

TIIAP FY 1999
Project Narrative

North Mississippi Health Services, Inc.

Grant # 28-60-99030
Health
Tupelo, Mississippi

Application of Telemedicine to Home-Managed Congestive Heart Failure Patients in Rural Mississippi

EXECUTIVE SUMMARY

This project is intended for the **health** application area.

Goals:

1. Improve the home-based management of our rural region's congestive heart failure (CHF) patients.
2. Enhance the quality of CHF patients' lives; possibly prolong their lives; and make the end of their lives more comfortable.

Outcomes and Impact:

1. Decrease emergency room visits and hospitalizations.
2. Reduce CHF patients' sense of isolation.
3. Increase the home health care nurses' efficiency.

Evaluation and Sites:

We will identify 23 patients from our CHF home care population and place a telemedicine monitor in their homes. They will transmit information to a central unit. We will monitor patients daily, assess problems, and provide early interventions. We will evaluate the following parameters:

1. patients' self perception;
2. hospitalization and emergency room visits, and their costs;
3. nursing visits and travel time.

* we will compare these outcomes to CHF patients without telemedicine

Technology

We will use 2-way interactive video and personal telemedicine module containing a camera, monitor speakerphone, blood pressure and pulse meter and a telephonic stethoscope. Information will be fed to the central unit and a computer program will flag patients who are outside of preset clinical parameters.

Communities

This project will serve home-bound patients who are debilitated by CHF. These patients are sick and often dying. Our rural CHF patients have compounded problems: geographically isolated and they live in Mississippi (a poor, medically underserved state with the highest rate of heart disease and death).

Partnership

North Mississippi Medical Center's Biomed Department is partnering with the Home Health Agency, Clinical Outcomes Department, Internal Medicine Associates, and Heart Institute.

Application of Telemedicine to Home-Managed Congestive Heart Failure Patients in Rural Mississippi

Project Narrative

The problem of CHF in rural communities

Patients with congestive heart failure (CHF) are unable to generate the cardiac output necessary to meet their body's demands. CHF patients experience shortness of breath, rales, edema, fatigue and poor exercise tolerance. The lifestyles of CHF patients are often restricted by these symptoms many of them are home bound. These patients are usually elderly and often live alone or with an aging caregiver. Even with optimal management, the progressive symptoms of CHF mandates the patient's isolation. This disease has considerable emotional impact on both patients and their families. It causes anxiety whenever the patient's symptoms worsen and on-going depression because of the patient's isolation and morbidity.

Life with CHF is a dismal picture. The patients are sick, isolated, depressed and then they die (the mortality rate of CHF is high, with more than 50% of patients dying within 5 years of diagnosis). [1] With close medical management, most CHF patients can be managed in their homes, however, it is not uncommon for these patients to get "out-of-control" and to cycle between home, hospital and emergency room. All of these problems are made worse for our community's patients for 4 reasons: Mississippi is a rural state, which means that patients are already geographically isolated; Mississippi is a poor state, with the lowest per capita income in the U.S., as well as low education levels; Mississippi is a medically underserved state, with 141.8 physicians per 100,000 residents (compared to national ratios of 228.4 physicians per 100,000 residents), which means our patients have poor access to on-going medical management; and Mississippi is ranked 50th in the nation for inhabitants with heart disease and for deaths due to it. [2] In summary, our patients are more likely to develop and die from CHF, they are already geographically isolated, and they have poor access to primary care which makes home management more difficult and hospitalization more common. Our integrated health system, North Mississippi Health Services (NMHS), is doing its best to rectify these circumstances. NMHS serves 600,000 people in 22 counties of North Mississippi and we provide acute, subacute, long-term and home care management of CHF patients.

Enhanced and expanded home management with telemedicine technology

Our project's goal is to enhance and improve the management of our region's CHF patients in their homes. By placing a telemedicine monitor in our case-managed CHF patient's homes, we will provide better management to more patients than is currently possible in this poor, rural region. Every day patients will weigh themselves and take their blood pressure and pulse, which will then be transmitted to the home care CHF case managers (CM). The case manager will be able to detect changes early and provide immediate interventions. The CHF CM will be able to listen to the patients' heart and lung sounds as well as review vital signs and can monitor the patients' response to these interventions. The CHF CM will be able to provide home-bound patients with close (sometimes several times a day) monitoring that would not be routinely possible outside of an institutional setting. The telemonitors can also be used for specialized CHF teaching (e.g., by dieticians and pharmacists) as well as to link patients to each other for mutual support.

Benefits of enhanced and expanded home management with telemedicine technology

With telemedicine technology, the CHF CM will not only be able to screen and respond to objective vital information on the CHF patients, she will be able to "see" more patients each day and can expand the home health care's CHF patient base. We expect that this early and enhanced monitoring will result in decreased emergency room visits and hospitalizations. We also believe that this ready face-to-face access to a primary health care provider and other

patients will reduce the patient's sense of isolation as well as minimize the patient's and family's anxiety associated with this disease. We feel that we can improve the CHF patients' knowledge of their disease, enhance the quality of their lives (by increasing their independence and social interaction), possibly prolong their lives, and make the end of their lives more comfortable.

Evaluation

What is this project's impact on CHF patients and the community's health system?

We plan to evaluate the use of telemedicine in CHF patients' homes so that we can answer the following questions: How does it effect the patients' perceptions of well being?; Does it decrease the frequency of patients' hospital admissions and emergency room visits?; How do the patients with telemedicine monitors compare to the patients who do not have them?; What impact does telemedicine have on the way the CHF case managers and home health nurses practice?.

Measuring the impact: data collection and analysis

We will examine technical and clinical process and measure 3 types of outcomes: humanistic, clinical and economic. Two hundred CHF patients are currently being managed by our home health care (HHC) CHF nurses. With this grant we will be able to provide telemedicine to just a portion of these patients. In addition, our acute care CHF CM follows 30-50 CHF patients, who are not managed by HHC CHF nurses. This nurse routinely calls these patients for at least 3 months after discharge from the hospital. In order to assess the impact of telemedicine, we plan to concurrently evaluate selected outcomes in these 3 populations of CHF patients: HHC with telemedicine; HHC without telemedicine; non-HHC and without telemedicine.

Process Indicators

Technical Process Indicators: number of units in service; repair records; new phone lines; educational conference calls

- collected by the technical coordinator, Joyce Duquette, Biomedical Customer Service Representative

Clinical Process Indicators: number of CHF patients monitored by home health care (i.e. are more patients referred to the CHF home care program because of telemonitoring capabilities); number of patients who required interventions because they were outside of their set parameters; number of "real" and "tele"visits per week; number of home care visits per telemedicine and non-telemedicine CHF patient; number of miles traveled per week for telemedicine and non-telemedicine CHF patients; number of "support" contacts telemedicine CHF patients make with each other.

- collected by the clinical project coordinator: Melody Poole, RN, Home Care Cardiac Clinician

Outcomes

Humanistic Outcomes: We will assess all telemedicine patients' satisfaction with the telemedicine service through a patient satisfaction survey. [3] For the patients who have been receiving traditional CHF home management and then begin with telemedicine, we will specifically test the impact of the telemedicine service. We will assess these patients' perceptions of their health status by asking them to complete a well established self assessment tool [4] prior to the implementation of telemedicine and then again at 3 and 6 months after implementation.

- collected by the 40 CHF-certified home health care nurses who will be caring for these patients

Clinical Outcomes: For all 3 populations we will collect the following information regarding CHF related hospitalization or emergency room visits (non-CHF-related events will be noted but not included in the evaluation analysis) - number of hospitalizations; rehospitalization within 30 days (Medicare combines the bill for the second admission with the first); length of hospital stay; and number of emergency room visits.

- collected by Peggy Estes, RN, Acute Care CHF Case Manager

Economic Outcomes: For all 3 populations we will collect the following information regarding CHF related hospitalization or emergency room visits (non-CHF-related events will be noted but not included in the evaluation analysis) - cost of hospitalization; cost of rehospitalization within 30 days; and cost of emergency room visits.
- collected by Judy Cook, Data Analyst

The data collection tools will be developed by the study's evaluator, Karen Koch, PharmD. Dr. Koch is the medical writer and healthcare research coordinator for NMHS and she has training and experience in outcomes research. Dr. Koch will work closely with Judy Cook, an experienced data analyst. Ms. Cook will develop and maintain a Microsoft Access database.

The clinical coordinators, the technical coordinator, and the data analyst will have on-going responsibilities and their time is accounted for as a percentage of the current positions. The evaluator will be involved at the onset of the project, at the midpoint and at the conclusion and her time will be budgeted for in this manner. This group will be known as the CHF-Telemedicine Advisory Committee and will meet regularly and call upon the expertise of others throughout the project.

Significance

The management of CHF and the impact of telemedicine: What's new?

Heart failure is a major health problem and it is estimated that more than 2 million Americans have heart failure and 400,000 new cases are diagnosed each year. [1] Because CHF is so pervasive, its management has been extensively studied. [1, 5-8] The benefits of an integrated case management team approach in managing CHF patients have been well demonstrated in both acute and home care settings. [5, 9, 10] [7, 11] Several studies have examined the use of telemedicine in the management of home care patients, [3, 8, 12-23] and a few studies were specific to rural populations. [3, 15, 18] Congestive heart failure patients were among the groups of chronically ill patients for whom these studies demonstrated good patient outcomes and patient satisfaction. We are unaware, however, of a telemedicine study with the following characteristics:

1. **dedicated** to home-based management of **CHF patients in a rural setting**;
2. provides 24-hour per day nurse response and physician oversight;
3. utilizes telemedicine to provide regularly scheduled teaching to CHF patients;
4. provides rural, homebound CHF patients with the opportunity to communicate with other similar patients.

Our CHF telemedicine project will reach out to very sick, often dying, patients in remote rural settings. We plan to provide patients with 24-hour per day access to home health nurses. During the weekdays they will be followed by the home care CHF case manager, who will review their status daily. At night and on the weekends, the covering home health nurses will follow patients' progress and respond to their requests. Each of the home health nurses uses a laptop computer to access the computer-based patient record (CPR) in "realtime," so the nighttime and weekend nurses can continue to remotely monitor the daily weights and vital signs that the patients transmit via the telemonitor. The two central monitors will be placed in physician office areas: the internal medicine group; and the cardiology group. These physicians manage many of these CHF patients and are readily available to "see" a patient via the telemonitor, upon the nurses' request. The hospitalist for the internal medicine group can provide nighttime coverage by reviewing the monitor in the cardiology office, which is part of the hospital building.

We have identified 7 benefits that this project should provide to our CHF patients and our community's health care resources. Please see Appendix A.

This project can serve as a model to other rural health providers

Managing CHF patients is a common problem that is more difficult in rural communities. Closely tracking patients'

stability by screening weights and vital signs daily appears to be the best way of keeping patients out of the hospital. In-person daily screening of home care patients would be difficult in urban areas and absolutely impossible in rural regions. Telemedicine provides a mechanism for monitoring patients daily and this project will rigorously assess whether it makes a difference. The project's design is basic and it could be easily replicated by other rural-based hospital and home care CHF management programs. In addition, the framework of this project can be expanded to managing other chronic illnesses (e.g., chronic obstructive pulmonary disease, diabetes).

Project Feasibility

Technical Approach - How We Plan To Do It

We plan to select 23 CHF patients who appear to be good candidates for home telemedicine. Please see Appendix B for selection criteria.

An automated video/voice communication device will be placed in each patient's home. It will consist of a two-way interactive H.324 compliant video and personal telemedicine module containing a camera, display speakerphone, a blood pressure and pulse meter and a telephonic stethoscope. It will be capable of providing two-way video interaction as well as measuring heart rate, blood pressure and transmitting breath and heart sounds. The information is fed to a central unit (mobile unit or one of the two located in internal medicine or cardiology offices) via plain old telephone system (POTS) much like the way EKG, Holter "dumping" works. Note, these units will not procure patients' weights; patients will be provided with electronic scales for this purpose. The patient will press a button on the telemedicine unit and it will assess their vital signs. The patient will then transmit this information, along with his or her weight to the central station.

The central station includes a receiver to identify incoming calls, a video screen for the health care staff, and the listening end of the electronic stethoscope. The central station also has a personal computer and a storage device for the patient's home-care records. We plan to create a database with each patient's clinical parameters (weight, heart rate, and blood pressure). We will program the software to flag patients when their values are outside of their established parameters. The CHF case manager will initiate a telemedicine interview with the patients and evaluate their condition. The CHF case manager can then decide on the appropriate course of action: she can contact the patient's home health nurse and arrange a personal visit; consult with other CHF team members (e.g. social worker, physical therapist, pharmacist); or contact the patient's physician. This patient population is primarily managed by internists and cardiologists and central units will be placed in both of their office settings so that they, too, can use the telemonitor to rapidly assess the patient's condition, reassure the patient and recommend interventions. In addition to screening patients who are experiencing problems, the CHF case manager will also routinely visit and assess home bound patients via the telemonitor.

We will utilize a program that will interface the central telemonitor unit computers to the health system's mainframe computer. As mentioned earlier, our home health nurses each have a laptop computer which they take on their routine visits to patients' homes. They are able to access the mainframe computer from their laptops and have "real time" access to the computer-based patient record (CPR). For weekend and nighttime coverage one of the home health nurses will have access to the portable central unit. The rest of the nurses covering this 17-county region will be able to access the information that the patient is transmitting to the central unit from their laptops (because of the central units' interface with the mainframe computer).

In order to provide routine patient education, we will arrange conference calls to the patients' homes and the educator (e.g. pharmacist or dietician) will "broadcast" from the central unit to the patients' homes. Regarding patients acting in a "support" group with each other, the home care nurse will identify interested patients and provide them with the opportunity to contact each other.

Scalability: We are planning very stringent documentation of the telemedicine program and careful comparison of outcomes with CHF patients who do not have access to telemedicine. The results of this demonstration project will determine the growth of the telemedicine program.

Maintenance and/or Upgrading: We are planning to procure the training of our biomedical staff, so that they will maintain and upgrade the telemedicine system.

Biomedical and CHF-Managers Qualifications

Biomedical: The Biomedical/Communication Services Department of North Mississippi Health Services (NMHS), was established in 1977. It has grown to a department of 30 employees with fourteen assigned to the communications section as technicians and supervisor. Twelve others are dedicated to the management, installation and maintenance of medical equipment from Angiography to X-ray. The department manages over 3000 items of medical equipment and over 5000 items of computers, network and telephone equipment through out the system. Two full time technicians will have primary responsibility for the system and training, with three additional employees assigned to installation and maintenance as needed. This department provides the connection and support to all of the integrated health system's facilities (5 hospitals, 4 dialysis centers, 42 ambulatory care clinics, 2 nursing homes, and 11 home health care offices). NMHS's Biomedical/Communication Services Department recently completed the training for, and installation of, TeleVideo Conferencing Equipment and Basic Communications equipment. All five hospitals now have V-tel capabilities with each other. This department is fully capable of performing maintenance and orientation for the project. (Appendix C)

CHF Care Management: This project's CHF management will be coordinated through North Mississippi Health Services (NMHS) Home Health Agency. This agency has over 200 nurses in 11 branch offices. They provide home health services to people in a 17-county region made over 360,000 visits in 1998. The CHF case manager is a specially trained nurse who initially sees all of the CHF patients and then coordinates their care through 40 home health care nurses who have been certified in CHF management. There are currently 200 CHF patients being managed through home health care. The majority of these patients were referred to the program by the hospital-based, acute-care CHF case manager. This specially trained nurse assesses and educates patients who are admitted to the hospital with CHF. As necessary, she refers them to the home care CHF program and works closely with the home-care based CHF case manager. (Appendix D)

Budget, Implementation Schedule, and Timeline

Budget: We feel that our budget is very thorough. We have accounted for project management, data collection of indicators and outcomes, data analysis and evaluation. Our equipment and maintenance estimates are current and thorough. (See Budget Narrative)

Implementation Schedule and Timeline: We intend to take 9 months to plan this program: order equipment, visit model site, train nurses, develop clinical protocols, coordinate weekend and evening coverage, develop data bases, and select patients. We will then implement and operate the program, and collect data for 2 years. We will then spend the last 3 months of the study period analyzing the data we have collected. See Appendix E for schedule and timeline.

Our Plans to Sustain This Project

As mentioned under scalability, we are planning stringent documentation of the telemedicine program and careful comparison of outcomes with CHF patients who do not have access to telemedicine. The results of this demonstration project will determine the growth and sustainability of the telemedicine program. Based on the reports in the literature, of improved patient outcomes and decreased costs of home-based and hospital care, we believe that

the health system will want to perpetuate this valuable program and will allocate funds to do so.

Community Involvement

Partnerships

North Mississippi Health Services (NMHS) is a vertically integrated health system that provides care to over 600,000 people in 22 counties in rural Northeast Mississippi and parts of Alabama. This project's goal is consistent with NMHS' mission statement "to improve the health status of the people in our region" and NMHS is committed to providing the resources for its success. For this project, NMHS' Biomedical Department is partnering with divisions and departments of NMHS as well as with regional physician groups: NMHS's home health agency (CHF CM's time); NMMC's clinical outcomes department (acute-care CHF case manager, data analyst and evaluator); the Heart Institute (rental space for central unit); and Internal Medicine Associates Foundation (rental space for central unit). The rural-based family medicine physicians are supportive of the project and they, along with other physicians, have provided letters of support for it. (Appendix F) Note, NMHS is the dominant health care provider to the Northeast region of Mississippi and we were compelled to "partner" with groups associated with NMHS. The nearest hospital that is not affiliated with NMHS is 30 miles away. We have a good working relationship with this small facility, but it did not seem like a good partner for this particular study. We have requested a waiver on this issue because our remote location and the medical-technical nature of program was not conducive to including non-medical partners.

Involvement of the Community

We have randomly surveyed our CHF-certified home care nurses, our acute care cardiology nurses, and our CHF patients on their perceptions of the need for, and usefulness of, this project. All 3 groups were strongly in favor of this project. The patients were a bit apprehensive that such a thing (as telemedicine) could be done "out in the country". Once they were reassured that it was technically possible and easy to use, they were very supportive. Copies of surveys and results are attached in Appendix G.

Support for End Users

This programs end users are very familiar to us because they are the patients who are already in our CHF home health care program. Upon patient selection for the telemedicine program, the CHF CM will visit each patient's home, set up the telemonitor, and train the patient and his or her caregivers in its use. The CHF CM has another training session planned for later in the same month. We have planned for the CHF CM (or a biomedical technician) to visit the patient every other month to review, adjust, or repair the telemedicine monitors. Meanwhile, the patient will be regularly visited by his or her routine home health nurse who will also be trained in the equipment's use.

The following is a scenario in which the telemedicine monitor could be used.

Ms. Smith, is an 80 year old white woman with a 4-year history of CHF. She is currently stable and in Stage III (NYHA). This morning the CHF CM notices a 3 pound weight gain when reviewing the daily transmissions. She contacts Ms. Smith on the telemonitor and notices that she looks weak and distressed. Ms. Smith states that she is having difficulty breathing and by listening to her breath sounds over the telemonitor the CHF CM hears some rales in her right lower lobe, (indicative of fluid accumulation). The CHF CMs shares this assessment with the patient's internist, who also "sees" the patient and listens to her breath sounds. They agree that she would benefit from a 40 mg dose of furosemide (a potent diuretic). The home health nurse is contacted and she visits the patient and gives her the dose of medicine. The CHF CM continues to "visit" Ms. Smith throughout the day and checks on her response to the medication and her clinical progress.

Protecting Patients' Privacy

This project will deal with very sensitive and private medical information. This information, however, is the same information that these health care professionals routinely deal with. They are trained in maintaining patient

confidentiality. The information will become part of the patient's CPR. The access to this information is closely guarded and security audits are routine.

Reducing Disparities

Description and documentation of disparities

Mississippi is tied with Idaho as the most medically underserved states in the United States. Our health system's 22-county service area has 117.3 physicians per 100,000 residents (lower than the state's figures 141.8 physicians per 100,000 residents) and almost half of the national ratio (228.4 physicians per 100,000 residents). All but 2 counties in our region are characterized by the Department of Health and Human Services as Health Professional Shortage Areas. (Appendix G) These are also poor counties with median household incomes of \$20,115, 31% less than the U.S. average. (Appendix H)

NMHS has worked hard to maintain existing rural primary care practices and to develop new ones. [24] Despite our best efforts, however, there is still a shortage of primary care providers. It is difficult for many of these home-bound rural patients to travel, but particularly for those who must travel long distances to see their physicians. Home health care is a bridge for these patients, but it is difficult for the nurses to see patients as often as is sometimes necessary. NMHS' home care agency serves ALL patients and provides services to many patients who are charity cases. Federal changes in home health care reimbursement are forcing cut backs in home care agencies and may threaten clinical services. We feel that this grant can help us to provide not only a bridge to, but a safety net for, this vulnerable patient population.

Strategies for overcoming barriers to access

The implementation of telemedicine monitors will permit us to overcome the barriers of CHF patient access to medical care through the following mechanisms: screen patients daily and intervene as soon as a problem is detected; incorporate regular telemedicine visits with regular home visits, thereby increasing overall number of visits; providing patients with the security of access to an immediate visit and basic physical assessment; providing patients with regularly scheduled educational sessions; provide patients with the opportunity to communicate with one another as a "support group".

Documentation and Dissemination

Documentation Plan

We will develop data collection forms for the technical project manager and the clinical project managers. They will include the components outlined in the **Evaluation** section. The data will be given to the data analyst who will enter them in the database.

Information Dissemination Plan

We will disseminate the information internally and externally.

Internally: through system-wide newsletters, conferences and website

Externally: regionally - through presentations and periodicals; statewide - through periodicals, and regular quality improvement (QI) programs (e.g. Information Quality Healthcare (IQH)); nationally - through QI forums (e.g. Eye on the Patient) and refereed publications (we have a good publishing track record) [24-30]