

# TELECOMMUNICATIONS, HEALTH AND EDUCATION

**RALPH P. CHRISTENSON, M.D.**

**Division Director for the Mountain States Health Corp.**

**Summary.** Prior to 1971 there were many experiments conducted in order to demonstrate or test the feasibility, acceptance and effectiveness of communications technology applied to health care and education systems. Within the past year two groups of experiments were completed. One, utilizing terrestrial broad band systems, included seven separate applications. The other, which utilized the National Aeronautics and Space Administration's Applications Technology Satellite Six (ATS-6), had five experiments in health care and education. Each of these experiments is briefly described. Further experimentation is needed with special emphasis being given to the impact of technology on human systems. There is growing acceptance of the fact that demonstrations of feasibility are no longer needed.

This particular session is concerned with "Telemetry for the Benefit of Mankind." I will assume that telecommunications is not excluded and that I can spend my time in describing some of the applications of communications technology to health care delivery and health education. I will not attempt to include all applications but will limit my attention to those that seem most timely and effective. Since all applications that will be mentioned were experimental in nature, concerned largely with feasibility and effectiveness, cost-benefits were incidental considerations.

However, there is now growing acceptance of the fact that experiments concerned with feasibility are no longer needed. This is one of the fundamental precepts upon which the Public Service Satellite Consortium, Inc. was organized. This new development will be discussed briefly later on in this presentation.

If we are to successfully and usefully introduce technical and scientific advances into health care systems, attention must be given to operational systems in which costs are carefully examined and the impact of new technology on existing health care systems is evaluated. What changes in personnel behavior are required if new innovative systems are to be used effectively and advantageously? What disruptions in associated systems occur as a result of changes in the systems to which technology has been applied? There are many questions of social, economic, political and humanistic nature that must be considered when we begin to plan telecommunications applications for the future "benefit" of mankind.

At this point, I should like to quote a friend of mine, Dr. Lawrence M. Gould, Geologist and Chief Scientist with the first expedition made to the South Pole by Admiral Richard Byrd. Speaking at the dedication of the Earth Sciences Center at the Arizona-Sonora Desert Museum Dr. Gould said, "Technology has gotten us into a lot of trouble, but that isn't the fault of technology. You know there is a kind of basic assumption in the minds of many people that when we learn we can do something, we ought to do it. You may remember when there was a debate in the Congress over whether we should manufacture the Supersonic Transport or not, one Congressman said, 'Yes, we must. If we don't do so, it will be the first technology we have perfected and not used.'" Dr. Gould goes on to say "we must learn what not to do."

Decisions will have to be made concerning when broad-band communication is most desirable and effective. What are the advantages of motion and color and the ability to interact on a real time basis?

The applications of telecommunications to health care delivery have been studied extensively by individuals and organizations funded by DHEW which has had a \$50,000,000 yearly investment in biomedical communications projects.

I have been asked to bring to your attention some of the more significant experiments that have been carried out in applying telecommunications technology to health care and health education systems.

Rather than attempt a survey or "listing" of what experimental applications of telecommunications to health have been made, I have selected two major, recent groups of experiments to describe because I believe they demonstrate most of the technologies. More than most earlier experiments, they address some of the questions that have to do with relationships, impact, etc., on people and people's problems in health. Who does what to whom and why do they do it (or why is it done). Engineers and other scientists can tell us "how." Costs are not always clearly seen. Benefits continue to be hard to identify and measure.

I will also comment briefly on the experiments with ATS-1 that were carried out in cooperation with the Indian Health Service in Alaska. This particular experiment emphasizes so dramatically the value of being able to "talk" when that communication mode has not previously been available. I believe it also suggests that those who want to introduce new systems must look carefully at what changes are truly necessary and desirable before irrevocable decisions are made.

The following list of projects is not intended to ignore many earlier experiments in telemedicine such as those of Dr. Kenneth Bird in Boston.

In June 1972, seven exploratory two-way visual telecommunication projects were funded by the Division of Health Care Information Systems and Technology (Bureau of Health Services Research HRA) DHEW to (1) gain clinical impressions of the utility of this technology; (2) develop methods for assessing the utility; and, (3) develop a framework for further research in the logistics of health care delivery.

I have had some first-hand experience with some of these seven experiments. The others I know by word -of -mouth and reading. in brief, they are as follows:

1. Illinois Mental Health Institute. A 12 -unit picture phone network in a health care system that consisted of two neighborhood mental health clinics, a school for emotionally disturbed children and three psychiatric clinics to provide instantaneous consultation.
2. Case Western Reserve. Use of laser link (two-way, wide band audio-visual and data communication) designed to support nurse anesthetist at night at Veterans Administration Hospital by having anesthesiologist at Case Western Reserve monitor visual signs, electrocardiograms, etc. Systems provided voice communication and black and white T.V. signal to V.A. Hospital.
3. Cambridge Hospital. Evaluation of video augmented consultation system between physician extenders (nurse practitioners) in three satellite health clinics in East Cambridge, Massachusetts.
4. Bethany Brethern--Chicago Westside Ghetto. Experiment included two community hospitals, three medical clinics and a drug awareness clinic staffed by ex-addicts. It utilized picture phones and video frame storage discs by cable, microwave and infrared for transmitting medical records from point to point.
5. Lakeview Experiment. Connected geographically dispersed group practices with bidirectional cable links, joined two clinics and a one hundred-ten bed hospital.
6. Dartmouth Experiment. Two -way T.V. support of (1) speech therapy and (2) remote dermatologist.
7. Mt. Sinai Experiment. Explored feasibility of providing coverage of neighborhood pediatric clinic in housing project in East Harlem.

There are available to you two documents that describe and comment on these experiments: (1) The Dr. Maxine Rockoff Paper; and, (2) The Mitre Evaluation Benefits and Problems of Seven Exploratory Telemedicine Projects.

From each of these I wish to make one short quote --- (1) The Dr. Maxine Rockoff Paper. “What started out as a program to assess the potential utility of visual telecommunication in health care systems taught us more than anything else that this utility will have to be determined not by communications engineers alone but rather by communications engineers in partnership with biomedical engineers, health care consumers, health care providers, health care system planners, economists, sociologists, psychologists, lawyers and legislators.”<sup>1</sup>

(2) The Mitre Evaluation. “The net effects of visual communications were almost exclusively beneficial for the patients. New services were provided to the patients by the telemedicine system that were not available before its introduction. Patients accept the recommendations of their doctors and rely on their judgment. As such, no appreciable patient dissatisfaction with telemedicine care was detected or registered. It would appear that from all projects the patients received increased quality of care in one form or another (e.g. received emergency treatment sooner, received physician supervision of non-physician and received specialist consultation where it wasn’t available previously).”<sup>2</sup>

Beginning in 1971 the Lister Hill National Center for Biomedical Communications (NLM) in cooperation with the Indian Health Service carried out experiments with ATS-I in the Yukon Basin of Alaska. Here 26 low-power ground stations formed a network that, for the first time ever, provided reliable voice contact between native Health Service doctors at area hospitals and village aides widely scattered in small remote villages throughout the Yukon Basin. The provision of reliable, regular, voice contact generated great expectations on the part of Alaskan natives as well as the providers of health care. Although the initial experimental activities are finished, ATS-I continues to provide valuable service in supporting healthcare, education, and emergency services in Alaska. ATS-I was also included as part of the communication system used by the Indian Health Service when ATS-6 experiments were conducted.

In 1974 a series of experiments in health care and education was begun utilizing the National Aeronautic and Space Administration’s Applications Technology Satellite Six (ATS-6). This satellite permitted ground reception with low-cost antennae systems and provided both audio and video capability. I will mention these experiments only briefly and suggest that you consult the list of presentations made at the July 21-24 meetings of the American Institute of Aeronautics and Astronautics held in Denver, Colorado. Each of the experiments considered below was discussed at considerable length at that meeting.

---

<sup>1</sup>“An Overview of Some Technological/Health Care System Implications of Seven Exploratory Broad-Band Communication Experiments.” Transactions on Communications, Institute of Electrical and Electronics Engineers, January 1975, p. 29

<sup>2</sup>Benefits and Problems of Seven Exploratory Telemedicine Projects. The Mitre Corporation, February 1975, p. 19

**Veterans Administration (V.A.).** The V.A. is interested in developing new methods for exchange of medical information to and among the more than 170 institutions in the service. On ATS-6, 90 hours of broadcasting involving about 75 subjects were developed and presented. The modes involved were those common to most health education applications: medical grand rounds, video seminars, computer assisted instruction, clinics for patients and faculties and teleconsultation. This opportunity to introduce the very latest medical technology demonstrated by the pioneers and recognized leaders in the field, to large audiences, at widely scattered institutions, with provision for real time interaction with the speaker, is indeed a much appreciated application of the ATS-6 satellite system. Extensive experiments in adult basic education, job placement and counseling, emergency medical services and graduate in-service training were also carried out by the Appalachian Regional Commission.

**Federation of Rocky Mountain States.** The Satellite Technology Demonstration (STD) has shown us that it is possible to maximize the application of technology and educational television programming by involving people in the planning, development and implementation. Even in most rural communities in the continental United States, television via satellite is not a new experience. Our rural communities have witnessed man walking on the moon and the Olympic games, and unless the programming is exciting it will be difficult to maintain their attention.

The STD has made it possible for teachers in very small rural schools to receive educational services that would otherwise not be available to them. The STD has provided small rural schools access to information resources previously available only to larger school districts.

**University of Washington Regionalized Medical School (Washington, Alaska, Montana, Idaho --- WAMI).** In funding the WAMI program of regional medical education, Congress has recognized that the mobility of graduates of professional schools makes it inappropriate for one state alone to assume sole responsibility for the education of several states' physicians. Regionalized graduate medical education creates many problems in communications and movement of teaching and administrative personnel. In the case of WAMI, it was necessary to coordinate five university faculties and local physicians in fifteen Northwest and Alaskan communities. Some of these communities are as far apart as New York and Los Angeles.

ATS-6 was used experimentally by the University of Washington regionalized medical school which included instruction of medical students in four states (Washington, Alaska, Montana, Idaho). First year instruction was provided at home state institutions.

Students at the University of Alaska, Fairbanks, enjoyed a fully interactive color television contact with teachers at the University of Washington in Seattle.

Administrative conferences involving the cooperating universities were held and pre-admission interviews of candidates for admission to medical school were successfully carried out.

The University of Washington is presently planning continued experiments to be carried out on Communication Technology Satellite (CTS) the joint enterprise of the United States and Canada.

The ATS-6 experiment of the University of Washington also conducted clinical teaching sessions via the television network which connected the University and Omak, Washington where one of the clinical care units is located.

**Indian Health Service.** Indian Health Service ATS-6 experiments tested the application of television combined with a Health Information System to the problems of health care delivery in remote areas of Alaska in which village aides provide almost all primary care to villagers. Non-physician providers of care at Fort Yukon and Galena were able to demonstrate patient problems to the physician at the Area Health Center Hospital at Tanana. Voice communication was possible via ATS-I which also permitted access to the patient data in the computers at the Health Program Systems Center of the Indian Health Service at Tucson, Arizona.

As a follow-up of the ATS-I experiments, ATS-6 added additional fuel to the already hot fires of expectation felt by the people of Alaska, particularly those natives immediately affected by the communications systems. Having achieved the ability to reliably communicate, the people will not accept a lesser substitute.

In October, 1974, at a meeting held in Palo Alto, California, initial consideration was given to the possibility of developing a consortium for the purpose of aggregating potential users of satellite medical services in the interest of public good. Several months, meetings, and conversations later the Public Service Satellite Consortium was incorporated and in July 1975 this organization was funded by DHEW at almost half-a-million dollar level.

Believing, as we do, that the interests and resources of many potential users will have to be aggregated and coordinated if a Public Service Satellite can provide cost-beneficial services, special emphasis during the coming year will be placed on the identification of those potential users, a specification of their needs and resources, and finally a clear statement as to costs. This will not be an easy task. It is necessary, however.

These experiments are by no means all that have been done in an effort to determine the feasibility, acceptance and value of telecommunications application to health care and education. They are, however, some of the more recent. The two major communication systems, terrestrial and satellite (ATS-6) included several experiments which have been or will be examined or evaluated collectively.

It seems apparent to me that continued experimentation is needed in order to determine the variety and degree of adjustment that the human elements of the service system must make if the technological innovations are to function near full efficiency. I believe too, like Dr. Gould, that we may sometimes have to decide “what not to do.”