait and Afghanistan (6). Through e-mail, this tele-consultation service provides a centralized business practice to manage consultation requests in a timely and consistent manner between deployed medical providers and rear-based consultants. It is a world-wide teleconsultation system which is fully functional and meets operational requirements. This system utilizes theater providers' personal digital cameras (which are common in the theater) and routine Internet email access, which is provided at nearly all deployed locations. To obtain a consult, the deployed health care provider initiates an email and enters an adequate description of the patient's condition and attaches digital images necessary to illustrate the patient's condition. Upon transmission, the email is sent to an on-duty clinical specialist (i.e. dermatologist) who will respond to the deployed provider within 6 hours for urgent requests and 24 hours for routine requests.

The AKO tele-consultation is not encrypted, therefore to remain within compliance with U. S. Public Law 104-191, Health Insurance Portability and Accountability Act (HIPAA), consultation requests must not include Protected Health Information (PHI). Digital imagery must obscure the face or identifiable markings unless required for a diagnosis. This consultation service is designed for use by all DOD healthcare providers, with special concentration on deployed or otherwise isolated healthcare providers serving at any U.S. Army, Air Force, Navy, or Marine Corps facility.

The theater provider is responsible for following local policies on the electronic transfer of patient information and imagery, as well as requirements to document the consult in the patient record. Network connectivity issues are addressed through appropriate theater channels.

Quality Management - Informed consent is not required for a tele-consult or to use digital imagery within the tele-consultation. Tele-consultation is considered part of the routine course of medical care and thereby covered under the blanket HIPAA consent in the form of the Notice of Privacy Practices (NOPP) required

under AF 4-66, 2-2. An informed consent is required to use the imagery for any other purpose such as case presentation or publication. The request for tele-consultation, the number and nature of the imagery, the informed consent, if required, the consultant recommendations and subsequent treatment plan should be documented in the patient field treatment record.

Consultant Responsibility - The consultant who first responds to the consult is the primary responder. He/she will assume responsibility for the initial response and any follow-on recommendations until completion of the case. Other members of the clinical specialty team will correspond separately with the primary responder if additional advice is warranted, allowing the primary responder to direct communications with consulting providers.

To date, the system has expanded beyond teledermatology and includes 19 medical and 7 dental specialty services available. Currently-available specialties include:

Burns-Trauma	Cardiology
Dermatology	Infectious Diseases
Internal Medicine	Nephrology
Neurology	Occupational Medicine
Ophthalmology	Pediatrics
Preventive Medicine	Rheumatology
Toxicology	Urology
Orthopedics	Traumatic Brain Injury (TBI)
Laboratory Medicine	+
Infection Control	7 Dental Specialties
Sleep Medicine	

From April 2004 to 1 February 2010, over 6642 tele-consults have been completed: top 3 clinical specialties include dermatology – 47%, infectious disease – 8%, and neurology – 6% (See Figure 1). The average response time for stateside medical consultants to answer the tele-consult over the last 5 year period (across all specialties) was approximately 5 hours. Tele-consultation referrals resulted in more than 85 avoided aero medical evacuations (potential cost savings of \$2.0M), and 265 cases where evacuation was facilitated by tele-consultation. Over 1710 deployed providers have used the US Army Tele-consultation system with approximately 26% of the consults coming from US Air Force and US Navy/Marine deployed providers (see Figure 2). Deployment problems included frequent interruption of electrical power, initial bandwidth constraints, and frequent marketing campaigns to inform newly arrived deployed personnel in theater of the AKO tele-consultation capability. Over 63% of all tele-consults from deployed providers came from Iraq, 15% from Afghanistan, and 5% from the US Navy afloat.

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	Total Consults By FY																				Program Totals	% Consults Program
	2004	2005	2006	2007	2008	2009	2010															
	Totals	Totals	Totals	Totals	Totals	Totals	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	YTD			
Burn-Trauma		23	24	19	32	31														5	134	2%
Cardiology		2	67	41	61	67	5	7	3	6										21	259	4%
Dental				0		14	1	1	2	2										6	20	0.3%
Dermatology	321	543	528	467	562	526	38	33	38	53										162	3,109	47%
Infection Control				0	0	11	5	1	1											7	18	0.3%
Infectious Diseases		82	110	106	100	110	3	8	10	6										27	535	8%
Internal Medicine				34	50	57	9	5	8	5										27	168	3%
Microbiology				0	0	8														0	8	0.1%
Nephrology		13	18	33	30	29	2		3	2										7	130	2%
Neurology				78	123	145	12	8	16	6										42	388	5.8%
Ophthalmology	10	51	38	54	70	65	6	2	6	5										19	307	5%
Orthopedics				11	105	169	19	13	21	8										61	346	5.2%
Pediatrics		8	21	27	24	20	2		1											3	103	2%
Prvt Med			3	13	13	25			2	1	2									5	59	0.9%
Rehabilitation			1	0	0	0														0	1	0.0%
Rheumatology			13	26	20	21			1	5	1									7	87	1.3%
Sleep Medicine						12	1	1												2	14	0.2%
Toxicology		2	19	15	14	8				2										2	60	0.9%
Traumatic Brain Injury				8	42	3	2	6	4											15	65	1.0%
Urology				6	69	108	11	10	9	11										41	224	3.4%
Other Specialties		7	61	124	178	185	14	10	17	10										52	607	9%
Totals	331	731	903	1,054	1,459	1,653	131	105	146	128	0	0	0	0	0	0	0	0	0	511	6,642	

Figure 1: Program Summary by Clinical Specialty.

	Patient Branch																				Program Totals	% Consults Program	
	2004	2005	2006	2007	2008	2010	2010																
	Total	Total	Total	Totals	Totals	Totals	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	YTD				
Air Force	11	62	85	95	142	96	8	6	6	14	0	0	0	0	0	0	0	0	0	34	525	7.9%	
Army	252	405	431	539	751	888	64	62	85	59	0	0	0	0	0	0	0	0	0	270	3,536	53.2%	
Coast Guard						5					0	0	0	0	0	0	0	0	0	0	5	5	0.1%
Marine Corps	8	101	78	149	212	178	13	15	25	16	0	0	0	0	0	0	0	0	0	69	795	12.0%	
Navy	18	8	37	30	71	191	21	13	10	13	0	0	0	0	0	0	0	0	0	57	412	6.2%	
Contractor	6	27	30	24	40	36	3	1	4	7	0	0	0	0	0	0	0	0	0	15	178	2.7%	
Detainee	3	13	23	33	15	27	3				0	0	0	0	0	0	0	0	0	3	118	1.8%	
Non-Combatant	13	43	130	87	150	121	5	4	11	15	0	0	0	0	0	0	0	0	0	35	578	8.7%	
Other	1	27	38	45	36	51	4	4			0	0	0	0	0	0	0	0	0	8	206	3.1%	
Not Stated/NA	19	45	51	52	42	60	10	1	5	4	0	0	0	0	0	0	0	0	0	20	289	4.4%	
Total	331	731	903	1,054	1,459	1,653	131	106	146	128	0	0	0	0	0	0	0	0	0	511	6,642		

Figure 2: Program Summary by Patient Branch of Service.

Lessons Learned - From the initial 69 months of teleconsultation capability in Iraq and Afghanistan, the email with digital image attachments system works well, is easy to use and is well received by deployed providers. Telemedicine has become an important part of health care delivery for the U.S. Army. Nearly all deployed providers own their own digital camera which negates the need for training and centrally providing cameras in theater. Providers on both end of the teleconsult have ready access to email which facilitates the ease in consulting and the quick turnaround time in answering the consult, respectively. Capturing solid outcome based data and metrics on teleconsultation requires dedicated personnel and is best analyzed at home station. The need to identify and train replacement units before they deploy on the teleconsult capability is desirable. Bandwidth availability is the rate-limiting resource in theater for teleconsultation, especially during the early stages of the military conflict.

Establishing official policy on use of teleconsultation facilitates user acceptance and informs ground commanders of the capability. Two policies approved by the US Army Surgeon General's office on use of AKO for Teledermatology (May 2004; revised June 2009) as well as a general overarching policy for establishment of other specialties (March 2005; revised December 2008) have greatly facilitated acceptance of the tele-consultation by providers and field commanders.

Clinical use of the AKO teleconsultation system has been adopted by deployed medical providers for the medical response in September 2005 to Hurricane Katrina and the January 2010 Haiti earthquake relief. The service was available to all DOD, Public Health Service and FEMA healthcare professionals that supported relief operations. Dermatology and Infectious Disease were the leading specialty services used in the system.

Whereas other similar systems have been used on an ad hoc basis, primarily to exploit personal relationships with personally known consultants, the U.S. Army system is organized as a coherent program. Consultant responses are assured through the establishment of an organized tele-consultant pool, in many specialties, with a group of consultants in each medical specialty taking the on-call responsibility in rotation. Medical specialists, who may be located either in the United States or at US Army overseas hospitals, answer tele-consults 24x7.

3.0 NATO PROGRAM EXPANSION

In June 2007 the NATO Telemedicine Expert Team, which had become aware of the benefits of the U.S. Army system, requested NATO concurrence/approval of a U.S. Army teleconsultation offer for NATO use in Afghanistan, and subsequently began developing and staffing a NATO/United States Memorandum of Agreement (MOA), which would authorize the use of the U.S. system by deployed NATO health care providers. As is well-known, international staffing of such documents may be slow, and it was not until November 2008 that the MOA was approved by NATO & the U.S. Army. Implementing instructions and operating directives were developed, and in February 2009, U.S. Army personnel deployed to Afghanistan to make the system known to NATO medical forces, and to give instruction in using the system.

The basic provisions of the agreement are:

- NATO participation is voluntary
- The U.S. will not charge for this support
- U.S. Army offer is for an interim basis (6-12 months) and will assist NATO in establishing a NATO tele-consultation system, if desired
- NATO nations must provide computer/Internet access and digital cameras (which are commonly already in theater)

The Agreement considers:

- Legal Issues (e.g. Liability/NATO SOFA/PFP SOFA)
- Patient Privacy/Security
- Finances
- Technical Arrangements
- Metrics for Demonstrating Effectiveness
- Clinical Supervision in Theatre
- Quality Assurance

The United States Army has agreed to:

- Permit access to the Teleconsultation System by NATO and Partnership for Peace (PFP) medical personnel deployed in Afghanistan



- Maintain an adequate number of specialty consultants to provide teleconsultation on a timely basis (< 8 hours)
- Maintain a consultation management system which ensures that all teleconsultations are routed to an appropriate consultant, that a response is given in a timely manner, and maintain appropriate metrics to document usage, successes, and problems
- Provide system description, instructions, and guidance on use of the system to NATO Allied Command Operations (ACO) Medical Advisor, suitable for distribution to deployed NATO and PFP medical personnel

Additionally, the U.S. maintains metrics on the NATO use of the system, which will allow regular reports to NATO/ACO on such items as:

- Data usage on a monthly basis
- Number & type of medical specialties consulted
- Response time for each consult
- Audit reports
- Individual case use analysis

Currently, there are 26 Tele-Consultation Clinical Specialties to which consults may be directed. Each of these specialties has a consultant on-call at all times, with monitoring to ensure that consults are answered in a timely manner and that the requesting physician is satisfied with the answer. This monitoring is provided by a full-time consult manager who ensures that consults are routed to the correct consult group (often, they may go to several groups), that the response is given in a timely manner, and that the requestor is satisfied with the response. If a consult request is received for a specialty for which we have no standing consultant group, the manager can access other U.S. Army specialists on an ad-hoc basis.

Requirements on the part of NATO include that the ACO Medical Advisor will:

- Insure use of this system is incorporated into Operational Orders
- Publish and distribute the instructions and guidance provided by the U.S. Army to all deployed clinical providers in Afghanistan
- Insure that providers are trained in the use of the system

4.0 EXPERIENCE WITH NATO USE OF THE SYSTEM

Following the initial fielding of the system to NATO forces in Afghanistan, the NATO initial use of this system for tele-consultation was encouraging with a slow but steady usage. Each consulting physician was personally contacted after the consult was completed to see if they were satisfied with the results, and if they felt that the system was beneficial to them in their practice. The results were 100% positive, and in fact the users were so happy that one of the nations has formally asked for permission to use the system in all of their international deployments, not only in Afghanistan (The response to this request is still pending.). No technical problems in using the system were reported, and all clinicians felt their use of the system had been beneficial to their patients. As shown in figure 3, consults were addressed to many of the consultant groups, with most (52%) being Dermatology. Usage was spread across several NATO nations, and patients treated came from NATO and Afghan forces, with about ½ the use being generated by Canadian medical personnel.

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NATO Afghanistan Summary										
Specialty	2009								YTD	Specialty %
	Feb	Mar	Apr	May	Jun	Jul	Aug			
Dermatology	1	5	1	5	1				13	52%
Gastroenterology				1					1	4%
Hematology		1							1	4%
Infectious Diseases				1					1	4%
Internal Medicine				1					1	4%
Ophthalmology	1	1	1						3	12%
Otolaryngology		1							1	4%
Orthopedics	2								2	8%
Pulmonology		1							1	4%
Urology		1							1	4%
Total	4	10	2	8	1	0	0	0	25	

NATO Afghanistan Summary										
Patient Branch	2009								YTD	Specialty %
	Feb	Mar	Apr	May	Jun	Jul	Aug			
Afghanistan National	1	1		3					5	20%
Bosnia Contractor	1								1	4%
Canada Army		5	1	3	1				10	40%
Canada Contractor			1						1	4%
Denmark Contractor		1							1	4%
Netherland Army	1			2					3	12%
UK Contractor		1							1	4%
US Army	1	2							3	12%
Total	4	10	2	8	1	0	0	0	25	

7 consults received in May 2009 but one consult requested Gastroenterology and Infectious Diseases

Figure 3: Consults Received February to August 2009.

Unfortunately, as is noted in Figure 4 below, the initial usage stopped in only 5 months, and as of February 2010, no usage has been seen since July 2009.

2009		2010	
Month	Total	Month	Total
Feb	4	Jan	0
Mar	10	Feb	
Apr	2	Mar	
May	7	Apr	
Jun	1	May	
Jul	0	Jun	
Aug	0	Jul	
Sep	0	Aug	
Oct	0	Sep	
Nov	0	Oct	
Dec	0	Nov	
Total	24	Dec	
		Total	0

Figure 4: NATO/PPF use of the Teleconsultation System.

To investigate the causes for the sudden drop-off in consults, it was requested that the Medical Advisor for NATO's ACO, which is the operational command for operations in Afghanistan, undertake an investigation as to why there had been such a sudden drop-off. An officer from ACO was sent to theatre to investigate in December 2009, and found that the major problem occurred as a result of personnel changes—those personnel who had been using the system had rotated home after their normal tour, and information about the availability of the system and its capabilities had not been included in routine turn-over briefings. Thus, there was found to be nearly a total lack of knowledge among recently-arrived NATO medical personnel of the availability of the teleconsult system. These personnel were reminded by the visiting officer of the availability of the system.

Accordingly, following this visit, several actions have been implemented to spread the word about the system. Notes concerning its utility have been inserted each month into the ACO Medical Advisor's Monthly Report, which is sent to all senior medical leaders in theatre.

In the two months since that visit, we have seen no use of the system, so apparently our efforts have failed to spread the word adequately.

Another U.S. Army medical officer will visit the theatre in March 2010, and will personally discuss this with the remaining multinational medical personnel.

ACO has decided that the most effective solution will be to influence the pre-deployment training for medical personnel going to be deployed to Afghanistan so that instruction on the use of the teleconsultation system is included in this training for all deploying medical personnel. A secondary effort will be to discuss (and push) this issue during fact finding visits from ACO and JTF Brunssum to Afghanistan.

Further, it has been requested that the operational lead headquarters for the theatre (JFC Brunssum) should undertake an educational/fact-finding study to see if there are previously undiscovered problems which are impeding continued usage.

5.0 RESULTS

This effort has not been as successful as hoped, though it has clearly demonstrated the viability of the concept. After an initial surge of utilization with excellent user satisfaction, we have seen a rapid drop-off in usage. Early investigations have demonstrated that there were no reasons which could be identified as a cause for this drop-off, other than the originally trained personnel were replaced, and inadequate information was passed to the new personnel on their arrival. We have clearly shown that within NATO the technology works, and is well-accepted when utilized. The lack of any technological impediments to multinational teleconsultation within the NATO environment has clearly been demonstrated. Since the common languages of all NATO operations are English and French, and nearly all medical personnel deployed are conversant in English, we have not had a problem with languages used in the consultations—if other languages were to be involved, as in a disaster relief operation in which the services were being provided to physicians who do not speak English, this might pose a larger problem than it has been for us.

6.0 LESSONS LEARNED / SUMMARY

- Teleconsultation in the multinational environment works—there is no technological or clinical impediment.

- E-mail with JPEG image attachments works well, and allows an acceptable level of clinical consultation support.
- Digital cameras are common in theater.
- This type of system requires minimal bandwidth, and thus is suitable for use in isolated, military, or disaster situations.
- No training requirements beyond familiarization with the procedures and knowledge of the referring email address are needed to implement such a program.
- Erosion in use of telemedicine equipment occurs as new units rotate into theater, if they are not familiar with the use of such a system before deployment.
- There is a distinct need to identify & train replacement units before they deploy.
- Frequent communication with deployed units concerning their clinical tele-consultation needs is essential.

The views and opinions expressed in this manuscript are those of the author(s) and do not reflect official policy or position of the U.S. Government.

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