TIIAP FY 1999
Project Narrative

Tufts University

Grant # 25-60-99013
Health
Boston, Massachusetts

Telemedicine Networks: from Corrections to Community Users

Lemuel Shattuck Hospital
Tufts University School of Medicine

TIAAP Proposal, 1999

Contents

Authors:
Dr. Donnie McGrath
Dr. Joseph Cohen
Department of Medicine
Lemuel Shattuck Hospital
170 Morton Street
Boston MA 02130

Executive Summary

This project is intended for the Health primary application area: and Public safety as a secondary application area. The primary goal of the project is to evaluate the cost-effectiveness of a telecommunications network involving an urban academic medical center, a suburban community hospital and two state correctional facilities (diagram 1). This will be done in a scientific way involving control groups at facilities not in the proposed network. The communities to be served vary depending on the site. Groups in correctional facilities include 1) inmates with illness, 2) medical staff, 3) correctional officers, and 4) administrators. In the community hospital and academic medical center the community is the medical staff. The anticipated primary outcomes are 1) decreased morbidity amongst inmates, 2) decreased hospitalizations, 3) increased physician-patient interaction, and 4) overall decreased correctional healthcare and ongoing education costs. Secondary anticipated outcomes are increased satisfaction amongst inmates, correctional medical staff, and nonmedical correctional staff concerning inmate care and continuing education for all groups. Also a decreased sense of isolation of correctional medical staff and decreased security concerns regarding medical care are anticipated. The network will be connected via ISDN lines. Additionally the project will evaluate a mobile telemedicine unit by comparing it with high-end rollabout telemedicine systems in place in the initial sites. It will then be used to expand the network in a cost-effective manner. Community groups and non-medical, non-correctional institutions in rural and urban areas will utilize the network for their own purposes.

Project Narrative

Project Definition

The problems: The prison population in the US has been increasing steadily over many years. Similarly the number of prisoners with intravenous drug abuse related problems and those needing immediate medical treatment after incarceration have increased. In Massachusetts over 36 state and county correctional facilities contain 24,000 inmates. The proportion of prisoners with TB or HIV is greater than the general population [35] and is becoming a significant problem in Massachusetts' prisons[36]. Equally disturbing is increasing average age of the prisoners. As more and more people are incarcerated for longer periods of time prisons are being confronted with people with chronic diseases such as HIV/AIDS, hypertension, diabetes and coronary artery disease, etc. As a result health care costs in the federal prison system increased 91% from 1990 to 1994 [34]. Outpatient visits increased 90 % between 1993 and 1994 and 49% between 1994 and 1995 [34]. The cost of medical guard escorts has increased 166% in the same time period [34].

This is becoming a major burden on the correctional facilities since prisoners must be transported under guard to a distant penitentiary. In addition, the limited size of the population within the correctional facilities means they cannot support specialty clinics. Even in a highly populated state such as Massachusetts many prisons are over 50 miles away from specialist medical providers, and prisoners must endure prolonged periods of being shackled for transport to and from urban hospitals for outpatient care. The situation is aggravated at island facilities, such as on Martha's Vineyard. This creates a burden on the prison primary care provider, inconvenience to the prisoner and added cost to the system. In diseases that require frequent follow up, such as HIV, this situation can result in increased medical costs from potentially preventable hospitalizations. Finally, prisons that aspire to provide medical, dental and mental health services to inmates consistent with community [34] and NCCFC standards must struggle to achieve such standards while containing costs.

One potential solution to these problems is the deployment of telemedicine. However, it has been widely cited that a significant barrier to the deployment of telemedicine is the lack of solid evaluative data regarding it's cost, quality and access [1,3,17-19,21-23,25,31,32]. The Institute of Medicine[1] has noted that to date only three groups have even begun to evaluate these features [1,3,5-14,21,24,25]. Furthermore, low numbers of telemedicine consultations[33, 48 have] hampered even those studies sanctioned by HCFA.

Despite being identified as having an important role in controlling the cost of prison health care[34], however most studies of telemedicine in the prison environment have been post hoc or anecdotal. The two most complete evaluations were in Texas and Virginia[13, 14.] Both were post hoc and involved no control groups. The Texas study focussed on continuing medical education, a clinical consultation service, and static radiology and pathology. The clinical outcomes were the number of patients referred to the medical centers and users' satisfaction measured with a non-validated research tool. In the Virginia study's cost benefit analysis, the measure of benefit was the reduction in utilization of hospital and prison staff. It did not consider the health outcomes of the patients[14].

Primary Aim: The primary aim of this project, therefore, is to examine the cost-effectiveness of primary care and specialty clinics to the inmate population using basic telemedicine technology in a new network involving several correctional facilities, a hub site community hospital and an academic medical center who have existing medical and educational relationships. The costs examined will be those incurred in using the health services and the effectiveness of the intervention will be measured as changes in health outcomes such as morbidity and mortality using validated instruments. (See Appendix 1and Appendix 2)

We anticipate improvement in overall health outcomes. There is evidence that specialist care improves patient health and reduces costs e.g., HIV patients [37-42], chronic kidney failure [43], asthma [44] and diabetes [45].

Specifically we hypothesize that 1) the number of hospitalizations will decrease as will the number of trips per patient to the LSH; 2) the length of stay in hospital will decrease, as it becomes easier to provide good follow-up care for the discharged patient; 3) there will be a decreased number of significant morbidity's, as measured as the number of unscheduled re-hospitalizations for the last hospitalization's diagnosis; 4) both the health care provider and patient satisfaction with the care delivered will increase.

Secondary aims: evaluation of the effects of the network on non-medical users in the correctional facilities. Since "telemedicine programs may also serve educational and administrative as well as clinical objectives…" [1] we propose to monitor, in partnership with our correctional and educational institution partners, the secondary effects in the areas of Public Safety and Education as defined in the TIIAP Notice 1999. It has been noted that there is a dramatic increase in staff education coupled with decreased costs in a medical center utilizing telecommunications networks [47]. This benefit is anticipated to extend to the non-medical staff also, i.e. correctional officers and administrators. We will use existing cross-agency and institutional collaborations to introduce many different sections of the community to the concepts, practice and benefits of modern interactive information technology networks (See Appendix 3). We believe that the network can help our partners train their personnel for the digital age, and enable us train our physicians and nurses in training for the burgeoning age of digital medicine. A descriptive analysis will also be performed to evaluate the involvement of the various network partner personnel and community agencies and groups in the utilization of the network.

Tertiary Aims: A barrier to wide spread deployment of telemedicine is the cost of equipment. It is not feasible for Massachusetts to install high-end teleconferencing equipment in al 36 correctional facilities, particularly in the many "smaller" sites. The hub site of the proposed network, the Lemuel Shattuck Hospital, and the two initial prison sites in the network have installed high-end relatively "fixed" rollabout telemedicine systems. The project aims to examine the feasibility of adapting the new generation of lower-priced, set-top videoconferencing codecs to clinical telemedicine. These units include a camera, microphone, codec and inverse multiplexer (IMUX) in one compact package designed to sit on top of a conventional television monitor (See Appendix 3). In final deployment, television monitors and network termination devices would be installed at each site. Set-top units, with appropriate telemedicine peripherals, would be temporarily placed at sites as needed. Cost savings would result from the ability to

share equipment though mobile deployment and the lower price of the set-top codec over conventional rollabout systems. This system should enable the rapid deployment of telemedicine services to all sites along with the expected secondary benefits outlined above.

Evaluation Plan
The primary outcomes of this study will be evaluated in a two-phase study. The first phase will be a 6 month pilot to establish the feasibility of measuring network user and patient satisfaction, define baseline characteristics of the study population and determine existing health care costs. The second phase will be a prospective cohort trial of the proposed intervention network. (See Appendix 4 and Appendix 5)

The secondary outcomes of the study will similarly be assessed in a two-phase study (See Appendix 4 and Appendix 6). In the first 6-month pilot phase baseline network utilization data will be established. In addition qualitative data will be collected using a survey instrument to be designed and validated during the pilot. Phase 2 will consist of prospective data collection in the network sites using the instruments validated during the pilot.

The tertiary outcomes will be evaluated in a two-phase study also (See Appendix 6).

Staffing / Evaluators: The primary investigators, Dr. McGrath MD and Dr. Cohen MD, in addition to the co-investigator, Dr. Kathy Lasch Ph.D., will be responsible for managing the evaluation components of the study. Dr. Lasch will develop all the surveys to be used in the study. Various consent and participant statement forms have already been generated. One full-time research assistant for 24 months and one half-time research assistant for 18 months are budgeted for this study. Dr. Lasch will train and direct the research assistants to perform the surveys and enter the data. The research assistant will also be responsible for collecting all telemedicine logbook data, and entering it into a database. Dr. McGrath will liaise with the research assistants, the technical support officer and the LSH telemedicine office secretarial staff to coordinate the clinics to enable surveyors to be present to collect data. At non-intervention sites the research assistants will collect data. Drs. Lasch, McGrath and Cohen will perform all data analyses. A team approach to reporting the analyses will be taken, with different members taking primary authorship depending on their interests (See Information Dissemination).

Evaluation Plan: Primary Outcomes (See Appendix 5)
Evaluation Plan: Secondary Outcomes (See Appendix 6)
Evaluation Plan: Evaluation of a Mobile, Low-Cost High-bandwidth Telemedical Unit (See Appendix 6)

Significance: The primary aim of this project is significant in the broader context for two reasons. First, a properly controlled evaluation of the cost-effectiveness of providing health care clinics via telemedicine will help establish criteria for making allocation decisions for this technology. This is innovative in that a prospective evaluation with a control group has never been attempted. Second, we propose a unique organizational structure where we are linking primary health care providers, a community hospital and an academic tertiary care center within a tightly capitated system. In this network patient care will have two hubs each with slightly different functions. The community teaching hospital (LSH) will take care of the bulk of hospitalized patients, as is standard practice at present. Physicians employed at the LSH will staff

the telemedicine clinics in each specialty. The academic tertiary center will be used for complex patients, as is the present practice. At the local level, education, training, and experience will be shared as the network develops. This network structure can be scaled up easily by installing ISDN lines and minimal fixed equipment at new sites. The model proposed here is transferable and should work in any capitated health care system where clinical expertise, education and technical support are needed. Other potential situations where this model may be used are other prison systems, nursing homes within a health maintenance organization, youth detention centers or any capitated system where the reduction of logistical costs can benefit the whole system. This project will also provide significant data on the non-medical benefits to correctional institutions and other community users of this model network. Further the model of a mobile low-cost high-bandwidth telemedicine until has potentially great significance for institutions worldwide interested in telemedicine, but also in education and other uses such as legal hearings.

Project Feasibility

Technical Approach: We intend to set up a network of telemedicine sites, which will be composed of basic videoconferencing units and diagnostic peripherals. The three initial sites have had high-end telemedicine suites developed. Subsequent network expansion (See Appendix 1) will be based on the mobile systems to be developed and evaluated in this study. The network will operate over ISDN lines and all units will use the H.320 video standard keeping the system open to special consultation or conferences from outside the network as needed. Advantages of the proposed technology are first that it is well -tested, robust and readily available, with all the components except for the diagnostic peripherals being old technology. Second the units are multipurpose and can be used for telemedicine applications, group conferencing for administrative purposes, legal hearings, continuing medical education and other educational purposes. Also the initial site units are mobile enough to be wheeled from one room to the other if needed. Each network partner will be encouraged to utilize the equipment to its maximum potential. There are few available alternatives to connecting over ISDN for live action conferencing. Higher end alternatives include high bandwidth satellite links or T1 lines. Both provide high resolution images but are prohibitively expensive. Another alternative is an interactive World Wide Web site though again image transmission is usually too poor to replace the clinical interaction and additionally they have many more potential security and confidentially problems than a dedicated connection.

Technical support: Through experience, we have learned the importance of support in the field for users of telemedicine. Users must be relieved of the burden of troubleshooting unfamiliar technology, and be allowed to focus on the clinical and educational issues with which they are familiar and expert. Additionally, with the development of the mobile equipment model, we anticipate that a trained technician will be needed for delivery and set up on location. While mobile equipment will decrease hardware costs and increase access to the technology, it will greatly increase the need for field support. A full-time technician will be recruited. Given this new and rapidly developing technology, it is anticipated that the appropriate candidate will have a suitable technical background (e.g. in video technology), but will likely require further training in ISDN based videoconferencing in general and telemedicine in particular during the ramp-up phase of the project. The project's Senior Technology Director will manage the training and supervise the technician, who will be an employee of the Tufts-New England Medical Center

Educational Media Center. The Center has responsibility for the technical management and support of telemedicine and videoconferencing on the Tufts Health Sciences Campus. In addition to this full-time support funded through the study there will be the ongoing commercial service contract with the equipment vendors (e.g. ViewTech, PicturTel and AMD)

***Project Coordination*:** A telemedicine office will be established in the LSH to act as a central liaison point for the network. Staff will consist of the Project Director, Dr. D. McGrath MD, and a full-time secretary. The office will coordinate all clinical and medical educational activities on the network with the medical units in the prisons. Teleconferencing will be supplemented by email and fax to aid in scheduling and coordination of services. Clinics will be block scheduled via email or fax. Prison medical staff will forward all relevant information to the scheduled clinic physician (laboratory data, radiology results etc.) prior to the clinic thereby maximizing the use of the scheduled ISDN time. Similar to the routine clinic set up, the inmate will be brought into the exam room. There a physician will be waiting for him on the television ready to interview and examine him. The exam will be conducted with the already familiar tools of the physician, such as a stethoscope and ophthalmoscope though modified to work over the television with the help of the nurse or doctor present. If there is any change in therapeutic plan it can be relayed live to the supporting local health staff. If the patient needs to be seen initially at the hospital, for example for a broken bone or intestinal bleeding, follow-up visits can be performed in the same way. This has the benefit of providing more contact time between the physician and patient without incurring the cost and inconvenience of prisoner and physician transportation. This also will make a broader range of specialties easily accessible to the patient at the click of a button. A specific example of how the clinic may function is detailed in Appendix 7.

In addition the Telemedicine Office will liaise with network partners and outside agencies and community groups interested in utilizing the network facilities. The office will maintain the study World Wide Web site and organize the proposed annual conference focussing on network issues and new technology. Ongoing utilization review of the network will enable the study investigators to determine if further or upgraded equipment and personnel are required.

Applicant Qualifications

***Principle investigators*: Dr Joseph Cohen** is Medical Director of the LSH and has long established working relationships with all of the partners in the proposed network. He has negotiated contracts with the correctional authorities in both in the state and county systems for the specialist care and hospital care of inmates. He also works closely with NEMC because of the LSH's role as a teaching hospital of Tufts University Medical School (TUSM), in which he holds a faculty position. Dr. Cohen's project responsibilities will be senior leadership and management of ongoing negotiations between the network partners. Dr. Cohen will oversee the study analyses with Dr. McGrath and Dr. Lasch Ph.D.

Dr. Donnie McGrath is an assistant professor of Medicine of TUSM. He is an infectious disease physician with appointment in both NEMC and the LSH. He has considerable experience in telecommunications. He is Director of Internet Continuing Education projects for TUSM and is responsible for developing telemedicine services at the LSH. Dr. McGrath has considerable experience in providing specialist care to prisoners including active telemedicine clinics. He will

work as the Project Director responsible for day-to-day management and liaising with all partners and interested groups, both institutional and community based. He will have primary responsibility for implementing the study. Dr. McGrath has experience in implementing international informatics and telemedicine training programs as Coordinator of the NEMC-TUSM ITMI program, a four-year program funded by the Fogarty International Center of the National Institutes of Health. He also has experience in telemedicine research projects in developing countries.

***Technical Director*: Joseph Bakan**, MS will serve as Senior Technology Director for the project. He is Director of the Tufts-New England Medical Center Educational Media Center, and provides technical management and support for telemedicine and videoconferencing on the Tufts Health Sciences Campus. He has had extensive experience in telemedicine, videoconferencing, and technology management. He will train and direct the full-time technical officer for the project. IN addition he will help organize and teach in ongoing training sessions for network partners and community users. He will liaise with other technical members of the network, including staff from the Moakley Center for Technical Applications at Bridgewater State College (see below).

Co-investigators

Robert Marland is the Educational Officer of PCCF. He will be primarily responsible for liaising with the various agencies in an established PCCF Collaborative group (See Appendix 3). He will assist outside groups interested in learning about and using the network. He will also liaise with the different personnel in the network responsible for ongoing staff education and administration and facilitate non-medical sues of the network. He will also assist the research assistants in data collection regarding the utilization of the network for non-medical purposes.

Kathy Lasch is an assistant professor of Social and Behavioral Sciences with considerable experience in the assessment of medical technology and the evaluation of medical and technical innovations. She will serve as consultant during the study in training the research assistants, adapting the SF-36 surveys, and designing end user surveys for medical and non-medical users of the network.

Budget, Implementation Schedule and Timeline

The total budget for this project is $1,134,492. $371,285 is budgeted for personnel, $23,184 for travel, $344,999 for equipment, $6,000 for supplies, $20,140 for contracts, and $133,340 for other costs.

The implementation of this project calls for 24 months of work. The details of the various components are detailed in the appendices (Appendices 4-6). The timeline is outlined in Appendix 4.

Sustainability: The commitment to maintaining the network is already in place. The study has budgeted for a full-time technical support officer. The maintenance of ISDN lines and ISDN line utilization costs will be borne by the network partners out of operating budgets. Any demonstrated savings in operational costs will be used to defray the cost of the system. There is a commitment from the initial network partners to maintain the network from operating budgets

once the study period is complete and the benefits of the network have been demonstrated. In addition further grants will be applied for to study the management of specific chronic diseases in this population. Examples are to study interventions to prevent HIV transmission within prisons; to facilitate the scaling up and continuing evaluation of a growing network to include as many of the prisons in the state who express interest. Personnel involved in the project (nurses, case managers, non-medical staff) will be encouraged to develop further research protocols as unique observations arise during the development of the network and to apply for grants to enable further study.

Community Involvement

Partnerships: LSH will act as the hub site for the telemedical network. The LSH will be the primary referral hospital for the inmate patients where it provides a special security ward. The LSH currently staffs on-site clinics and will assume responsibility for the telemedicine clinics. The LSH will provide some salary support to the investigators. It expects to receive the majority of patient referrals, improve its use of physician time, reduce the costs of transporting physicians to the correctional facilities, provide ongoing education to the medical staff in the prisons, and in turn have increased access to continuing medical education resources from NEMC. PCCF and SBHOC will be hosting the pilot telemedicine clinics and provide the patients for those clinics. They expect to receive the benefits of improved patient care, increased patient and physician satisfaction, increased continuing medical education, and experience with state of the art technology and improved security for the inmate patients. NCCI Gardner and NCCF will be used as control sites for the intervention sites PCCF and SBHOC during the prospective phase of the study.

All facilities will expect to see cost savings due to decreased transportation and security costs, improved medical outcomes and security for the inmates, increased continuing medical education for the correctional facility health staff and increased continuing education for the security officers. TUSM-NEMC will provide part of the infrastructure support, some salary support to the investigators and provide tertiary care back up for patients. The benefits it expects to receive are academic publications and some patient referrals. Regular “Lessons Learned” meetings involving the key personnel at each site will enable sharing of information and resources in addition to introducing potential new members of the network to the existing team. All the parties have met and discussed the project on several occasions to establishing goals for the project. A Telemedicine Advisory Committee has been organized in PCCF to assist in the deployment of the telecommunications facility (See Appendix 3). In addition PCCF has for five years run a collaborative educational network involving many regional institutions (See Appendix 3). It is anticipated that similar advisory committees and collaboratives will be will be constituted at each new site prior to their joining the network.

We plan to conduct focus groups for the patients, health care providers, and non-medical network users as part of the pilot phase of the project to establish their needs and desires. From these focus groups we will be developing survey instruments to track health status, patient, health care provider and non-medical user satisfaction. The health status measures will be based on the SF-36, which will be adapted to local circumstances.

Support for end users: The end users in this project will be the patients at the correctional facility, the nurses and physicians at the correctional facility and the physicians at LSH and NEMC. In addition other community users will be invited to utilize the network for their own purposes. They will be supported by the study technical officer who will organize training sessions in each facility both in conjunction with commercial vendors, and with other study team members such as Dr. McGrath and Joseph Bakan. In addition the Joseph Moakley Center for Technological Applications at Bridgewater State College is a member of the PCCF Collaborative. This center is committed to developing both the medical non-medical uses of the proposed network through assisting in training and research.

As part of the pilot phase of the project the staff in PCCF and SBHOC will be trained in the use of the video, peripheral diagnostic equipment and email. Bell Atlantic, MCI or other telecom providers will provide technical support under commercial contracts with individual sites relating to ISDN lines. All suggestions to improve the system from the end users during the pilot phase will be incorporated as part of working out of the operational details of the system. Part of this will be elicited during the focus groups. Part of this will be a function of a commitment to support the end users through out the project. The focus groups will be composed of a random selection of volunteers from both the patients and the health care providers. The investigators will advise the remote site staff on how best to operate the telemedicine equipment for clinical interactions.

Privacy: All tapes or other information elicited during the focus groups will be sealed until transcribed. At transcription all individual identifying information will be removed. Only the primary investigator will examine this information. After the information has been transcribed all tapes will be erased. All patient medical records will be kept and used on site and not removed from the premises. Standard institutional procedures to protect written medical records will be enforced on site. Tapes will be made of the initial telemedicine clinics and transcribed as part of the medical record. The physician at LSH and nurse or other health care professional in the prison will fill out a standard telemedicine clinic interaction form. This will ensure an objective and reliable record of the clinics and will be the only records kept once clinicians and nurses are comfortable with the operational aspects of the clinics.
Confidentiality will be ensured during email and fax communications by using a standard encryption method approved by the Massachusetts Department of Public Health.

Reducing Disparities

Prisoners by their very nature have limited access to health care though they as wards of the public sector their care is usually guaranteed by law. Telemedical access should provide an opportunity to alleviate any disparities between the general population and the inmate population. In addition, access to continuing medical education and having access to clinical support from the above mentioned hospitals should help to alleviate the isolation that prison practitioners may experience as well as offer them equal opportunity for continuing medical education. This will help in the recruitment and retention of medical staff. Bridgewater State College is committed to developing distance learning programs to utilize the network. Through imaginative non-medical uses of the network such as this it is anticipated that some of the benefits of modern telecommunications will become available rural, island or small town community groups near the proposed network sites.

Information Dissemination

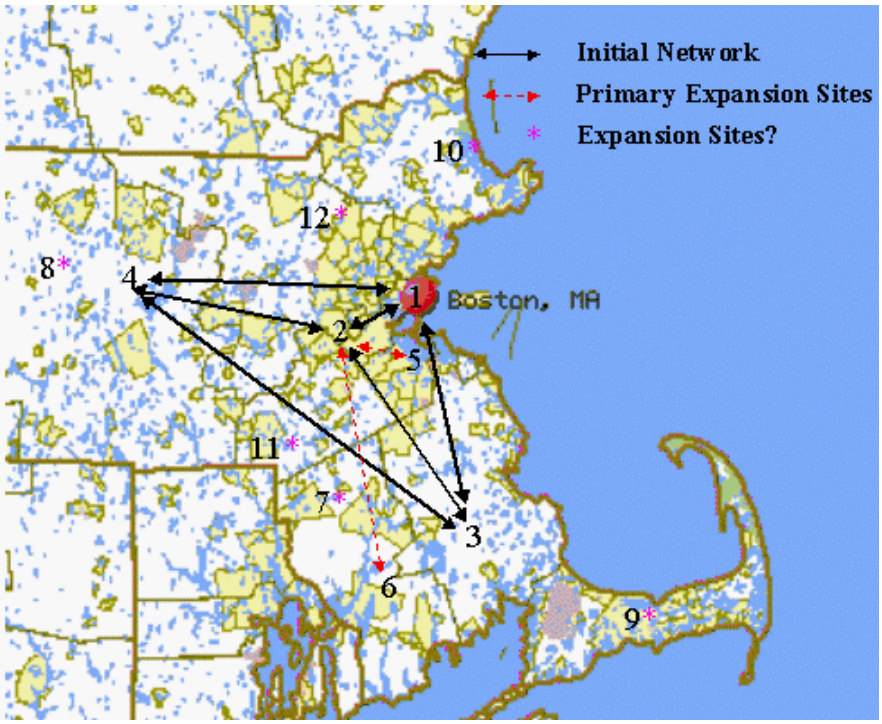
Information will be primarily disseminated in the form of abstracts and papers presented to the appropriate clinical (telemedical, subspecialty, and nursing conference's) and judicial and correctional societies. Regular meetings will be held involving the key personnel from each site to discuss any issues that arise during the course of the project and information forwarded to potential new members of the network.

Meetings will also be held with the Telemedicine Advisory Committees to facilitate prompt dissemination of information to interested parties in the outside community and other prisons. Information regarding the developing network will be available on the NEMC website and inquiries forwarded to the primary investigators. Regular progress reports will be submitted as desired to the TIIAP and the participating partners.

A Massachusetts State Correctional Telemedicine Network World Wide Web site will be developed by Dr. McGrath and housed on the Massachusetts Department of Public Health web site. This site will provide information about the technical and medical aspects of the network. In addition conference information will be available ion the site. Visitors will be able to submit inquiries online via the site.

Appendix 1

Map of Correctional facilities and proposed initial network



Sites

1: New England Medical Center
2: Lemuel Shattuck Hospital
3: Plymouth County House of Corrections
4: Souza Baranowsky Correctional Center
5: Suffolk County House of Corrections
6: Bridgewater Complex
7: Bristol County House of Corrections
8: Gardner MCI
9: Barnstable County House of Corrections
10: Essex County House of Corrections
11: Norfolk County House of Corrections
12: Middlesex House of Corrections

Appendix 2

Proposed Initial Network Sites
Lemuel Shattuck Hospital
The hospital is located in Jamaica Plain in the city of Boston. The LSH is the primary hospital of the Massachusetts Department of Public Health. It is also a major teaching hospital of the Tufts University School of Medicine (TUSM) and runs an active residency program training young doctors. It has a long history of serving underserved communities in the city of Boston. For over twenty years the hospital has provided services to the correctional facilities both as the major referral site for inpatient care but also through a large outpatient facility. The hospital has in recent years developed and extensive program of on-site specialty clinics to serve the inmates of the state and county facilities in the prisons. The inmates and correctional authorities have uniformly greeted this system with enthusiasm. The LSH is keen to develop a telemedicine network to serve the undeserved prison community, both inmates and staff alike. Similarly the LSH has a long history of being involved in community education programs, particularly in the area of AIDSA awareness and mental health. The LSH sees the proposed telemedicine network as a logical extension of its services to undeserved communities in other parts of the state, both in terms of increased and cost-effective health care, but also in terms of enabling other underserved community groups to learn about and use a modern telecommunications network for there own purposes.

New England Medical Center is the primary teaching hospital of TUSM. It is located in downtown Boston. It has a long tradition of telemedicine applications and has carried out extensive overseas consultation in recent years. NEMC is keen to develop as a partner of the proposed network as a route to proving advanced medical care and medical education to underserved correctional inmates and staff.

Plymouth County Correctional facility is a modern correctional institution with a reputation for forward thinking correctional management. It is located about 80 miles from Boston near Cape Cod in southeastern Massachusetts. PCCF is known throughout the state for its educational programs and progressive health care system run in conjunction with the LSH. It is also very active through its Collaborative Education Network with several other medical, correctional and educational institutions in an effort to develop cross-agency programs and sharing of resources. PVCF sees the porpos4ed network as an excellent opportunity to build on its existing collaborative network of institutions to introduce modern telecommunications in the service of a wide variety of community and institutional programs.

Sousa-Baranousky House of Corrections is the newest prison in Massachusetts having opened in the fall of 1998. It represents a state of the art correctional facility with advanced computerized security and administrative services. SBHOC views the proposed network as an opportunity to continue to introduce new technology in the service of its inmates and staff. The telemedicine network will provide increased security and increased educational and ongoing training opportunities for both the inmates and staff.

Expansion Sites
The proposed expansion sites for months 12-24 of the study are Suffolk County Correctional facility and the Bridgewater Complex of correctional facilities. SCCF has been chosen because it represents an urban site with opportunities to involve urban community groups in the network once it is established. The Bridgewater complex has been chosen as it consists of 6 separate facilities in close approximation. ISDN lines will be introduce into two sites, the Bridgewater State Hospital and the SouthEastern Correctional facility. The mobile unit will be brought to one facility for a morning clinic and then moved over to the other for afternoon clinics. This enables a much greater impact to be achieved in one day than would be possible with far-flung sites.

Appendix 3

Advisory Committee

The Sheriff of Plymouth County has constituted an Advisory Committee on Telemedicine to help in a rationale and acceptable deployment of the new technology. This committee includes representatives of local hospitals, the local community, the state department of corrections, the PCCF director, the sheriff and representatives from other county departments of corrections including representatives from Martha's Vineyard island jail. The aim is to disseminate through these people to interested parties in the community at large and within the corrections system throughout the state information learned from the deployment of the new technology, and to enable the local community and medical institutions to learn about and utilized the infrastructure once deployed.
It is anticipated that the sheriffs or directors of other facilities will constitute similar committees during the run up period to their joining the network. In this way interested parties from the wider community will be able from the outset to participate in the deployment of the new technology and hence lead to its widest possible application and utilization. It is envisaged that the local communities can utilize the equipment for purposes such as evening classes, ongoing professional training etc.

Collaborative Education Network
This collaborative has functioned for more than five years. It involves several southeast area hospitals, area high schools, universities and other educational institutions, and correctional facilities. In addition to the Joseph Moakley Center for Technological Applications at the Bridgewater Sate University has agreed to lend its support to the programs developed by the collaborative in the area of telecommunications technology training utilizing the proposed network. This collaborative will act as a model for cross agency and cross-institutional cooperation on a telecommunications network.

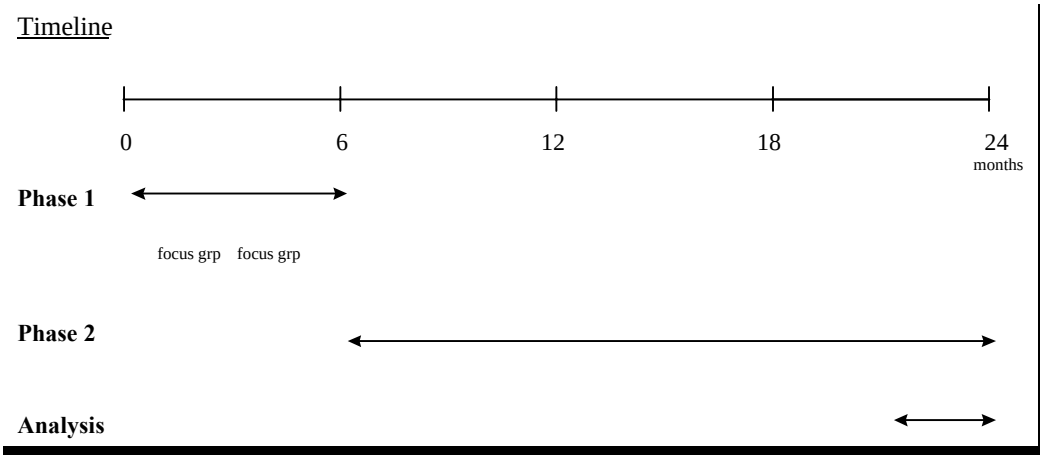
Mobile Equipment Prototype

PictureTel SwiftSite II
Standalone display monitor
Portable cart w/shelf
NT1 network termination devices (3@$290.00)
Powerstrips/surge protectors (2@$23.00)
Installation and service contract for above items
AMD-2500 General Exam Camera
AMD-300S Camera and Illuminator
AMD-2015 ENT Scope Attachment
AMD-2020 Opthalmoscope Attachment
AMD-2030 Dermascope Attachment
AMD-3400S Digital Stethoscope
Canon RE-350 Video Visualizer
Misc. Cables, video switches, etc. for telemedicine integration
Cases for Transport

Appendix 4

Timelines

Primary and Secondary Outcomes Timeline



Tertiary Outcomes Timeline

Phase 1 Network Analysis: months 0-3
Personnel Training: months 3-6

Phase 2 Pilot Mobile Unit: comparison with High-end Venue 2000 Telemedicine Equipment at PCCF: months 6-12

Phase 3 Data Analysis and Network Expansion: months 12-24

Appendix 5

Evaluation Plan: Primary Outcomes in the Area of Health

Purpose: To examine the cost-effectiveness of health care clinics using telemedicine technology in a prison population.

Hypotheses: 1) Telemedicine will increase health care utilization, as measured by the absolute number of patient-physician interactions, physician-hours available to the patients and use the of outpatient clinical services 2) Telemedicine will reduce a) total hospital admissions b) hospital re-admissions for the same illness c) in-hospital length of stay and e) decrease transportation costs 3) Patient and health care provider satisfaction with the provision of healthcare will improve.

Study design: Phase 1) Pilot study. Phase 2) Prospective cohort study (see Appendix: Timeline)

Study groups: *Intervention group:* prison population of the PCCF (~1300 inmates), and SBHOC (~1400 inmates). *Control groups* prison population of NCCF (~1300 inmates), prison NCCI Gardner (~1200). Because equity is crucial in the prison population the intervention groups and the control groups must be at separate institutions.

Methods:
Phase 1: Duration: 6 months.
This phase will establish first the feasibility of measuring satisfaction in the patients and health care providers and measuring health outcomes in the patients. Second, the baseline characteristics of the study populations i.e. demographics and baseline health care utilization will be determined. Thirdly, the costs involved in providing health care to this population will be determined. These include the cost of hospitalization at the LSH (cost /bed-day), the cost of transporting of prisoners to hospital and physicians to correctional facilities, physician time, and telecommunication time and equipment.

Measuring Health Status: In phase 1, we will test the feasibility of administering a short survey form on general health status and determine if any additional questions specific to this population need to be added. We will use as a model the standard health outcome survey tool, the SF-36. The form is to be applied at each telemedicine encounter, as well as, at transfers to hospital.

Measuring Satisfaction and Quality of Life: In phase 1, we will develop instruments to measure patient and physician satisfaction based on the recommendations of the Institute of Medicine [1] and ORHP[2] using focus groups of these individuals. The questions derived from the Institute of Medicine and the Office of Rural Health Policy recommendations will be modified, when necessary, to reflect the specific circumstances of this population.

Validating Survey instruments: At the end of phase 1, the validity and reliability of any new survey instruments developed will be measured. Reliability, the extent to which a test is free of random errors, will be measured by checking for homogeneity of content and internal consistency among test items, using Cronbach's alpha. We will also test for reproducibility by comparing test-retest scores. Each participant will be required to repeat the survey on two separate occasions during the course of the study. Validity, the degree to which the test measures what it is intended to measure, will be evaluated by assessing it against external measures such as physician assessed clinical severity and health care utilization.

The intervention: In phase 1, we will determine if a telemedicine supplemented outpatient clinic lasting approximately 3 hours or equal to a standard ambulatory clinic is a feasible and acceptable intervention. It will be added to the regularly staffed clinics. Access to telemedicine will be scheduled as new patient visits or scheduled follow-up visits. We will initially concentrate on the high volume clinics but telemedicine will be available to all inmates at request. Facilities will be made available to arrange for consultations for any individual who needs attention via telemedicine outside the regularly scheduled clinic time over the course of the study.

Quantitation / Utilization: both the LSH and PCCF will maintain a telemedicine logbook to be filled out by clinic staff at the end of each encounter. This will note a variety of descriptive data points enabling a complete record of utilization.

Phase 2: Duration: 18 – 24 months, Prospective cohort trial

Study groups: *Intervention group:* prison population of the PCCF (~1300 inmates), MCCF (~2400 inmates), and SBHOC (~1400 inmates). *Control group*: prison population of NCCI Gardner (~1200 inmates), NCCF (~1300 inmates), and SCCF (~1200 inmates).

Measuring Health Status: In Phase 2, we will administer the short-form survey before and after each intervention or transfer to hospital in the intervention group and at 1 and 6 months. The control group will only be surveyed at transfer to hospital and during the current standard clinic. We will either use the standard version of the SF-36, which reflects health status over the previous 4 weeks and which has known reliability or a questionnaire modified according to needs identified in phase 1.

Measuring Satisfaction and Quality of Life: In phase 2, we use instruments developed in phase 1 to measure patient and physician satisfaction. They will be applied at the same time as the health status measures.

The intervention: Outpatient clinics using telemedicine and elective consultations using

telemedicine. This will be applied to the study institution's patients. The group exposed to telemedicine access will then be compared to their controls at the sister institution.

Data collection: Data will be gathered in the form of an intake survey and an exit survey at each telemedicine interaction, outpatient clinic visit and hospitalization and from the medical record if available. The *intake survey* will cover the chief complaint/reason for visit, self-reported comorbidities and the SF-36 [28] as developed in phase 1. The local health care provider or research assistant at the prison will provide help to fill out the forms for patients with limited literacy. The clinician at this time will be asked to fill out the log asking the reason for using telemedicine, the patients severity of illness and reason for visit and to describe it's utilization as per the Office of Rural Health Policy and the Institute of Medicine's recommendations [1]. We anticipate the survey will take 5-10 minutes to complete and can be done in the waiting room.

The *exit interview:* immediately after their encounter, patients and physicians will be asked to complete brief questionnaire to assess their satisfaction with the interaction and identify any operational problems with the encounter [1.]

Follow up interviews: At 1 month and 6 month's after the initial telemedicine encounter, patients and physicians will be contacted and surveyed again to determine the final clinical outcomes as well as satisfaction with the process.

Costs: The mean Medicaid reimbursement for each diagnosis and inpatient and outpatient costs at LSH, PCCF and MCCF will be used as proxies for the true costs. Telecommunication costs, e.g. ISDN lines, will be derived from the local telecom provider and will be paid for by the Department of Corrections. LSH and PCCF already own the requisite telemedicine equipment. The fixed costs of equipment will be amortized over 3 years. Transportation costs for the prisoner patients will be calculated as per McCue.[15]

Consent: When patients are first eligible to enter the study, i.e., their first encounter with telemedicine or first transfer to LSH during the period of the study, all risks and benefits will be explained to them both orally and in writing by the attending physician or nurse who will be acting as the representative of the principle investigators by prior agreement.

Bias: Because inmates are a not a fully autonomous population[30] great care must be taken to avoid any inadvertent or subtextual coercion by on site staff due to enthusiasm for the project. This would most likely tend to bias towards increased utilization. To prevent this all telemedicine access will be only supplemental to current standard care, thereby, making it as much as an autonomous choice as possible for the patient. In the consent, patients will be made explicitly aware that they can at any time refuse access via telemedicine in favor of standard access.

Data entry and analysis: Data will be systematically entered into computerized files using standard database software, ACCESS™. We will use a double-entry format to prevent any data entry errors.

Preliminary sample size analysis: In our study we are comparing differences in the proportions of

patients who are utilizing the resources of LSH and their local penitentiary, relative rates of morbidities and mortality. We will use a two-tailed statistical test to detect any increase or decrease in utilization rates. A recent study[14] suggested a 69% decrease in the number of ambulatory visits to the local hospital though this was not properly controlled. To detect a difference in the mean utilization or health outcome using a much more conservative estimate of 20%, using a two tailed alpha = .05 and a power of 80%, we would have to have 98 patients be seen in both the intervention and control groups for a total of approximately 200 patients. Assuming 10 % loss to follow up over the study period the sample size would need to be 108 patients in each group. To detect a 10% change in outcome would require 392 patients in each group, while a 40% effect would require 25 patients. It is important to note that any survey measures of health status are as yet exploratory in the prison population. Therefore, any expected effect size and standard deviation of the scores are currently hypothetical. Determining the sample size needed to detect any change in health status by these measures must wait until these features can be determined from phase 1. When this has been established the sample size will be calculated using Cohen's[29] methodology. Our preliminary review of the number of ambulatory patients seen from the target institutions at LSH, indicates that well over 400 patients would be available to enter the study within the first 12 months.

Analysis: We will use descriptive univariate statistical tests and pairwise comparisons to explore the differences between intervention and control groups, using chi-square tests, t-tests and simple regression techniques. Chi-square and t-test will be used for testing association between categorical variables and differences in the means of continuous variables, respectively. Regression analysis will be used to test hypotheses that one variable is dependent on another. Subset analyses will be performed when numbers in specific diagnoses are large enough to analyze with statistical relevance.

Software: Data will be analyzed using, JMP statistical software produced by the SAS corporation.

Documentation plan: Focus group data will be stored as transcriptions of the discussions. Individual specific information will be removed. Outcome information from the satisfaction and health surveys as well as other outcome information from the hospitals will be gathered and entered into an SQL database.

Appendix 6

Evaluation Plan: **Secondary Outcomes in the areas of Public Safety and Education**
Public safety: The proposed project has a secondary application in the area of public safety insofar as the network will enable the correctional facilities to share resources and information on the deployment of the new technology and its application in improving security, cutting costs and potential uses for court hearings. This information will be disseminated not only to the correctional partners in the network, but also to other interested institutions with whom the pilot institution, PCCF, has existing collaborative relationships (See Appendix 3). Further the information will be available to any other institution which expresses interest in joining the network. In this way public safety officials will have exemplary data available to review prior to deploying their own telecommunications equipment.
Education: The proposed project has secondary educational applications. It is anticipated that the networked correctional facilities will be able to provide more ongoing staff training and education at a lesser cost than the control sites. The facilities will be provided with teleconferenced training from the LSH in addition to providing training to each other.

Purpose: to examine the effectiveness of nonmedical uses of a telecommunications network within the correctional system.

Hypotheses: 1) The network will increase ongoing staff training as measured by the absolute number of hours per staff-member training. 2) the network will decrease the cost of training in terms of cost per man-hour training. 3) staff satisfaction with training will increase

Study design: Phase 1) Pilot phase 2) Prospective phase

Methods:
Phase 1: Duration 6 months
This phase will enable the pilot institution to begin to adapt their training program to the new technology. Various staff groups (correctional officers, medical staff, administrators) will utilize the equipment and operational procedures will be developed. Quantitative data will be collected regarding utilization through a telecommunications site logbook. Baseline utilization will be established at this time, i.e. average number of training hours/staff member and average cost/hour of training over the previous year. Qualitative data will be collected in the form of a user intake survey to be designed and validated during the period of the pilot. A second survey will be applied at the end of the pilot phase to measure staff satisfaction at that point.

Phase 2: A prospective study will evaluate the effectiveness of the network over an 12 month period in answering the hypotheses outlined above. This study will involve all 3 proposed correctional sites. The quantitative data will be collected at the 3 correctional sites via the logbook and compared to internal control quantitative data collected from each site for the period one year prior to the deployment of the network. Costs will be adjusted for inflation.
Surveys designed and validated during the pilot phase at PCCF will be used to evaluate user satisfaction at each site their initial use and 12 months later.

Evaluation Plan: (Tertiary Aims) Evaluation of a Mobile, Low-Cost High-bandwidth Telemedical Unit

The proposed project will evaluate a mobile telemedicine unit to try and establish a model for a low-cost high-bandwidth telemedicine network.

Purpose: to examine the effectiveness of low-cost, high-bandwidth telemedicine unit

Hypotheses: 1) The unit will provide as effective and satisfactory telemedicine services compared to a rollabout system as measured by staff-member and inmate/patient satisfaction. 2) The unit will decrease the costs of providing services compared to a rollabout system

Study design: Phase 1) Pilot phase and 2) Prospective phase

Methods:
Phase 1: Duration 6 months
The pilot phase of the project will examine the feasibility of the mobile unit model. AS demonstration unit will be configured (see Appendix 3) over the first 3 months of this phase. The quality of video, audio, transmitted images, and data for clinical applications will be evaluated through comparisons, in actual case consultations, to a system based a rollabout codec. These comparisons will take place in PCCF over the period months 3-6. The survey instruments developed for the primary outcomes evaluation will be used to evaluate and compare user satisfaction between the mobile and high-end rollabout units.
Additionally during this phase a network analysis will be conducted of potential sites for inclusion in the network. This analysis will include gathering data on local ISDN provisions, including CO switch type, local construction and installation issues, etc.
Quantitative data will be collected regarding utilization through a telecommunications site logbook.

Phase 2: based on the analysis from the first phase, and assuming success in the quality trials of the technology, a plan for widespread deployment, including procedures to accommodate the individual ISDN configurations, will be developed. This network expansion will occur over the subsequent period of the study (month 12-24). Survey instruments for utilization and user satisfaction will be applied during the network expansion to continually evaluate the performance of the network and identify problems as they arise. Quantitative data will be collected as in other parts of the study.

Appendix 7

Clinical Scenario

A patient arrives at the infirmary at PCCF complaining of malaise, diffuse lymphadenopathy and mild shortness of breath. He has risk factors for HIV disease and has been tested for this on the advice of the prison physician but the results are not yet available. The nurse accompanies the patient to the telemedicine suite where the infectious disease physician I waiting on-line. The physician then carries out an interview with the patient establishing all pertinent history of the illness. The patient is then examined via the telemedicine set-up. With the aid of the nurse in the room, his eye grounds are looked at via the tele-opthalmoscope, as are the insides of his mouth and ears with a tele-otoscope. His hear and lungs are listened to via the tele-stethoscope. The physician then discusses a diagnostic plan with the nurse and patient and investigative studies are ordered and performed locally. He also orders that the patient be started on antibiotics for pneumocystis pneumonia having explained his suspicions to and discussed the side effects of the treatment with the patient. Results are emailed back to the physician the next day. The patients chest x-ray is clear but his sputum sample is positive for *pneumocystis carinii*. The patient s T-cells are low and his HIV test is positive. A follow-up telemedicine visit of arranged by email. The patient is lead into the room by the nurse and the physicians counsel him on the improved prognosis for HIV and answers any questions the patient has. The patient completes a course of therapy for his pneumonia and during a follow-up telemedicine clinic a therapeutic plan is agreed upon. A viral load is sent prior to starting anti-HIV therapy. The patient complains of diarrhea during a follow-up telemedicine clinic one week after starting therapy. The physician explains that this is common but should remit soon. The patient agrees to try some symptomatic relief and perseveres after the physician explains the risks of being noncompliant with anti-HIV medications. The patient is followed closely via telemedicine for the next few months and responds well to his therapy.

In this scenario it can be seen how the telemedical clinic and electronic follow-up facilitated a prompt intervention which prevented the development of a potential fatal illness in this patient and also a transfer to a hospital for a costly evaluation and treatment. If the disease had progressed further. Further it outlines how close follow-up via telemedicine enabled the physician to counsel the patient and get him through the difficult early phase of the anti-HIV therapy when side effects leading to noncompliance are a serious problem.

Bibliography

1) Telemedicine, A Guide to Assessing Telecommunications in Health Care, Institute of Medicine, Committee on Evaluating Clinical Applications of Telemedicine, National Academy Press, Washington, DC 1996
2) Exploratory Evaluation of Rural Applications of Telemedicine, Final Report - February 1, 1997. Office of Rural Health Policy, Health Resources and Services Administration, US Dept. of Health and Human Services
3) Sanders JH, Bashshur R. Proposal to the Health Care Financing Administration: The Effects of Telemedicine on Accessibility, Quality and Cost of Health Care in Rural Areas. Submitted by the University of Michigan and the Medical College of Georgia, March 18, 1994
4) Harrison R, Clayton W, Wallace P. Can Telemedicine be used to improve communication between primary and secondary care? BMJ. 313(7069):1377-80, Nov. 1996
5) Veitch PC. Anticipated response to three common injuries by rural and remote residents. Social Science and Medicine 41(5):739-45, 1995 Sept.
6) Appleby C. Telemedicine. A Prison Plugs in. Hospitals and Health Networks 69(21):56, 1995 Nov.
7) Perednia DA. Telemedicine System evaluation and a collaborative model for multi-centered research. Journal of Medical Systems. 19(3):287-94, 1995 Jun
8) Tangalos EG. Clinical Trials to Validate Telemedicine. Journal of Medical Systems 19(3):281-5, 1995 Jun
9) Bashshur RL. Telemedicine effects: cost, quality and access [review]. Journal of Medical Systems. 19(2);81-91, 1995 Apr.
10) Haughom JL, Gibson LJ. Improving the cost, quality, and access to health care in community hospitals through the use of reorganized integrated delivery systems and implementation of sophisticated clinical information systems: an organizational experience. Medinfo. 8 Pt 2:1558-61, 1995
11) London JW Morton DE Marinucci D et al. Cost effective Internet Access and videoconferencing for a community cancer network. Proceedings - the Annual Symposium on Computer Applications in Medical Care p 781-4, 1995
12) Allen A Hayes J. Patient satisfaction with telemedicine (letter], American Journal of Public Health 84(10):1693, 1994
13) Hartman JT et al. Using Telecommunications to Improve Rural Health Care: the Texas Tech MEDNET Demonstration Project. Lubbock: Texas Tech University Health Services center, 1992
14) The Case of Powhatan Correctional Center/Virginia Department of Correction and Virginia Commonwealth University /Medical College of Virginia. Telemed Jour Vol. 3.no 1 1997 p 11-17
15) Williams ME, Remmes WD, Thompson BG, Nine reasons why healthcare delivery using advanced communications technology should be reimbursed. Journal of American Geriatrics Society. 44(12):1472-5, 1996 Dec.
16) Smits HL, Baum A. Health Care Financing Administration (HCFA) and reimbursement in Telemedicine. Journal of Medical Systems. 19(2):139-42, 1995 Apr.
17) Perednia DA, Allen A. Telemedicine Technology and Clinical Applications. Journal of the American Medical Association 273(6):483-487, 1995

18) Lipson L, Henderson T. State Initiatives to Promote Telemedicine. Washington, DC: Intergovernmental Health Policy Project, 1995
19) Grigsby J. Current Status of Domestic Telemedicine. Journal of Medical Systems 19(l):19-27,1995
20) Sanders TH, Bashshur R. Proposal to the Health Care Financing Administration: The Effects of Telernedicine on Accessibility, Quality and Cost of Health Care in Rural Areas. Submitted by the University of Michigan and the Medical College of Georgia, March 18, 1994
21) Masys DR. Telehealth: the need for evaluation [editorial], JAMIA. 4(l):69-70, 1997
22) Kottke TE, Little Finger L, Trapp MA et al. Telernedicine: an application in search of users. Mayo Clinic Proceedings 71(4):420-1, 1996 Apr.
23) McLaren P, Ball CJ. Telemedicine: Lessons remain unheeded. BMJ. 310 (6991): 13901, 1995 May
24) Perednia DA. Telemedicine System evaluation and a collaborative model for multi-centered research. Journal of Medical Systems. 19(3): 287-94, 1995 Jun
25) Tangalos EG. Clinical Trials to Validate Telemedicine Journal of Medical Systems 19(3): 281-5, 1995 Jun
26) Lemping DL. Measuring Quality of Life in an HIV Survey: Validation of SF-36 Short Term Health Survey, In IXth International Conference on AIDS, Berlin, 1993
27) Wilson IB, Cleary PD. Clinical Predictors of Declines in Physical Functioning in Persons with AIDS: Results of a Longitudinal Study. J of Acq Imm Def Syn and Human Vir *(publication pending).*
28) Christensen LB. Experimental Methodology, Fourth Ed. Texas A&M, Allyn and Bacon, Inc, 1988
29) Cohen J Statistical power analysis for the behavioral sciences. New York, Academic Press 1977
30) Beauchamp TL, Childress JF. Principles of Biomedical Ethics, Second Edition. Oxford University Press, NY 1983
31) Joint Working Group Telemedicine. Telemedicine Report to Congress. January 31, 1997
32) McLaren P, Ball CJ. Telemedicine: lessons remain unheeded. BMJ 310:1390-1, 1995 May 27
33) Grigsby J. oral Presentation at the "Paying for Telehealth Workshop", February 2, 1998, Denver, CO.
34) Department of Justice. Inspection of Inmate health Care Costs in the Bureau of Prisons. November 1996
35) McDonald DC. Managing Prison Health Care Costs. National Institute of Justice Issues and Practices, National Institute of Justice, May 1995.
36) DeMaria A, Gallagher K, Werner B, Gagnon T, Epstein A, and Hall T. HIV/AIDS in Prisoners in Massachusetts. Nat Conf Hum Retroviruses Relat Infect (2nd), 113, January 1995.
37) Flanigan TP, Bubbly G, Hoy J, Jesdale B, Lee S, DeCantis M. Care of HIV Infection and progression among prison inmates. Int Conf AIDS, 9(l):516, 1993 June.
38) Palella F, et al: Declining morbidity and mortality in an ambulatory HIV-infected population. Abstract 1-17, 37th ICAAC, Toronto, Canada, September 1997.
39) O'Donovan C, Angello JT, Eng RHK. The impact of protease inhibitors on HIV infected' patients. Abstract 1- 177, 37th ICAAC

40) Bermudes RA, Toerner JG, Mathews WC, Barber RE. The effect of initiating protease inhibitors on hospitalization rates and quality of life in HIV patients. Abstract 1- 182, 37th ICAAC
41) Hogg RS, et al: Improved survival among HIV infected individuals: The potential impact of newer antiretroviral therapy strategies. Abstract 1-197, 37th ICAAC
42) Turner BJ, McKee L, Fanning T, Markson LE. AIDS specialist versus generalist ambulatory care for advanced HIV infection and impact on hospital use. Medical Care. 32((: 902-16, September 1996
43) Sexton DJ, et al., Primary care of Patients Infected with Human Immunodeficiency Virus. Clinical Infectious Diseases 26(2): 275-77, Feb. 1998
44) Ifudu 0, Dawood M, Homel P, Friedman EA. Excess morbidity in patients starting uremia therapy without prior care by a nephrologist. Amer J Kid Diseases. 28(6): 841-5, 1996 Dec
45) Storms B, Olden L, Nathan R, Bodman S. Effect of allergy specialist care on the quality of life in patients with asthma. Annals of Allergy, Asthma & Immunology. 75(6): 491-4, 1995 Dec
46) Baurner JH, Hunt LP, Shield JP. Audit of diabetes by caseload. Archives of Disease in Childhood. 77(2): 102-7, 1997 Aug
47) Huggins J. Telecommunications and Education. Presentation at "Paying for Telehealth Workshop, February 2, 1998, Denver, CO
48) Telemedicine and Telehealth Networks. Feature Article, February 1998