Final Progress Report for Research Projects Funded by Health Research Grants

Instructions: Please complete all of the items as instructed. Do not delete instructions. Do not leave any items blank; responses must be provided for all items. If your response to an item is "None", please specify "None" as your response. "Not applicable" is not an acceptable response for any of the items. There is no limit to the length of your response to any question. Responses should be single-spaced, no smaller than 12-point type. The report **must be completed using MS Word**. Submitted reports must be Word documents; they should not be converted to pdf format. Questions? Contact Health Research Program staff at 717-783-2548.

1. **Grantee Institution:** Temple University – of the Commonwealth System of Higher Education

2. **Reporting Period (start and end date of grant award period):** 01/1/2009 -12/31/2012

3. **Grant Contact Person (First Name, M.I., Last Name, Degrees):** Germaine Calicat, MLA

4. **Grant Contact Person's Telephone Number:** 215.204.7655

5. **Grant SAP Number:** 4100047651

6. **Project Number and Title of Research Project:** 16 - *Using a Telemedicine System to Promote Patient Care Among Underserved Individuals*

7. **Start and End Date of Research Project:** 9/15/2009 – 12/31/2012

8. **Name of Principal Investigator for the Research Project:** Alfred A. Bove, MD, PhD

9. **Research Project Expenses**.

   9(A) Please provide the total amount of health research grant funds spent on this project for the entire duration of the grant, including indirect costs and any interest earned that was spent:

   $ $36,279

   9(B) Provide the last names (include first initial if multiple individuals with the same last name are listed) of **all** persons who worked on this research project and were supported with health research funds. Include position titles (Principal Investigator, Graduate Assistant, Post-doctoral Fellow, etc.), percent of effort on project and total health research funds expended for the position. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project	Cost
Kashem	Research Assistant	70	$ 16,000

9(C) Provide the names of **all** persons who worked on this research project, but who *were not* supported with health research funds. Include position titles (Research Assistant, Administrative Assistant, etc.) and percent of effort on project. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name	Position Title	% of Effort on Project
Bove	Principal Investigator	70
Santamore	Co-Investigator	50
Homko	Co-Investigator	30
Kerper	Research Nurse	100
Berger	Research Technician	75

9(D) Provide a list of **all** scientific equipment purchased as part of this research grant, a short description of the value (benefit) derived by the institution from this equipment, and the cost of the equipment.

Type of Scientific Equipment	Value Derived	Cost
None		

10. Co-funding of Research Project during Health Research Grant Award Period. Did this research project receive funding from any other source during the project period when it was supported by the health research grant?

Yes____X_____ No_____

If yes, please indicate the source and amount of other funds:

AHRQ $377,833

11. Leveraging of Additional Funds

11(A) As a result of the health research funds provided for this research project, were you able to apply for and/or obtain funding from other sources to continue or expand the research?

Yes____X_____ No_____

If yes, please list the applications submitted (column A), the funding agency (National Institutes of Health—NIH, or other source in column B), the month and year when the application was submitted (column C), and the amount of funds requested (column D). If you have received a notice that the grant will be funded, please indicate the amount of funds to be

awarded (column E). If the grant was not funded, insert "not funded" in column E.

Do not include funding from your own institution or from CURE (tobacco settlement funds). Do not include grants submitted prior to the start date of the grant as shown in Question 2. If you list grants submitted within 1-6 months of the start date of this grant, add a statement below the table indicating how the data/results from this project were used to secure that grant.

A. Title of research project on grant application	B. Funding agency (check those that apply)	C. Month and Year Submitted	D. Amount of funds requested:	E. Amount of funds to be awarded:
Telemedicine based management of hyoerlipidemia	☐NIH ☐ Other federal (specify:_____) X Nonfederal source (specify: Merck Shering Plough)	1/2010	$80,000	$80,000

11(B) Are you planning to apply for additional funding in the future to continue or expand the research?

Yes____X_____ No_____

If yes, please describe your plans:

Grant application to CMSS, and PCORI submitted

12. Future of Research Project. What are the future plans for this research project?

Extend the study to a community based BP management program

13. New Investigator Training and Development. Did students participate in project supported internships or graduate or post-graduate training for at least one semester or one summer?

Yes____x_____ No_____

If yes, how many students? Please specify in the tables below:

	Undergraduate	Masters	Pre-doc	Post-doc
Male				2
Female			2	
Unknown				
Total			**2**	**2**

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic			2	2
Unknown				
Total			**2**	**2**

	Undergraduate	Masters	Pre-doc	Post-doc
White				1
Black				1
Asian			2	
Other				
Unknown				
Total			**2**	**2**

14. **Recruitment of Out-of–State Researchers**. Did you bring researchers into Pennsylvania to carry out this research project?

    Yes_____ No____x_____

    If yes, please list the name and degree of each researcher and his/her previous affiliation:

15. **Impact on Research Capacity and Quality**. Did the health research project enhance the quality and/or capacity of research at your institution?

    Yes____x_____ No_____

    If yes, describe how improvements in infrastructure, the addition of new investigators, and other resources have led to more and better research.

    One Pa Department of health non-formula fund grant, two NIH grants, and one industry grant were funded subsequent to this work using the same telemedicine platform.

16. **Collaboration, business and community involvement.**

    16(A) Did the health research funds lead to collaboration with research partners outside of your institution (e.g., entire university, entire hospital system)?

    Yes____x_____ No_____

    If yes, please describe the collaborations:

    Insight Telehealth Systems, LLC, Valley Forge, Pa. developed the IT platform for this research

16(B) Did the research project result in commercial development of any research products?

Yes_____ No_____x_____

If yes, please describe commercial development activities that resulted from the research project:

16(C) Did the research lead to new involvement with the community?

Yes____x_____ No_____

If yes, please describe involvement with community groups that resulted from the research project:

The research was based in the North Philadelphia community, and created liaisons with local churches in the community.

17. Progress in Achieving Research Goals, Objectives and Aims.

List the project goals, objectives and specific aims (as contained in the grant agreement). Summarize the progress made in achieving these goals, objectives and aims for the period that the project was funded (i.e., from project start date through end date). Indicate whether or not each goal/objective/aim was achieved; if something was not achieved, note the reasons why. Describe the methods used. If changes were made to the research goals/objectives/aims, methods, design or timeline since the original grant application was submitted, please describe the changes. Provide detailed results of the project. Include evidence of the data that was generated and analyzed, and provide tables, graphs, and figures of the data. List published abstracts, poster presentations and scientific meeting presentations at the end of the summary of progress; peer-reviewed publications should be listed under item 20.

This response should be a DETAILED report of the methods and findings. It is not sufficient to state that the work was completed. Insufficient information may result in an unfavorable performance review, which may jeopardize future funding. If research findings are pending publication you must still include enough detail for the expert peer reviewers to evaluate the progress during the course of the project.

Health research grants funded under the Tobacco Settlement Act will be evaluated via a performance review by an expert panel of researchers and clinicians who will assess project work using this Final Progress Report, all project Annual Reports and the project's strategic plan. After the final performance review of each project is complete, approximately 12-16 months after the end of the grant, this Final Progress Report, as well as the Final Performance Review Report containing the comments of the expert review panel, and the grantee's written response to the Final Performance Review Report, will be posted on the CURE Web site.

There is no limit to the length of your response. Responses must be single-spaced below, no smaller than 12-point type. If you cut and paste text from a publication, be sure

symbols print properly, e.g., the Greek symbol for alpha (α) and beta (ß) should not print as boxes (□) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.

Goals and Objectives: In this study, we are using principles of patient centered care focused on health knowledge, self management, and shared decision making to assess the efficacy of an Internet based communication system for reducing blood pressure in asymptomatic individuals with grade I hypertension. We are interested in reducing cardiovascular risk in underserved communities. Our prior work demonstrated that a program that enhances communication and health reminders plus self measured blood pressure improves overall cardiovascular risk as measured by the Framingham risk Score. This study hypothesized that a telemedicine communication system combined with self measured blood pressure would be successful in lowering blood pressure in underserved urban subject with grade I hypertension (Systolic BP ≤160 mmHg). This formula fund grant supplemented a funded grant from the Agency for Healthcare Research and Quality (AHRQ).

The study focused on asymptomatic subjects who did not have evident cardiovascular disease. This cohort of subjects is at increased risk of CVD, but in most cases subjects are unaware of their increase risk. By increasing awareness of personal risk, we attempted to improve CVD risk by restoring elevated blood pressure to normal.

Subjects: We recruited subjects from inner city Philadelphia and from northern Delaware into the study. Subjects were recruited from medical clinics at Temple University and at Christiana Medical center, by public announcements, health fairs and advertisements in local newspapers. Institutional Review Boards at each institution approved the study.

To be eligible for the study, subjects had systolic blood pressure documented over 150 mmHg and no evidence of overt heart disease. In most cases, recruited subjects had hypertension as their primary CVD risk factor. Because of the target population characteristics, we expected to find a significant number of diabetics, and increased our target recruiting goals to allow a subset analysis of diabetic and non-diabetic subjects.

Intervention. The subjects were randomized to an advanced telemedicine communication system with bidirectional communication for reporting of self measured blood pressure using a digital sphygmomanometer, and feedback on health status from our research team. Subjects could report via a secure website that after logon, provided education information on hypertension and screens that allowed subjects to enter their blood pressure, heart rate, weight, steps per day from a pedometer and smoking status. They could also send a text message and received text messages from the research team on management of their hypertension. They could also opt to use a telephone communication system where they dialed a toll free number, entered a personal identification number (PIN), and responded to instructions on entering blood pressure and pulse, as well as weight. The telephone system was voice interactive so that individuals could use voice data entry, and could leave voice messages that were recorded as MP3 files for the research staff to hear and respond to. Telemedicine subjects were instructed to send their data twice weekly. Actual treatment for hypertension was provided by individual primary care physicians who received upgrades on status of blood pressure at monthly intervals in the telemedicine subjects. The control group received an initial evaluation, report about their blood pressure and advice to

follow up with their primary care physician. Subjects in both the telemedicine arm and the control arm were followed for 6 months at which time a final visit was conducted that included evaluation of blood pressure, blood lipids, and completion of a behavior questionnaire.

Results

The study was conducted over a three year period, and a fourth year was incorporated to complete followup and to analyze and process the clinical data. During the second and third years of the study, with use of the supplemental funding from the formula fund grant, we added another clinical site to accelerate recruiting. The medical clinic of the Christiana medical center in northern Delaware participated in the study to add subjects. This addition achieved a recruiting goal that allowed accurate statistical analysis of the outcome data. Our recruiting goal was 252 subjects with an expected 20% dropout rate. Upon completion of the study we recruited 242 subjects of which 206 completed the 6 month followup period. This final number was within our expected recruiting goal and allowed us to properly power the study for statistical significance.

Principal Findings: Table 1 shows the characteristics of the control and telemedicine subjects. Average age was 60 years, 65% were female and 80% were African-American. More than 50% had family incomes at or near the poverty level. 27% completed high school, and 11% completed college. Approximately 20% of subjects either were covered by medicaid or had no insurance. No significant demographic differences were noted between control and telemedicine subjects. The majority of the subjects resided in federally designated underserved communities. The large proportion of subjects with income at or below the poverty level, the predominance of minority subjects, dependence on Medicaid and the urban environment defines these subjects as representing a vulnerable population. Our data indicate that this form of communication system can be applied to vulnerable populations with success in lowering blood pressure, which remains a serious risk factor for CVD mortality in this population.

Outcomes: Figure 1 shows the overall blood pressure response to this 6 month program in controls and in the telemedicine subjects. For the entire cohort, there was significant improvement in systolic and diastolic blood pressure in both the control and in the telemedicine groups. The systematic participation in the study for both controls and for the telemedicine group allowed an improvement in cardiovascular risk. The telemedicine group trended toward a greater reduction in systolic blood pressure ($p = 0.12$). In addition, there was a significant reduction in blood lipids that was not a planned outcome of the study.

Table 2 shows the proportion of subjects in both groups who reached goal blood pressure. More than half of all subjects reached a goal of <140 mmHg systolic pressure, while 31% of controls and 36% of telemedicine subjects reached a goal of less than 130 mmHg. Table 3 shows the overall results in the 206 subjects who completed the study. Significant reductions in blood pressure and in blood lipids were noted after the 6 month study and blood glucose trended lower ($p = 0.062$).

Diabetics vs. non-Diabetics: The study was initially designed to examine the effects of the communication system in non-diabetic hypertensive subjects. However because of the high prevalence of diabetes in the study population we planned to analyze these two cohorts separately.

Non-Diabetics. Table 4 shows the initial and final data for the non-diabetic population. Average age was 58.3 years. Sixty nine percent of the non-diabetic subjects were females, and 81% were African -American. Smoking incidence was approximately 20%, with the control group higher than the telemedicine group. In this group there was a substantial improvement in systolic blood pressure in the telemedicine group compared to the control group ($p = 0.037$). In addition, total cholesterol and LDL improved significantly in both control and telemedicine groups, identifying an accompanying benefit that appears to link several risk factors for CVD even though only one was being addressed. This linking phenomenon suggests that once subjects become aware of CVD health risk, they incorporate broader health goal into their lifestyle and health care programs. This finding in asymptomatic hypertensive underserved adults also indicates that health awareness is a critical component of reducing CVD risk. A program for self assessment appears to achieve this goal in subjects who otherwise consider themselves to be in good health. Figure 2 summarized the BP outcome in the non-diabetic subjects.

Diabetics. Results from the diabetic population are shown in table 5. Note that the subjects in both control and telemedicine groups all improved both blood pressure and blood lipids, and there was a trend toward improvement in FBG. Significant changes favoring the telemedicine group were noted in Triglycerides and BMI. However the Telemedicine group had a less favorable response to blood glucose compared to controls. This group showed equal blood pressure responses in the telemedicine and the control groups. However all of these subjects had an established diagnosis of type II diabetes, and were under the care of a primary care physician, therefore were aware of their health status. In this group the reminder system had less effect, as the subjects were already involved in self care of their health condition and had developed health care strategies to improve their CVD risk.

Figure 3 compares the systolic blood pressure response in telemedicine and control subjects among diabetic subjects. The reduction in BP is similar in the control and telemedicine subjects with diabetes.

Internet Utilization: The use of advanced communication systems provides the opportunity to evaluate use behavior for the subjects who used the telemedicine system. This system allowed use of a computer for input using a web browser, or telephone input and two way communication using the telephone keypad and Internet voice recognition methodologies. The telemedicine subjects used telephone communication 65% of the time and Internet communication 35% of the time. This is not surprising as we added telephone capability for bidirectional communication due to the lack of access to personal computers and the Internet in the inner city underserved neighborhoods. On the other hand, cell phone use is ubiquitous and became the communication choice for nearly two thirds of the subjects. Frequency of use is shown in figure 4. Average use by subject was 46.5 transmissions in 6 months (equivalent to 1.8 communications per week). We did not find a correlation between blood pressure outcome and utilization frequency, between age and utilization frequency, or between family income and utilization frequency. We did find a positive correlation between education level and utilization frequency.

Measures of Behavior and Adherence: We provided all subjects with questionnaires to complete at the beginning and end of the study. These were designed to analyze medication adherence, health knowledge and health care decision making. In addition, the CAHPS

questionnaire was competed at the beginning and end of the study. We found no effects of Internet accessibility, ethnic background, age, sex, education or family income on overall study outcome. Similarly, none of these factors had any effect on outcome comparing control and telemedicine groups. As noted above, presence or absence of diabetes did influence the effects of the telemedicine intervention on outcomes. As shown in table 6, adherence to hypertensive medications, aspirin, hyperlipidemia medications and diabetes medications were similar in the control and telemedicine groups. Figure 5 shows similar adherence for hypertensive medications in the control and telemedicine groups, and figure 6 shows a significantly higher compliance with lipid lowering medications in the diabetes group compared to the non-diabetes group.

Physician-Patient Interaction: We examined the number of hypertensive medications that were prescribed for each study subject. In the control group there was no change in average number of medications over the 6 month study period (1.95±1.02 to 1.91±1.21, p=0.468). In the telemedicine group there was a significant increase in prescribed medications (2.20±1.20 to 2.34±1.15, p=0.004). Multivariate analysis showed no effect on prescribed medications with respect to age, ethnicity, education, or income. We interpret these findings as indicating that the monthly reminders that reported blood pressure data and JNC VII guidelines to the primary care physician, with the same information provided to the patient, encouraged physicians to pay attention to patient's blood pressure. The fact that both physician and patient were aware of the blood pressure data and the treatment goals appears to encourage better control of blood pressure through interaction between the patient and physician that allowed sharing of care plans between patient and physician. Although we offered the physicians access to the internet based patient information, no physician used the system to examine patient status. We experienced this behavior in previous Telemedicine studies, and designed an autofax system to provide information to the primary care physicians. This fax system appeared to be effective based on physician prescribing of antihypertensive medications, and the greater reduction in blood pressure in the telemedicine group.

Our survey of patient-physician interaction indicated that 98% of patients reported that their blood pressure was recorded during the office visit, and 94% discussed BP management with their physician. 85% of subjects were aware of their BP goal, and 79% informed their physician of their BP goal. 60% discussed lifestyle changes with their physician. These findings were similar in the control and telemedicine groups.

CAHPS survey. This survey examines the patient to physician interaction. It asks 5 questions regarding health care availability, 6 questions on patient to physician communications, 2 questions about office staff, an overall assessment of the physician encounter experience and assessment of personal health. The questionnaire was administered to all subjects in the study at the initial and final visits. Table 7 provides overall results of the surveys. Data in the table represent the proportion of subjects who responded positively to the questions. A yes answer was recorded as a positive response in questions with a binary response, and a response of "usually" or "always " was recorded as a positive response in questions with a 4 point response (always, usually, sometimes, never). In both control and telemedicine groups a positive response of about 70% was recorded on both initial and final questionnaires. There was no change in patient perception of health care availability over the 6 month study in either group. Communication was graded in the mid nineties for the control group, and while somewhat lower at the initial visit in

the Telemedicine group, there was a significant increase in the percent of subjects who responded positively. This increase in communication assessment was significant. Also of note is the initial difference between control subjects and Telemedicine subjects regarding patient to physician communication. Since subjects were assigned randomly to the control and Telemedicine groups, this cannot be explained by selection bias. The data of table 1 demonstrate a high level of similarity between the two groups in age, ethnic makeup, education, income and insurance, and supports this conclusion. The improved communication noted over the 6 month study in the Telemedicine group could be interpreted as indicating that better blood pressure management can be achieved if patient perform self measures on a periodic basis, and the data are aggregated and a summary report sent to the physician on a monthly basis. For hypertension, where frequent observation of blood pressure can guide therapy, this system offers a solution to the long term management of hypertension at minimal cost.

Conclusions and Significance. Several important observations can be drawn from the study that are likely to impact programs to improve CVD outcomes in at risk individuals without symptoms. There is a clear finding that all subjects who participated in the study gained some benefit, with significant lowering of blood pressure in both the control group and the telemedicine group. In the subset of individuals without diabetes, who were asymptomatic and not likely to be continuously engaged in their health care, there was a significant advantage with the use of the telemedicine system. It is clear however that any means of getting individuals engaged in their health care to understand CVD risk and the means to improve risk will have benefit. This would best be achieved by a Patient Centered approach to self care and health literacy. Our telemedicine system was designed to be used by individuals with computer access as well as individuals who could respond by telephone. We designed the system to automate both telephone and web-based reminders about self assessment of blood pressure and other risk factors, and to report using either a web screen or the telephone keypad. The fact that 65% of the subjects used the phone system indicates that this means of communication can be used on a larger scale to reduce population risk. Use of mobile telephones is ubiquitous and has become the communication choice in the underserved community because of the favorable economics of this form of telephone use. Designing automated telephone communications that are concise, educational and relevant poses a challenge but at the same time does succeed in engaging individuals in their personal health care. Such reminder and data reporting systems can be one important means of achieving the goals of the new federal Million Hearts program (http://millionhearts.hhs.gov) to reduce the incidence of heart attach and stroke over the next 5 years.

Integration and Sustainability. These communication systems are readily managed by specially trained nurses, pharmacists or physician assistants with physician backup for patients who do not respond to the initial surveillance and advice. Periodic communication and self assessment seems to motivate subjects to be health conscious, and this component of care can be delegated to a physician-led care team that leaves the most complex management issues to a physician while less complex management can be accomplished by non-physician providers. These systems can be automated to minimize time commitments of health care providers and reduce costs of screening and prevention programs. They can be offered to a large cohort of individuals by health care systems, linked with community centers, churches, libraries and worksites. Such systems are readily scalable as the main component of the system is a patient database and personal health record. Minimal hardware is needed, and many subjects can take advantage of free biometric

systems available in worksites, pharmacies and other health centers to obtain their health status data. Sustainability requires maintenance of servers and periodic updates of software applications. Review of data and advice on risk management could then be offered by individual patient centered practices linked to the communication system.

Publications

We closed and verified our main database for the study in September 2011, and analyzed the data, wrote the papers reporting the data, and presented the data at several national meetings during 2012-1013. Several papers on applications of telemedicine in community health settings were published during the active grant period*. The main outcome paper and several abstracts were published over the period 2009 -2013. One preliminary abstract was presented at the American College of Cardiology meeting in April 2011, and the final outcome data were presented at the Annual meeting of the American College of Cardiology in March 2013.

Kashem A, Kerper M, Homko CJ, Santamore WP, Hewitt V, Eubanks A, Raza F, Reed A , Alkhouli M, Bove AA. Hypertension Management in Urban Underserved Patients Using an Internet Communication System. JACC 2011;57 (Apr):E1280

Homko CJ, Zamora L, Santamore WP, Kashem A, McConnell T, and Bove AA Gender Differences in Cardiovascular Risk Factors and Risk Perception Among Individuals With Diabetes The Diabetes Educator 2010 36: 483-488

Bove AA, Homko, CJ, Santamore WP, Kashem M, Kerper, M, Elliott DJ. Managing Hypertension in Urban Underserved Subjects using Telemedicine – a Clinical Trial. (in press) American Heart Journal, March 2013.

Bove AA, Homko, CJ, Santamore WP, Kashem M, Kerper, M, Elliott DJ. Managing Hypertension in Urban Underserved Subjects using Telemedicine – a Clinical Trial. (abstract) Presented ACC scientific sessions, March 2013.

*None of the articles listed cite Pennsylvania Department of Health CURE program as a funding source, and therefore may not be listed in Question 20 which follows.

Figure 1. Overall blood pressure response for the entire cohort after 6 months. The telemedicine group trended to a greater reduction in blood pressure (p = 0.12)

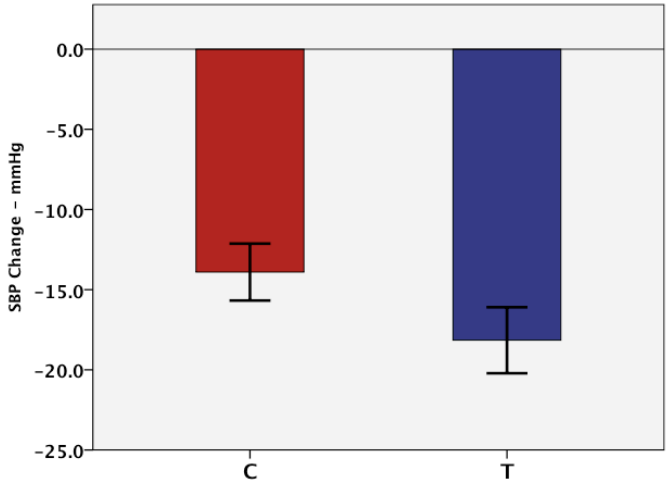

Figure 2. Change in Systolic BP for the non diabetic group. C-control, T-telemedicine. Difference between C and T is significant at p = 0.037

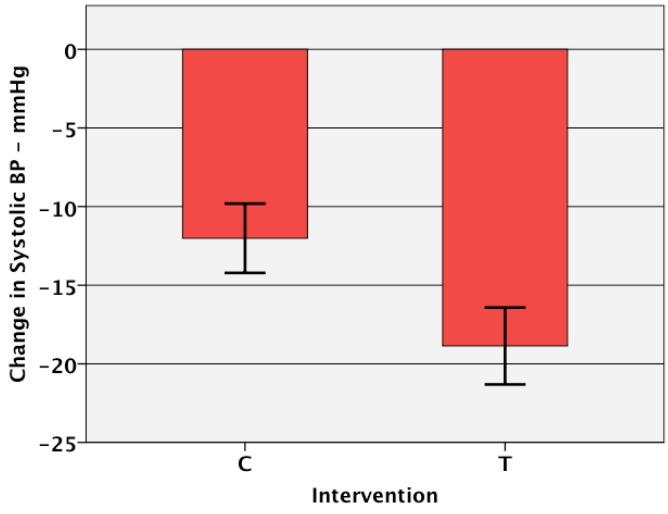

Figure 3 - Change in systolic BP for diabetics after 6 months. C-control, T-telemedicine. Both control and telemedicine groups showed significant reductions in systolic BP that were similar in magnitude.

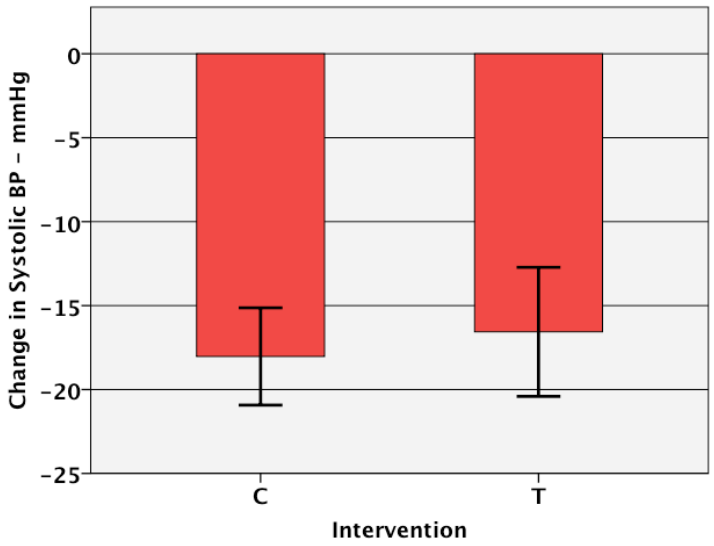

Figure 4 - Distribution of Internet utilization in the T group. Data show number of days of use for the 6 month study. Mean Internet use for the T group was 46.5 reports in 6 months (7.75 reports/month)

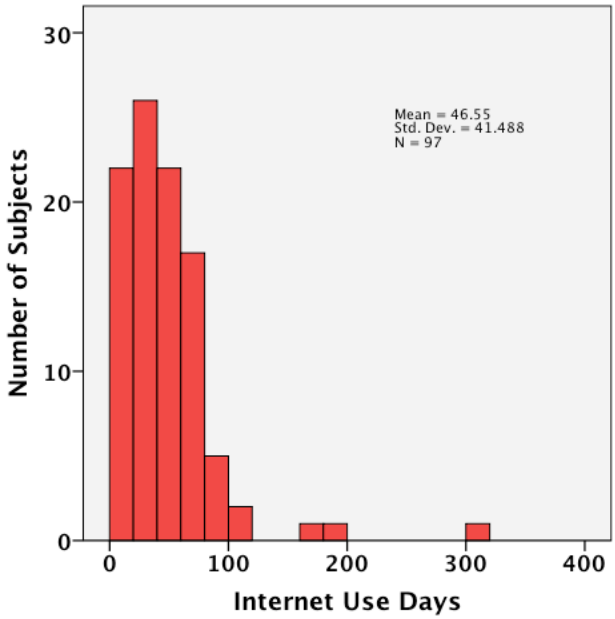

Figure 5 - Average medication compliance based on a score of 1 to 4 comparing control and telemedicine groups. No differences are noted between the groups.

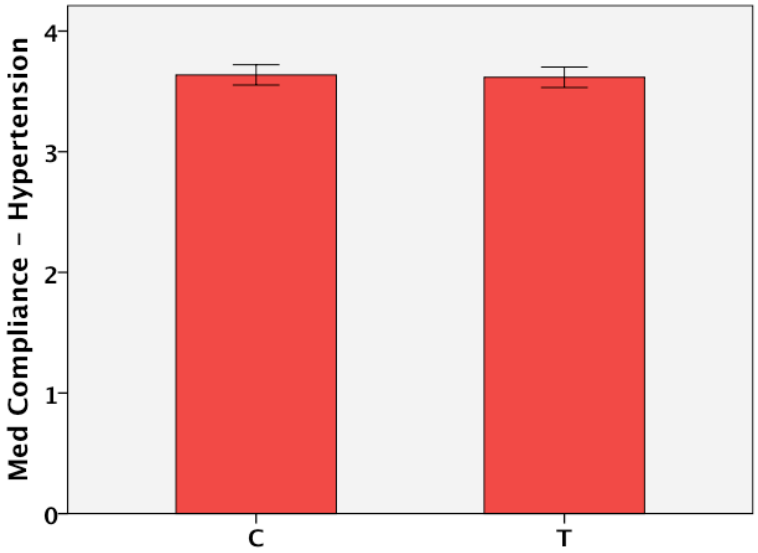

Figure 6 - Medication compliance score for lipid lowering medication comparing diabetics to non-diabetics. Compliance was higher in the diabetic group ($p < 0.001$)

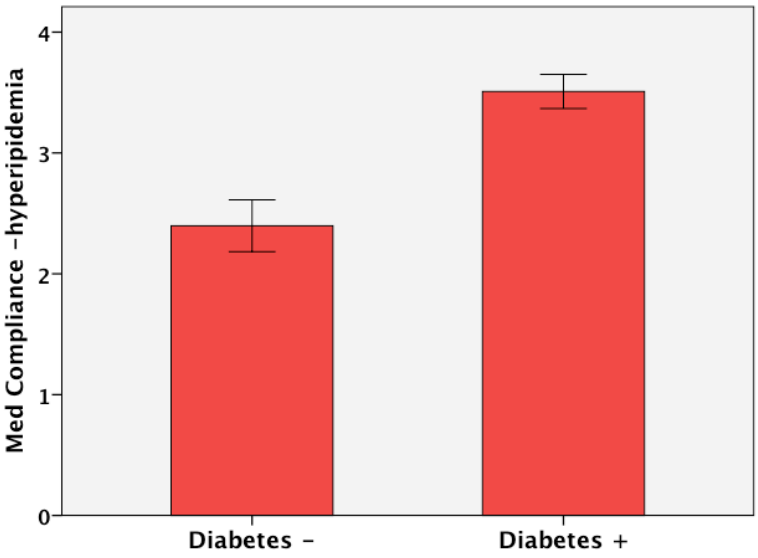

Table 1 - Characteristics of the control and telemedicine study groups

		Control N (%)	Telemedicine N (%)
	N	122	120
	Female	79 (65)	78 (65)
	Male	42 (35)	42 (35)
	Age (yrs)	58.2±13.5	61.0±13.6
	BMI (kg/M^2)	33.7±7.8	33.7±7.5
Ethnicity	AA	99 (81)	96 (80)
	Caucasian	17 (14)	18 (15)
	Hispanic	3 (2.5)	4 (3.3)
	Other	3 (2.5)	2 (1.7)
	Diabetes	41 (33)	35 (29)
	Hyperlipidemia	66 (50)	50 (42)
	Smoker	29 (24)	20 (17)
Education	< High School	17 (14)	22 (18)
	High School	44 (36)	30 (25)
	Some College	30 (36)	36 (30)
	Completed College	13 (11)	14 (12)
	Graduate School	13 (11)	9 (8)
Income	<$15,000	43 (35)	35 (29)
	$15,000-24,999	25 (20)	25 (21)
	$25,000-34,999	7 (6)	6 (5)
	$35,000-44,999	13 (11)	11 (9)
	$45,000-54,999	9 (7)	9 (8)
	>$55,000	21 (17)	24 (20)
Insurance	Medicaid	16 (13)	21 (18)
	Medicare	38 (31)	44 (37)
	Private	57 (47)	39 (32)
	None	9 (7)	4 (3)

Table 2 - Percent of subjects in control and telemedicine groups who reached goal blood pressures. No significant differences were noted between the control and telemedicine groups. SBP-systolic blood pressure, mmHg

	Control (%)	Telemedicine (%)
SBP < 140		
All Subjects	52.3	54.5
Non-diabetics	52.1	58.2
Diabetics	52.9	46.7
SBP < 130		
All Subjects	30.8	36.4
Non-diabetics	31.5	35.8
Diabetics	29.4	36.7

Table 3 - Change in clinical measures at the end of 6 months. All Subjects. P values identify significant changes over the 6 month study period.

	Mean± SD	P
Systolic BP mmHg	-15.9±19.3	.0001
Diastolic BP mmHg	-5.9±11.0	.0001
MAP mmHg	-.3±12.3	.0001
Fasting Blood Gluc mg/dl	-4.8±35.6	.062
Total Chol mg/dl	-9.2±40.6	.002
HDL Chol mg/dl	-0.10±11.9	.909
LDL Chol mg/dl	-13.7±33.6	.0001
Triglycerides mg/dl	16.2±80.7	.006
BMI kg/M^2	0.14±3.78	.597

Table 4 - Outcome results for the non-diabetic subjects. Significance compares control vs. telemedicine

	Control (80)	Telemedicine (83)	Significance
Age years	55.8±13.6	60.9±14.7	NS
Height inches	65.9±3.4	65.8±3.8	NS
Weight pounds	197.2±40.8	200.1±48.6	NS
Waist Circ cm	40.5±5.2	40.1±5.6	NS
Initial Values			
BMI kg/m^2	32.0±6.9	32.4±7.3	NS
BP Systolic mmHg	152.0±13.8	155.7±13.2	NS
BP Diastolic mmHg	88.2±10.0	89.9±11.2	NS
MAP mmHg	109.5±9.2	111.8±10.3	NS
FBG mg/dl	96.9±16.8	97.2±14.8	NS
Chol Total mg/dl	193.8±41.4	186.8±45.4	NS
Chol HDL mg/dl	50.6±20.1	55.4±16.2	NS
Chol LDL mg/dl	119.5±38.4	112.1±42.4	NS
Triglycerides mg/dl	119.9±85.2	96.4±49.7	NS
A1c %	5.78±0.43	5.76±0.47	NS
Change over 6 months			
BMI kg/m^2	0.2±4.5	-0.1±2.8	NS
BP Systolic mmHg	-12.0±18.7	-18.9±20.0	.037
BP Diastolic mmHg	-4.6±10.3	-7.6±12.3	NS
MAP mmHg	-7.1±11.6	-11.4±13.5	.047
FBG mg/dl	2.4±19.4	-3.3±15.7	.066
Chol Total mg/dl	-8.2±34.7	-9.5±35.1	NS
Chol HDL mg/dl	1.1±12.2	-0.4±12.5	NS
Chol LDL mg/dl	-15.0±28.6	-15.1±30.5	NS
Triglycerides mg/dl	17.3±78.0	20.6±60.4	NS
			NS
Males	26 (32.5)	25 (30.1)	NS
African American	64 (80.0)	69 (83.1)	NS
Caucasian	12 (15.0)	12 (14.5)	NS
Hispanic	2 (2.5)	1 (1.2)	NS
Smoker	21 (26.3)	12 (14.5)	NS

Table 5 - Baseline characteristics and outcome results for the subject with diabetes. Significance compares control vs. telemedicine

	Control (41)	Telemedicine (35)	Significance
Age years	63.0±12.0	61.3±9.9	NS
Height inches	66.0±3.7	65.6±3.7	NS
Weight pounds	229.1±54.8	224.3±51.3	NS
Waist Circ cm	45.4±7.0	44.5±6.2	NS
Initial Value			
BMI kg/m^2	37.0±8.5	36.6±7.3	NS
BP Systolic mmHg	159.0±19.7	156.4±15.2	NS
BP Diastolic mmHg	86.4±12.6	86.5±11.0	NS
MAP mmHg	110.6±13.3	109.8±10.3	NS
FBG mg/dl	157.5±69.2	147.0±61.9	NS
Chol Total mg/dl	175.7±43.4	181.9±52.3	NS
Chol HDL mg/dl	46.8±15.6	43.6±12.1	NS
Chol LDL mg/dl	107.1±38.4	106.6±46.8	NS
Triglycerides mg/dl	110.6±59.3	171.56±124.7	.007
A1c %	7.55±1.81	8.38±2.53	NS
Change over 6 months			
BMI kg/m^2	1.2±4.4	-0.6±2.6	.049
BP Systolic mmHg	-18.0±16.6	-16.6±21.0	NS
BP Diastolic mmHg	-5.5±10.1	-5.9±10.8	NS
MAP mmHg	-9.7±10.5	-9.4±12.7	NS
FBG mg/dl	-23.8±63.4	-3.6±47.9	NS
Chol Total mg/dl	-2.0±36.1	-19.8±65.0	NS
Chol HDL mg/dl	-0.4±10.3	-2.0±11.4	NS
Chol LDL mg/dl	-9.2±29.9	-12.9±53.1	NS
Triglycerides mg/dl	36.9±96.1	-21.6±99.3	.023
Males	16 (39.0)	17 (48.6)	NS
African American	35 (85.4)	25 (71.4)	NS
Caucasian	5 (12.2)	6 17.1)	NS
Hispanic	1 (2.4)	3 (8.6)	NS
Smoker	8 (19.5)	7 (20.0)	NS

Table 6 - Compliance score for four categories of medications in Control and Telemedicine groups. A score of 4 indicates 100% compliance. No significant differences were noted between the groups for any medication category.

	Control	Telemedicine
Hypertension	3.67±0.89	3.60±0.87
Aspirin	3.00±1.62	2.68±1.70
Hyperlipidemia	2.64±1.78	2.65±1.79
Diabetes	2.42±1.96	2.60±1.90

Table 7 CAHPS Analysis. Percentages are proportion of subjects who responded favorably to questions on health care measure noted in the left column. For questions with a binary response, the value is % of yes responses. For questions with a graded response, the values are the % of subjects who responded with either "usually" or "always." Question 23 asks for an overall estimate of the physician encounters on a 1-10 scale with positive responses considered with scores of 8-10. Question 26 is a rating of personal health on a 1-5 scale with positive responses considered 4 or 5. Numbers in parentheses in left column are the number of questions in each category.

		CONTROL		TELEMEDICINE	
		Initial	final	Initial	final
appts/health care	mean	71%	73%	71%	69%
when needed (5)	SD	11%	16%	21%	19%
How Well Dr.	mean	95%	94%	89%+	93%*
Communicates (6)	SD	3%	1%	2%	1%
Office Staff (2)	mean	60%	62%	54%	58%
	SD	52%	1%	47%	4%
Overall (14)	mean	84%	85%	80%	82%
	SD	14%	14%	15%	16%
Overall (Q 23)		93%	89%	79%	78%
Rate Health (Q26)		60%	68%	61%	65%

*significant initial to final difference, $p < 0.001$. + significant difference between control and Telemedicine, $p < 0.001$

18. Extent of Clinical Activities Initiated and Completed. Items 18(A) and 18(B) should be completed for all research projects. If the project was restricted to secondary analysis of clinical data or data analysis of clinical research, then responses to 18(A) and 18(B) should be "No."

18(A) Did you initiate a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

___x__Yes
_____No

18(B) Did you complete a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

__x___Yes
_____No

If "Yes" to either 18(A) or 18(B), items 18(C) – (F) must also be completed. (Do NOT complete 18(C-F) if 18(A) and 18(B) are both "No.")

18(C) How many hospital and health care professionals were involved in the research project?

___6___Number of hospital and health care professionals involved in the research project

18(D) How many subjects were included in the study compared to targeted goals?

___252___Number of subjects originally targeted to be included in the study
___242___Number of subjects enrolled in the study

Note: Studies that fall dramatically short on recruitment are encouraged to provide the details of their recruitment efforts in Item 17, Progress in Achieving Research Goals, Objectives and Aims. For example, the number of eligible subjects approached, the number that refused to participate and the reasons for refusal. Without this information it is difficult to discern whether eligibility criteria were too restrictive or the study simply did not appeal to subjects.

18(E) How many subjects were enrolled in the study by gender, ethnicity and race?

Gender:
_158___Males
__84___Females
_____ Unknown

Ethnicity:
__7___Latinos or Hispanics
235___Not Latinos or Hispanics
_____Unknown

Race:
_____American Indian or Alaska Native
__5___Asian
199___Blacks or African American
_____Native Hawaiian or Other Pacific Islander
_38___White
_____Other, specify:_____
_____Unknown

18(F) Where was the research study conducted? (List the county where the research study was conducted. If the treatment, prevention and diagnostic tests were offered in more than one county, list all of the counties where the research study was conducted.)

Philadelphia County, Pa.

19. Human Embryonic Stem Cell Research. Item 19(A) should be completed for all research projects. If the research project involved human embryonic stem cells, items 19(B) and 19(C) must also be completed.

19(A) Did this project involve, in any capacity, human embryonic stem cells?
_____Yes
___x__ No

19(B) Were these stem cell lines NIH-approved lines that were derived outside of Pennsylvania?
_____Yes
_____ No

19(C) Please describe how this project involved human embryonic stem cells:

20. Articles Submitted to Peer-Reviewed Publications.

20(A) Identify all publications that resulted from the research performed during the funding period and that have been submitted to peer-reviewed publications. Do not list journal abstracts or presentations at professional meetings; abstract and meeting presentations should be listed at the end of item 17. **Include only those publications that acknowledge the Pennsylvania Department of Health as a funding source** (as required in the grant agreement). List the title of the journal article, the authors, the name of the peer-reviewed publication, the month and year when it was submitted, and the status of publication (submitted for publication, accepted for publication or published.). Submit an electronic copy of each publication or paper submitted for publication, listed in the table, in a PDF version 5.0.5 (or greater) format, 1,200 dpi. Filenames for each publication should include the number of the research project, the last name of the PI, the number of the publication and an abbreviated research project title. For example, if you submit two publications for PI Smith

for the "Cognition and MRI in Older Adults" research project (Project 1), and two publications for PI Zhang for the "Lung Cancer" research project (Project 3), the filenames should be:

Project 1 – Smith – Publication 1 – Cognition and MRI
Project 1 – Smith – Publication 2 – Cognition and MRI
Project 3 – Zhang – Publication 1 – Lung Cancer
Project 3 – Zhang – Publication 2 – Lung Cancer

If the publication is not available electronically, provide 5 paper copies of the publication.

Note: The grant agreement requires that recipients acknowledge the Pennsylvania Department of Health funding in all publications. Please ensure that all publications listed acknowledge the Department of Health funding. If a publication does not acknowledge the funding from the Commonwealth, do not list the publication.

Title of Journal Article:	Authors:	Name of Peer-reviewed Publication:	Month and Year Submitted:	Publication Status (check appropriate box below):
1. None				☐Submitted ☐Accepted ☐Published

20(B) Based on this project, are you planning to submit articles to peer-reviewed publications in the future?

Yes____x_____ No_____

If yes, please describe your plans:

Primary outcome paper, funded by AHRQ was presented and published simultaneously in March 2013. Secondary papers on behavioral findings will be published subsequently.

21. Changes in Outcome, Impact and Effectiveness Attributable to the Research Project.
Describe the outcome, impact, and effectiveness of the research project by summarizing its impact on the incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of outcome, impact or effectiveness of the research project. If there were no changes, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

The study demonstrated a method for engaging community subject with hypertension in a system of care that results in reduction in blood pressure and return to normotensive levels. As health care reform moves hypertension care to outcome based reimbursement and the Patient Centered Medical Home is developed for chronic care, use of a self measurement program with direct communication with a care provider will be an important component of

this change in practice structure. The research is designed to demonstrate the value of this modern paradigm for chronic disease management; and likely will become the norm for care of hypertension in the new health care model.

22. Major Discoveries, New Drugs, and New Approaches for Prevention Diagnosis and Treatment. Describe major discoveries, new drugs, and new approaches for prevention, diagnosis and treatment that are attributable to the completed research project. If there were no major discoveries, drugs or approaches, insert "None"; do not use "Not applicable." Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

The research demonstrated a modern paradigm for hypertension management; and likely will become the norm for care of hypertension in the new health care model that is focused on quality and outcome instead of procedure based fee for service.

23. Inventions, Patents and Commercial Development Opportunities.

23(A) Were any inventions, which may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under this health research grant? Yes_____ No___x_____

If "Yes" to 23(A), complete items a – g below for each invention. (Do NOT complete items a - g if 23(A) is "No.")

a. Title of Invention:

b. Name of Inventor(s):

c. Technical Description of Invention (describe nature, purpose, operation and physical, chemical, biological or electrical characteristics of the invention):

d. Was a patent filed for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes_____ No____

If yes, indicate date patent was filed:

e. Was a patent issued for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?
Yes_____ No____
If yes, indicate number of patent, title and date issued:
Patent number:
Title of patent:
Date issued:

f. Were any licenses granted for the patent obtained as a result of work performed under this health research grant? Yes_____ No____

If yes, how many licenses were granted?_____

g. Were any commercial development activities taken to develop the invention into a commercial product or service for manufacture or sale? Yes___ No____

If yes, describe the commercial development activities:

23(B) Based on the results of this project, are you planning to file for any licenses or patents, or undertake any commercial development opportunities in the future?

Yes_____ No____x_____

If yes, please describe your plans:

24. Key Investigator Qualifications. Briefly describe the education, research interests and experience and professional commitments of the Principal Investigator and all other key investigators. In place of narrative you may insert the NIH biosketch form here; however, please limit each biosketch to 1-2 pages. *For Nonformula grants only – include information for only those key investigators whose biosketches were not included in the original grant application.*

NAME Alfred A. Bove, M.D., Ph.D.	POSITION TITLE Professor of Medicine (emeritus) Department of Medicine
eRA COMMONS USER NAME ABOVE01	

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.*)

INSTITUTION AND LOCATION	DEGREE (*if applicable*)	YEAR(s)	FIELD OF STUDY
Drexel University, Philadelphia, PA	BSEE	1962	Electrical Engineering
Temple University, Philadelphia, PA	M.D.	1966	Medicine
Temple University, Philadelphia, PA	Ph.D.	1970	Physiology

A. Personal statement

This research is conducted at Temple University Hospital to improve overall cardiovascular health in underserved communities. This is an area of clinical cardiology in need of epidemiologic data and clinical trials to provide clear guidelines on the management of coronary disease in this population. This work follows on from 14 years of clinical studies using advanced communication technologies to establish communication between patients and their health care providers. In particular we have shown benefit with these Internet based technologies in reducing heart failure hospitalization, in reducing CVD risk, and in managing hypertension. In addition, I have used this technology in my clinical practice for 8 years and find it significantly enhances my ability to manage CVD risk in a private cardiology practice. Temple University Hospital, serves an urban population with a high incidence of hypertension, and will provide experience with managing hypertension and CVD risk in underserved minorities.

B. Positions Held and Honors

Assistant Professor Division of Cardiology, Temple University Medical School	1973 - l977
Professor of Medicine, Division of Cardiology, Temple University Medical School	1981
Adjunct Associate Professor of Medicine, Inst for Environmental Medicine Univ. of Penna	l978 - l98l
Bernheimer Professor of Medicine, Chief, Cardiology Section Temple Univ School of Medicine,	1986-1999
Associate Dean, Practice Plan Affairs, Temple University School of Medicine,	1998-2001
Professor of Medicine Emeritus, Temple University School of Medicine	2001-
Medical Director, InSight Telehealth, Inc.	2001-2002
Editor-In-Chief www.cardiosource.com	2002-2007
Established Investigator, American Heart Association	l975 - l980
President American College of Cardiology	2009 - 2010
Paul Dudley White Award, Assoc. of Military Surgeons of the United States	1998
Distinguished Fellowship Award, American College of Cardiology	2002
Outstanding Engineering Alumni Award, Drexel University, Philadelphia	2005
Chief of Cardiology, Temple Univ. Medical School	2005-2008
Director of Research Laboratories, Section of Cardiology, Temple Univ Medical School	l973 - l98l
Director of Clinical Exercise Stress laboratory Temple University Hospital	l973 - l975
Medical Director Adult Fitness Program Temple University	l977 - l98l
Director, Cardiac Catheterization Laboratory, Temple University Hospital	1979 - l98l
Staff, Cardiac Catheterization Laboratory Mayo Clinic Rochester, Minnesota	l98l - 1986
Staff, Cardiovascular Health and Fitness Center Mayo Clinic Rochester, Minnesota	l98l - 1986
Chief of Cardiology, Temple Univ School of Medicine	1986 – 1999
Associate Dean, Practice Plan Affairs Temple University School of Medicine	1998 - 2001
Executive Editor, American College of Cardiology On-Line Services	1998- 2002
Editor in Chief, ACCEL, the ACC audio Journal	2010-

C. Selected Peer Reviewed Publications

1 Bove AA, Kreulen TH, and Spann JF: Computer analysis of left ventricular dynamic geometry in man. Am.

J. Cardiol. 4l:l239-l248, l978.
2 Mann DL, Denenberg BS, Gash AK, Makler PT, and Bove AA: Effects of age on ventricular performance during graded supine exercise. Am Heart J 111:108-115, 1986.
3 Bove AA, Kashem MA, Cross RC, Wald JW, Furukawa S, McClurken JB, Berman GO, Eisen HJ. Factors affecting survival post heart transplantation: comparison of pre and post 1999 listing protocols. *Journal of Heart and Lung Transplantation. 25:42-47,* 2006
4 Masucci MM, Homko C, Santamore WP, Berger P, Crawford MC, Bove AA. Heart Failure Prevention for Underserved Patients Using The Internet: Bridging the Digital Divide. . *Journal of Telemedicine and e-Health.* 2006;*12: 58-65*
5 Kashem A, Droogan MT, Wald JW, Marble JF, Cross RC, Berger P, Santamore WP, Bove AA. Surveillance of heart failure patients using an Internet-based Telemedicine communication system. *Journal of Telemedicine and e-Health.* 2006;12(4):439-447
6 Kashem, A, Droogan, MT, Santamore WP, Wald JW, Bove AA. Managing Heart Failure Care Using an Internet-Based Telemedicine System. Journal of Cardiac Failure 2008; 14:121-126
7 Homko CJ, Zamora L, Santamore WP, Kashem A, McConnell T, and Bove AA Gender Differences in Cardiovascular Risk Factors and Risk Perception Among Individuals With Diabetes The Diabetes Educator 2010 36: 483-488
8 Squires, R.W., Bove, A.A., Kottke, B.A., Mao, S.J., Starts, B.A., Menzel, P.: Exercise training and the apolipoprotein A-1 to HDL-cholesterol ratio. J. Cardiopulm. Rehab. 7:481-486, 1987.
9 King, S.B., Ullyot, D.J., Basta, L., Bove, A.A., Conti, D.R., Jenemann, A.H., Singer, P.A.: Bethesda Conference on Ethics in Cardiovascular Medicine. Task Force 2: Applications of Medical and Surgical Interventions Near End of Life. JACC 31:923-924, 1998.
10 Bove, AA: Risk of Decompression Sickness with Patent Foramen Ovale. Undersea and Hyperbaric Med. 25:175-178, 1998
11 Flower J, Dreifus LS, Bove AA, Weintraub WS: Technologic Advances and the next 50 years of Cardiology. JACC 35:1082-1091, 2000
12 Homko CJ, Santamore WP, Whiteman V, Bower M, Berger P, Geifman-Holtzman O, Bove AA. Use of an internet-based telemedicine system to manage underserved women with gestational diabetes mellitus. Diabetes Technol Ther. 2007 Jun; 9(3):297-306.
13 Homko CJ, Zamora L, Santamore WP, Kashem A, McConnell T, and Bove AA Gender Differences in Cardiovascular Risk Factors and Risk Perception Among Individuals With Diabetes The Diabetes Educator 2010 36: 483-488
14 Santamore WP, Homko CJ, Kashem A, McConnell TR, Menapace FJ, Bove AA. Accuracy of blood pressure measurements transmitted through a telemedicine system in underserved populations. Telemed J E Health. 2008;14:333-8.
15 Bove AA, Santamore WP, Homko CJ, Kashem A, Cross R, McConnell TR, PhD[1], Gail Shirk G, Menapace, FP. Reducing Cardiovascular Disease Risk In Medically Underserved Urban and Rural Communities. American Heart Journal 2011;161:351-9
16 Ahrensfield DC, Bove AA, Tucker AM, Lincoln AE, Dunn RE, Vogel RA, Carotid Intima-Medial Thickness in National Football League Players as an Index of Cardiovascular Disease Risk. J. Am. Coll. Cardiol. 2012;59;699-700
17 Walsh MN, Bove AA, Cross RR, Ferdinand KC, Forman DE, Freeman AM , Hughes S et al. ACCF 2012 Health Policy Statement on Patient-Centered Care in Cardiovascular Medicine: A Report of the American College of Cardiology Foundation Clinical Quality Committee. J. Am. Coll. Cardiol. 2012; 59: 2125 - 2143
18. Bove AA, Homko, CJ, Santamore WP, Kashem M, Kerper, M, Elliott DJ. Managing Hypertension in Urban Underserved Subjects using Telemedicine – a Clinical Trial. (in press) American Heart Journal, March 2013

NAME	POSITION TITLE
Carol J. Homko, RN, PhD	Associate Research Professor
eRA COMMONS USER NAME CJH001	Departments of Medicine & Obstetrics and Gynecology

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE (*if applicable)*	YEAR(s)	FIELD OF STUDY
University of Connecticut, Storrs, CT	BSN	1970	Nursing
Quinnipiac College, Hamden, CT	MPS	1986	Health Administration
Temple University, Philadelphia, PA	PhD	2000	Health Studies

A. Personal Statement

I am a nurse and certified diabetes educator, with more than 30 years of experience in diabetes education and management. I currently hold a dual appointment as Associate Research Professor in the Department of Medicine, Section of Endocrinology, Metabolism and Diabetes and the Department of Obstetrics, Gynecology and Reproductive Sciences at the Temple University School of Medicine. I am also the Assistant Director of the Temple Telemedicine Research center and as such administratively responsible for the clinical core of three large multi-center telemedicine trials. For the past fifteen years, my research has focused on GDM and pregnancies complicated by pre-existing diabetes. I have been principal investigator of two telemedicine trials in gestational diabetes (both funded by NIH).

B. Positions and Honors

1970-1972 Staff Nurse, Yale-New Haven Hospital, New Haven, CT
1972-1975 Head Nurse, Fitkin II, Adult Medicine, Yale-New Haven Hospital
1975-1977 Assistant Administrative Supervisor, Medical Nursing, Yale-New Haven Hospital
1977-1991 Diabetes Nurse Clinician, Nursing Education Dept, Yale-New Haven Hospital
1985-1991 Clinical Instructor, Yale University School of Nursing, New Have, CT
1991-2000 Coordinator, Diabetes-in-Pregnancy and Perinatal Research Programs, Department of Obstetrics and Gynecology, Temple University, Philadelphia, PA
1991- Diabetes Nurse Specialist, Dept of Obstetrics and Gynecology, Temple University
2000- Nurse Manager, Clinical Research Center, Temple University
2002-2008 Assistant Research Professor, Department of Medicine
2005-2008 Assistant Professor, Dept of Obstetrics, Gynecology & Reproductive Sciences
2008 Associate Research Professor, Department of Medicine
2008 Associate Research Professor, Dept of Obstetrics, Gynecology and Reproductive Sciences

Other Experience and Professional Memberships

2004-2007 Board of Directors, American Diabetes Association
2004- Assistant Director of Research, Temple Telemedicine Research Unit, Temple University School of Medicine, Philadelphia, PA
2006-2007 Council Chair, Pregnancy and Reproductive Health Specialty Practice Group, American Association of Diabetes Educators, Chicago, IL

2008- Co-chair, Grants Subcommittee, Am Assoc of Diabetes Educators, Chicago, IL
2010 -2011 Chair, Research Committee, American Assoc of Diabetes Educators, Chicago, IL

C. Selected Peer Reviewed Publications

11158010 **Homko CJ**, Sivan E, Chen X, Reece EA, Boden G (2001). Insulin Secretion During and After Pregnancy in Patients with Gestational Diabetes Mellitus (GDM). Journal Of Clinical Endocrinology and Metabolism 86:568-573.
12540625 **Homko CJ**, Cheung P, Boden G. (2003). Effects of Free Fatty Acids On Glucose Uptake And Utilization In Healthy Women. Diabetes 52:487-91.
12832307 **Homko C**, Deluzio A, Jimenez C, Kolaczynski JW, Boden G. (2003). Comparison Of Insulin AsPart And Lispro: Pharmacokinetic And Metabolic Effects. Diabetes Care 26:2027-31.
15734868 Boden G, **Homko C**, Mozzoli M, Showe LC, Nichols C, Cheung P. (2005). Thiazolidinediones upregulate fatty acid uptake and oxidation in adipose tissue of diabetic patients. Diabetes 54:880-885.
15800559 Sargrad KR, **Homko C,** Mozzoli M, Boden G. (2005). Effect of high protein vs high carbohydrate intake on insulin sensitivity, body weight, hemoglobin A1c and blood pressure in patients with type 2 diabetes mellitus. Journal of the American Dietetic Association. 105:573-80.
16380494 Vaidyula VR, Rao AK, Mozzoli M, **Homko C**, Cheung P, Boden G (2006). Effects of hyperglycemia and hyperinsulinemia on circulating tissue factor procoagulant activity and platelet CD40 ligand. Diabetes 55:202-208.
17213471 Boden G, Vaidyula V, **Homko C,** Mozzoli M, Rao AK (2007). Differential effects of somatostatin on circulating tissue factor procoagulant activity and protein. American Journal of Physiology. 292:E1333-9.
17456592 Trout KK, **Homko C,** Tkacs NC (2007). Methods of measuring insulin sensitivity. Biological Research for Nursing. 8:305-318.
17192489 Boden G, **Homko C**, Mozzoli M, Zhang M, Kresge K, Cheung P (2007). Combined use of Rosiglitazone and Fenofibrate in patients with type 2 diabetes: Prevention of fluid retention. Diabetes 2007;56:248-255.
17561800 **Homko CJ,** Santamore WP, Whiteman V, Bower M, Berger P, Geifman-Holtzman O, Bove AA (2007). Use of an Internet-based telemedicine system to manage underserved women with gestational diabetes. Diabetes Technology & Therapeutics. 29: 277-286.
18596496 **Homko CJ,** Santamore WP, Zamora L, Shirk G, Gaughan J, Cross R, Kashem A, Petersen S, Bove AA (2008). Cardiovascular disease knowledge and risk perception among underserved individuals at increased risk of cardiovascular disease. Journal of Cardiovascular Nursing. 23: 332-337.
18567819 Boden G, Duan X, **Homko C,** Molina EJ, Song WW, Perez O, Cheung P, Merali S (2008). Increase in endoplasmic reticulum stress-related proteins and genes in adipose tissue of obese, insulin-resistant individuals. Diabetes 57:2438-2444.
20360597 **Homko CJ**, Zamora L, Santamore WP, Kashem A, McConnell T, Bove AA (2010). Gender differences in cardiovascular risk factors and risk perception among individuals with diabetes. Diabetes Educator 36:483-8.
21315219 Bove AA, Santamore WP, **Homko C**, Kashem A, Cross R, McConnell TR, Shirk G, Menapace F (2011). Reducing cardiovascular disease risk in medically underserved urban and rural communities. American Heart Journal 2011;161:351-9.
22512287 **Homko CJ**, Deeb LC, Rohrbacher K, Mulla W, Mastrogiannis D, Gaughan J, Santamore WP, Bove AA (2012). Impact of a telemedicine system with automated reminders on outcomes in women with gestational diabetes mellitus. Diabetes Technology & Therapeutics. In press.

NAME	POSITION TITLE
William P. Santamore, PhD	Co-Investigator Professor of Medicine
eRA COMMONS USER NAME WSANTA02	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Manhattan College, Bronx, NY	B.S.	6/69	Electrical Engineering
Drexel University, Philadelphia, PA	MS	6/72	Biomedical Engineering
Temple University, Philadelphia, PA	PhD	6/75	Physiology

A. Positions and Honors

Positions and Employment

7/78 to 6/81 Assistant Professor, Department of Medicine; Temple University

7/81 to 6/85 Assistant Professor, Department of Physiology; University of Pennsylvania

7/85 to 6/89 Associate Professor, Department of Medicine; Wake Forest University

7/89 to 6/93 Adjunct Assoc. Professor, Department of Physiology; University of Pennsylvania

7/93 to 6/96 Associate Professor, Div. Thoracic and Cardiovascular Surgery; University of Louisville

7/96 to 6/98 Professor, Division of Thoracic and Cardiovascular Surgery; University of Louisville

6/98 to Present Professor, Departments of Medicine and Physiology, Temple University

7/03 to Present Director of Telemedicine Research

Other Experience and Professional Memberships

1970-present Institute of Electrical and Electronic Engineering

1977-present American Physiological Society

1980-present American Heart Assn.

1988-present American Federation of Clinical Research

1994-present Academy of Surgical Research

1994-present American Society for Artificial Internal Organs

Honors

1979 Finalist A.N. Richards Young Investigator Contest

Editor, Eta Kappa Nu , Electrical Engineering Honor Fraternity; Finalist, Deborah Young Investigator Award

1982-1985 Bulletin of the Physiological Society,

B. Selected Peer-Reviewed Publications

(Selected from over 175 papers)

1. Austin EH, Santamore WP, Barnea O. Balancing the circulation in hypoplastic left heart syndrome. J Cardiovasc Surg 1994; 35(Suppl 1 to No. 6):137-9.

2. Santamore WP, Gray L Jr. Significant left ventricular contributions to right ventricular systolic function: Mechanism and clinical implications. Chest 1995; 107:1134-45.
3. Barnea O, Santamore WP. Intra-Operative and Post-Operative Monitoring of IMA Flow: What Doest It Mean? Ann Thorac Surg 1997; 63:S12-S17.
4. Chiang BBY, Ali AT, Unger LS, Slater AD, Santamore WP. Cardiomyoplasty: Hemodynamic benefit to normal and depressed canine left ventricular function. ASAIO J 1997; 43:M786-M790.
5. George DT, Binder-Macleod SA, Delosso TN, Santamore WP. Variable-frequency train stimulation of canine latissimus dorsi muscle during shortening contractions. J Appl Physiol 1997; 83:994-1001.
6. Chiang BBY, Ali At, Storey JH, Riordan CJ, Ballen J, Montgomery WD, Slater AD, Santamore WP. Variable effects of cardiomyoplasty on left ventricular function. Artificial Organs 1997; 21:1277-1283.
7. Santamore WP, Barnea O, Riordan CJ, Ross MP, Austin EH. Theoretical optimization of pulmonary to systemic flow ratio after a bi-directional cavopulmonary anastomosis in the univentricular circulation. Am J Physiol 1998; 274:H694-700.
8. Santamore WP, Dell'Italia LJ. Ventricular interdependence: Significant left ventricular contributions to right ventricular systolic function. Progress in Cardiovascular Diseases 1998; 40:289-308.
9. Dell'Italia LJ, Santamore WP. Can indices of left ventricular function be applied to the right ventricle. Progress in Cardiovascular Diseases 1998; 40:309-324.
10. Santamore WP, Barnea O, Riordan CJ, Ross MP, Austin EH. Theoretical optimization of pulmonary to systemic flow ratio after a bi-directional cavopulmonary anastomosis in the univentricular circulation. Am J Physiol 1998; 274:H694-700.
11. Barnea O, Santamore WP, Rossi AF, Salloum E, Chien S, Austin EH III. Estimation of oxygen delivery in newborns with a univentricular circulation Circulation 1998; 98:1407-1413.
12. Ali AT, Santamore WP, Chiang BY, Dowling R, Slater AD. Preconditioning of the latissimus dorsi muscle in cardiomyoplasty: vascular delay or chronic electrical stimulation. Europ J Cardio-thoracic Surg 1998; 14:304-310.
13. Ali AT, Santamore WP, Chiang BY, Dowling R, Tobin GR, Slater AD. Cardiomyoplasty after vascular delay results in marked improvement in left ventricular hemodynamic function. Ann Thorac Surg
1999; 67:1304-11.
14. Chiang BY, Ahsan A, Kashem A, Unger L, Chien S, Santamore WP, Slater AD, Gray LA Jr. Two step cardiomyoplasty with vascular delay: Effect of stimulation of latissimus dorsi muscle on diastolic function. ASAIO J 1999;45:350-55.
15. Kashem MA, Santamore WP, Chiang BY, Slater AD. Effect of varaible and constant-frequency train in latissimus dorsi muscle stimulation. Basic Applied Myology 1999; 9: 113-116.
16. Chiang BY, Roberts AM, Kashem AM, Santamore WP, Chien S, Gray L Jr, Dowling R. Chemoreflexes: An experimental study. Arch Surg 2000; 135:577-581.
17. Kashem MA, Santamore WP, Hassan S, Chiang BY, Slater AD. Can Latissimus Dorsi Muscle Stimulation Benefit Heart During Training Period After Vascular Delay? J ASAIO. 2001; 47:655-61.
18. Kashem MA, Santamore WP, Chiang BY, Unger L, Ali AT, Slater AD. Vascular delay and intermittent stimulation: keys to successful latissimus dorsi muscle stimulation. Annals of Thoracic Surgery. 2001; 71(6): 1866-73.
19. Masucci MM, Homko CJ, Santamore WP, Berger P, Bove AA. Bridging the digital divide in underserved patients with cardiovascular risk. (In press, Telemedicine Journal and e-Health**).**