



Employing Electronic Health Records To Influence Care of Diabetic Patients:

A Report of HEALTHeWV Health Outcome Project Research

Prepared by Wheeling Jesuit University
In Partial Fulfillment of National Aeronautics and Space
Administration Grant - NNX08AP69G S01

May 2010

TABLE OF CONTENTS

INTRODUCTION.....	3
BACKGROUND AND SIGNIFICANCE OF RESEARCH.....	3
HEALTHeWV Program Configuration	4
RESEARCH PROCESS	6
HYPOTHESIS.....	6
CREATION OF THE DATA POOL AND DATA COLLECTION PROCEDURES	7
CREATING THE RANDOM SAMPLE.....	7
DATA ANALYSIS AND RESULTS	8
DEPENDENT VARIABLES	8
INDEPENDENT VARIABLE.....	8
Patient Marker Thresholds	9
STATISTICAL ANALYSIS.....	9
lessons learned	10
SOURCES CONSULTED	11
APPENDICES.....	13
APPENDIX 1 - HEALTHeWV PROJECT STAFF.....	14
Appendix 2 – HEALTHeWV SAMPLE SCREEN SHOTS.....	15
APPENDIX 3 – HEALTHCARE CLINICS INCLUDED IN RESEARCH PROJECT DATA POOL.....	16
APPENDIX 4 – RAOSOFT – SAMPLE SIZE CALCULATOR SCREEN SHOT	17

INTRODUCTION

HEALTHeWV is an electronic health records-based disease management and health promotion program designed to improve health care quality, patient outcomes, and patient safety. Based at the Robert C. Byrd National Technology Transfer Center (NTTC), on the campus of Wheeling Jesuit University (WJU), HEALTHeWV was inaugurated in 2005 with funding from the National Aeronautics and Space Administration (NASA) to improve the health of West Virginia's rural communities by linking national health care advancements with the expertise of health care professionals to fulfill community health care needs.

A component of the HEALTHeWV project funding has been devoted to investigating the significance of utilizing electronic health records within clinical settings to effect modifications in health outcomes for diabetic patients. To date, the majority of HEALTHeWV projects have been undertaken within the confines of the state of West Virginia.

Employing Electronic Health Records To Influence Care of Diabetic Patients :A Report of HEALTHeWV Health Outcome Project Research details the specifics of this project and reports the results of the research. The project and compilation of this report are funded by NASA Grant Number NNX08AP69G. Project staff members are enumerated in Appendix 1.

BACKGROUND AND SIGNIFICANCE OF RESEARCH

The Centers for Disease Control and Prevention note that “Diabetes is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Diabetes can lead to serious complications and premature death, but people with diabetes can take steps to control the disease and lower the risk of complications.” (http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2007.pdf) The prevalence of diabetes in the United States continues to grow steadily each year. Nationally, the American Diabetes Association reports:

- Diabetes affects 23.6 million children and adults in the United States (8 percent of population)
- Nationally, approximately 17 million persons are diagnosed with diabetes, 5.7 million are undiagnosed, and 57 million are pre-diabetic
- One in seven Americans either has diabetes or is at high risk for developing diabetes (Agency for Healthcare Research and Quality, 2004)
- In 2007, the national cost of diabetes exceeded \$174 billion (\$116 billion in excess medical expenditures as well as \$58 billion in reduced national productivity)
- People diagnosed with diabetes, on average, have higher medical expenditures that are approximately 2.3 times higher than expenditures in the absence of diabetes
- Approximately \$1 in every \$10 health care dollars is attributed to diabetes

In West Virginia, the West Virginia Health Statistics Center reports:

- West Virginia has the highest prevalence of diabetes in the U.S. (2006 data)
- In West Virginia, 12.1% of the population is diagnosed as diabetic
- Approximately, 256,000 West Virginians are considered to be diabetic (171,000 diagnosed, 85,000 undiagnosed)
- During the past 13 years, diabetes prevalence among West Virginia adults doubled
- The oldest adults (65 and older) had the highest diabetes prevalence among all age groups in West Virginia – 23.5% in 2006

In addition to diabetes, West Virginia leads the nation in the incident of other chronic diseases such as cancer and heart disease. The state's residents also experience higher prevalence rates of co-morbid conditions such as obesity, physical inactivity, and hypertension.

Within the state, access to diabetes education, care, and management is limited or non-existent in many rural regions. With an aging and predominantly poor citizenry, West Virginia must often cope with the devastating consequences of chronic diseases such as diabetes. The disease's social, psychological, physical, and economic costs create significant burdens for individuals, families, and society as a whole.

Therefore, the primary significance of this project lies in the measurement of potential positive health outcome impacts upon the population surveyed. According to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), studies in the United States and abroad have found that improved glycemic control benefits people with either type 1 or type 2 diabetes. In general, every percentage point drop in A1C blood test results—for example, from 8 to 7 percent—can reduce the risk of microvascular complications—eye, kidney, and nerve diseases—by 40 percent.” (<http://diabetes.niddk.nih.gov/dm/pubs/statistics/index.htm>) Additionally, White (2002) reports that economic savings from a 1 percent reduction in A1c levels can be as much as \$4,000 in patients with a combination of diabetes, heart disease, and hypertension, which are common comorbidities of diabetes. In 2008, Wyne extrapolated a 3-year period savings from patients who reduced their A1c levels by one percent:

TABLE 1 Standardized Per-Patient Cost of Care Differentials for 1% Changes in A1c Levels for 1,694 Adults With Diabetes Over a 3-Year Period^a

A1c Level	10% to 9%	9% to 8%	8% to 7%	7% to 6%
Diabetes with heart disease and hypertension	\$2675 ± 1164	\$2536 ± 1048	\$726 ± 953	-\$1001 ± 2000
Diabetes with heart disease	\$2078 ± 900	\$1970 ± 811	\$564 ± 745	-\$778 ± 1547
Diabetes with hypertension	\$1130 ± 498	\$1071 ± 449	\$306 ± 400	-\$423 ± 849
Diabetes without heart disease or hypertension	\$805 ± 353	\$763 ± 318	\$218 ± 287	-\$301 ± 603

^aData abstracted from Gilmer TP, et al. *Diabetes Care*. 2005;28:62.¹⁰

Source: Wyne, K. Information Technology for the Treatment of Diabetes: Improving Outcomes and Controlling Costs.

Clearly, then, there is potential benefit in identifying the role that an electronic health records-based disease management and health promotion program can fulfill in improving patient well-being.

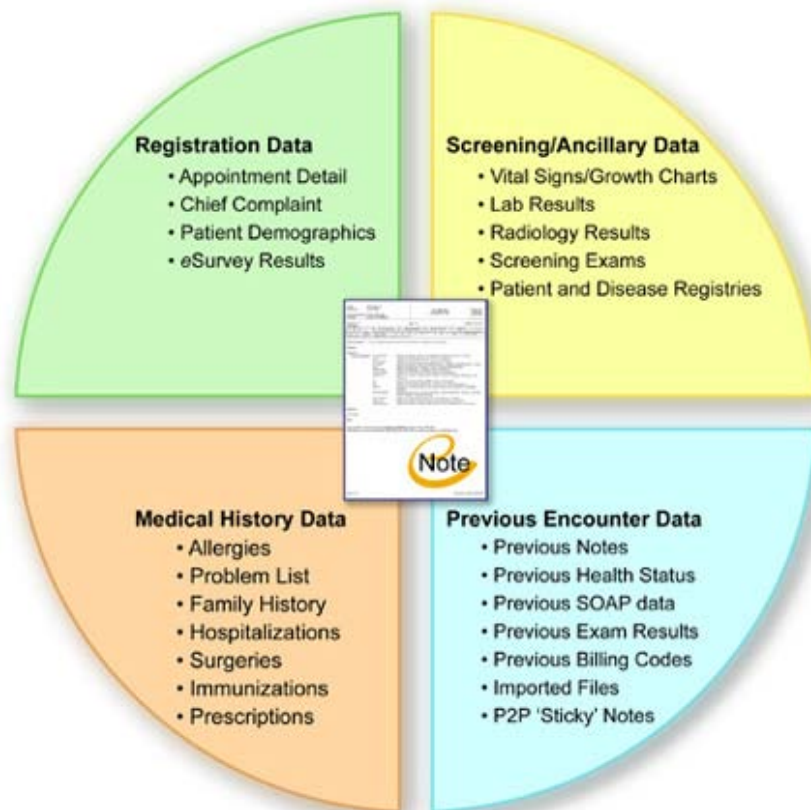
HEALTHeWV Program Configuration

In 2005, the U.S. Congress directed the Robert C. Byrd National Technology Transfer Center to adapt and implement the Walter Reed Army Medical Center's HEALTHeFORCES electronic health records system to benefit rural, medically underserved areas of the nation. The pilot geographic region chosen for implementation was the state of West Virginia and the program was called HEALTHeWV.

The HEALTHeWV program is a full-featured, user-friendly program with system functionalities that include:

- **HEALTHeNOTES** – outpatient medical record documentation that incorporates data from a variety of sources, such as HEALTHeSURVEYS, patient registries, laboratory/radiology results, notes from previous visits, prescription information, master problem list, medications, surgeries, and family history.
- **Prescription Order Entry (POE)** - includes robust features for writing, renewing, printing, or e-faxing patients' prescriptions.
- **Disease Registries and Reporting** – allows tracking of patient data, setting of specific goals for self-care, and comparison of patient data against national norms.
- **HEALTHeSURVEYS** - 15 disease-specific and general health patient surveys currently available in the system. Customized clinic surveys can also be developed.

HEALTHeNOTES Features

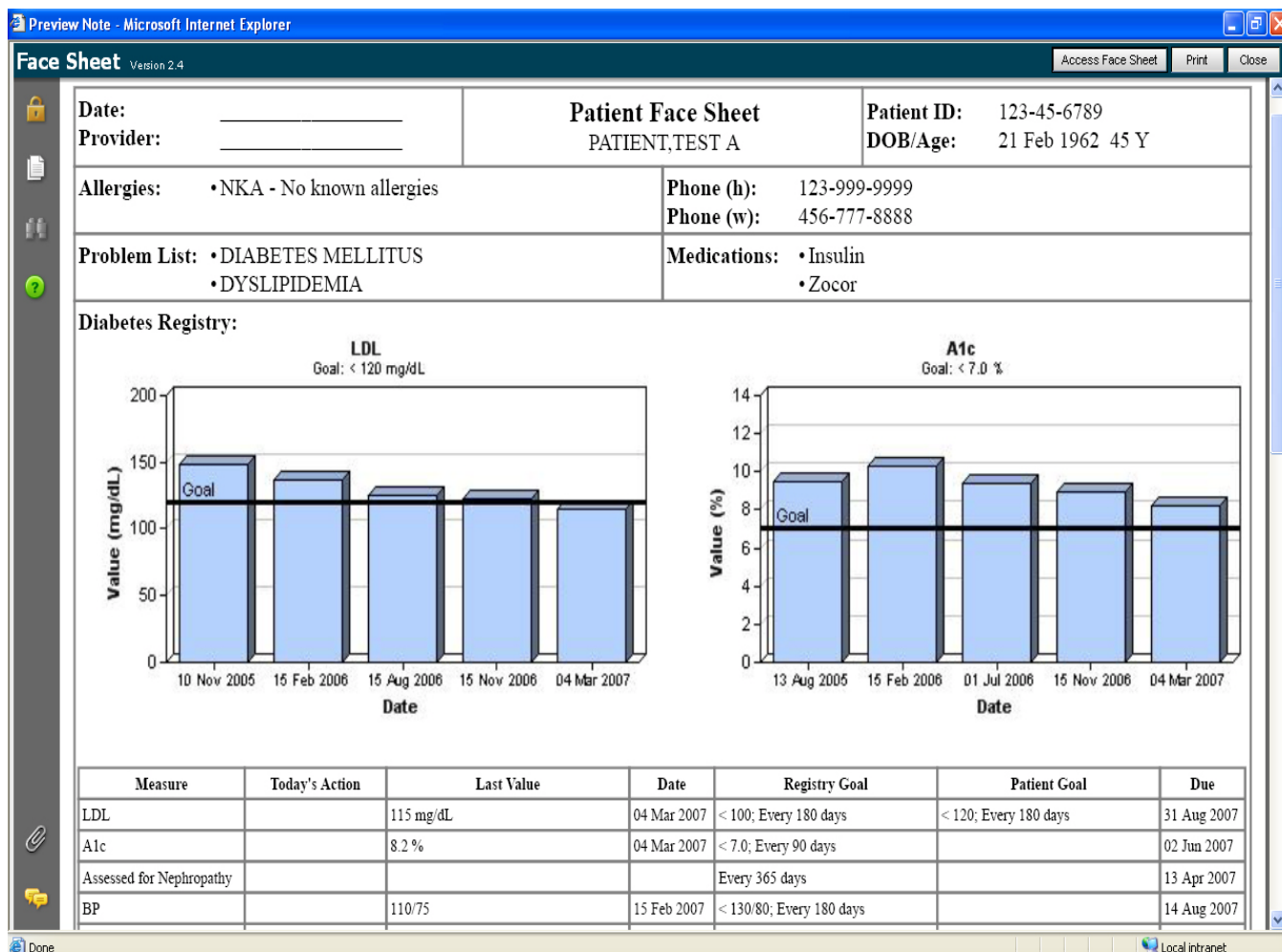


Source: HEALTHeSTATE LLC

The HEALTHeWV project and its staff (based at the NTTCC) have adopted the application service provider (ASP) model for hosting electronic health records and their software applications. ASPs host, manage, and deliver applications to multiple entities from a remote data center across a wide area network

At the on-site medical clinics, providers are prompted by the registry information that is a component of each patient's record.

A typical HEALTHeWV patient display demonstrates graphically whether or not the patient has met the LDL and/or A1c goals:



Other displays are utilized by healthcare providers to counsel the patient or to serve as reminders to place orders for diagnostic testing (see Appendix 2). Thus, the HEALTHeWV system provides tools to identify at-risk patients; collect and synthesize patient population data; individualize patient health status; and assist with patient education with the goal of improving medical care (Wyne, 2008).

RESEARCH PROCESS

Hypothesis

The research project utilized the following hypothesis:

The usage of the HEALTHeWV electronic health records-based disease management and health promotion program (with chronic disease registry evidence-based guidelines) will result in enhanced health outcomes for diabetic patients as measured by hemoglobin (A1c), low-density lipoprotein cholesterol (LDL), and hypertension (blood pressure) levels.

Creation of the Data Pool and Selection of the Sample

The Data Pool and Data Collection Procedures

Population of the potential HEALTHeWV research project data pool began in 2010 when records from the previous 4 years were evaluated for potential selection. Data was collected from onsite charting and by electronically polling the HEALTHeWV diabetic registry for each healthcare clinic.

Clinics participating in the potential pool during the 4 previous years totaled:

Year	Total Participating Clinics
2006-2007	5
2007-2008	16
2008-2009	8
2009-2010	5
Total	34

The 14 clinics used in the study were of similar rural settings and patient populations. In addition, primary care providers across all clinics were trained in the same manner and relied upon similar treatment guidelines for diabetic care. Training was delivered in a consistent format to comprehensively cover the proper use of the EHR, implementation, and go-live support.

Previous to 2008 (and prior to implementation of the electronic records module), information from a 12-month data set of paper-based charts was considered for inclusion in the data pool. Because of varying and staggered implementation dates, the 3-year window of record collection for each clinic varied. Year 1 data samples (derived from paper charts) represent the baseline for the project data pool. During Year 2, some participating clinics continued electronic data entry in the records management system while others continuing manual charting. Thus, a mixture of paper-based and electronic records existed. Since there was not a significant pool of electronic-only records for healthcare Clinics, no records were sampled from this year. For Year 3 data, any clinic which met the criterion of 100 percent electronic charting by January 1, 2009 was included in the potential data set pool. Fourteen (14) healthcare Clinics met this definition and their records were included in the data pool (see Appendix 3 for list of Clinics). The Year 3 records were electronically derived from the master database's individual charts utilizing the reporting capabilities of the HEALTHeSTATE™ software. Each patient listed in an individual clinic's diabetic registry was included in the data pool. Individual clinic records were maintained in discrete files for that clinic.

All research data records involved with this project are classified as confidential and were de-identified in the analysis of individual clinic diabetes registry and charted paper entries. Results from the registries, in the form of ordinal numbers, were entered into spreadsheets either manually or electronically and original records disassociated from the tallies. The collected data is physically secured in locked facilities and will be destroyed in May 2015.

Creating the Random Sample

From the 14 clinics included in the research pool, study patients were selected who met the criteria of: a diagnosis of diabetes (ICD-9 codes 250.xx) and at least 2 visits to their primary care provider during the study year.

From the dataset of annual (2007-2009) records, a total of 3773 charts were reviewed: 2007 – 1037; 2008 – 1226; and 2009 – 1410.

To create a simple random sample for each clinic, the total study patient population was entered into Raosoft's Sample Size Calculator (see Appendix 4). The sample size was calculated using a 5 percent margin of error and a 95 percent confidence level.

Results for the 14 clinics are noted below.

CLINIC	TOTAL DIABETICS	SAMPLE SIZE	TOTAL MEETING CRITERIA 2007	TOTAL MEETING CRITERIA 2008	TOTAL MEETING CRITERIA 2009
Wheeling Health Right	764	256	156	153	156
WVHR	749	255	69	115	105
Fairmont	670	245	125	131	131
Sissonville	426	203	115	177	169
Dawes	402	197	114	159	169
Ebenezer	383	193	80	65	149
Clendenin	352	184	122	145	138
Eastern Panhandle	275	161	66	104	119
Beckley	207	135	44	63	71
Good Samaritan	200	133	18	18	18
Mercer Health Right	160	114	36	68	68
Milan Puskar	151	105	76	97	87
Health Access	72	61	16	31	30
Totals	4811	2242	1037	1326	1410

DATA ANALYSIS AND RESULTS

This study was designed to assess the effect upon health care outcomes that implementation of an electronic medical records system might provide as measured by individual A1c, LDL, and blood pressure levels for patients with diabetes mellitus.

Dependent Variables

Dependent variables included glycemic control, lipid control, and hypertension control as measured by HbA_{1c}, LDL, and systolic/diastolic blood pressure testing.

Independent Variable

The independent variable for this study is represented by an indicator of the year [2007 (paper) or 2009 (electronic)] in which the outcome measures were taken.

Patient Marker Thresholds

HbA_{1c} less than 7
LDL less than 100 mg/dl
BP 130/80 mm Hg

Healthcare Effectiveness Data and Information Set (HEDIS) measures were used to determine patient marker thresholds (<http://www.ncqa.org/tabid/1044/Default.aspx>).

Statistical Analysis

The difference in the mean percentage for each of the measures across all of the centers before and after conversion was checked for significance using a two-tailed Student's t test. The differences are significant if the Probability (P) that the means are not different is less than 0.05 ($P < 0.05$).

Mean and Standard Deviation Percentages of A1c, LDL and BP Falling Below Their Respective Thresholds

Threshold Measures	2007		2009		P
	Mean (%)	Std Dev	Mean (%)	Std Dev	
A1c < 7	43.41	9.88	39.59	9.66	0.20
LDL < 100	43.32	11.33	44.13	10.20	0.81
BP < 130/80	46.76	12.16	47.98	9.24	0.75

n=2,242

There were no significant ($P < 0.05$) differences

Results indicate that changes in percentage of patient threshold measures were not statistically significant to draw any conclusions. Percentage of total patients presenting an A1c score of less than 7 decreased after implementation of the EHR system. Total patients who presented with lower LDL and blood pressure levels increased after EHR implementation, but only slightly. Therefore, due to the lack of statistical significance, the clinical relevance of these changes cannot be extrapolated or utilized in the formation of valid conclusions.

LESSONS LEARNED

In this study, the use of electronic health records vs. charting patient progress in paper formats does not appear to have resulted in any substantial improvement in the health outcomes of diabetic patients. Thus, the hypothesis is not proven either true or false.

Such results are not unique to HEALTHeWV as noted by Dr. David J. Ballard at Baylor University's Health Care System in Texas:

Comparing the numbers at clinics before and after the EHR was put in place, Ballard says, showed that when the electronic system was used, more patients met standards deemed "optimal" by the health care center and its doctors. But when the researchers broke the results down further, they showed that electronic health records aren't a panacea. Improvements tended to be limited to quick fixes: With a prompt to add aspirin to a list of medications for a patient with diabetes, or a reminder to prescribe a drug to lower cholesterol or blood pressure, the electronic system got results. "It improves outcomes that are easily achieved by pharmacological therapy," Ballard says.

Yet when it came to things that couldn't simply be fixed with the stroke of a pen—say, getting someone to quit smoking or to closely manage blood glucose—the system made little difference. "Educating people requires physician time," says Cliff Fullerton, MD, a Baylor Health Care System doctor who helped design and implement the Baylor EHR. "Getting an EHR ... doesn't buy that extra 15 or 20 minutes to talk to the patient." (Diabetes Forecast: 2010).

It is likely that workers at the 14 clinics in this research project did not take full advantage of the tools within the HEALTHeWV diabetes registry. The reasons most probably are related to:

- A significant learning curve for clinic employees to overcome in a short period of time
- A less flexible point of entry for data (laptops or desktop computers were used – no voice recognition software was available)
- Varying experiential levels among clinic staff – few technophiles are employed in the clinics
- Cultural acceptance of the benefits to be reaped from utilizing the full capabilities of the system (as opposed to feeling that the system was imposed upon the staff)

Research results have reiterated the need for continuous work with all clinic employees and staff. Specifically, the HEALTHeWV project staff will concentrate on:

1. Re-educate and re-orienting clinicians and support staff on meaningful use of HEALTHeWV electronic health records.
2. Developing, distributing, and analyzing a survey to assess which method(s) of training will be most beneficial to clinicians and clinical support staff
3. Implementing results of the needs assessment survey to redesign or enhance training opportunities to accommodate varied learning styles, preferred method of instructional delivery, and frequency of delivery
4. Reintroduce diabetes registry training to focus on how the reminders, prompts, and reporting capabilities can be used to improve care coordination; reduce healthcare disparities; improve population health outcomes; and engage patients, families, and the entire care team in the wellness process.

Sources Consulted

- Agency for Healthcare Research and Quality. (2004, September). *Diabetes care quality improvement: resource guide*. Retrieved May 10, 2010, from Agency for Healthcare Research and Quality: <http://www.ahrq.gov/qual/diabqual/diabqguidemod1.htm>
- American Diabetes Association. (2010). *Estimated prevalence and cost of diabetes in West Virginia*. Retrieved May 10, 2010, from American Diabetes Association Advocacy and Legal Resources: <http://www.diabetesarchive.net/advocacy-and-legalresources/cost-of-diabetes-results.jsp?state=West+Virginia&district=0&DistName=West+Virginia+%28Entire+State%29>
- Centers for Disease Control and Prevention. (2007). *National diabetes fact sheet, 2007*. Retrieved May 10, 2010, from Centers for Disease Control and Prevention: http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2007.pdf
- Curry, A. (2010, May). *Assessing the impact of electronic health records*. Retrieved May 13, 2010, from Diabetes Forecast: <http://www.forecast.diabetes.org/magazine/your-ada/assessing-impact-electronic-health-records>
- Fallon Community Health Plan. (2010). *2010 HEDIS measures*. Retrieved May 10, 2010, from Fallon Community Health Plan: http://www.fchp.org/NR/rdonlyres/47FCDE8E-971F-486B-8672-AF7EAC19E770/0/2010_HEDIS_Measures.pdf
- HEALTHeSTATE LLC. (2010). *HEALTHeSTATE product overview*. Retrieved May 10, 2010, from HEALTHeSTATE: <http://www.healthestate.us/Default.aspx?Content=PRODUCTS-OVERVIEW>
- HEALTHeWV diabetic outcomes research study*. (2010, January). Retrieved May 10, 2010, from HEALTHeWV: http://www.healthewv.net/news&events/news/2010/pressrelease_20100101.asp
- National Committee for Quality Assurance . (2010). *HEDIS and quality measurement*. Retrieved May 13, 2010, from Healthcare Effectiveness Data and Information Set (HEDIS): <http://www.ncqa.org/tabid/59/Default.aspx>
- National Institute of Diabetes and Digestive and Kidney Diseases. (2008, June). *National Diabetes Statistics, 2007*. Retrieved May 10, 2010, from National Diabetes Information Clearinghouse: <http://diabetes.niddk.nih.gov/dm/pubs/statistics/index.htm>
- O'Connor, P. J., Crain, A. L., Rush, W. A., Sperl-Hillen, J. M., Gutenkauf, J. J., & Duncan, J. E. (2005, July/August). *Impact of an electronic medical record on diabetes quality of care*. Retrieved May 11, 2010, from Annals of Family Medicine: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1466905/pdf/0030300.pdf>
- Raosoft, Inc. (2010, May). *Sample size calculator*. Retrieved May 11, 2010, from Raosoft.com: <http://www.raosoft.com/samplesize.html>
- Shaik, M., & Comerchi, J. L. (2007, March/April). *EMR initiatives at the Robert C. Byrd National Technology Transfer Center at Wheeling Jesuit University*. Retrieved May 10, 2010, from West Virginia Medical Journal:

http://www.wvsma.com/shared/content_objects/media_objects/mediafilepath/2007_mj//2007marchapril.pdf

West Virginia Department of Health and Human Resources. (2009, February). *West Virginia Behavioral Risk Factor Survey Report - 2006*. Retrieved May 10, 2010, from West Virginia Health Statistics Center:
<http://www.wvdhhr.org/bph/hsc/pubs/BRFSS/2006/2006WestVirginiaBehavioralRiskFactorSurveyReport.pdf>

West Virginia Diabetes Prevention and Control Program. (2006). *West Virginia Diabetes Prevention and Control Program*. Retrieved May 10, 2010, from West Virginia Diabetes Prevention and Control Program: <http://www.wvdiabetes.org>

West Virginia Health Statistics Center. (2007). *Diabetes in West Virginia*. Retrieved May 10, 2010, from West Virginia Diabetes Prevention and Control Program:
<http://www.wvdiabetes.org/Portals/12/Diabetes%20in%20WV.ppt>

Wheeling Jesuit University. Office of Health Technology Programs. (2006, June 19). Overview - HEALTHeWV (PowerPoint presentation). Retrieved May 10, 2010, from HEALTHeWV.
Wheeling Jesuit University. Office of Health Technology Programs. (2006, August). HEALTHeWV measuring value (PowerPoint Presentation).

Wyne, K. (2008, March). *Information technology for the treatment of diabetes: improving outcomes and controlling costs*. Retrieved May 10, 2010, from Journal of Managed Care Pharmacy: http://www.amcp.org/data/jmcp/JMCP_Suppl_March%2008.pdf

HEALTHe**WV**



APPENDICES

APPENDIX 1

HEALTHeWV Program and Assisting Staff

Principal Investigator
J. Davitt McAteer, J.D.
Vice-President Sponsored Programs

Executive Director – Health Technology Programs (Principal Investigator through
January 2010)
Dr. Mazharullah Shaik, MD

Interim Director – Health Technology Programs
Sandy Linsky

Principal Project Researcher
Kathy Gaudio Platter, RN, MSN, CPHQ
Manager, Health Applications and Clinical Services

Research Report Editor
Dr. Charles A. Julian, PhD

Analysis of Data
Dr. Theodore S. Erickson, Dr. Ben Hitt, and Ralph Seward
Wheeling Jesuit University

Clinical Projects Coordinator – Health Technology Programs
Melissa Mealy, M.A.

Health Applications Coordinator
Pam Scott

Clinical Systems Analyst
Brian Moore

Technical Support Specialist
Beth Coleman

Program Associate
Peggy Simmons

Manager, Public Relations – Sponsored Programs
Tricia Lollini

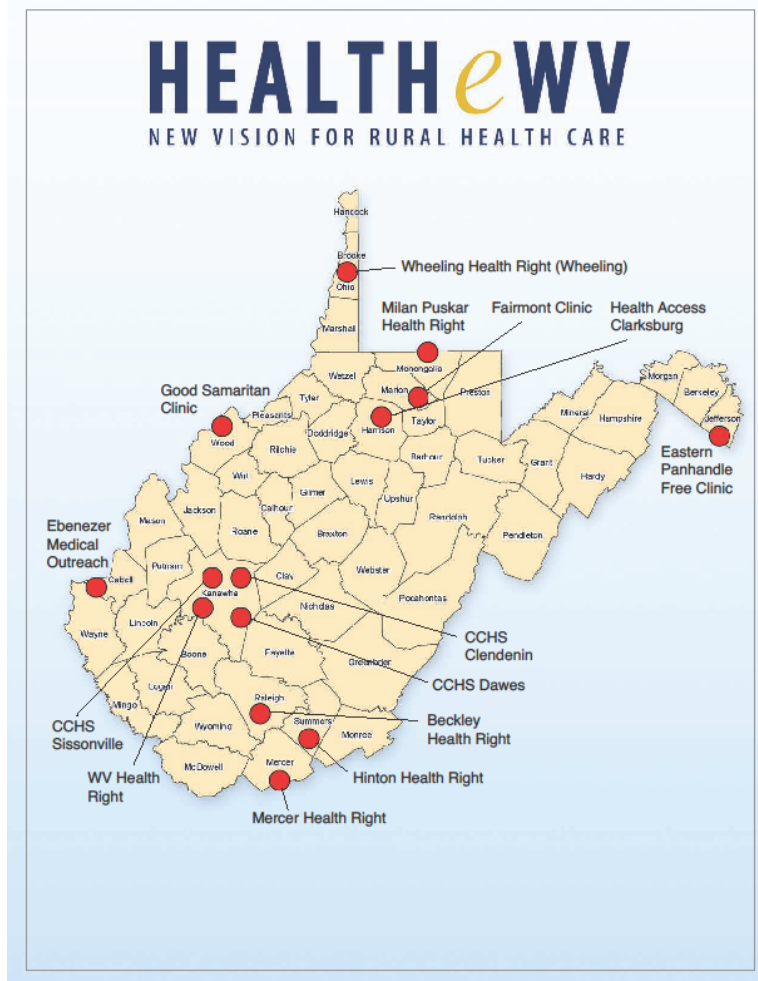
APPENDIX 2 HEALTHeWV Sample Screen Shots

The screenshot shows a web browser window displaying a patient portal. The patient's name is TEST, ADULTFEM1, and the user is PLATTER, KATHY. The 'Face Sheet' section is titled 'Patient Face Sheet' and contains a table of 'Registry Measures' for Diabetes. The table lists various measures such as LDL, A1c, Microalbumin/Creatinine, BP, Dilated Fundus Exam, Foot Exam, Diabetes Education, Diabetes Self-Mgmt Goal, Exercise, Current Tobacco Use, and Glucose, along with their values, dates, and goals.

Registry	Measure	Value	Date	Registry Goal	Patient Goal	Due
Diabetes Registry	LDL	69 mg/dL	23 Apr 2009	< 100; Every 180 days		23 Apr 2010
Diabetes Registry	A1c	10.2 %	01 Oct 2009	< 7.0; Every 90 days		30 Dec 2009
Diabetes Registry	Assessed for Nephropathy	MICROALBUMIN/CREATININE, URINE: normal	21 Jul 2009	Every 365 days		21 Jul 2010
Diabetes Registry	BP	110/72	17 Feb 2010	< 130/80; Every 180 days		16 Aug 2010
Diabetes Registry	Dilated Fundus Exam	Dilated Fundus Exam: Normal	01 Sep 2009	Every 365 days		01 Sep 2010
Diabetes Registry	Foot Exam	Foot Exam: Normal	01 Sep 2009	Every 365 days		01 Sep 2010
Diabetes Registry	Diabetes Education	Diabetes Education with Nutrition Counseling	01 Sep 2009	Every 365 days		01 Sep 2010
Diabetes Registry	Diabetes Self-Mgmt Goal	Check Blood Sugars	01 Oct 2009	Every 365 days		01 Oct 2010
Diabetes Registry	Exercise	>=3x per wk 20 minutes	23 Feb 2010	in (>=3x per wk 20 minutes); Every 365 days	Not applicable	
Diabetes Registry	Current Tobacco Use	No	18 Feb 2010	in (No; Former); Every 365 days		18 Feb 2011
Diabetes Registry	Glucose	130 mg/dL	13 Nov 2007			

Score	Edit	Question	Info	Response	Last Date Completed	External Lab
✓	Add	Patient Lipid profile completed in less than 12 months?		Yes	6/6/2006	Yes
✓		Patient with a low-density lipoprotein (LDL) less than 101 mg/dl?		Yes (LDL: 95)	6/6/2006	Yes
✓	Add	Has patient had at least one HbA1c within 12 months?		Yes	6/6/2006	Yes
✗		Patient HbA1c level less than 7.1%?		No (10.1%)	6/6/2006	Yes
✓	Add	Patient assessed for nephropathy?		Yes		
		Spot Urine Microalbumin		20	6/6/2006	Yes
✓	Edit	Patient with blood pressure less than 130/80 mm Hg?		Yes (110/75)	06/14/2006	
✗	Edit	Dilated fundus exam done within the last 12 months?		Unknown		
✓	Edit	Patient received a well-documented foot exam to include a risk assessment in the past 12 months?	?	Current	06/14/2006	
✗	Edit	Self-management education to include nutritional counseling?		Unknown		

APPENDIX 3 –CLINICS INCLUDED IN RESEARCH PROJECT DATA POOL



Clinic	City	County
Wheeling Health Right	Wheeling	Ohio
Cabin Creek Health System - Sissonville	Sissonville	Kanawha
Cabin Creek Health System -Clendenin	Clendenin	Kanawha
Cabin Creek Health System -Dawes	Dawes	Kanawha
Health Access Clarksburg	Clarksburg	Harrison
Mercer Health Right	Bluefield	Mercer
Beckley Health Right	Beckley	Raleigh
Ebenezer Medical Outreach	Huntington	Cabell
Eastern Panhandle Free Clinic	Ranson	Jefferson
Milan Puskar Health Right	Morgantown	Monongalia
Monongahela Valley Association - Fairmont Clinic	Fairmont	Marion
West Virginia Health Right	Charleston	Kanawha
Hinton Health Right	Hinton	Summers
Good Samaritan Clinic	Parkersburg	Wood

APPENDIX 4 – SAMPLE SIZE CALCULATOR

Sample size calculator

What margin of error can you accept?
5% is a common choice

What confidence level do you need?
Typical choices are 90%, 95%, or 99%

What is the population size?
If you don't know, use 20000

What is the response distribution?
Leave this as 50%

Your recommended sample size is **197**

Online surveys with Vovici have completion rates of 66%!

Alternate scenarios

With a sample size of

With a confidence level of

Source: <http://www.raosoft.com/samplesize.html>