MEDICAL CONSULTATIONS

Communication equipment was installed in Yerevan in late April and early May with the first broadcast to the U.S. on May 4th. A patient with complicated pancreatitis was presented along with x rays in order to fully test the system. All the physicians felt that color television and voice transmissions were of excellent quality — furthermore, the transmission of x rays, CT, and ultrasound was surprisingly good. Translation (Armenian, Russian, English) was ably performed by one physician and an assistant in Yerevan. With this very successful opening broadcast, all of the participants enthusiastically anticipated the first earthquake casualty consultations.

As part of the Implementation Plan, a daily calendar for May and June was included which contained the subject matter to be discussed each day (See Supporting Materials). Furthermore, that U.S. medical center which had the most expertise was appointed lead for that day, although the remaining three centers were always invited to join in at any time. Usually two or three centers were on the air every day, each one contributing to the discussion regardless of who was designated the lead. In general, the scheduled consultations took place as indicated on the calendar, although at times some days had to be interchanged or modified because of unforeseen events or the unavoidable absence of clinicians or patients. Teleconference topics were selected on the basis of the specific needs of the Armenian physicians.

As the schedule went, there were broadcasts Monday through Friday (excluding U.S. and Soviet holidays), 9:00 a.m. - 1:00 p.m. EDT (6:00 p.m. - 10:00 p.m. Armenian time). Every Friday, Armenia would fax to the U.S. medical centers information on patients to be presented the following week. This then allowed the centers to prepare in advance for the discussion and to ensure the presence of the appropriate specialists. On the following Monday, the U.S. medical centers would then fax to Armenia journal articles and papers relative to the cases to be presented that week. On Tuesdays, Wednesdays, and Thursdays, the Armenian physicians would then present those cases for which they desired consultation. Frequently the patient was present and was examined in front of the camera; x ray, CT, and ultrasound studies were usually available as well. A lively exchange would then ensue, with particular emphasis upon management.

Communications sessions on Monday and Fridays, unfortunately, were clearly not efficient. For example, after communications had been established, it sometimes happened that the participants had not planned any transmission for that day or that the planned facsimile transmissions for that day would require only 1-2 hours. Therefore, on these days, the use of communications time was inefficient. It would have been possible to coordinate the transmissions needed for facsimiles and associated time requirements in advance, and use the remaining time more efficiently, for example, for short conferences on a very specialized area with a limited number of participants.

Subsequently, experience showed that if the number of conferences in a block exceeded four, it was expedient to divide the block into two sessions, separated by an interval of 1-2 weeks. Aside from psychological relief, this allowed time for the formation of interim conclusions from the results obtained, study of the literature that had been sent, and better planning of further telebridge activities on the particular topic.

In accordance with the mutual agreement of all participants in the conferences and organizations supporting communications, and taking account of the time difference of from 9 to 11 time zones, the conferences were held between 6:00 and 10:00 p.m. Yerevan time, which corresponded to 7:00 - 11:00 a.m in Utah, 8:00 a.m. - 12:00 noon in Texas, and 9:00 a.m. to 1:00 p.m. in Maryland. Four hours were allocated to each conference. The Armenian physicians attended the conferences after their work day, while their American colleagues sacrificed work time. This was the sole mutually agreeable time interval.

The Armenian physicians disagreed about the duration of the conferences. Without doubt, 4 hours of high intensity work represented a significant mental strain for all the participants, especially the Armenian physicians. However, the great interest and practical benefit of the conferences prevented even a single participant from complaining of fatigue. A 10- to 15-minute break during the conference was a necessity, since by the end of the first 2 hours, the physicians sorely needed a short rest.

Ongoing planning and support of the functioning of the telebridge required major organizational efforts on the part of all participating organizations. The central

coordinating link in the telebridge structure was, without a doubt, the NASA Life Sciences Division. The medical coordinator on the American side, Dr. Russell Rayman, participated in all conferences, addressing on the spot any problems that arose. His colleague from Armenia, the director of the "Diagnostika" Scientific Productive Organization, Dr. Haik Nicogossian, was also always available.

The conference leader on the Armenian side, Dr. Ashot Sarkisian, also participated in all conferences. Since the majority of participants on the Soviet side were participating in teleconferences for the first time, substantial time was devoted to working out a format for presenting data and sequencing the various types of activity. The leader had to receive information on upcoming conferences ahead of time and arrange for its translation. His responsibilities included establishing communication, coordinating the conference agenda, and other administrative matters.

Groups were formed to consider each topic. Each group was composed of leading specialists who prepared the patients for the presentation and compiled documentation, lists of questions, and requests for literature. Two employees who knew English worked on alternate shifts in the studio: setting up the communications and notifying the appropriate individuals, copying and distributing material, preparing data for facsimile transmission, and filing.

A very positive factor was the powerful diagnostic capability of the institution in which the teleconference was organized and conducted. No fewer than half of the patients presented for consultation, some directly before or after it, were given additional examination in the "Diagnostika" organization.

The standard mode of presentation of patients' medical data, which had been agreed upon ahead of time, proved satisfactory. It was utilized in all cases when the working groups presented their data on time.

In cases where written information about the patient was sent in advance, repetition of the same information during the consultation was superfluous. Such time could have been used more efficiently for discussion of details, presentation of additional x rays, etc.

Quality of interpretation was one of the most important factors in the bilingual conferences of the "Armenia-U.S" telebridge. In the unanimous opinion of all

participants, the interpreter Valentina Simonenko was all that could have been desired. However, the following conclusions can be drawn. First, in a number of pathological states, translation into the patient's language plays a key role; for example, consultation on patients with psychological disturbances. Second, significant time can be gained by including a physician who knows both languages. Without being a professional interpreter, the physician is nonetheless capable of ensuring mutual understanding through short and accurate translation of the meaning of what has been said and through his knowledge of the basic terminology, Latin terms, equivalent terms for drugs, normal values of laboratory data, and a full understanding of what is being translated. Experience with the conferences showed that such a physician could significantly reduce the time required for interpretation. In conversation among colleagues, it was often possible to replace a long sentence with only a few words. The professional level of the interpreter Simonenko would have permitted simultaneous interpretation. However, the absence of the appropriate technical conditions and devices required interpretation that was primarily sequential. Of the two alternatives — sequential interpretation by a physician and simultaneous interpretation by a language specialist — the latter is definitely preferable.

The quality of the translation of texts transmitted to the consulting centers was also important. Lists of the questions discussed, lists of participants, and final patient data were sent via the facsimile channel after translation into English.

QUALITY OF THE CONSULTATIONS

Overall, the Spacebridge project, in spite of its complexities, was considered a great success by all parties. The telecommunications system performed magnificently, providing excellent audiovisual quality. Furthermore, the quality of transmission of x rays, CT, and ultrasound went well beyond what was expected by the physicians. The overall success of the communications network is attested to by the fact that only 2 of 55 broadcasting days had to be cancelled due to technical malfunction.

Discussion of how well the teleconferences were organized may begin with the words of one of the most active participants in the telebridge — Dr. Bruce Houtchens, a professor at the University of Texas: "When the right people are present, the right things get done." For the right people to be present at the conferences, it is essential to:

- Follow the schedule to the maximal extent; changes in the schedule must only be made well in advance.

- Send data on the subjects of the consultation no later than 3 days ahead of time.

- Prepare and send lists of very specialized questions well ahead of time, to allow time to invite the necessary consultants and prepare appropriate answers and material.

Of course, these requirements cannot always be met in every instance. Urgent consultations not stipulated in the plan naturally may force exceptions. However, in planned medical teleconsultations on the "Armenia-U.S.A" telebridge, such cases should occur only 10 percent of the time, while in actuality they constituted 50 percent of all the consultations.

It is very important that each teleconference be well organized. The conferences proved most useful, interesting, and substantive when they were carefully prepared ahead of time, and structured to constantly retain the interest of the participants. The most interesting conferences were those in which:

- Patients were actually presented. Experienced practitioners eagerly discussed differential diagnoses, examined x rays, and sought confirmation of their hypotheses, consulting with each other. When the patient was present in the hall, he was virtually always asked additional questions. Many questions were asked of the attending physicians.

- Discussion of pathogenesis, therapeutic or diagnostic methods followed specific consultations or, in other words, the patients were selected in accordance with the issues discussed.

- There were few or no long speeches or analyses by individual participants that went beyond the limits of the specific issues discussed.

- Specific questions were asked that required specific answers.

- The format of presentation of the patients was appropriate; information about the patient was objective and unbiased

- Information about the patients was sufficient.

Sufficiency of the information provided played a direct role in determining the efficacy and completeness of the consultation. The reluctance of consultants to base their conclusions on insufficient information, and to replace conclusions by guesses, must be understood. An example might be the nephrological patient whose diagnosis was unclear and for whom kidney biopsy data was lacking. The availability of these data would have diminished the likelihood of differential diagnoses, and the consultant would have been more confident that the treatment he recommended was appropriate. Unfortunately, in a number of cases the attending physician did not bring all the x-rays, encephalograms, etc., to the conference. The reluctance of participating consultants to blindly accept oral descriptions was understandable.

It is essential to note the psychological strain on the consulting specialists. During the consultations they had not only to express their opinions, but to justify them, and even convince the other participants of their correctness.

A great deal of attention was given to deontological issues during the functioning of the "Armenia-U.S." telebridge. On U.S. territory, the video signal was propagated in a coded form, in order to guarantee the medical privacy of the patient and avoid accidental reception by private individuals or nonmedical organizations.

The period in which the patient was presented and the period during which his case was discussed were strictly separated in the overwhelming majority of cases. That is, after the patient was examined and questions put to him, he was asked to wait in an adjoining room, with the understanding that he might again be asked to come to the hall during or after the consultation.

The physicians were not the only participants who were disappointed with the absence of video transmission from the consulting centers. The patients were even more disappointed that they could not see the consulting physician, in whom they had placed such great hopes. The opportunity to see the physicians undoubtedly would have had a positive psychological effect.

AREAS OF CONSULTATION

While the "Armenia-U.S." telebridge was in operation there were 31 thematic conferences (i.e., conference devoted to a single topic), in which 230 physicians participated on the Armenian side and 405 on the American side. During approximately 124 hours of work, consultations were held for more than 200 patients, about 30 of whom were present at the conferences. (Cf. Table 1). As the table shows, the conferences covered more than 13 medical specialties.

Of the 230 physicians participating in the conferences, more than 60 were lecturers at the Yerevan Medical Institute and Yerevan Institute of Advanced Physician Training, including more than 20 who regularly lecture to specialists, 50 directors of medical institutions, 10 chief specialists and directors of branches of the Armenian Ministry of Health, and 9 foreign physicians.

The medical results of the teleconferences were deemed significant by all groups of specialists. These results can conveniently be categorized according to the major focus of the the physicians during the conferences (Cf. Table 2).

As the tables show, the medical results go far beyond consultative aid for individual patients. Unlike the majority of past experiments, here the patients were introduced by their own physicians, who frequently were specialists in their area. It should be noted that in approximately 25% (53 of 210) patients, the diagnosis was changed after consulting with the U.S. specialists.

The following discussion of the medical results of the conference is organized according to conference topic.

Surgical Conferences

A leading role in teleconsultations on surgical patients was played by visual information — pictures of the locus of injury, gait and other physical signs, and also a large number of x rays, tomograms, etc. This was equally true for orthopedic, spinal, and neurosurgical cases. Laboratory data and the results of general physical examinations played a much more minor role in these cases. Surgical

Table 1

Topic	# Confs	Total Hours	# Physi-cians	# Consul-tations	Pages Facs	Group Eval.
Surgical group	5	20	38	44	232	
Psychology	7	28	24	25	451	
Epid/Infec.	4	16	42	5	69	
Int.Disease	1	4	13	5	--	
Diagnostic visualization	2	8	33	33	79	
Laboratory med	1	4	14	--	77	
Burns/Ufa	5	20	14	24	20	
Vascular surgery	1	4	5	16	25	
Endocrino-logy	1	4	11	5	--	
Ophthal-mology	1	4	25	6	51	
Neurology	1	4	8	4	--	
Urology	1	4	3	25	--	
Dialysis	1	4	17	6	30	
Total	31	124	230	210	1026	

Table 2

	# Consul-tations	Altered diagnos	Altered treat	Recomms for new studies	Altered diagnos process	Altered interp. of diag results	Intro.of new treat method
Surgical group	44	0/21	12	30	16	2	5
Psychology	25	1/8	17	3	--	--	3
Epid./inf.	15	2/2	4	7	5	2	1
Int. disease	5	0/1	2	2	2	1	-
Diag. visual	33	4/10	--	12	12	15	--
Lab. med.	-				5	4	
Burns	24	--	XX				
Vasc. surgery	16	0/7	1	5	4/?	3	1
Endocrinology	5	1/1	2	2	--	--	2
Ophthalmology	6	1/2	1	--	--	--	1
Neurology	5	1/1	3	2	2	--	1
Urology	25	--	5	7	1	--	2
Dialysis	6	1/1					
Total	210	9/53	47	70	47	27	16

teleconferences were devoted to discussion of methods of treatment since, as a rule, diagnosis was not subject to doubt.

The first surgical conference was held on May 18th. The leading orthopedists and traumatologists of the Republic and directors of the traumatological services in the earthquake zone participated in this conference. The first to speak was the Chief Specialist of the Ministry of Health, Ruben Nicogossian. He described in detail the situation that had developed in the disaster area and in the Republic as a whole and spoke of the procedures for evacuating trauma patients and of the measures taken to provide the most effective aid to the victims at all evacuation stages. Next, physicians from the disaster area spoke. Then 12 patients, the majority of whom had suffered trauma during the earthquake, while two suffered from severe osteomyelitis, and two others from complications following burns, were presented and discussed.

The conference on reconstructive and plastic surgery and transplantation of soft tissue generated a great deal of interest. Physicians from the two major departments devoted to this field in the Republic posed many questions that had arisen during the treatment of the victims, and a major portion of the conferences was devoted to discussion of techniques for various kinds of surgical interventions. The Armenian physicians were given many recommendations with regard to surgical treatment of bed sores and postburn and post-traumatic damage to soft tissue. Consultations were held for six patients.

The conference of May 30th was the most tightly organized. After visual presentation of three spinal patients accompanied by discussion of certain aspects of spinal surgery, the physicians turned to issues of spinal rehabilitation. At this conference, the method of playing video tapes made previously was first used. After a patient with bed sores was shown, questions were put concerning the treatment of bed sores; after a patient with particular ossification was presented, relevant questions about this complication and its treatment were raised.

The recommendations of American specialists on questions of spinal rehabilitation were very useful. The newly established Center of Spinal Rehabilitation in the city of Yerevan, staffed with young specialists without a great deal of experience working with this category of patients, received a great deal of essential information.

The next conference, to be devoted to orthopedics, was interrupted at the very beginning by an urgent unscheduled consultation. A pediatric physician in Salt Lake City, who had been called in specially, held a consultation on a 9-year-old child with severe pulmonary pathology. This consultation could be called one of the most effective -- it resulted in alteration of the diagnosis, and a program of further examination and treatment was recommended. After this child was seen, consultations were held for five orthopedic cases.

The final conference, devoted to neurosurgery, was very substantive. Consultations on individual patients were followed by animated discussions of the efficacy of various diagnostic methodologies and different methods of treating brain injuries.

Many pages of printed information relevant to surgery were received. In addition to the literature requested before or during the conferences, the Americans kindly sent the latest review articles of potential utility to the Armenian physicians. Works on internal fixation of the thoracic portion of the spinal column, classification and treatment of osteomyelitis, retrograde cholangiopancreatography, and many other topics were gratefully received. At the request of the Armenian physicians, articles were sent concerning easing or eliminating causalgic pain in patients suffering from crush syndrome.

These and other materials transmitted by facsimile communications could, and in the opinion of the Soviets, definitely would have a discernible positive influence on the diagnosis and treatment of the relevant categories of patients. The majority of the works obtained were xeroxed and distributed to participants in the conferences. Nonduplicated works were given to coordinators for the appropriate specialties for further dissemination.

Epidemiological and Infectious Diseases

Any of the four conferences held on this topic could be used to demonstrate the expediency and utility of the selection of this subject. The first conference (May 10th, first telebridge conference) was devoted to the epidemiological situation that had developed after the earthquake. The participation of many specialists, including the directors of the Epidemiological Service of the Republic and affected regions and cities, and consideration of the monthly patterns of the incidence of particular diseases

before the disaster, made it possible to find optimal solutions for limiting and eliminating foci of infection if the epidemiological situation were to become more severe. In particular, there was discussion of different scenarios for incidence patterns of acute upper respiratory infection and intestinal infections due to the disruption of water supply and waste disposal systems, food supplies, and prophylactic and therapeutic services in the affected regions. The American colleagues agreed that only those infectious diseases that had been recorded previously or for which the causal agent had been identified in one or another local natural environment were likely to be activated.

Among the pathologies discussed, the most frequently mentioned were bacterial and amebic dysentery, salmonellosis, viral diarrhea, viral hepatitis, toxic infections from food and food poisoning, and meningoccocal infections. Also considered were factors such as the death of a large number of [domestic] animals and increase in rodents, including rats. The Armenians described the set of preventive measures that had been taken.

The American physicians were informed of the results of mass operational induction of phagocytic immunity to particular intestinal infections and the use of Interferon to prevent acute upper respiratory infections and judged that these measures were adequate. Certain administrative aspects of epidemiological monitoring of the developing situation were discussed; particularly with regard to cities suffering substantial damage that had had adequate systems of structures for preventing the spread of infection before the catastrophe.

The second conference, devoted to the problem of viral hepatitis, was attended by 18 physicians from Armenia, including 14 from the disaster area, and more than 12 physicians from Bethesda and Utah.

Discussion of the first case lasted 50 minutes. Although the discussion of this very complex case did not resolve the question of concomitant polyarteritis nodosa or persistence of the hepatitis B antigen from the outset as possible reasons for the development of hepatitis, useful advice was given concerning future management of the patient. The soundness of this advice was confirmed by tracking of the antibody titer.

During the discussion, many different approaches to the use of drugs in hepatitis and many different ideas about the efficacy of diagnostic tests came to light. At the end, the American specialists answered questions concerning sensitivity and specificity of particular methods for diagnosing leptospirosis.

The third meeting — on May 17th — was attended by a total of more than 45 specialists. The first half of the conference was spent exchanging experience concerning diagnosis and treatment of viral hepatitis in children. The American physicians provided interesting and useful material on the combination of AIDS and hepatitis B. After a break, the question of treating a child believed to have both hepatitis and yersiniosis was discussed. The consultants argued cogently that the patient did not have a viral infection of the liver and proposed measurement of the hepatitis B antigen as a differential test. The American participants were interested in the extensive use of antioxidants in Armenia. The Armenian specialists sent material concerning their experience and scientific research in this area by facsimile communication.

The fourth conference was devoted to intestinal infections and also to analysis of the most severe complications of infectious pathology, such as toxic shock, hemorrhagic syndrome, and neuritis. The specialists from Bethesda kindly agreed to provide written answers to questions on botulism. The discussion of means for correcting disruption of fluid-electrolyte and acid-base balance in children, including neonates, was very productive.

The Armenian specialists characterized these conferences as "very effective and useful." There is no doubt that these conferences will have a long-term influence on diagnostic and therapeutic tactics for the diseases discussed.

Many pages of printed material on problems of interest to the Armenian specialists were received by facsimile communication. All the material obtained was xeroxed and distributed to the appropriate groups.

Psychology and Psychological Rehabilitation

The conferences on psychology and psychological rehabilitation generated special interest on both sides of the "Armenia-U.S." telebridge. The experienced

professionals working on both ends of the telebridge turned the conferences into absorbing exchanges of opinions, discussion, and debate.

Only the topic of the conference was agreed upon in advance. The psychologists did not consider it essential to send lists of questions or patient data ahead of time. Post-traumatic stress disorders, the effect of the catastrophe on families and children, drug therapy in psychological rehabilitation, group psychotherapy, the use of the mass media, mass examination of people who had been compelled to leave their homes, remote consequences of a major catastrophe with regard to psychological health of the population, effects on individuals already under stress — this is an incomplete list of the problems addressed at these conferences.

Significant emphasis was placed on the psychological effects of the earthquake on medical personnel of the disaster zone, the influence of stress on their work capacity and professional capabilities. Organization of appropriate and complete psychological and psychiatric aid for the population of the disaster zone was considered the most important issue.

It should be noted that before the earthquake, Armenia did not have an adequate independent psychological [aid] service — this service was still in the developmental stage. The small group of psychologists/physicians available were not capable of coping with the severe consequences of the earthquake on the psychiatric health of the population without help from psychiatrists. The Mental Health Center was established after the earthquake. The newly appointed director of the Center, was one of the most active participants in the teleconferences.

Little Conferences

The 10 "little" conferences in 9 medical specialties also were a great success. Of special interest, in the opinion of the Soviet participants, were the conferences on diagnostic visualization, dialysis, vascular surgery, and ophthalmology.

The conference on dialysis coincided with a period of rapid development of this treatment method in Armenia. During the preceding months, a large number of new dialysis centers had been established in the Republic and new specialists in dialysis were trained. The conference gave the physicians the opportunity to receive answers

to many questions that had arisen during the period after the earthquake. Their American colleagues congratulated the Armenian dialysis specialists on their success in treating a large number of cases of crush syndrome associated with the earthquake.

The two conferences on diagnostic visualization permitted discussion of problems of computer tomography, nuclear medicine, x-ray technology, and ultrasound diagnosis. Aside from the many dozen medical images, more than 30 patients whose diagnostic data offered certain interpretation problems were presented for discussion. Before the conferences, the consulting centers had received facsimile material listing questions, to which they provided exhaustive answers during the conference. As a result of the consultations, the interpretations of many diagnostic images were modified. The Armenian specialists received valuable advice concerning improvement of many diagnostic methodologies.

During the conference on vascular surgery, the American physicians provided consultation on 16 patients. This was one of the most animated and interesting conferences held on the telebridge. A technical innovation in this conference was the demonstration of colored slides made during an operation. A sensitive video camera of high quality transmitted the frames projected on the screen of the slide projector.

The conferences on ophthalmology, urology, endocrinology, laboratory diagnostics, and internal diseases were very effective.

CONSULTATION TO UFA

After the Ufa train accident on June 4th, further communications arrangements became necessary in order to link the Ufa Burn Center with the existing Spacebridge. Because of a short lead time and urgency of the situation, it was decided to link Ufa with Yerevan (by land lines) where all transmissions could be patched into the existing Spacebridge and retransmitted to the U.S. This add-on system was capable of two-way voice communications and black-and-white slow scan video. The slow scan video transceivers and camera equipment (at the request of Public Service Satellite Consortium) were generously donated by Colorado Video of Boulder, Colorado. Transportation to and from the U.S.S.R. was provided by Aeroflot.

Transmissions from Ufa began on July 5th and terminated July 12th. Twenty-four patients were presented during this week, with most of them having severe burns. In addition to these cases, there was much discussion concerning general burn treatment, grafting techniques, fluid replacement, and antibiotic prophylaxis. Several hours were also given to psychological problems following burns, particularly those that caused disfigurement of the face.

The Ufa consultations went very well considering the requirement to begin consultations after only a few days' warning. This precluded the use of color video, leaving no alternative other than slow-scan black and white. With slow scan, a still picture of the patient is transmitted every 20-40 seconds. Hence, there was not only no color, but also no movement. Although the American doctors would have preferred full motion color video, given the constraints of the situation, the still-frame photos, strongly supplemented by audio interacting, were considered adequate for its purpose.

RESULTS

Virtually every Soviet and Armenian physician who participated in Spacebridge felt it was highly successful, that it was worthwhile, and that they would participate in a similar such operation again if given the chance.

Spacebridge was an unqualified success, demonstrating that medical care can be effectively delivered through a telecommunication system. It was an example, par excellence, of space age technology helping man to cope with a down-to-earth tragedy.

As a result of this experience, it was concluded that there are four major applications for telemedicine: patient presentations; discussion of general medical topics; diagnostics; and education. For disaster situations, this can be best done if all arrangements were made in advance with participating medical centers and that international agreements addressing communications and funding in particular be negotiated beforehand. With prearranged agreements, a telemedicine system could be installed and operational in the very early phases of a disaster (at 24-28 hours) as well as during the rehabilitation period.

Of utmost importance is good two-way audiovisual capability and a system to permit faxing independently. Although Spacebridge was not capable of televising from the U.S. to Armenia, the LDS Hospital in Salt Lake City was able to arrange televising back to Armenia 2 hours of consultation demonstrating its value. The use of slow scan video received mixed reactions by the U.S. physicians because it was neither in color nor capable of transmitting movement. It would be of value, nevertheless, if regular television was not available. It was also further noted that it transmits diagnostic imaging pictures very well.

The participants agreed that use of broadcasting time is far more efficient if all presentations are scheduled in advance and that the consultations proceed accordingly. This is the only way to ensure that the appropriate specialists are available at the right time for the right patients. Otherwise, the patient will not get the full benefit of specialty consultation. Spacebridge clearly demonstrated that with the proper specialists on hand, as well as complete patient information, including x rays, there will be a direct salutary impact upon diagnosis and treatment. Because of the

success of Spacebridge, the Soviet and U.S. participants unanimously agreed that it should be continued and that efforts should be made to establish an on-call international capability. To this end, a briefing was given on September 11th to a number of Federal agencies involved in disaster response.

General conclusions of the group were as follows:

a. Spacebridge succeeded at the technical and medical level. It satisfied the objectives to demonstrate on an international level and was adaptable to changing circumstances.

b. Although medicine and telecommunications have an evolving relationship, specific needs challenge our capacity for compatibility.

c. International constraints were more substantial than technical or medical considerations to implement the program.

d. The program led to substantial changes in diagnostic and therapeutic outcome for specific patients, and new technologies in diagnosis and treatment were introduced.

e. The value of the program extended far beyond the immediate needs of the disaster.

f. The program accumulated a unique body of information, technical and medical, of international value.

g. The program established a new and enduring relationship between the medical communities of the U.S.S.R. and U.S.A., involving hundreds of physicians and other health care personnel.

h. The common ground and sophistication of medicine in Armenia and U.S.A. permitted detailed recommendations about specific patients facilitated by high quality telecommunications.

i. The practice of medicine via a telecommunications system has direct application to the care of astronauts in space.

An important outgrowth of this program has been the increased awareness of the medical, technical and political institutions of the use of satellite communications for disaster medicine.

Several participants are involved in proposals to continue and expand the Space-bridge concept on a world-wide permanent basis. They are also investigating approaches to reduce its technical, administrative and regulatory complexity and to reduce its cost.

Proposals are also being developed to establish international agreements that would include provisions for facilitating frequency assignments and entry and operations of relief teams and their communications and rescue equipment into foreign countries for disaster relief.

RECOMMENDATIONS

Because Spacebridge to Armenia and Ufa was an unprecedented experiment, much was learned in its planning and execution. During the broadcasts in late June, a few hours were given to lessons learned to make some mid-course corrections. However, in order to have a full, detailed discussion, and to write a final report, representatives from the Soviet Union were invited to Washington, DC, September 8-11, 1989 to meet with their American colleagues. The product of this meeting was this joint Spacebridge report, recommendations, and a Protocol. We hope this experience will serve others should tragedy occur.

1. A Spacebridge telecommunications system should be available for world-wide deployment in event of disaster.

2. International agreements should be negotiated in advance of disasters to address implementation and funding to ensure an unhampered rapid response.

3. National or international organizations should be identified which will take the responsibility for action in the future, to include organization, funding, and implementation.

4. The responsible organization should maintain an updated resource date base to include critical personnel, satellite coverage, etc.

5. Prior to the inception of such a project there must be an analysis of cultural and medical practices to establish a common language for lab instruments and data, medical technology, pharmaceuticals, surgical instruments, etc. Pharmacopeias should be exchanged.

6. A subgroup (mainly spacebridge to Armenia and Ufa participants) should be formed for the purpose of

    a. finding a national or international organization to continue spacebridge

    b. transferring its telemedicine expertise and knowledge to other appropriate agencies.

c. completing the analysis of data, organizing international workshops, and preparing joint publications in Russian and English.

7. A permanent subgroup under the auspices of the Soviet-U.S. Space Biology and Medicine Joint Working Group should also be formed for the purpose of

   a. standardizing telemedicine procedures in space.

   b. providing experts to deal with emergency needs in space flight.

   c. supporting research to advance telemedicine support for space flight and facilitating development and evaluation of space medicine to provide optimum medical care to man in space.

   d. advising as to how space telemedicine advances can best be applied to terrestrial medical needs.

8. Medical centers with comprehensive specialty services should be preselected for Spacebridge operations and its staff trained for telemedicine operations. Specialty consultation should be available for pediatric and burn cases. All participating medical centers must be committed and ready to respond on short notice.

9. There should be a two way video so patients and consultants can see one another. Also should consider telecommunications to demonstrate techniques in the operation room.

10. There should be capability to fax simultaneous with audiovisual transmissions.

11. Patient presentations and discussions should adhere strictly to prearranged schedules to ensure that the proper specialists are available. With undependable scheduling, specialists may be absent which will result in a deficient consultation.

12. Conferences can be of 1-4 hours duration with scheduled breaks.

13. A common consistent format for patient presentation as well as for fax'd material is essential.

14. FAX material must be sent ahead of time to ensure proper presentation and availability of the appropriate consultants at the right time.

15. A proper facility for patient presentation including physical examination is essential.

16. Use keyed microphones to avoid echos.

17. Consider use of digitized video for 2-way capability.

18. Translation, written and oral, should be given high priority. (Simultaneous translation would be advantageous.)

19. Critical communication elements include FAX, audio, and video. Optimal would include two-way color video with color slow-scan video availability.

20. Use slow scan as an alternative to regular video.

21. Begin any Spacebridge project with overall description of the disaster and video if possible of the disaster area to be viewed by participating consultants.

22. Must know cases in advance, presented on time with right specialists in the room at the right time.

23. Advantageous to have skilled presenters who can do a good physical examination on TV.

24. Telemedicine should be part of medical school curricular as it will probably be a part of private practice in the future. Techniques need to be developed to make it as effective as possible.

25. Should have pointer capability for imaging and patient examination.

26. All x rays of patients to be presented should be on hand.

27. Develop through sustaining and educational programs, international teams which could respond promptly to implement the programs.

28. The data from the program should be analyzed in a scholarly way to permit joint publication coordinated by Drs. Arnauld Nicogossian and Haik Nikogossian.