Afghanistan Medical Informatics Demonstration

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1) **Overview**
    a) **Intent:** We intend to design and implement a medical communications architecture within the clinical and administrative structure of the Bamyan province of central Afghanistan. Bamyan is a poor, underserved, and culturally important area just north of the Hindu Kush mountain range roughly 100 miles west of the capital, Kabul. It has few medical resources, minimal communications capability, and almost no access by ground. It is often used to contrast the resources of the capital with the poverty of the nearby provinces.
    b) **Health status:** Our best available information in 2003 agreed that the health and nutritional status of approximately 22 million Afghans is the worst in Asia and among the worst in the world. Life expectancy is 44 years for women and 43 years for men. With that life expectancy, the Disability-Adjusted Life Years (the DALY, a World Health Organization development metric and a measure of individual productivity) drops into the middle-30s which is again one of the worst in the world. Poor health has an important negative impact on the economic productivity of any population, and on the capacity for their long-term growth and development, on the maintenance of their intellectual capacity (lost as a result of caloric and micronutrient deficiencies, communicable diseases, and chronic pain), and on their chances for a sustained peace when competing for scarce resources. The lack of health-care communications compounds the problem. With no rural medical communications links, the collecting of information about the health of the provinces is challenged, the appropriate implementation of emergency resources is obscured, and the design of effective development programs is impaired.
    c) **Bamyan:** Bamyan is fairly close to Kabul and contains a former UNESCO World Heritage Site, the cliff-carved Great Buddha, 180-feet tall and first described in AD 630 by a Chinese traveler passing through on the Silk Road to Damascus. That Buddha, with others nearby, was destroyed by the Taliban in March 2001, bringing the area to world attention. The city itself flourished in the 12th century on the Silk Road until destroyed by Genghis Kahn in 1221 and it has never recovered. As of January 2003 there were approximately 356,000 people living in Bamyan Province, only 4% of whom were within the urban area near the old city. The drinking water is from rivers, canals, and unprotected springs and 92% is assessed as "unsafe". Of the latrines, 96% are assessed as "unsanitary" and most are pits within the living compounds. Only 60% of children receive a measles vaccination, and only about 30% receive a diphtheria-pertussis-tetanus (DPT) vaccination. In the 2003 survey 40% of the children reported diarrhea within the previous 15 days, and most cases were left untreated. The Province probably has a total of about 26 hospital beds, but the available information is difficult to extract and even more difficult to confirm.
    d) Note that we do <u>not</u> intend to address the general delivery of health care within the Province. There are already solid efforts underway to improve the delivery of both preventive and clinical care delivered there and we will assist those efforts where we can but not to the extent of direct patient care. Our task, as we see it, is to enhance communication between the health care workers delivering patient care and those most able to assist them.
    e) Based on the January 2004 assessment published on the Afghanistan Information Management Service (AIMS) site in November 2004, there are two hospitals and eight

active clinics within the five districts of Bamyan Province. As of December 2003, none of those Bamyan province clinics meet criteria set by USAID and the Afghan MOPH for Basic Health Centers. The distribution is as follows:

  i) Yakawlang has three clinics in the northwest
  ii) Panjab has, we think, a small hospital and a separate clinic in the center-south
  iii) Waras has two clinics in the extreme southwest of the province
  iv) Bamyan district has the largest hospital and two clinics in the east of the Province.
  v) Shibar, the easternmost district closest to Kabul, apparently has no medical facilities whatever.

f) The information flow in this Demonstration would begin within the existing clinics. We expect them to gradually become USAID-level Basic Health Centers and our working hypothesis is that their transformation may be assisted and enhanced by improvements in communication. That, in turn, may enhance the delivery of effective care to a population in need. Representative Measures of Effectiveness for the tasks we consider important can be found on page 12, section 9c, near the end of this document.

g) Beyond the clinics, information flow will scale in sophistication and depth through the District and Provincial Offices of the Ministry of Public Health (MOPH), to the Kabul Medical Institute, the Afghan National Army (ANA) Hospital, and the Indira Ghandi National Pediatric Referral Hospital in Kabul.

h) The lowest common denominator within the remote clinics will be:
  i) Thuraya Sat-Cell phones in Farsi (Dari) using pre-configured SMS messaging and voice.
    (1) Energy will be provided by
      (a) A solar powered battery charger and
      (b) a vehicle-based 12v/220v inverter.
  ii) Worldspace digital radios
    (1) Solar chargers

i) For the District Medical Officers and higher, communications will be through the USAID District Communications Network (DCN) of VSat terminals, supported by:
  i) **Ruggedized laptops**
    (1) supported by alternative energy sources.
  ii) **Email and Web browsers**
    (1) Thunderbird and Firefox
      (a) free, open-source, international standards,
  iii) **Stat!Ref DVD medical library texts**
    (1) international academic standards, US Navy experience,
  iv) **Axon telemedicine referral software**
    (1) open-source, NATO interoperability standards,
    (2) NATO and UK Defence Medical Service experience
  v) **Groove Networks international collaborative software**
    (1) US State Department, UN World Food Programme, CARE International, USAID, and NASA experience
    (2) With forms development appropriate to the tasks requested by the MOPH
    (3) With database integration and reporting standards through MySQL database software (free, open source) appropriate for the Afghanistan Information Management Service (AIMS)
    (4) Encrypted, peer-to-peer architecture.
  vi) **Skype VOIP**
    (1) referral, consultation, and assessment software
      (a) free on digital VOIP links
      (b) inexpensive local switch access for landline/cell calls

        (c) encrypted, peer-to-peer architecture.

        (d) very positive Strong Angel review

    vii) **VSee videoteleconferencing**, transport protection, and distance learning software

      (1) Encrypted, peer-to-peer architecture.

      (2) Strong Angel choice

    viii) **A Microsoft Office equivalent** for word-processing, spreadsheet, presentation, and database management (OpenOffice free, open source, Microsoft-transparent file types, international standard XML)

    ix) **WorldVistA hospital information systems**

      (1) US Veterans Administration and Brazilian national hospital system experience.

j) **Information content:** The content of the information flow will be determined by the Ministry of Public Health in concert with developers for each software tool. Epidemiologic surveillance, for example, will be performed by Groove forms tools, ToucanNavigate GIS, and MySQL database integration, all submitted to the Afghanistan Information Management Service (AIMS) of the United Nations Development Programme (UNDP) for the Afghan government.

k) **Translation:** Language services will be provided through adaptation of the suggested software into Dari or Farsi (reportedly an adequate approximation) wherever feasible, and with an acceptance that some valuable options are worth providing in English. Our experience thus far indicates English readers can be found within many regional towns, and we recognize that the presence of desirable resources in English may stimulate further interest in, and access to, the West. We also intend to introduce machine translation capabilities used within Strong Angel as a field capability for evaluation.

l) **Timeline:** The timeline for the Demonstration is driven by an assessment and reporting mandate. Our current understanding is that the telephones, laptops, and training should be ready for implementation within the clinics, regional offices, and referral hospitals by May 2005. We will assess the preliminary impact and early effectiveness of the installation at the 90-day mark and report our initial assessment, and recommendations for refinement, iteration, and perhaps expansion, at the World Summit for the Information Society in Tunis, Tunisia in November 2005.

m) **Expectations:** If this Demonstration proves effective, there is a reasonable expectation that expansion into other provinces may be useful. Note that much of the communications capability required for the Kabul referral facilities will already be complete, and it's only the Provinces that would require implementation.

n) **Documents:** A requirements document and a proposed budget will be provided once acceptance of this proposal is received, but there are caveats. See the last lines of this document.

2) **Background:**

a) **Mission:** At the request of the Office of the Assistant Secretary of Defense - Networks and Information Integration (OSD-NII), two of the authors (ER and DW) visited urban and rural health care facilities in Afghanistan during November of 2004. The purpose of the visit was to ascertain whether medical information exchange could be improved in a manner that made sense for a nation in the early stages of recovery from a quarter-century of war.

b) **Authors:** The five authors each have a background in both formal and practical evaluations of information management within austere environments and biographies for each can be found in the appendix. Relevant recent experience has included development of the Iraqi Health Logistics System within the International Humanitarian Operations Center during and after the 2003 Iraq War, and two civil-military

demonstrations of information management options for civil-military operations (the Strong Angel set).

c) **Strong Angel II:** The second Strong Angel demonstration was held on the lava beds north of Kailua-Kona, Hawaii in July of 2004. It incorporated roughly 80 tasks intended to address specific problems noted at the civil-military boundary during the Iraq War. A review of the lessons learned in the research and performance of that demonstration can be found at www.strongangel.telascience.org.

d) **Topics:** The report from Strong Angel II led to a request that the Strong Angel director (ER) and the Strong Angel lead for medical technologies (DW) offer opinions and advice on applying the Strong Angel model to a real-world problem. At the request of members of the Afghan government and the Afghan Reconstruction Group of the US government, OSD-NII asked that we choose Afghanistan for implementation of medical information exchange and coordination using lessons from four Strong Angel topic areas:

   i) **communication,**
   ii) **collaboration,**
   iii) **translation and**
   iv) **sustainability**.

e) **Scope of the evaluation:** During the evaluation we looked at a range of hospitals and clinics providing care in both rural and urban settings. We focused on clinical care delivery, medical education, medical logistics, referral capabilities, specialist allocation, the epidemiology of clinical diagnoses in both rural and urban environments, and the capabilities and resilience of the current communications infrastructure. We intend that medical information should flow both horizontally (i.e. between healthcare centers), and vertically within an administrative reporting responsibility, but we also recognize that medical information will need to flow across the multiple and parallel systems of healthcare that already exist within the country. We conclude that a limited pilot project for a single province is warranted. It will incorporate a complete chain of administration and clinical inquiry from the Basic Health Centers, through the District and Regional Medical Officers, to the Kabul Medical Institute, and then out to international tele-consultation.

3) Goal:

a) Develop and implement a model for the exchange of medical information within a national infrastructure for a post-conflict reconstruction. We will use a single province within Afghanistan as the evaluation and implementation site, but the design is expected to have wider applicability.

4) Foundation:

a) **Development:** Afghanistan is a nation suffering the effects of more than a quarter-century of war. Even before the recent series of conflicts, Afghanistan was ranked the 7th poorest country in the world and at no point has it had much infrastructure outside the capital, Kabul. Kabul itself was the site of intense fighting for a number of years and, during the civil war in the mid-90's called "the Commander's War", reportedly was assaulted by up to 400 rockets every day for months on end. Reconstruction of the nation after the cessation of major hostilities in early 2002 has been slower than originally anticipated but is underway.

b) **Communications:** The communications infrastructure was virtually nonexistent under the Taliban, but is now under development by both private and governmental ventures. As of November 2004, there were an estimated 50-100 Internet cafes within Kabul and a very few others elsewhere within the country. The cell phone network is expanding

rapidly, with an estimated 550,000 subscribers to the dominant provider, Roshan, and a lower number across at least two other companies.

c) **Health status:** Although few current or reliable statistics are available, as of 2003 it was generally agreed that the health and nutritional status of approximately 22 million Afghans is the worst in Asia and among the worst in the world. Life expectancy is 44 years for women and 43 years for men. One in four infants dies before their first birthday. As of 2003, an estimated 1 in 15 women die of maternal causes during their reproductive years, compared to 1 in 3,500 in the U.S. The poor health situation has an important negative impact on the economic productivity of the population, and the capacity for long-term growth and development. This particularly affects women, as many are unable to work outside the home due to high fertility rates, poor health, depleted nutritional status, and cultural barriers. (data from the 04 Jan 2003 USAID Action Memorandum on the REACH program)

d) **Dominant medical issues:**
   i) **High Maternal Mortality:** High maternal and neonatal mortality rates are due primarily to a lack of skilled maternal health care services to handle pregnancy, delivery and postpartum complications. Contributing to the high mortality and morbidity is:
      (a) inadequate birth spacing;
      (b) compromised nutritional status; and
      (c) childbearing at the extremes of reproductive age.

      These factors are compounded by an acute shortage of trained female health personnel able to competently provide maternal and neonatal health services. (data from the 04 Jan 2003 USAID Action Memorandum on the REACH program)
   ii) **High Child Morbidity and Mortality:** The major causes of mortality and morbidity in children under five are preventable, and include respiratory infections, diarrheal diseases, and malaria, all of which are exacerbated by high levels of chronic and micronutrient malnutrition. Other illnesses, such as measles and tetanus, are easily prevented through an expanded program of basic immunizations. (data from the 04 Jan 2003 USAID Action Memorandum on the REACH program)

e) **Healthcare:** There are a large number of physicians within Afghanistan, but they are of variable competence and are largely located within Kabul. The WHO-MOPH Reports from 2003 indicate a density of roughly:
      (a) 1 physician per 1000 population in Kabul, but
      (b) 1 per 100,000 in the central province of Bamyan that we've chosen for this pilot,
      (c) Perhaps 1:125,000 in Badakhshan in the extreme northeast (all but inaccessible).
   ii) In addressing this, the USAID REACH project (Rural Expansion of Afghanistan's Community-based Healthcare) is working to provide a rural clinic system that will help provide the five items in the Afghan Basic Package of Health Services listed below.

- **Afghanistan Basic Package of Health Services (BPHS):**
     1. **maternal and newborn health,**
     2. **child health and immunizations,**
     3. **public nutrition,**
     4. **communicable diseases, and**
     5. **essential drugs**

These will be provided throughout a network of more than 700 clinics, each intended to support approximately 30,000 people. Of the estimated 733 clinics required, more than 250 need to be constructed from scratch. Another 275 or so need significant renovation to meet Basic Health Center standards (see section 6a below).

f) **Medical education:** There are 12 medical schools within Afghanistan, with more than 10,400 medical students registered in 2004. The curriculum has been problematic and the staffing is woefully inadequate. As a consequence, the Government of Afghanistan intends to reduce the number of medical schools from 12 to 3 and to overhaul the curriculum. We have initiated discussion with the Kabul Medical Institute and the Afghan National Army (ANA) Hospital Director of Medical Education to ascertain the most effective method for improving curriculum content and delivery. As expected there are a number of agencies working on this issue and we intend to assist the responsible Afghan medical administrators with communications in any manner they deem helpful.

g) **Medical communications:** There is no discernible data exchange between healthcare facilities. Discussions with the Afghan Surgeon-General, the Minister of Health, and the Senior Advisor to the Ministry of Health have revealed that there are no communications links between healthcare facilities other than a landline telephone and the cellular telephones of the staff members. In addition, there is no codified method for referral or consultation even within the Kabul medical facilities, much less outside of the capital, as of this writing.

   i) **Example:** The USAID-International Medical Corps Model Clinic in Qala-e-Qazi within the Qarabagh District north of Kabul has no communications and has no transportation available since reportedly no one in the village owns a car. As a consequence, a severely ill woman recently presented after hours at Qala-e-Qazi and required urgent transport for a difficult birth. There was no communications capability intrinsic to the clinic (despite five-bars of signal on a personal cell phone (ER) the day of our visit) and no one in the village owned a cell phone. The patient was first transported by donkey to the Qarabagh Clinic several kilometers away where a car was borrowed for transport to Kabul. Regrettably, the baby died and the mother suffered permanent injury. Communication is not a part of the planning for the Basic Health Centers but, had a cell phone been available to the guard at the Clinic, transport might have been arranged sooner and both mother and child might have had a different outcome. Please note paragraph (4.d.i) above.

h) **Medical staff education:** The graduates of Afghan medical schools have succeeded despite significant obstacles. Personal communication to one author (ER) has indicated that newly graduated physicians might benefit from continuing medical education but there is very little within the country. International travel is prohibitively expensive so medical education within Afghanistan seems ripe for comprehensive referral support and distance learning once adequate communications capability is established.

i) **Power:** The current energy sources for both the hospitals and the rural clinics are 3kW to 5kW diesel generators, supplemented by grid facilities where available. The generators require a significant and unwavering logistical and financial tail of initial transport and training, maintenance, fuel, and repair, and we noted shortfalls in each element. While such generators are ubiquitous both within the larger towns of Afghanistan and within the developing world in general, better methods for the delivery of sustainable power are available and will be emphasized in this effort.

j) **Lighting:** The lighting observed at both the hospital and clinic levels was a mix of compact fluorescents and incandescents. Both are fragile and relatively short-lived, and incandescents are inefficient to the point of foolishness in an energy-constrained environment. Other, more robust and efficient, options are available and will be demonstrated.

5) **Principles**
   a) **Strong Angel:** In our designing of a medical communications proposal for Afghanistan, a few of the principles and guidelines from Strong Angel II seem relevant.
      i) **Interdependent web:** It is neither possible nor desirable to view medical communications in isolation. Any design for information flow depends upon other components of the national and local infrastructure. Medical communications, if considered desirable may, in fact, serve as a springboard for the intelligent design of other aspects of reconstruction, encouraging a whole-systems approach to proposed solutions.
      ii) **Sustainable power:** Sustainable power is one certain method for improving the resilience of any healthcare facility and should be an integral part of the communications design.
      iii) **Scaled solutions:** The larger hospitals in Kabul (e.g. Indira Ghandi pediatric referral hospital and the ANA hospital) require more data sharing capability than does a rural clinic. Dedicated satellite access may well be appropriate within Kabul and in the district offices, but a satellite-GSM telephone may be a reasonable start and a significant improvement in medical information sharing from within a village. Common sense will drive the solutions proposed for a facility, based on the information density and the collection frequency.
      iv) **Host-population integration:** Virtually all of the local inhabitants of an area will require medical attention at some point. Ensuring that the potential patient population is consulted prior to the introduction of a communications capability for a clinic may reduce misunderstanding, resentment, vandalism, and pilferage, and may reveal unsuspected synergy with other local efforts.
      v) **Ruggedized equipment:** Electronic devices intended for field use should be designed for the field and offer resilience and efficiencies beyond the norm. To select field gear on lowest-cost or easiest purchase may both impede performance in the field and reduce the likelihood of mission success.
      vi) **Shared communications:** Many communications devices are used only occasionally and for a scheduled purpose. Offering the use of a communications capability to the local population can pay unexpected dividends from a very small investment. There are precedents for charging access fees to a local population for non-medical calls in order to make the capability self-sustaining. That may be appropriate with the satellite phones within the clinics.
      vii) **Disconnected operations:** Disconnected operations are the rule, rather than the exception, and any data exchange solution must contain the capacity to work offline with no access to a network, then transmit saved information with very little effort. In some cases, such offline data acquisition might be pencil and a piece of paper (see 4(a) iii above), delivered to where it is collated into an electronic format, aggregated, and analyzed for later decisions. That sequence worked well for the early weeks of the Iraq war, has been refined through the Strong Angel demonstration, and is reproducible in Afghanistan.
      viii) **Micro-entrepreneurial efforts:** As noted in 5(a)vi above, many communications capabilities are well-suited to local business initiatives and such efforts should be encouraged. Particular opportunities exist in locally-manufactured renewable power support and the development of future technologists.
      ix) **Collaboration tools:** Eventually many locations will discover benefit from interaction in horizontal and vertical collaboration using voice, video, and text. Sri Lanka's "InfoShare" is an example of a successful communications capability using a collaborative tool in all three of those modes. InfoShare served as an oversight monitoring resource for the Sri Lankan elections with significant success. They are

also proving effective in conflict early-warning, human rights monitoring, and donor-coordination work.

    x) Language courtesies: Afghanistan has two official languages (Pashto and Dari) with many Aid agencies having field staff that speak neither, preferring English or French. Tools that improve trans-lingual communication can improve efficiency and reduce misunderstandings. Such tools, though quite imperfect, are available and help identify material worth a deeper, dedicated analysis. For this demonstration we will provide essential capabilities in Dari or Farsi, with less critical capabilities remaining in English.

6) **Afghan Medical Facilities:**

  a) **Basic Health Centers:** There will eventually be more than 700 rural and urban clinics, many in remote, inaccessible, austere, and perhaps primitive, areas. The staffing may include only Community Health Workers and caretakers for the facility. The current design from USAID and International Medical Corps includes:

    (1) **Basic Clinics** – eight rooms with no designed capacity for childbirth. This level facility is intended to deliver only the five components of the Basic Package of Health Services seen in 4(e) above:

      (a) maternal and newborn health,

      (b) child health and immunizations,

      (c) public nutrition,

      (d) communicable diseases, and

      (e) essential drugs

    (2) **Comprehensive Clinics** – Much like the Basic above, but with eleven rooms, including labor, delivery, and post-partum.

    (3) **District Medical Officers -** with logistical and epidemiological reporting requirements

    (4) **Provincial hospitals -** with referral and consultation requirements

    (5) **Provincial Medical Officers -** with consolidated epidemiological reporting requirements

    (6) **Referral hospitals -** with associated information requirements

    (7) **Medical schools** – needing referral capabilities, distance learning, and research tools.

    (8) **Public Health laboratories -** with multiple requirements for medical information exchange.

7) **Desirable medical information capabilities:**

  a) **Urban and Rural Clinics (approximately 730):** Require only routine reporting of surveillance results, outbreaks, and medical logistics requirements (e.g. the supplying of the Essential Drugs from the Basic Package of Health Services list), determined by the Ministry of Health or another authoritative body. There may, perhaps, also be notification of urgencies. We hesitate to consider evacuation requests as an expected requirement because that implies a response architecture that does not currently exist. Such a capability should be expected to develop over time and it will then likely become an obligatory capability for the Clinics. We are also interested in the distribution of Worldspace digital radios. We would use the information-delivery capability for public health messages, for distance learning, and for information transfer using the carrier frequency in a model pioneered by Worldspace.

  b) **District and Provincial Health Offices (approximately 34 Provinces and 397 Districts, depending on the political model used):** At this level the District Communication Network (DCN) should be able to provide reasonable bandwidth, and so the medical communications expectation can be far more robust. Medical referrals, comprehensive logistics, evacuation coordination, policy dissemination and

implementation, and public health surveillance and epidemiology can all be performed from this point up through consolidation at the Provincial offices and forward to the central facilities in Kabul. The DCN VSat is not dedicated to medical information exchange but is reportedly accessible to Medical for brief periods and may be geographically close.

c) **Referral hospitals:** Of the 21 or so hospitals within the Kabul area, there are a small number of specialty hospitals, four which have direct support from the US government (Rabia Balkhi, Indira Ghandi, and Malali, each focusing in some aspect of maternal-child health, and the ANA hospital for the Afghan military under the ANA Surgeon-General, a general-care facility). Of note, the ANA hospital reportedly treats civilians as well, and civilians have been roughly half of their 2004 patient load. Indira Ghandi Hospital is currently the national pediatric referral hospital, yet the facilities are poorly provisioned even by developing-world standards. No one of the four hospitals has any data-exchange capability (beyond couriers carrying paper), and none has any access to the Internet as of November 2004. Reliable power is a significant problem within each of the four as well.

d) **Medical schools:** There are currently 12 medical schools within Afghanistan, soon to be reduced to three. By personal report from the Afghan military Surgeon-General to an author (ER), there are a total of 8 professors of medicine within the 12 medical schools, and the medical textbooks are French mimeographs, badly out of date. The provisioning of these schools, which currently have more than 10,000 medical students, should be a priority, and can be facilitated through the communications resources considered here and through the establishing of a collegial relationship with a non-Afghan academic medical facility.

e) **Public Health Laboratories:** This is a necessary component of any medical information flow plan, but most laboratory facilities currently reside within Kabul hospitals that are not independent governmental resources. Provisioning the hospitals will, as a result, often provision the public health laboratories, but there is an expansion plan that reportedly establishes independent public health laboratories within the next year. None of the authors has read that plan.

f) **Central Statistics Office:** This office in Kabul is responsible for many topic areas beyond health, and they are the central repository for information collected by Governmental agencies throughout the country. The CSO has more than 900 staff, 150 of those working within the districts outside of Kabul. The results of their collection, collation, and analysis are fed to the Afghan Information Management Service for tabulation and GIS visualization.

g) **Afghanistan Information Management Service (AIMS):** AIMS is a Directly Executed (DEX) project of the UN Development Programme (UNDP), administered and managed by UNDP. The project is located in Kabul and delivers Afghan information, particularly GIS-based visualization, to global organizations interested in Afghanistan, and to agencies within the Afghan government. It is specifically tasked with the development of information management capacity within the Afghan government, building appropriate skills for the management of information systems through six services: Global Customer Support, Afghan Government Agency Support, General Advisory Services, Training in GIS and database management, GIS display for Afghan data, and Database development and management. Of interest, AIMS is **NOT** an information collection agency, data repository, or analytical resource, but instead is a recipient of data from outside sources which they validate (minimally, for staffing reasons) and then publish in order to allow interested parties to review a single website for information on all evaluated sectors. Current sectors include Agriculture and Food Security, Health and Social Welfare, Education, Government and Civil Society, and perhaps a dozen others.

Of interest, the staff of AIMS will undergo a significant management change within the time allocated for this proposal with loss of both their director and their most experienced employee, both foreign nationals, before the Tunis meeting.

8) **Recommendations for Medical Communications:**

   a) **Capabilities and recommendations:**

   i) **Remote:** Remote and austere-environment Clinics need efficient and reliable power, highly efficient lighting, and communications that are simple, reliable, and resilient. We suggest

   (1) **Power Primary:** solar power to deep-cycle marine batteries

   (i) www.sustainablevillage.com

   (b) **Power Secondary:** 3kW to 5kW diesel generator

   (i) Preferred provider based on local acquisition

   (2) **Lighting Primary:** LED panels appear to be the most rugged, efficient, and effective. While more expensive initially, they have an estimated life well in excess of 100,000 hours and eliminate the logistics support of fragile compact fluorescent bulbs. They are also, in 2004, the most efficient lighting system on the planet

   (a) **Lighting Secondary:** Compact fluorescent bulbs.

   (3) **Communication:**

   (a) **Basic Health Care Clinics** require the regular submission of information to a district office and, ideally, to neighboring clinics. The information required is that determined by the Ministry of Health and the District Medical Officers.

   (i) Communication should be through SMS and voice from a satphone-cellphone optimized for the region. The combination is needed because the cell system within Afghanistan is unreliable and suffers outages as frequently as the power fails. A satellite fallback position ensures reliable and resilient comms with inexpensive cell service when found. Our choice would be Thuraya Satellite Telecoms Company for its geographic support to Central Asia, South Asia, and Europe, its intrinsic GPS capability, its Muslim sensitivities (e.g. Prayer-time SMS alerts, complete with GPS-indicated Qibla directions), its language-enabled phones (including Farsi-Dari), its WAP-enabled phones optimized for low-bandwidth, and the solar telephone chargers designed for austere-environment support.

   (ii) We would purchase the current-generation phones, and determine the optimal requirement for reporting each week, plus the time required to consult on patient management concerns, medical logistics support, and urgencies. We would then provision that much time for that phone number on a monthly or quarterly basis. A rough estimation might be three hours a week.

   (iii) The Afghan Thuraya representative is

   1. **New Ansari Ltd.**
      Ahmad Jamil Salihi - Manager
      House #563 Street Dz Road 13 Wazir Akbar Khan Kabul Afghanistan
      Tel: 0093 (0) 20 2301746 Fax: 0093 (0) 20 2301747
      Mobile: 0093 (0) 70 300515 Thuraya: 0088216 2311 1111,0088216 8444 0000.
      Email: newansari_kbn@hotmail.com , jamilsalihi@yahoo.com

   (b) **District and Provincial health officers:**

   (i) **DCN VSat:** These sites will have VSat support from the District Communication Network (DCN). The VSat terminals will have public

access through the Post Office, and the siting of the terminals may, at some locations, be co-located with the health facilities.

1. Resources at this level should include:
   a. Distributed, peer-to-peer collaboration capability for
      i. Inter-District, inter-Province problem recognition and solution development
      ii. Outbreak notification
      iii. Epidemiological surveillance
      iv. Emergency intercom to appropriate sites.
      v. Distributed learning
      vi. Logistics transport scheduling
      vii. Warehouse management
      viii. Referral questions in medicine and policy

(ii) **District and Provincial Medical Officers** require:
1. **Ruggedized laptops:** The Panasonic Toughbook series is appropriate and is used by UN relief agencies for field staff, but we've not yet determined the ideal laptop for this demonstration.
2. **A solar charger and spare batteries for the laptop**
3. **A web-camera:** Logitech QuickCam for Notebooks Pro. (US$99), the VSee recommendation.
4. **A separate digital camera:** Canon Powershot S200 (2MP)
5. **Two 512Mb USB drives**
6. **Microsoft Office or its equivalent** (Open Office or Star Office from Sun Microsystems), with
7. **2005 Microsoft Encarta Reference Library**,
8. **ACDsee photo manipulation software**, and
9. **Norton Anti-viral software**.
10. **For medical library reference** we would load Stat!Ref, the electronic medical library provided to Navy physicians shipboard, onto the hard-drive of the laptop.
11. **For collaboration**, particularly for humanitarian assessments, epidemiological surveillance and evacuation coordination, we would use Groove Professional edition.
12. **For videoteleconferencing**, distance learning, site security, and transport security we would provide VSee VTC software
13. **For low-bandwidth VOIP** and nearly-free referral consultations we would provide Skype,
14. **Axon telemedicine software**: For formal hospital system reachback and referral tracking from the District and Provincial levels, particularly for Afghan tele-consultation within Kabul, we would provide Axon telemedicine software from the UK and the NATO Telemedicine Interoperability Study.

(c) Referral centers and analytical repositories
(i) Center-based systems in Kabul would be provided the same capabilities as the regional and district level officers, since the resources are inexpensive and need to be familiar to those who rotate between the sites (e.g. promoted from the field to the center, or sent from the center to the field for assessments).
(ii) For hospital information system management we would seriously consider Care2x or WorldVistA, two open-source hospital systems in wide use.

(d) Medical schools:
  (i) Again, the capabilities provided would be identical. These resources are the state of the art for austere environments and the developing world in 2005 and should become familiar to those being trained for work within Afghanistan. We have found that healthcare providers tend to tolerate remote postings better if they sense a continued connection to places of power and knowledge, so ensuring the medical students understand the capabilities in the field may enhance their willingness to serve there and so perhaps improve the care later delivered to the population as a whole.

9) Implementation:
  a) **Sequence:** This pilot is designed for later discussion and review at the World Summit on the Information Society to be held in Tunisia in 2005. The implication is that a limited implementation, a brief post-installation assessment, and the report, should all be completed within the next 12 months.
  b) **Milestones:** Our expectation is that there will be six-month design and development phase (December 2004 - May 2005), with installation, training, and reachback complete by 31 May 2005. There will be a 90-day use period, then an evaluation in early September 2005. The results of that evaluation will be presented at the World Summit in November 2005, a year from this writing.
  c) **Measures of Effectiveness (MOEs):** The MOEs for this project will be developed in concert with international experts external to Afghanistan, the Afghan Minister of Health, the chancellor of the Kabul Medical Institute, the ANA Surgeon-General, and the director of AIMS. Examples of appropriate MOEs for evaluating the new medical communications capability might include the suggestions below, where "successful" means the action was repeatable on at least three different occasions, each separated by a calendar week:
    i) Successful (n>2) use of a medical communication capability at each medical facility within the Bamyan Province.
    ii) Successful medical communication between each of the district clinics within the Bamyan Province.
    iii) Successful independent medical communication between each Bamyan clinic, the district medical officer, and the Provincial medical officer.
    iv) Successful epidemiology reporting from a rural Clinic to a regional facility.
    v) Successful request of medical supplies from a rural clinic to a logistics provider.
    vi) Successful notification of inbound medical support a clinic from a regional facility
    vii) Successful response to a clinic query from a regional facility.
    viii) Successful reporting of provincial epidemiology to the Central Statistics Office.
    ix) Successful consultation from provincial facility to a Kabul referral center.
    x) Successful publication of Bamyan provincial information from the provincial medical administrator through the Ministry of Public Health and onto the AIMS website, viewed by the Afghan Reconstruction Group.
    xi) Consistent and uninterrupted power to all Demonstration lighting, telephones, and computers outside of Kabul facilities for 30 days.
    xii) No loss of power for greater than 24 hours to any Demonstration lighting, telephones, or computers outside of Kabul facilities within the 90-day evaluation.
    xiii) No loss of Demonstration resources to theft, vandalism, or maintenance failures during the 90-day Demonstration duration.
    xiv) Any documented improvement in care at a rural clinic as a result of this demonstration
    xv) Any documented improvement in the quality or effectiveness of medical education within the Kabul Medical Institute.

xvi) Successful consultation from a Kabul specialty center to a non-Afghan academic medical facility.

xvii) Successful consultation between the Kabul Medical Institute and any of these four supported hospitals:
   (1) Rabia Balkhi
   (2) Indira Ghandi
   (3) Malali
   (4) ANA

xviii) Successful reporting of a pediatric diarrhea case from a rural clinic to the Ministry of Public Health.

xix) Successful voice communication over VOIP from a district medical facility to the Ministry of Public Health.

xx) Successful voice communication over VOIP from a Kabul specialty facility to a physician located outside Afghanistan.

xxi) Successful videoteleconferencing (VTC) for addressing a clinical question between a district medical facility and a Kabul medical facility.

xxii) Successful discussion of a case by VTC from a district medical center to a Kabul medical facility

xxiii) Successful discussion of a new policy between the Ministry of Public Health and a provincial medical facility

xxiv) Successful viewing of a "continuous medical education" (CME) lecture over a Demonstration VTC between a Kabul medical facility, a Provincial medical provider, and a non-Afghan academic medical facility.

xxv) Discussion between the Afghan Reconstruction Group, OSD-NII, the ANA Surgeon General, the Ministry of Public Health, and the Provincial Medical Officer on the opinion of the local population regarding the implementation of medical communication capability within the province.

d) **Funding:** Acceptance of this proposal is NOT enough to initiate activity. No part of this effort can be initiated without funding in place, able to be obligated. Confirmation of accessible funding will mark the initiation of the six-month design and development phase referenced in 9(b) above.

END