Department of Health Policy

rchn
community health foundation

**Geiger Gibson /
RCHN Community Health Foundation
Research Collaborative**

Policy Research Brief No. 13

Health Center Data Warehouses: Opportunities and Challenges for Quality Improvement

**A. Seiji Hayashi, M.D. M.P.H.
Emily Jones, M.P.P., Ph.D. [cand.]
David M. Stevens, M.D.
Peter Shin, Ph.D., M.P.H.
Brad Finnegan, M.P.P. Ph.D. [cand.]
Sara Rosenbaum, J.D.**

August 7, 2009

About the Geiger Gibson / RCHN Community Health Foundation Research Collaborative

The Geiger Gibson Program in Community Health Policy, established in 2003 and named after human rights and health center pioneers Drs. H. Jack Geiger and Count Gibson, is part of the School of Public Health and Health Services at The George Washington University. It focuses on the history and contributions of health centers and the major policy issues that affect health centers, their communities, and the patients that they serve.

The RCHN Community Health Foundation, founded in October 2005, is a not-for-profit foundation whose mission is to support community health centers through strategic investment, outreach, education, and cutting-edge health policy research. The only foundation in the country dedicated to community health centers, the Foundation builds on health centers' 40-year commitment to the provision of accessible, high quality, community-based healthcare services for underserved and medically vulnerable populations. The Foundation's gift to the Geiger Gibson program supports health center research and scholarship.

Additional information about the Research Collaborative can be found online at gwumc.edu/sphhs/departments/healthpolicy/ggprogram or at rchnfoundation.org.

Acknowledgements

EXECUTIVE SUMMARY

The Health Disparities Collaboratives funded by the Health Resources and Services Administration have catapulted federally-qualified health centers to the forefront of quality improvement innovation and technology. The nationwide learning networks and national results reporting have enabled health centers collectively to improve their performance. Building on these advancements, health center controlled networks (HCCN) and primary care associations (PCA) have developed data repositories that contain rich quality of care information. While the information has potential for use both for practice improvement as well as for policy deliberations, there is little information about HCCN and PCA capacity and infrastructure.

This Policy Research Brief reports on a pilot effort to leverage the growing presence of health center data warehouses to advance health care quality improvement through data sharing and exchange. This project builds on a partnership between the Michigan Primary Care Association and The George Washington University's Geiger Gibson/RCHN Community Health Foundation Research Collaborative that centers on developing approaches to using existing health center data for quality improvement.

The Michigan Primary Care Association hosts a data warehouse that includes care delivery processes and health outcome data collected for patients with diabetes, cardiovascular disease, asthma, and depression from over 100 health centers in 24 states. Despite the warehouse's technical capacity to aggregate and analyze data from all participating health centers, this function has not been fully utilized. But incredible potential exists if this data is used to create performance measures that are tailored to each center's needs, operating environment, and population served, and to provide comparative and inter-facility reporting. The main findings of the first exploratory phase of this project are:

- ***Valuable information exists for improving health center operations and policies.*** Health centers possess rich information that can be utilized to optimize health center operations if it is aggregated and used to construct stratified comparative performance measures.

- ***Health centers are willing to share data if there is trust and shared vision.*** Health centers are enthusiastic about maximizing their use of data. The burden of project participation is very low since the data are already contained in the warehouse; however, health centers' trust and a sense of shared vision are necessary before data sharing can occur.

- ***The warehouse has the potential to improve quality of care for entire populations and regions.*** Since health centers provide care for large percentage of medically underserved areas and populations, improving quality of care is vital and can impact population-level health status.

- *Performance data alone is insufficient for meaningful quality improvement.* The ability to profile health center performance using various operational and systems analyses is still insufficient for direct application for quality improvement. Identification of high performing health centers must be coupled with information regarding the actual practice that leads to high performance.

- *Assurance of data validity and standardized analytical methods are necessary.* Data and methodological challenges also loom large. Inconsistent reporting and missing data pose challenges to data validity.

This multi-center, multi-state research project provides the vision and initial steps towards a national quality of care data repository (NQDR) that integrates all health centers regardless of the type of EHR or registry used. As primary care providers to over 17 million medically underserved Americans, health centers are capable of leading innovation and positively impacting the nation's health. A deliberate and coordinated effort with shared vision is necessary to realize a national health center quality of care data repository that can lead to practice transformation, and this project lays the foundation for a groundbreaking attempt to harness the power of already-collected data to drive quality improvement.

1. INTRODUCTION

Federally-qualified health centers ("health centers"), as the largest primary care safety net system, have been innovators and leaders in quality improvement. As of 2007, more than two-thirds of all health centers participated in the Health Disparities Collaboratives ("Collaboratives") of the Health Resources and Services Administration (HRSA) aimed at improving chronic disease care; a reflection of their unique mission to furnish high quality comprehensive health care to medically vulnerable and underserved communities and populations.[1]

Health centers assess the quality of care delivered to their patients using various performance measures developed by the Collaboratives or endorsed by others (e.g. National Quality Forum.)[2] A health center's performance on a particular measure becomes especially useful when comparisons can be made over time to another primary care practice or to a group of practices. HRSA created the Health Disparities National Results (HDNR) website for the Collaborative's health centers to track and assess their impact on chronic conditions on a monthly basis.[3] With performance measures aggregated from adequate numbers of health centers, HDNR provided a platform for generating meaningful trends and developing benchmarks.

Although national and regional performance benchmarks are considered useful, they often do not translate directly into interventions specific enough to improve quality of care. How a health center achieves high performance depends greatly on its practice characteristics, available resources, and the population served. For example, wishing to improve diabetes care, a large urban health center serving predominantly African Americans may look for best practices at other health centers with similar practice characteristics, rather than a small rural migrant health center serving mostly Latinos in another region of the country.

Because HDNR compiles summary data excluding patient-level detail, full analysis of individual health center performance is difficult. In order to create this level of detail, health centers must be willing to not only share their disaggregated quality indicators, but also to share adequate details about their practice and practice environments. Data repositories that contain this level of detail already exist in health center controlled networks (HCCN) and a number of health center data warehouses. However, very little has been documented on the capabilities of these HCCNs and data warehouses, and the extent to which they use the detailed data for quality improvement.

---

[1] Landon B, Hicks L, O'Malley J, Lieu T, Keegan T, McNeil B, E Guadagnoli. 2007. "Improving the Management of Chronic Disease at Community Health Centers." *The New England Journal of Medicine* 356(9): 921-934.

[2] Health Resources and Services Administration. 2005. "Diabetes Phase 2 Measures." Health Disparities Collaboratives. Accessed on July 29, 2009 at www.healthdisparities.net; National Quality Forum. March 2008. "National Voluntary Consensus Standards or Ambulatory Care – Part 1." Available at www.qualityforum.org.

[3] HRSA National Results Sharing site: http://www.hdnr.org/html/FAQ_Guest.aspx

This Policy Research Brief reports on a pilot effort to leverage the growing presence of health center data warehouses to advance health care quality improvement through data sharing and exchange. The warehouse used in this initial effort is maintained by the Michigan Primary Care Association (MPCA), and includes one of the largest health center data repositories collected from over 100 health centers in 24 states. This pilot effort builds on a partnership between MPCA and The George Washington University's Geiger Gibson/RCHN Community Health Foundation Research Collaborative, which centers on developing approaches to the use of health center data for quality improvement.

This brief reports on preliminary performance measures, analytical approaches for quality improvement and related health policy, and the potential for a national health information exchange.

2. BACKGROUND

Quality Improvement Initiatives in Health Centers

The Institute of Medicine (IOM) defines health care quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."[4] Health centers have embraced the mission to provide the high quality of care that the IOM further describes as being safe, effective, patient-centered, timely, efficient, and equitable. Health centers have long served as laboratories for addressing unmet health and social needs of vulnerable populations and have engaged in unique quality improvement initiatives, relying on the strength of their data collection efforts and the advantages of networking with other health centers to share information and best practices. Health centers also engage in extensive mandatory public reporting of patients, revenues, staffing, and performance and are thus accustomed to operating with a relatively high degree of information transparency.

During the 1990s, in a strategic decision similar to that pursued by the Veterans Administration, the health center program developed a system-wide quality improvement strategy. This strategy evolved from simple convenience sampling of patient medical records to assess adherence to the use of evidence-based guidelines through patient registries. An early example of this quality improvement initiative using a standardized, population-based health center management and tracking system is the Clinical Assessment Software Application (CASA) for childhood immunizations, which was designed by the Centers for Disease Control and Prevention (CDC) for use in a pilot

---

[4] Institute of Medicine. 2001. Crossing the Quality Chasm: A New Health System for the 21st Century, National Academy Press. Washington, DC.

program (Together for Tots) that took place between 1995 and 2002 and included health centers in ten states.[5]

Recognizing the special characteristics of health centers and their critical role in caring for underserved populations, HRSA launched the Collaboratives in 1998. The purpose of the Collaboratives was to improve chronic disease care management, primarily through the application of systematic quality improvement efforts in a cohort of centers. The expectation was that these centers would serve as models and the best practices would be disseminated to other centers.[6] The Collaboratives used a "communities of practice" learning network framework to implement and disseminate rapid cycle quality improvement methods based on Wagner's chronic care model.[7] This structured learning network involved state and regional health center primary care associations (PCAs), as well as individual health centers, and the process centered on facilitating iterative dialog, exchanging ideas, and improving information flow across state and regional strata.[8] Researchers have documented the effectiveness of the program in improving quality of care for low-income patients with diabetes, hypertension, and asthma.[9] Other studies indicate that the quality of care provided by health centers often meets or exceeds the national average.[10]

The Collaboratives originally focused on diabetes and quickly expanded to include other chronic conditions such as cardiovascular disease, asthma, depression, and cancer, as well as other issues such as general prevention, access, practice system redesign, and oral health. As of 2008, over 900 health centers, representing over 90 percent of the total universe of centers, had participated in at least one type of Collaborative.[11] Consistent with health centers' active efforts to embrace the use of health information technology,

---

[5] Clinical Directors Network. Together for Tots Immunization Project. Accessed on July 27, 2009 at: http://www.cdnetwork.org/NewCDN/tots.aspx

[6] In general, the Collaborative participants must adhere to strict reporting, infrastructure, and implementation requirements. For example, see the policy information notice for applicants, available at http://bphc.hrsa.gov/policy/pin0107/introduction.htm

[7] Wagner EB, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. 2001. Improving Chronic Illness Care: Translating Evidence into Action. *Health Affairs* 20(6): 64-78.

[8] The Collaboratives launched a program of education, training, and technical support aimed at developing and optimizing the available quality improvement infrastructure, capacity, and methods. Experts in QI provided individual and group support, and a website was developed with QI information, resources, and best practices that were developed with input from the coordinators and participating health centers.

[9] Quinn MT, Schaefer C, Chin M, DrumM, Guillen M, Rimington A, Levie JR, Kirchhoff AC, . 2007. Improving and Sustaining Diabetes Care in Community Health Centers with the Health Disparities Collaboratives. *Medical Care* 45(12): 1135-1143; Landon at al. 2007.

[10] Rosenbaum S, Shin P, Dor A et al. August 2008. Uninsured and Medicaid Patients' Access to Preventive Care: Comparison of Health Centers and Other Primary Care Providers. Geiger Gibson/RCHN Community Health Foundation Research Collaborative Research Brief #4; Chin MH, Auerbach SB, Cook S, Harrison JF, Koppert J, Jin L, Thief F, Karrison TG, Harrand AG, Schaefer CT, Takashima HT, Egbert N, Chin SC and WL McNabb. 2000. Quality of Diabetes Care in Community Health Centers. *American Journal of Public Health* 90: 431-434.

[11] Grossman E, Keegan T, Lessler A, Ly MH, Huynh L, O'Malley AJ, Guadagnoli E and B Landon. 2008. Inside the Health Disparities Collaboratives: A Detailed Exploration of Quality Improvement at Community Health Centers. *Medical Care* 46(5): 489-496.

the Collaboratives' collection, reporting, and analytic system relied on an electronic health data registry known as the Patient Electronic Care System (PECS).

HRSA formally ended its Collaboratives initiative in 2008; however, most health centers have continued many components of the Collaboratives, including use of the chronic care model and electronic registries. Furthermore, PCAs have continued to provide support for QI education, training, and infrastructure development.

While Together for Tots and the Collaboratives were discontinued, these initiatives provided the framework for a state-based infrastructure to provide technical assistance on quality improvement, supporting development of a platform for sharing outcome data and effective interventions, and facilitating support of senior leadership at the health center, state, and national levels.

In addition to participating in learning networks, health centers also have been early adopters of the 'medical home' model, which reflects and builds on their basic program design and has recently gained momentum as a national movement to enhance the quality and cost-effectiveness of care delivery.[12] The benefits of the medical home model and an orientation toward primary care are documented in a multinational meta-analysis indicating that access to a medical home is associated with better health outcomes, decreased overall costs of health care, and a reduction in disparities.[13] Evaluations of a pilot program in North Carolina show annual cost savings from implementing the medical homes model of $150-$170 million in 2006.[14]

More recently, the American Recovery and Reinvestment Act (ARRA) has further incentivized the adoption of quality-oriented health information technology among health centers. The ARRA provides $1.5 billion to health centers to improve health center infrastructure, including health information technology. In addition, an estimated 99 percent of all health center physicians are expected to qualify for Medicaid HIT adoption incentives to spur the "meaningful use" of HIT.[15] These investments can be expected to further advance HIT adoption by health centers. Health center networks that house large patient datasets can be expected to become an increasing focus of system-level quality improvement efforts as interest grows in understanding health care costs, quality, and efficiency across geographic regions.[16]

---

[12] Shin P, Ku L, Jones E, Finnegan B, Rosenbaum S. 2009. Financing Community Health Centers as Patient- and Community-Centered Medical Homes: A Primer. *The Commonwealth Fund*, The George Washington University Department of Health Policy Geiger Gibson Program in Community Health Policy, Washington, DC.

[13] Starfield B, Shi L. 2004. The Medical Home, Access to Care, and Insurance: A Review of Evidence. *Pediatrics* 113 (5): 1493-1498.

[14] Mercer Consulting. September 19, 2007. "CCNC/ACCESS Cost Savings, State Fiscal Years 2005 and 2006 Analysis." available at http://www.communitycarenc.com.

[15] Finnegan B, Ku L, Shin P and Rosenbaum S. July 7, 2009. "Boosting Health Information Technology in Medicaid: The Potential Effect of the American Recovery and Reinvestment Act." Geiger Gibson/RCHN Community Health Foundation Research Collaborative Issue Brief #9.

[16] Shin P, Ku L, Jones E, Finnegan B, Rosenbaum S, 2009.

The Michigan Primary Care Association Data Warehouse

During the development of the HRSA Collaboratives, the Michigan PCA (MPCA) was selected to support the participating health centers in the Midwest. As part of this work, MPCA developed the infrastructure and capacity to host and support the PECS registry used in the Collaboratives. Despite the end of formal funding for the Collaboratives, this data infrastructure was maintained and grew into the present day warehouse that hosts and supports various electronic health record applications, including PECS. The warehouse is currently maintained through a combination of contractual agreements and direct fees to the participating centers.

The MPCA data warehouse is one of several large health center-focused warehouses. Health care data warehouses are repositories of electronically stored clinical and administrative data from a variety of sources aimed at facilitating reporting and analysis.[17] Although the exact number of health center data warehouses is unknown, warehouses are operated by a number of state PCAs (e.g. Indiana Primary Health Care Association) or HCCNs (e.g. Oregon Community Health Information Network).[18]

The MPCA data warehouse has been steadily growing and currently hosts data from over 100 health center grantees in 24 states that collectively provide care to more than one million patients.[19] The warehouse maintains rich, patient-specific clinical data, including clinical information related to treatment (e.g. medications, health habit counseling) and biomarkers such as vital signs (e.g. blood pressure), body mass index, and laboratory results (e.g. hemoglobin A1c, cholesterol). Similarly rich data exist for cardiovascular disease, asthma, and depression.

The majority of participating health centers continue to report using PECS; however, a small but growing number of health centers now utilize electronic health records (EHRs) of various types as well as a data registry, called Cielo, to store, report, and analyze their data. Regardless of format, all of these data are included in the warehouse and data standardization software allows aggregation of data by matching similar fields (e.g. "Sex: F" can be matched with "Gender: Female"). All participating centers report detail, to varying degrees, on patient demographics, service utilization, clinical information and operational measures.

Despite the warehouse's technical capacity to aggregate data from all health centers that it hosts and thus to conduct analysis, this function has not been fully utilized. Instead, individual health centers simply generate performance reports based on their own data and use this information when designing quality improvement initiatives. Many centers

---

[17] Bernstam EV, et al. 2008. "Synergies and Distinctions Between Computational Disciplines in Biomedical Research: Perspective From the Clinical and Translational Science Award Programs." Academic Medicine, 84(7): 964-70.

[18] Phone interview with Michael Lardiere, Director of Health Information Technology, National Association of Community Health Centers, July 17, 2009.

[19] However, the data only include a subset of these patients since health center grantees often report data for only some patients (e.g., those with the chronic conditions covered by the Collaboratives) and sites due to resource limitations; see more detailed discussion below of shortcomings.

mainly focus on standard reports, formerly used by the Collaboratives, concerning clinical conditions such as diabetes, heart disease, and asthma. Until now, analysis has been focused on internal rather than comparative health center performance, but some PCAs—such as Illinois—have requested statewide performance measures, enabling health centers to compare their performance to others within the state.

MPCA is aware of the potential utility of the warehouse for quality improvement; however, various factors have impeded expansion of technical and analytical capabilities. As a fee-based service, the data warehouse is accountable for the technical support it provides to *individual health centers*, and aggregation and data analysis are not currently included in the scope of services. Furthermore, many health centers may be reluctant to be compared to others, fearing that their reputation or funding could be jeopardized. As a result, the analytical capacity necessary for data mining and analysis have not been developed fully. In order to overcome these challenges, MPCA and The George Washington University's (GW) Geiger Gibson/RCHN Research Collaborative partnered to execute Phase I of this project.

3. THE MPCA-GW GEIGER GIBSON/RCHN RESEARCH COLLABORATIVE PROJECT

Project Goals and Objectives

The overarching goal of the MPCA-GW data warehouse project is to guide quality improvement efforts, and thus bolster quality of care, by providing decision support to health centers and PCAs for program operations and policymaking purposes. The first phase of the project consisted of examining the stored data, identifying the parameters measured, and beginning analysis. Subsequent phases will expand the project to include more customized benchmarking and case studies of high performers to describe care delivery processes and other characteristics which may lead to their high performance. This may include health center size, staffing patterns, population served, urban/rural location, funding sources, and financial health. Below we describe the results of the first phase and their implications for the project's future. We also discuss the challenges and opportunities inherent in this type of effort to improve performance.

Building the Project

Establishing partnerships and working relationships is critical to any effort on this scale, and this project requires multi-tiered collaboration. Researchers from GW work closely with MPCA staff, who provide strategic vision, a communication conduit to individual health centers, and technical expertise with the data warehouse. A steering committee—comprised of MPCA staff, experts in quality improvement and health information technology, and health center leadership—guides the agenda, facilitates collaboration, and provides real-world knowledge of the needs and constraints on health centers that are pursuing data-driven quality improvement initiatives.

Although the contracts between the health centers and MPCA to host the data in the warehouse do not prohibit MPCA from aggregating and analyzing the data, MPCA recommended that data use agreements be obtained from each health center specifically for this project. The agreement describes the project and the intended uses of the data, and specifies that health center-level data would not be shared with others without permission. The additional burden on health centers is extremely low, since the data is already being reported and stored in the data warehouse.

GW researchers created a series of data tables that were populated by the warehouse systems administrator to avoid the disclosure of protected health information to the GW researchers. Tables 1 and 2 describe some of the data contained in the warehouse; we used only PECS data since the fields and data entry formats were more consistent. Of the over 250,000 patients for whom data was available in the warehouse, data for 182,177 patients were reported using PECS. This represents 1.1 percent of all health center patients nationally (16 million). Table 1 includes health center patients with at least one chronic disease diagnosis, and many patients have multiple diagnoses. The large numbers of patients with diabetes and hypertension reflect the high disease prevalence among the health center patient population, as well as health centers' higher participation rate in the Collaboratives focused on diabetes and cardiovascular disease.

Table 1. Number of Patients with Select Diagnoses		
Diagnosis	All U.S. FQHCs	Data Warehouse (% of All US FQHC)
Total	16,050, 835	182,177 (1.1%)
Diabetes	1,010,844	90,076 (8.9%)
Hypertension	1,584,992	69,987 (4.4%)
Asthma	470,874	10,601 (2.3%)
Depression	506,442	22,644 (4.5%)

Source: Analysis of Michigan data warehouse and Uniform Data System data.

Table 2 provides information on patient characteristics of those with PECS data in the data warehouse. The overall male/female ratio (33.2 percent/66.5 percent) shows higher inclusion rates for females compared to the national health center ratio.[20] Race and ethnicity data show that half of patients in the warehouse are racial and ethnic minorities, reflecting the overall patient composition among health centers in the region.[21] In 2007, close to a quarter of the patients were covered by Medicaid (versus 35.4 percent at health centers nationally), 11 percent had private insurance (versus 15.5 percent nationally), and a third were uninsured (versus 38.9 percent nationally). A total of 23 percent of all patients were identified as having the "other" insurance type, which may represent Medicaid managed care or other insurance types (e.g. Medicare fee for service, Medicare Advantage, or private insurance) that were not identifiable at this stage.

---

[20] GW Analyses of UDS data, 2007.
[21] GW Analyses of UDS data, 2007.

Table 2. Patient Characteristics		
Characteristic	All U.S. FQHCs	Data Warehouse
Total	16,050, 835	182,177
Gender		
Male	40.7%	33.2%
Female	59.3%	66.5%
Race/Ethnicity		
American Indian/Alaska Native	1.20%	0.7%
Asian/Pacific Islander	3.40%	1.4%
Black /African American	22%	20.9%
Hispanic/Latino	33.8%*	24.6%
White	49.70%	41.6%
Other	20.3%**	10.8%
Insurance		
Medicaid	35.40%	21.4%
Medicare	7.60%	8.6%
Medicare-Medicaid (dual eligible)	NA	2.4%
Private	15.50%	11.0%
Other	2.60%	23.2%
Uninsured	38.90%	33.5%

Source: Analysis of Michigan data warehouse and Uniform Data System data.


Defining Meaningful Performance

In order to evaluate the value of this dataset for performance improvement, MPCA identified four Michigan health centers with a track record of participating in quality improvement initiatives, and invited their participation in a pilot to assess the results and data analysis methods. The pilot group is diverse in terms of urban/rural location and special programs such as migrant, homeless, and school-based clinics.

Table 3 shows the four pilot health centers' practice characteristics based on federal designations and geography. Each health center has multiple sites, and many of these serve distinct populations. Of note, not all sites report their data to the warehouse nor are all patients at the sites included. Currently, the warehouse generates performance reports at the health center organization level irrespective of the number of sites. This means that performance measures for HC-C is an aggregate of their ten community, migrant, and school-based sites. Although disaggregation to specific sites is possible, this adds considerable additional work. Another approach may be to analyze performance across select health centers that specialize in certain populations such as migrants or homeless; however, this would drastically reduce the number of health centers included in an analysis.

| Table 3. Health Centers and Their Site Characteristics							
Health Center Organizations	CHC	Migrant	Home-less	Public Housing	School-based	Rural	Urban
HC-A	X					X	
HC-B			X		X		X
HC-C	X	X			X	X	X
HC-D	X					X	

Source: Analysis of Michigan data warehouse data.

Figures 1 and 2 show patient characteristics for the pilot health centers. Patients at Health Center A and Health Center D are almost all white and differ significantly from Health Centers B and C. This information may help health centers with similar patient characteristics share ways to provide culturally competent services and address racial and ethnic disparities to improve the overall quality of care. The MPCA data warehouse collects language data, but reporting by the health centers has been inconsistent. Using ethnicity data, however, some observations may be possible, particularly for Hispanic ethnicity and limited English proficiency.

Figure 1. Patient Race/Ethnicity
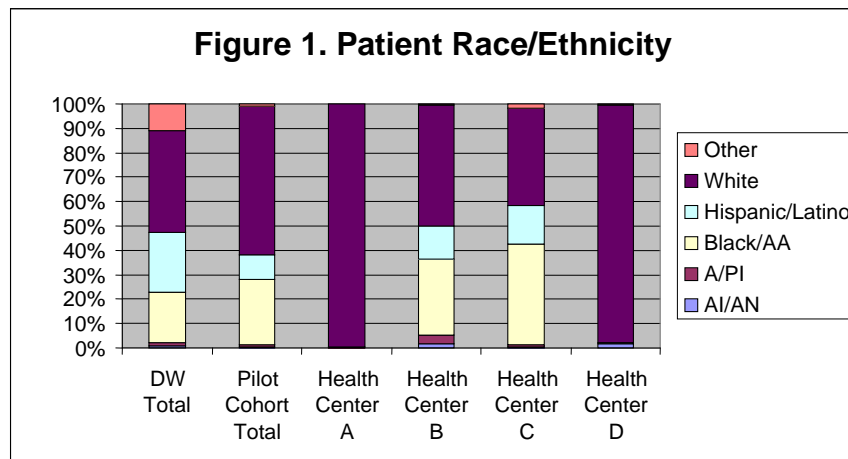
Source: Analysis of Michigan data warehouse data.

Besides patient race and ethnicity, Health Centers A and D have similar proportions of patient insurance types: both have many more privately insured patients compared to Health Centers B and C. Comparisons of health insurance information may be helpful for health center QI in a number of ways. Health insurance is often linked to the availability of specialists, medications, and other supportive services important to disease management and may affect quality of care. Furthermore, specific health plans may have care management programs useful to subpopulations of patients such as language support. This information may help health centers partner with other health centers that have similar needs and learn from each other how to structure clinical operations. Health centers with a large uninsured population may be able to work together to identify other resources or gain access to coverage for their patients.

Figure 2. Patient Insurance
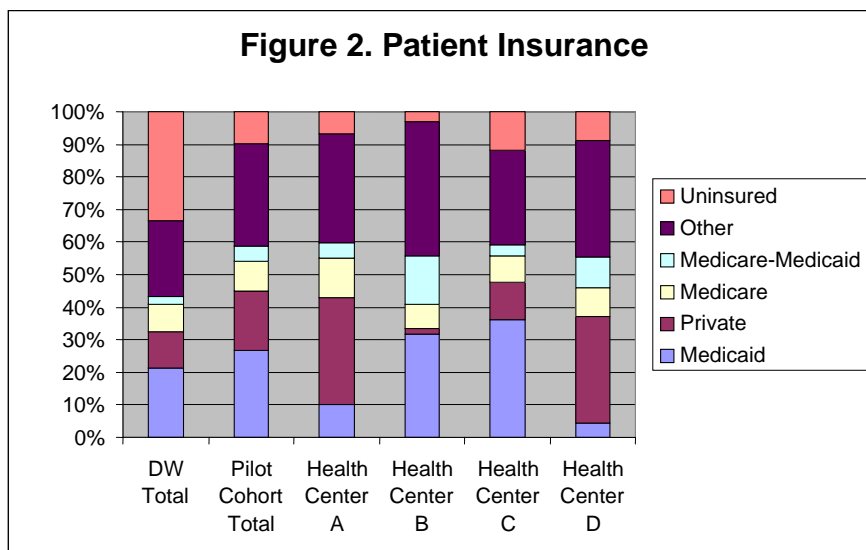
Source: Analysis of Michigan data warehouse data.

One of the primary objectives for examining the warehouse data is to stratify health centers by performance on quality indicators and identify high-performing health centers. Table 4 uses diabetes measures to compare the pilot health centers to the national rate, the warehouse mean, and the highest- and lowest-performing quartiles. Process of care measures attempt to measure care delivery, regardless of outcome. Outcomes are actual clinical measures, reflecting how well chronic conditions are controlled in the patient. Access to additional care and education are captured through inclusion of two criteria: whether the patient received a referral for services—such as dental and nutrition counseling—and whether the patient actually received the service.

The pilot health centers exceed national and warehouse means for the "Process of Care" measures, but fall short of the top quartile. Similarly, the pilot group exceeds the warehouse mean but performs with the second quartile for five of six "Clinical Outcome" measures. The pilot group performed less well with respect to the "Access to Additional Care and Education" measures, but examining the raw data and discussions with the pilot health centers revealed that many do not report on these measures. However, because missing data was factored as a "0," the combined performance results were reduced. This approach to addressing missing data raises the issue of determining which measures to consider based on the percentage of health centers that report them. This is a key point since it may alter the identification of high-performing health centers.

Table 4. Quality of Care Performance for Diabetes, 2007					
	Nat'l HC Rate	Warehouse Mean	Rate for Top 25%	Rate for Bottom 25%	Pilot Group Rate
Processes of Care					
At least 1 HbA1c per year	NA	86.57%	95.70%	56.20%	93.24%
Two or more HbA1c 3 mo apart	36.07%	45.18%	62.50%	11.40%	61.29%
Lipid profile	NA	57.92%	82.80%	29.70%	59.59%
Microalbumin/Creatinine Ratio	28.68%	32.44%	59.80%	0.90%	43.83%
ACE Inhibitor	68.51%	20.78%	37.70%	3.10%	24.72%
Aspirin	67.21%	19.09%	37.40%	2.00%	21.28%
Influenza Vaccine	27.37%	27.08%	55.00%	1.20%	40.62%
Clinical Outcomes					
LDL <100	53.33%	32.34%	52.70%	14.60%	35.10%
LDL <130	NA	48.49%	72.80%	24.20%	51.66%
Blood Pressure <130/80	38.65%	47.46%	57.80%	32.00%	50.32%
HbA1C < 9.5	NA	73.96%	85.60%	44.30%	82.87%
% diabetics whose HbA1c levels </= 9 percent	NA	71.71%	83.60%	42.10%	40.33%
% adults with HTN whose most recent BP < 140/90	NA	68.42%	78.90%	44.70%	74.20%
Access to Additional Care and Education					
Dental Exam	12.53%	16.44%	39.30%	0.20%	8.60%
Dental Referral	NA	9.96%	31.70%	0.00%	5.02%
Retinal Exam	21.88%	26.59%	48.90%	1.90%	36.30%
Retinal Exam Referral	NA	14.30%	34.70%	0.10%	11.01%
Foot Exam	38.75%	47.48%	79.20%	10.60%	50.08%
Foot Exam Referral	NA	5.42%	16.40%	0.00%	0.43%
Nutrition Education	NA	23.51%	62.60%	0.60%	14.69%
Nutrition Education Referral	NA	4.98%	12.60%	0.00%	3.98%
Exercise Education	NA	5.64%	15.20%	0.00%	0.07%
Diabetes Education	NA	30.06%	70.20%	1.50%	39.18%

Source: Analysis of Michigan data warehouse data.

Below warehouse mean
Above warehouse mean

Calculating performance measures is a relatively simple process using this warehouse; however, defining high performance requires insights from individuals with knowledge of the process of care at health centers and health center operating systems, since the practices that distinguish one level of performance from another may be nuanced,

requiring qualitative analytic techniques in combination with quantitative analysis. As mentioned earlier, this data warehouse currently cannot distinguish between a process that has not occurred versus a process that has occurred but was not reported. In order for researchers to identify this issue, a discussion with individual health centers was necessary.

Comparing Performance Based on Health Center Characteristics

A distinguishing feature of health centers is their ability to effectively customize health care for distinct groups of patients with elevated health risks. Given the challenges of customizing care, a key concern becomes capturing health center and patient characteristics that potentially impact quality of care. For example, patients in rural areas must often travel long distances to receive care due to the limited supply of primary care, specialty care, diagnostic services (especially high tech, high cost services such as MRIs), and even pharmacies. This may impact performance measures that require a patient to receive a certain type of care such as an eye exam for diabetics or a screening exam like mammograms for women. Health centers that care for migrant and seasonal farm worker populations may have difficulty establishing continuity of care and following practice guidelines that require periodic assessments (e.g. two or more hemoglobin tests three months apart). Health centers for the homeless must contend with populations who are particularly vulnerable to unhealthy living conditions and have competing priorities such as food, clothing, and shelter; therefore, the performance measures that assess patient adherence to treatments may be lower.

Sharing health center performance indicators for patients with diverse racial and ethnic backgrounds and with different language requirements may stimulate exchange of culturally and linguistically appropriate practices to improve quality of care. For example, if a migrant health center wishes to adopt methods to improve the quality of diabetes care for migrant farm workers, it may be most effective to emulate other migrant health centers with higher performance ratings. Similarly, health centers with a high volume of uninsured patients may wish to learn how to coordinate specialty care and medication adherence for this population from other health centers operating under similar situations.

Further discussions among the pilot health centers highlighted the potential for performance differences based on the availability of on-site services, such as specialists, pharmacies, and diagnostic services. We postulate that health centers that provide on-site or co-located specialists and diagnostic services would perform better on measures requiring these services than health centers that do not, since patients might find it easier to adhere to referral recommendations if they do not have to leave the site. This has been described frequently for co-locating behavioral health services with primary care.[22] Co-locating a pharmacy and a health center presumably would make it easier for patients to obtain their medicines and thus improve adherence to treatment regimens and ultimately

---

[22] Horvitz-Lennon M, Kilbourne AM, Pincus HA. 2006. From Silos To Bridges: Meeting The General Health Care Needs Of Adults With Severe Mental Illnesses. *Health Affairs*, 25(3): 659-669.

health outcomes. If this hypothesis proves true, then it lends weight to policies that promote co-locating key specialists and services at all health centers.

4. INITIAL CONCLUSIONS AND LESSONS LEARNED

Project Achievements

The MPCA-GW initiative begins to show the current capacity and functionality of the MPCA data warehouse. Furthermore, it demonstrates the potential uses of the quality improvement data specifically for health centers. Highlights of the initiative's achievements can be summarized below:

Valuable information exists for improving health center operations and policies. The data warehouse project reveals the richness of the information health centers possess that is not available elsewhere. Furthermore, the aggregation of health center data enables more meaningful and robust analysis and reporting. When the data analysis is expanded to include more of the centers in the data warehouse, and eventually linked to other existing data warehouses, information on practice patterns affecting medically underserved populations will become available. By coupling performance measures with health center characteristics (e.g. workforce, services), analysis may inform changes in health center operations. Examining performance measures tied to geography (e.g. counties, states) and populations (e.g. race/ethnicity, income) may inform policies related to access to care and distribution of necessary services.

Health centers are willing to share data if there is trust and shared vision. Currently, 26 health centers have agreed to share their data for detailed analysis. Many of these health centers have years of experience implementing quality improvement initiatives through the HRSA Collaboratives and welcome the additional information necessary to take the next steps. The project assured anonymity of the health centers unless direct authorization to identify the center was received. Although much work remains, the local and national partnerships formed through MPCA, the National Association of Community Health Centers (NACHC), and GW enabled the project staff and researchers to establish the necessary trust. Discussions with participating health centers reflected the essential role of a shared vision and trusting organizational collaborations in achieving data transparency

Improving quality of care for entire populations and regions is a potential benefit. Since health centers, by design, serve medically underserved areas and populations, their patients are at risk for poor health outcomes. By improving the quality of care for those most vulnerable, these centers have the potential to impact and elevate health care indices for the general population. The project demonstrated the ability of the warehouse to conduct system-wide profiling of performance levels and pin-point health centers with low performance. Interventions can then be planned for focused support, technical assistance, and resource sharing to low performing health centers.

Project Challenges

This project has faced challenges that are informative for the future, but not insurmountable with the appropriate level of investment and strategic partnerships.

Sharing data requires trust building and long-term commitments. The power and utility of a warehouse depends on the quality of the data it houses as well as the number of participating sites. The hesitance of some health centers to participate has already been noted, and the importance of trust cannot be understated in this process to promote transparency and collaboration in improving quality of care. Health centers that have agreed to share their data trust that their information will be used in a responsible manner that will not have adverse consequences. Expanding the group of centers will require demonstration of both the value of the process and positive experiences from those that participate currently. The researchers have tried to address various aspects of data security and disclosure issues, but new concerns arise. To anticipate and to create approaches to new challenges, the researchers must continuously gain and sustain the trust of the participants. Furthermore, researchers must have long-term commitments to the project that will encourage health centers to ultimately change and improve their practices.

Assurance of data validity and standardized analytical methods are necessary. Data and methodological challenges also loom large; inconsistent reporting and missing data pose challenges to data validity. Only some sites from each health center organization report data, and most centers report only on sub-populations of patients (mostly patients with chronic disease). Furthermore, since few health centers report on all quality indicators, practice patterns may not be accurately reflected in the data. Although standardization will be resource-intensive, especially as some centers move to various electronic health records systems, without consistent data entry and the creation and use of standard formats, comparisons among health centers will be impossible. For instance, most health centers report patient insurance using a health plan name rather than the category of insurance, such as "Medicaid" or "Private" insurance, creating an additional challenge for the system administrator, who had to decipher and categorize myriad health plans in the various states. Other issues abound—for instance, most patients in the cancer collaborative do not have a diagnosis of cancer but have been identified for screening purposes. Finally, point of care records are often recorded on paper and entered into electronic registries in a separate step, creating another opportunity for errors.

Performance data alone is insufficient for meaningful quality improvement. The ability to profile health center performance using various operational and systems analyses is not has not been fully developed for application to quality improvement or for use in the policy process. For QI purposes, identification of high-performing health centers must be coupled with information regarding the actual practice that leads to high performance, since these best practices would be most useful for health centers with similar patient populations and practice environments that include available resources and funding. Performance data, unless analyzed correctly, is difficult to use in policy

decisions since the warehouse is structured to provide quality of care information and thus lacks some of the policy inputs, such as workforce characteristics and financing structures. Also, policy landscapes differ from state to state, and the implications of new and emerging policies and legislation, such as ARRA, need to be examined.

5. FUTURE DIRECTIONS AND POLICY CONSIDERATIONS

Next steps for the MPCA-GW Data Warehouse Project

The project will continue with its work and focus more on data analysis and the development of case-use scenarios. In order to make the analyses more robust, health center recruitment will continue. The additional quality of care data from the health centers will be augmented by collection of health systems data at the state level. Developing the functional and technical capability of the warehouse to aggregate, store, and manipulate the data will become increasingly critical as participation expands and more information is available for analysis. Simultaneously, the project will enter the qualitative phase of supplementing the performance data with case studies of high-performing health centers. The combination of clinical, administrative, operational, and health systems data should provide health centers and their stakeholders the incentive to take the next steps. Furthermore, to gain truly meaningful data, health centers need the technical capability to integrate their data nationally and ultimately, to integrate their data with non-health center providers.

National Health Center Quality Improvement Infrastructure

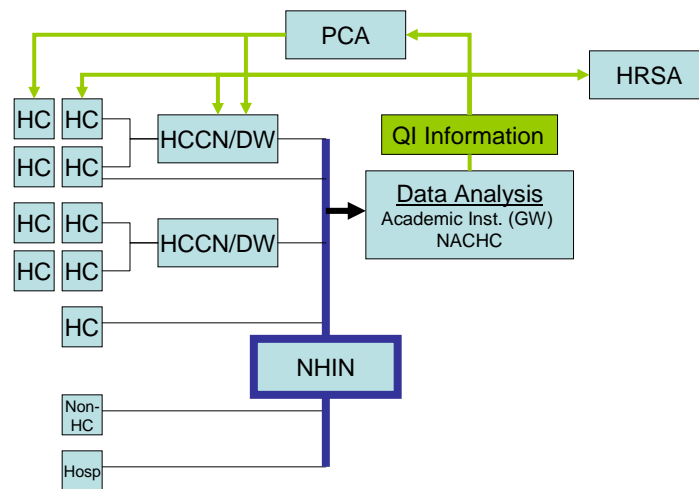*National Health Center Quality of Care Data Repository (NQDR)*
This multi-center, multi-state research project provides the vision and initial steps toward a national quality of care data repository (NQDR) that integrates all health centers regardless of the type of EHR or registry used. HRSA had set up the national result reporting site (HDNR) for the Health Disparities Collaboratives; however, the number of health centers that continue to report using this site has dropped significantly since the end of the Collaboratives program in 2008. HDNR was also used to report aggregate data and lacked patient-level data to do detailed or focused analysis. The vision for the NQDR includes patient-level data that can be analyzed and used to provide decision support for health centers, HCCN, PCAs and to HRSA.

The backbone of health center NQDR may be the Nationwide Health Information Network (NHIN) being developed by the federal government and accelerated by ARRA's HIT funding. NHIN proposes to securely connect patient level electronic health information among providers, insurers, consumers, and other stakeholders.[23] According to the Director of Health Information Technology at NACHC, approximately 53 health

---

[23] US Department of Health and Human Services, Office of the National Coordinator for Health Information Technology. Available at http://healthit.hhs.gov/portal/server.pt?open=512&objID=1142&parentname=CommunityPage&parentid=7&mode=2&in_hi_userid=10741&cached=true. Accessed on July 26, 2009.

center controlled networks (HCCN) of varying sizes share HIT infrastructure and data.[24] NHIN will allow each individual health center to share their data with others, but the HCCN structure will have advantages of providing regional data support and analysis specific to health center clients. The connection of HCCNs, PCA networks, and warehouses through NHIN will allow for national, state, and local level benchmarking. The involvement of HCCNs and PCAs will facilitate this process because in order for data sharing to occur, data use agreements between and across providers, such as those used in this project, are necessary.

Figure 3. National Health Center Quality of Care Data Repository and Nationwide Health Information Network (NHIN)

DW: Data Warehouse, **NACHC:** National Association of Community Health Centers,
PCA: Primary Care Association, **HCCN:** Health Center Controlled Networks, **HC:** Health Centers,

Innovations to Transform Health Center Quality of Care

Health centers and networks are also primed to take advantage of various implementation strategies for building a national quality improvement infrastructure. *Health Care Cooperative Extension Services* have been proposed as possible ways to combine research, education, and practice to transform primary care and diffuse quality improvement strategies.[25] Many health centers participate in research and education through academic partners, practice-based research networks (PBRNs), and Area Health Education Centers (AHECs). NQDR would provide valuable data to these partnerships to transform health care in medically underserved areas.

---

[24] Phone interview with Michael Lardiere, Director of Health Information Technology at the National Association of Community Health Centers. July 24, 2009.

[25] Grumbach K, Mold JW. 2009. A Health Care Cooperative Extension Service: Transforming Primary Care and Community Health. *JAMA*. 301(24):2589-2591

Accountable Care Organizations (ACOs) have also received attention recently from legislators and policy makers as a method to control cost and improve quality of care and are currently included in the proposed health reform legislations. ACOs are groups of ambulatory care practices and hospitals that work together to improve quality of care and hold down costs for a given population or region.[26] NQDR would allow ACOs that partner with health centers to access quality of care information that would help the most vulnerable segment of their patient population.

In summary, health centers continue to be committed to improving the quality of care for those at risk for poor health outcomes, and the MPCA-GW data warehouse project demonstrates the enormous potential for health centers to lead efforts using HIT for quality improvement. A deliberate and coordinated effort with a shared vision is necessary to realize a national health center quality of care data repository that can lead to practice transformation. As primary care providers to over 17 million medically underserved Americans, health centers are capable of leading innovation, improving our nation's health outcomes, and reducing health disparities.

---

[26] Fisher ES, Staiger DO, Bynum JPW, Gottlieb DJ. 2007. Creating Accountable Care Organizations: The Extended Hospital Medical Staff. *Health Affairs.* 26(1): w44-w57; Fisher ES, McClellan MB, Bertko J, et al. 2009. Fostering accountable health care: moving forward in Medicare. *Health Affairs.* 28:w219-w231.