

Section A: Identifying Information for CHO/Collaborative Entity Partnership Application

1. Community Health Organization names: New York Children's Health Project
2. Collaborative entity/health network name: Children's Health Fund
3. Name and title of applicant: Karen Redlener, M.S., Executive Director
4. Address: 853 Longwood Avenue, Bronx, NY 10459
Telephone: (212) 535-9779 Fax: (212) 744-7633 Email: kredlene@montefiore.org
5. Type of affiliated CHOs (select from CHO Applicant Qualifications): FQHC/Health Care for the Homeless program; affiliated with CHF (flagship program of CHF National Network).
6. Number of sites: 14
7. Annual number of patient encounters: 11,953 (2007)
8. Services offered (Indicate whether services are offered directly, through referrals or partners):
Adult medicine: Direct; Pediatrics: Direct; Women's health: Direct/Referral; Dental: Referral; Radiology: Referral; Lab: Direct/Referral; Mental health: Direct/Referral; Emergency care: Direct/Referral; Urgent care: Direct/Referral; Pharmacy: Direct/Referral;
Other services: Access to complete specialty and inpatient care at Montefiore Medical Center; Specialty referral management through outreach and transportation assistance; Case management and entitlements assistance; Substance abuse prevention and referral; Nutrition services; Emergency food assistance; HIV testing and counseling; Smoking cessation program; Asthma treatment and education; Pediatric literacy program; 24-hour, 7-day-a-week access to medical providers through a toll-free 800 number.
9. Staffing (number of FTEs):
Physicians: 4.3; Nurse practitioners: 1.5; Physician assistants: 0; Nurses (RN/LPN): 4; Certified nurse midwives: 0; Lab personnel: 0; X-ray personnel: 0; Medical assistants: 2; Other medical personnel: 0; Dentists: 0; Dental hygienists: 0; Other dental personnel: 0; Psychiatrists: 0; Other licensed clinicians: 5; Other mental health staff: 0; Information systems staff (collaborative entity): 4; Information systems staff (CHOs): 2; Number of all other FTEs (including administrative, executive, fundraising, etc.): 18.
10. Describe hospital affiliation(s): NYCHP operates under the auspices of the Community Pediatric Programs of Montefiore Medical Center.
11. Provide detailed information regarding any commercial/employment agreements with the vendor/s of EHR hardware/software: No commercial/employment relationships with any vendor of our EHR system.
12. Please list the names of the members of the EHR Implementation Team:
Collaborative entity: Nancy Brenner, L.M.S.W.; Jennifer Pruitt; Jeb Weisman, Ph.D.
CHOs: Delaney Gracey, M.D.; Sharon Joseph, M.D.; Michael Lambert, M.B.A.; Grace Matthew, L.M.S.W.; Wendy Quinones, N.P.; Karen Redlener, M.S.; Ariel Sarmiento, M.P.H.; Alan Shapiro, M.D.; Deborah Snider, M.P.H.; Clare Stone, M.P.H.; Ana Tinio M.D.
Will all be considered authors of the application? Yes

Section B: Essay

I. Populations: Anticipated Impact for Patient Populations Served

Organization Summary

The New York Children's Health Project (NYCHP or Project) brings comprehensive, high-quality primary health care services to homeless, medically underserved and severely disadvantaged children and families, providing them with a complete medical home. Mobile health care teams—made up of pediatric and family medicine practitioners, nurses, and support personnel—deliver care at 13 sites throughout New York City via custom-designed mobile medical units (doctor's office on wheels) or on-site shelter clinics on a regular weekly or twice weekly schedule. Sites include transitional homeless family shelters, a drop-in center and residential facility for runaway street youth, and two shelters for victims of domestic violence. Through a unique initiative, the NYCHP also brings women and children from several domestic violence shelters and safe homes across the city into care at NYCHP service delivery sites.

Over the past twenty years, homelessness in New York City has risen to critical levels. In 1987, when the NYCHP first set out bringing desperately needed health care services to children and families residing in homeless shelters, less than 5,000 families were housed in the city's shelter system.¹ Now, the number of homeless families in shelters has grown virtually twofold to more than 9,000 families—including nearly 15,000 children.² The NYCHP has become one of the largest providers of health care services for homeless children in New York City. Since its inception, the Project has provided close to 270,000 health encounters for nearly 60,000 patients. The NYCHP patient population is 43% Hispanic/Latino and 51% African American. More than half of the patients (64%) are children and 36% are adults. Nearly all patients are within 100% of the federal poverty limit or below the poverty line; 30% of the patients are uninsured and 70% have Medicaid coverage.

The NYCHP operates under the auspices of Community Pediatric Programs (CPP) of Montefiore Medical Center. The CPP aims to eliminate barriers to care, increase access, and improve the quality of health care. It is CPP's mission to provide comprehensive family-centered health care for New York City's most medically underserved children and families, as well as to close the gap in health disparities in New York City. In addition, NYCHP/CPP is the flagship program of the Children's Health Fund (CHF) National Network of 22 projects that provide health care for the nation's most medically underserved children and their families.

Electronic Health Technology in a Unique Environment

Twenty years ago, at a time when electronic health record systems were rare—and certainly not in use for homeless populations—the NYCHP recognized the need for EHRs and the value of health information technology in the homeless health care environment. The homeless patient population has complex health care needs, often involving chronic illness and psychological distress, and faces overwhelming challenges to access health care. The transient nature of homelessness forces families to access care intermittently, addressing only their most immediate health care needs. The NYCHP of Montefiore Medical Center bridges this gap between need and access by bringing family-centered, comprehensive health care directly to the doorsteps of New York City homeless shelters. NYCHP's current wireless electronic health record system, eClinicalWorks (eCW), is crucial to the delivery of high-quality and complete care for homeless patients. The EHR is used onboard the Project's fleet of mobile medical units and at all on-site clinics, and is tailored by NYCHP to meet specific needs of a unique population. In addition, CPP's community health center, the South Bronx Health Center for Children and Families, is a

¹ New York City Department of Homeless Services. Historic Data. Retrieved May 20, 2008 from: <http://www.nyc.gov/html/dhs/downloads/pdf/histdata.pdf>.

² New York City Department of Homeless Services. (2008). Critical Activities Report, Family Services, Fiscal Year 2008. Retrieved May 20, 2008 from: <http://www.nyc.gov/html/dhs/html/about/car.shtml>.

referral site for many of the homeless families seen by the NYCHP and access to EHR is also available there to allow for seamless continuity of care. Moreover, Special Initiatives and Programs at NYCHP target priority health issues such as asthma, obesity, and smoking among homeless children and families; specific templates are being devised in eCW to alert providers to collect significant medical information and to advise patients based on best practices recommended by organizations such as the American Academy of Pediatrics and the National Heart Lung Blood Institute.

As a program of Montefiore Medical Center, the NYCHP also utilizes a hospital-wide, web-based program that allows physicians to access radiology, pathology, and lab reports. NYCHP tracks all referrals in a unique electronic tracking and referral system called TRMS (Transportation and Referral Management System); the second generation of enterprise class technology developed out of work at NYCHP/CPF in collaboration with CHF and will soon be replicated outside of New York in Philadelphia. Furthermore, a reporting system designed by NYCHP and CHF allows clinical, administrative, and research staff to produce meaningful reports and data sets from the vast quantities of data collected through NYCHP's electronic health record systems with the push of a button. Over two decades, consistent with technological advances, the NYCHP has been able to implement increasingly more comprehensive and user friendly electronic health systems.

II. Purpose: Organizational Program Objectives

History of EHR

In 1988, the CHF/NYCHP developed health information systems for use in its everyday practice. NYCHP needed access to records on a mobile medical unit, which had little room for boxes of paper files. At that early date, the only commercial systems available were electronic billing systems. Therefore, NYCHP and CHF worked with Boston-based consultant John Snow, Inc. to develop an electronic system that could meet the unique needs of high-risk patients who often have chronic conditions. This initial database held select medical information such as routine labs and immunization records, a problem list, and brief summary of patient visits. Over time, however, the NYCHP's providers required a more complete, sophisticated, and Y2K compliant EHR system to care for its complex patient population.

The NYCHP transitioned to a new generation of EHR—adapted from a commercial system—in 2000. This system allowed NYCHP providers to build patient notes from customized templates designed to treat pediatric and adult patients and enter data as the patient visit transpired. Additionally, the EHR was affordable for a small ambulatory program and supported asynchronous multi-master database replication, a key process that ensures each mobile unit and shelter-based clinic has the most up-to-date patient information. In simplest terms, the data replication process, still in use at NYCHP, includes:

- Step 1: EHRs are accessed via laptop servers that are transported to each of NYCHP's 13 service sites;
- Step 2: Laptops are returned from mobile units and on-site clinics to the main office for weekly sync based on a pre-determined scheduled;
- Step 3: Data is uploaded to the main server and copied to individual laptop servers, allowing Project staff access to complete and current patient records at multiple locations across New York City.

Although NYCHP found the system functional, this EHR was heavily template driven and rigid in its organization of information. The system also lacked alert features and could not support the extent of data collection required by the Project. As a result, the NYCHP implemented a new, nationally utilized software application, eClinicalWorks (eCW), in 2007. eCW is a comprehensive EHR solution that includes practice management, medical charting, electronic prescribing, querying and reporting, and patient portal functionalities among others. eClinicalWorks is a Certification Commission for Health Information Technology (CCHIT) certified company. Significantly, implementation of eCW allows the

Project to incorporate many new child-focused components that facilitate guidelines-based pediatric care, thus improving quality of care to meet the organizational mission.

Strategic Plan

The implementation of eClinicalWorks at NYCHP is an essential component of CPP's five-year plan to grow the organization and improve health care delivery. The use of EHR allows the NYCHP to better realize its mission to provide comprehensive medical care for homeless children and families who lack resources and access; with electronic medical records, the Project overcomes challenges specific to an unconventional environment as well as the unpredictability and instability of homeless patients' complicated lives.

In 2006, NYCHP/PPP began a year-long strategic planning process. Senior Management met on a bi-weekly basis to: analyze internal data and external trends; determine program expansion and consolidation priorities; develop monthly activities for staff participation and workgroup assignments; and evaluate the strategic planning process. Each month NYCHP staff participated in trainings, workgroup activities, and presentations. The staff helped to develop the mission and vision statements. NYCHP staff presented internal data trends and external assessments to Senior Management, focusing on where the program is today, where it has been the past five years, as well as past and current trends of the external environment of the homeless in New York City. At the end of 2007, the refined program goals and objectives were presented, providing direction for future developments over the next five years. Goals and objectives concentrate on three areas:

- | | |
|----------------------------|---|
| Strategic Formulation I: | Expand access to health care for children and families; |
| Strategic Formulation II: | Improve quality of care and health outcomes; and |
| Strategic Formulation III: | Maximize organizational relationships. |

Realization of eCW at NYCHP has a direct impact upon organizational strategies. First, NYCHP has achieved a significant objective: implement eCW at all service sites and train all personnel on the system. Among the Project's health care teams, 100% of the clinical and support staff currently utilizes eCW. Over the next five years, the NYCHP will continue to carry out strategic activities to ensure staff is knowledgeable, supported, and well-versed in health information technology. The NYCHP seeks to increase site productivity by 5% in 2008, and it is well established that EHRs have the capability to increase organizational efficiency. As a medical home, NYCHP seeks to increase access, coordination, and quality of care; EHRs have been particularly useful in consolidating comprehensive patient histories and making them accessible to staff. Through eCW, providers are better able to comprehend the entirety of a patient's situation, and therefore address the myriad issues that may contribute to their condition. Since inception, the NYCHP strives to offer the best possible medical care to those who have the least, and implementation of eClinicalWorks plays a significant role in this objective.

III. Personnel: Leadership, Governance, and Key Staff

Leadership

The eClinicalWorks implementation at NYCHP has been spearheaded by a dedicated team of executives, clinicians, program administrators, and a health information systems specialist. All told, these talented individuals bring nearly 100 collective years of health care experience to the program—their length of service with the Project ranges from 10 to 20 years. They have witnessed the evolution of health information systems from the 1980s through the 90s and to present day, and they appreciate what works and what does not. Moreover, through their many years of service bringing desperately needed health care to underserved communities, the leadership team has developed a specific expertise within the homeless health care environment, which has been pivotal to the success of the eCW implementation.

Karen Redlener, M.S., *Executive Director*

Ms. Redlener has been a director of the NYCHP since its inception in 1987. In this capacity, she designed the prototype mobile pediatric unit, which has served as the model for projects across the United States. As of 1998, Ms. Redlener has been the Executive Director of Community Pediatric Programs (CPP) at Montefiore Medical Center. Ms. Redlener has principal responsibility for program development, budget, and oversight of the CPP. Ms. Redlener advocated for implementation of EHRs in its earliest days and contributed to the development of NYCHP's first EHR. She leads the Project with each new and improved generation of technology. While decision-making for the eCW implementation is a collaborative process among all parties of the implementation team, ultimately Ms. Redlener provides executive direction and approves all final decisions for the project.

Alan Shapiro, M.D., *Senior Medical Director*

Dr. Shapiro joined the CPP in 1990 as one of the first full-time pediatricians to work with the NYCHP. Dr. Shapiro became CPP Medical Director in 2002, and three years later he was appointed Senior Medical Director. Dr. Shapiro provides clinical supervision to CPP's Medical Directors and oversees the Special Initiatives, assuring development and implementation of all enhanced programming. He continues his work with the NYCHP by coordinating and providing health care to homeless street-involved youth. Dr. Shapiro played a part in the decision to utilize eClinicalWorks at NYCHP and across the CHF National Network. He gives direction and input for clinical content development, evidenced-based templates, and collection of data.

Deborah Snider, M.P.H., *Associate Executive Director*

In 2004, Ms. Snider was appointed Associate Executive Director for the Community Pediatric Programs, ensuring quality oversight and management of the program. She supervises the Program Directors of CPP. Ms. Snider has a long history with the NYCHP, as she was the original administrator and worked in that position from 1988 to 1992. She facilitated the strategic planning process at CPP and continues to provide direction for organizational objectives, including the implementation of eCW.

Sharon Joseph, M.D., *Medical Director*

Dr. Joseph joined the CPP in 1991 as one of the first full-time pediatricians to work with the NYCHP. Dr. Joseph was appointed Associate Medical Director of the NYCHP in 2002 and Medical Director in 2005; she oversees clinical and managerial services. Dr. Joseph is a key player for the eCW implementation team and provides direction for ongoing EHR activities, including clinical content development, user support, and reporting for quality improvement.

Michael Lambert, M.B.A., *Program Director*

In 1998, Mr. Lambert joined the CPP as the Program Director of the NYCHP. Mr. Lambert is responsible for program development, operations, fiscal/billing oversight, and personnel administration of the NYCHP. He brings administrative direction to the eCW implementation team. Mr. Lambert coordinates continuing support for staff in the field and facilitates ongoing meetings and dialogue for the implementation process.

Jeb Weisman, Ph.D., *Chief Information Officer*

Dr. Weisman has worked with NYCHP and CHF for nearly twenty years. He oversees the Information Systems and Technology departments for both the CPP and CHF, and coordinates activities for staff across departments who work to deliver technology and technology-centered education and advocacy. Dr. Weisman chairs the Primary Care Information Project's Adolescent and Pediatric Health Content Advisory Committee for the New York City Department of Health and Mental Hygiene. As a member of the eCW implementation team, Dr. Weisman is instrumental both in communicating needs and concerns to eClinicalWorks and in providing in-house instruction to the NYCHP team.

Community Advisory Board

A recipient of federal 330 funding, the NYCHP has been granted an approved waiver of independent governance requirements by the federal Bureau of Primary Health Care due to the delivery of services to a special population: homeless families. Per the Bureau of Primary Health Care waiver, NYCHP has a Community Advisory Board which maintains at least 51% patient representation. The Community Advisory Board meets quarterly to discuss issues and provide input related to service delivery activities, including programmatic, administrative and financial priorities (shaping of policies, staffing and service delivery priorities).

The NYHCP is a program of Montefiore Medical Center; therefore, its legal governing body is the Board of Trustees of Montefiore Medical Center. The Trustees have overall responsibility for the management and operation of the entire medical center integrated network of which the NYCHP is a part. Minutes from the NYCHP's Community Advisory Board meetings are forwarded to the Montefiore Medical Committee of the Board of Trustees. When NYCHP decided to implement eClinicalWorks, information was presented to and discussed with the Community Advisory Board, and subsequently reviewed by the Medical Committee of the Board of Trustees.

Implementation Team and Champions

As previously delineated, NYCHP and CHF have a long history of developing, implementing, and extracting data from electronic health record systems—in total, twenty years of experience in this field. NYCHP successfully implemented multiple iterations of electronic patient record systems in the homeless health care environment; previous implementation experience, including what works and what does not, informed and shaped the implementation of eClinicalWorks. In January 2007, an implementation team was established and began to meet regularly. In addition to key leadership mentioned above, the eCW implementation team included staff from the NYCHP and CHF:

NYCHP/PPP

- Delaney Gracey, M.D., Pediatrician and Co-Director of the Childhood Asthma Initiative
- Grace Matthew, L.M.S.W., Social Worker
- Wendy Quinones, N.P., Pediatric Nurse Practitioner and Co-Director of the Childhood Asthma Initiative
- Ariel Sarmiento, M.P.H., Project Analyst
- Clare Stone, M.P.H., Program Administrator
- Ana Tinio, M.D., Family Medicine Physician

CHF

- Nancy Brenner, L.M.S.W., Systems Manager for Electronic Health Record Initiative
- Jennifer Pruitt, Assistant Director, Clinical Systems and Health Information Content

Critical to the success of implementation, the multidisciplinary team included end users, clinicians, research, administrative, and information systems staff. In addition, three “champions” were chosen to represent: 1) Administration, 2) Clinical Needs, and 3) Data and Reporting. Champions are end users particularly interested in and knowledgeable about health information technology, program needs, and/or data collection. The NYCHP's champions took a proactive approach to mastering the system and then sharing knowledge with their colleagues. Most important, the champions were instrumental in moving the implementation of eClinicalWorks forward in a timely manner, and they continue to provide leadership for eCW at NYCHP.

IV. Partnerships: Collaborations for Community Health

Collaborative Entity: Children's Health Fund

The NYCHP of Montefiore Medical Center is the flagship program of the Children's Health Fund (CHF) and a member of its national network of community-based providers providing care for America's most medically-underserved and disadvantaged communities. CHF has been a pioneer of EHR systems, first developing and utilizing them within their network in the 1980s. Since then, CHF has helped its National

Network incorporate EHRs into daily operations; NYCHP was the first to implement EHR, now in 12 projects in the CHF network. Together, NYCHP and CHF staff successfully integrate health information systems in a unique and often challenging health care environment. For the NYCHP, CHF has championed the development of EHR through both financial and technical support. CHF plans to install eClinicalWorks throughout its national network within the next 24 months; the NYCHP is the first of CHF's programs to implement eCW, developing and testing the system before future expansion across the National Network.

Typically EHRs are not devised for a pediatric practice. As a children's health network, it became incumbent for CHF to develop a strong evidence-based pediatric component to the EHR. CHF assembled a national team of pediatric experts—including CPP/NYCHP's pediatric, family medicine, and mental health providers—to formally identify and codify information that pediatric providers need to collect from medically underserved patients to provide best practice primary, chronic, nutritional, and mental health care. First, the team identified the essential aspects of pediatric primary care visits and pediatric quality care indicators. Next, CHF and NYCHP designed decision support models for pediatrics, and finally updated existing pediatric EHR components to comply with best practices. CHF is in the process of translating these findings into EHR components that are compatible with the eClinicalWorks software.

Asthma care is an excellent example demonstrating how pediatric content works. Since asthma is the most common disease among New York City's children and the most common cause of hospitalization for children 14 years and younger, proper management of the illness can result in reduced hospital and emergency room visits and substantial cost savings. As part of its EHR program, the NYCHP/CHF Childhood Asthma Initiative team adapted National Heart Lung Blood Institute's new 2007 guidelines into a revised, streamlined EHR-based clinical assessment tool (called "the Asthma Toolbox") that has been shown to vastly improve documentation and care given to children with asthma. This tool was designed to prompt pediatric providers to meet standards of care, in accordance with complex clinical practice guidelines, in a busy primary care setting. The revised Asthma Toolbox retains essential parts of the guidelines, but reduces length and complexity. It identifies asthma triggers, and guides providers in their assessment of severity, control, and treatment of asthma. Providers can also use the EHR to complete asthma action plans that are then automatically printed out for the family and the child's school.

Community Affiliation: New York City Department of Health and Mental Hygiene

CHF and NYCHP are working closely with the New York City Department of Health and Mental Hygiene (DOHMH), providing direct and indirect guidance in the areas of EHRs for pediatric and adolescent providers. DOHMH selected eClinicalWorks as the vendor for its Primary Care Information Project (PCIP), a \$27 million initiative to improve the quality and efficiency of health care in New York City. PCIP has been established to support the adoption and use of prevention-oriented EHRs primarily among providers who care for the city's underserved and vulnerable populations. DOHMH is working with eClinicalWorks to enhance their system by developing "Take Care New York" public health functionalities for incorporation into EHR systems. Take Care New York allows the DOHMH to track trends in chronic health conditions throughout the city. These functionalities will assist ambulatory care providers working in underserved communities to view patient population level statistics to better target individuals for broad interventions, improve adherence to clinical best practices, and provide interfaces with existing DOHMH information systems such as the Citywide Immunization Registry and Reportable Diseases.

Recognizing CHF and NYCHP's years of experience with EHRs and expertise in pediatric care for disadvantaged populations, DOHMH looks to CHF/NYCHP for guidance and assistance with incorporation of pediatric clinical content in eCW. First, NYCHP/CHF created Clinical Decision Support Systems or pediatric "logic models" that could be added to the public health functionalities for incorporation into eCW. Dr. Weisman, CHF's Chief Information Officer, chairs the PCIP's Adolescent

and Pediatric Health Content Advisory Committee for EHRs, the first content advisory committee for DOHMH. CHF plans to host the Content Advisory Committee website on PCIP's behalf. NYCHP clinicians and eCW implementation team members also serve on the Content Advisory Committee along with CHF staff.

CHF exports technologies developed, lessons learned, and leadership to health care organizations similar to NYCHP across the country. CHF and NYCHP's work with DOHMH illustrates how this important project can impact care throughout New York City, particularly among underserved and vulnerable populations.

V. Preparation: Readiness and Workflow

Division of Labor

From the start NYCHP and CHF established an open dialogue and inclusive process for the transition to eClinicalWorks. Formation of the eCW implementation team allowed senior management and key program staff to discuss questions, concerns, and suggestions about the EHR system, as well as determine a course of action for implementation. Frequent regularly scheduled meetings included updates on topics such as application upgrades, removal of duplicate patient entries, cleaning-up data and reporting modules, DOHMH progress, and system interfaces. The team determined next steps for each discussion item, as well as point persons for activities like the creation of Clinical Decision Support Systems, supplementary training for ad hoc reports, and presentations to NYCHP staff.

Communication and Tools

Through time and experience, NYCHP has found that strong support from its clinical and administrative leadership motivates staff to learn a new system and feel comfortable using health technology. Medical and Program Directors stand side-by-side with staff to use eCW and troubleshoot issues on a daily basis. Champions presented eCW implementation updates at nearly every NYCHP staff meeting from the beginning of 2007 until training in November. Despite the fact that 100% of NYCHP staff utilized EHRs for years, new technology fears had to be overcome. The eCW implementation team effectively allayed staffs' fears and gained buy-in through early and repeated demonstrations of the product prior to training; the staff was afforded opportunity to bring forward questions before attending classroom training. In addition, written tools have been created to: 1) answer frequently asked questions, 2) facilitate team communication and document process, and 3) train staff.

The FAQ: Created by CHF's information systems and technology team, the "eCW Implementation FAQ (Frequently Asked Questions)" is a comprehensive document that introduces eCW and outlines core components of implementation. A tool for implementation teams and program staff, the FAQ can be used for future eCW implementation sites across CHF's National Network. The FAQ addresses:

- Language commonly used for EHR;
- CHF sponsorship for implementation and historical context for EHR projects;
- Introduction to the product eClinicalWorks;
- Getting started—how to approach EHR content;
- Transition: what happens to the old EHR and patient information;
- Training and support;
- Access to the system, e-prescribing, and reporting; and
- Who are champions and where to direct questions?

The Wiki: NYCHP and CHF established an eClinicalWorks implementation wiki for use during the project. This customized website is a vehicle for documentation and online conversation. The FAQ and pertinent eCW updates are included on the site. Meeting notes are posted for the implementation team's

reference. A "forum" is available to conduct conversations between meetings by posting comments and replies. Subsequently, the wiki has evolved to include hardwiring information, ongoing eCW developments, clinical content decisions, as well as user support and troubleshooting records.

Training Materials: In addition to materials provided directly by eClinicalWorks, CHF developed supplementary materials for NYCHP users. Information is presented in a concise manner for ease of future reference; the most common and/or the easiest methods of performing certain functions are described. Print screens are provided with function-based explanations. Training materials are specific to NYCHP staff roles.

High Priority on Content and Data

NYCHP and CHF continue to develop clinical content, templates, and reports for eCW. As a first step, the team and CHF staff examined core content or a relatively small set of data that all users are expected to collect on patients. Core content must be collected in a systematic, specified, and consistent manner. Examples include date of birth, height/length, weight, etc. The primary goal is to create an inviolable data set and ensure that evidence-based standards of care and medical home principles are honored.

The next tier of data addressed includes data for the Special Initiatives. Special initiatives at NYCHP and CHF include programs such as the Childhood Asthma Initiative (CAI) and the Starting Right Initiative (SRI). CAI is a unique, effective, and replicable model of care that aims to reduce asthma severity and hospital use among homeless and low-income children. SRI addresses epidemic rates of obesity among low-income children by developing pediatric-specific clinical screening protocols, health education, nutrition counseling and treatment interventions that can be incorporated into primary care. Each of these initiatives adapts and incorporates best-practice guidelines for the diagnosis and management of asthma and obesity into the primary care visit and subsequently the EHR system—uniform and complete data collection is critical to the success of these initiatives.

Quality and consistency of care for patients and families is of the utmost importance, and is the highest priority of NYCHP and CHF during the eCW implementation. Guidance on content and templates is gleaned from the professional literature and the experience of programs in the CHF National Network such as the NYCHP. The NYCHP eCW implementation plan determined that incorporation of customized content would be addressed after the Project began using the system so that adjustments, which reflect practical lessons learned, could be made to content and templates.

VI. Purchasing: Vendor/System Selection

The Earliest Years

The first vendor selection for an electronic medical record system took place in 1987. The criteria were very generally defined and there were three paramount concerns:

1. The software application had to be sensitive to the complex primary care needs of children and adolescents living in New York City's shelter facilities;
2. The software had to produce typical patient care records and reports as well as aggregate epidemiologic and public health reports so that social, environmental, and health conditions of the patient population could be tracked on a weekly basis; and
3. The software had to be usable on environmentally challenging mobile medical units with compact space.

Most software at that time was designed for hospitals and very large health networks, primarily focusing on patient billing systems. Further, these applications assumed many things about patients including

permanent housing and well established health care resources. Thus, in 1988 NYCHP partnered with CHF and JSI to develop an appropriate application.

In 1998, NYCHP and CHF determined that significant changes in hardware and software information technologies had evolved to support a more sophisticated health information system. A RFP was developed by NYCHP and CHF, reflecting the same general issues identified in 1987 and accounting for the NYCHP's growing size and sophistication, patient population, and changes in health care. Approximately 100 RFPs were sent out and roughly 30 responses were received. In the end, NYCHP and CHF partnered with a start-up company called Total Healthcare Solutions (later called PenChart). Together, NYCHP, CHF, and the company developed core technologies to permit asynchronous multi-master database replication: a variety of mobile sites access all available medical records across the practice and later contribute new records to each of its sister sites in the absence of any external network or Internet connections. In an environment that serves transient patients—without 3G communication, standardized and available WiFi—this technology was effectively revolutionary.

Selection of eCW

In 2004, NYCHP and CHF partnered to leverage: 1) enhancements in networking technology, 2) Presidential directives in support of a national health information infrastructure, and 3) the establishment of the CCHIT. The vendor selection process for a new EHR system drew on past requests for proposals and decision making processes and included additionally:

- I. Potential vendors were contacted by CHF's CIO;
- II. CIO conducted open-ended interviews;
- III. Vendors were queried on their:
 - i) Current status and plan regarding the CCHIT's ambulatory application certification process,
 - ii) Underlying database and application systems,
 - iii) Willingness to partner and develop innovative new technologies to support NYCHP's mobile medical, reporting, and advocacy needs, and
 - iv) Experience working with the breadth of specialties incorporated into an enhanced medical model.

Most established vendors' business models were not wholly enthusiastic to take on the challenges of the perceived market that the NYCHP represents. Alternately, young companies were looking for new opportunities, but lacked financial stability. However, eClinicalWorks demonstrated stability and entrepreneurial willingness to invest in new technologies and markets. eCW was both CCHIT certified and with enough of a technological and installed base record to assure a measure of future-proofing. After NYCHP decided to adopt eCW in 2006, the DOHMH signed onto its multi-million dollar project to develop eCW, and since that time NYCHP, CHF, eCW and DOHMH have worked towards a common goal—to share expertise and build tools that will mutually support health care, data and information management, and public health.

At an application level, NYCHP uses the technical support provided by eCW to implement functional changes that go beyond "bug fixes" to include features to improve on process, flow, and ease of use. The software system has been developed from direct needs, expectations, and experience of the clinicians and patients who use, access, and benefit from the selected EHR. Additionally, a dedicated organizational technical staff has supported NYCHP's use of EHRs since the late 1980s. This IT team is intimately familiar with the day-to-day operations of the mobile and on-site clinical programs. Philosophically, the operational principle is that practice should not be driven by technology—the information systems are tools to support clinical practice. Practically, software and hardware technology are a part of a dialectical relationship with the various end users. The end users shape and inform the software's content and features, while the fundamental boundaries and capabilities of the technology inform practice.

Vendor and system selection for eCW implementation at NYCHP incorporates two decades of real world experience. The process takes the notion of use cases and extends it to reflect the on-going, complex physical environment, patient populations, and experience/history of the Project and overlays them on all vendor claims. The NYCHP's long history of user experience in this domain allows realistic expectations to be established and reflects the true state of the EHR software application world, available resources, and best practices. This in turn makes each new technology, expectation, and feature easier to evaluate, integrate, and learn. It is a pioneer approach to a relatively young and complex field.

VII. Product: Software/Interoperability/Hardware/Networks

Atypical Environment and Needs

The technical operating environments for NYCHP's EHR systems are unusual in scope and operations. The vagaries of mobile medical unit operations—mechanical service, break downs, flat tires, and electrical generator capacities—require a permanent feeling installation for which any or all EHR system components can be removed, replaced, relocated, or reconfigured with only hours notice. The equipment itself must be interchangeable and integrate into a more traditional networked environment. Equipment must stand up to the rigors of a mobile environment with variations in climate, electrical provision, and changing staff members using it; and it must be reasonably cost effective both in terms of acquisition and on-going operations, repair, and replacement. Over the years, NYCHP and CHF have built up a model to meet these needs. With each new EHR application generation, variations and enhancements to the model take place. The model itself has been replicated to more than 15 similar programs across the United States—both urban and rural.

The software application itself is a highly modified and experimental version of eClinicalWorks, and it covers every aspect of clinical and administrative practice, from patient care to follow-up, reporting, and the potential for health information exchange as outside agencies and institutions come up to speed. The server side of the eCW application operates under Linux for reliability, ease of management, and reduced cost of operations and ownership. The eCW client requires MS Windows and a highly modified Internet Explorer client. While this is not ideal, it does provide great flexibility. For non-PC-based access and for general secure remote access, a Citrix server and operating system appropriate Citrix clients are used.

Asynchronous operations are critical at NYCHP. Effectively each MMU and fixed site clinic is a self contained system—an island—which must operate independent of all other systems and without Internet connectivity, except when such connectivity is available. Each system must have the full patient data set as it enters field use each week. As previously highlighted, this in turn requires a technology called asynchronous multi-master database replication. CHF has designed and built the data replication tools to support asynchronous multi-master database replication and is donating them to eCW, the DOHMH, and to anyone else who may benefit from them.

Moreover, the NYCHP's reporting needs far exceed the integrated capabilities of virtually any existing EHR/EMR. Therefore, the underlying databases and database management system needs to be highly accessible and if possible, based on an open source platform: the current implementation of eCW is based on mySQL 5.0. Reporting is provided through a web-based, point-and-click interface for which approximately 200 standardized reports exist as well as a series of general "data dumps" that can be used for broad trend and statistical analysis. A Cognos interface is under development for this version of eCW to allow enhanced business intelligence reporting.

Equipment

At this time, NYCHP employs the following equipment for its EHR and associated systems:

- Primary server: Dell PowerEdge rackmount servers,

Mobile servers: Panasonic Toughbook CF-30 laptops,
Server OS: Linux;

- Client computers: Dell Optiplex PCs, Panasonic Toughbook CF-30 laptops, and Fujitsu Stylistic ST5xxx series tablets;
- Wireless Networking: Cisco Aironet WAP,
Wired Networking: HP switches;
- Power management: APC Rackmount UPSs and TrippLite power conditioning systems;
- 3G Wireless: Airlink/Sierra Wireless Pinpoint X EVDO Rev A and HSPA Mobile access points;
- Satellite (outside of NYC): Mobilsat 1.2m dishes with controllers and low latency routers;
- Remote access software (where necessary): Citrix;
- Remote access security: Sonic firewalls/VPN systems;
- Printing: HP Laserjet and Inkjet printers.

Budget assumptions for hardware are based on the following: all equipment will be replaced in 3, 4, or 5 years. Classes of equipment (tablets, laptops, etc.) are replaced at once so that learning curves are centralized to a specific period of time and users can provide informal support to each other, and so that technical issues can be resolved and universally applied to all similar equipment. NYCHP is a not-for-profit organization so equipment leasing does not hold tax benefits.

NYCHP's Paradigm

The most current generation system includes a primary server at the administrative offices of the clinical organization. It is the data and application server for the "back office" operations as well as mental health, nutrition, referral management, and other allied health providers. Also, at the administrative offices is a Citrix based server for secure remote access when high speed Internet access is available and a server that supports a web-based interface for custom reporting. Typical laser printers and other Ethernet network devices support printing, wireless networking, and back-up capabilities.

In the field, at each service site—whether mobile unit or on-site clinic—is treated as a fully self-contained operation with wired and wireless networking, a local server, client computers, printers, and if available, Internet access. On the mobile units, remote access is also supported by shared 3G Airlink/Sierra Wireless milspec access points. High levels of security are provided through a combination of methods, including encrypted virtual private network (VPN) tunnels and Citrix clients where data are sent through networks and hardware-based encrypted hard disk drives for patient data storage. These are two-factor drives requiring a PIN and SmartCard. Taken all together, this scheme uniquely delivers a system that is both local-server based and similar to an ASP, depending on the limitations of the service delivery environment and the needs of patients and providers.

eClinicalWorks is a fully integrated product including medical, practice management, billing, lab, and similar systems. As the NYCHP and CHF entered into the processes of product selection and implementation, the Project took stock of what its information management needs would be in relation to all partners. NYCHP documented its needs from citywide immunization obligations to federal Uniform Data System (UDS) reporting requirements. The implementation team also sought a mid-level technical understanding of how specific data could be extracted from the system; they took time to understand and meet the capabilities and expectations of its data exchange partners. Ultimately, this process ensured that all of the data exchange stakeholders would have an appreciation for what could and could not realistically be accomplished during the eCW implementation. The champions also informed the end users of what data would be available to them and sought to establish workarounds where necessary.

Ongoing work is being done around integration with external organizations including Montefiore Medical Center and the DOHMH; partnerships have developed to build information management and exchange

processes and tools among all of the stakeholders. The NYCHP's ability to access information grows as new software capabilities are completed and tested. Currently, NYCHP uses eClinicalWorks in concert with a variety of "helper" applications in its patient care processes. These applications include the city's immunization registry, referral management systems, and hospital lab data, which are provided through a real-time Internet connection or 3G cellular modem technology.

Complete access to the patient electronic record is available to the clinical team throughout the patient visit. All program departments—medical, mental health, nutrition, registration/billing, and referral management—can access and contribute to the EHR throughout the patient encounter, from schedules and immunizations to labs, problem lists, and diagnoses. Some clinicians may choose to document their work at each step of the patient encounter and while the patient is present. Others may provide high level documentation, completing entry in greater detail after the encounter. Additionally, remote access to the EHR is available to providers through a secure connection via Citrix or VPN technology.

Specific devices and models are tailored to the functional needs and experiences of a given clinic site. Where options are possible, providers and other end users are given a choice or asked to select their preferred client computers from a defined set of choices. All decision about network topology, hardware, and peripheral software are driven by a set of over-arching principles:

1. User need versus the realities of technology capabilities and durability;
2. Lessons learned through 20 years of experience developing, implementing, and managing electronic record systems;
3. Best Practices as determined by respected technology, health care, and governmental sources;
4. The capacity to access data for enhanced reporting;
5. On-going cost of ownership.

Electronic health records help the NYCHP to maintain an aggressive commitment to continuity of care in the homeless health care environment—an environment where assuring uninterrupted care can be challenging. For those homeless families who may leave the shelter system for a period of time, their health records are still readily available to NYCHP providers should they re-enter the system, and without paper charts consuming valuable storage space. Patients may also move between NYCHP service delivery sites; with an EHR, the chart is always available and saves valuable staff time locating and transporting paper charts. The teams aboard mobile medical units or at shelter-based clinic sites can provide patients with copies of medical information such as forms for school health records in a more expedited fashion. Furthermore, complete and consistent records are more likely when proper templates and checks and balances are embedded in the electronic system. It is consistent recording of information that allows the NYCHP's quality initiatives to provide more accurate feedback to providers and other team members. Together, these items—accessible records, better documentation, and enhanced quality assurance initiatives—ease the care process, supporting superior patient care and more efficient resource utilization.

VIII. Process: Implementation and Transition to EHR

Training

When working in complex health care environments such as homeless shelters, training can be a challenge for mobile medical unit and on-site staff due to uncertain telecommunications capabilities and enormous geographic separation. Yet, CHF and NYCHP have developed an overall "go-live" process of about six weeks based on twenty years experience in the field. Training kicks off with three days of intensive classroom instruction, moves on to two days of simulations, and ends with practical time in the field. The implementation team and champions receive additional information and provide support to staff, communicating needs back to CHF's IT team who ultimately works directly with eCW staff.

Held in November 2007, NYCHP's eCW classroom training was five days long. All staff—medical, nursing, mental health, outreach, nutrition, research and evaluation, and program management—attended training classes applicable to core job functions. The implementation team tailored eCW's standard schedule to meet NYCHP's needs. After review of basic and role-specific functionalities, clinical exercises were presented and run through to allow for a hands-on and practical approach. The training schedule progressed as follows:

- Session 1: System Overview and Front Office;
- Session 2: Q&A, Front Office, and Nursing Functions;
- Session 3: Clinical Functions (Electronic Medical Record for Providers);
- Session 4: Review and Clinical Scenarios;
- Session 5: Clinical Scenarios and Administrative Training (Reports).

In the field

Immediately following the training eCW went live at all NYCHP service sites. CHF/CPP information systems and technology staff was present in the field to trouble shoot any problems that developed during the first two weeks. User support is ongoing and CHF works closely with eCW to rectify issues encountered by NYCHP in the field. Staff makes use of "EPR Help", an electronic mail address, to report any issues to program leadership and the IT team. Monthly implementation team meetings are maintained, and the NYCHP hosts monthly staff meetings to review accomplishments and challenges of the eCW implementation, as well as to update end users on system changes and to share learning pearls that are being discovered along the way.

Historical Data

Together CHF and NYCHP made decisions around transfer of historical data from the previous EHR to eCW. First, group discussions addressed data integrity—whether existing data was quality data, missing, duplicative, historical depth, and the like. At CHF's 2006 Annual National Meeting, clinical and technical staff agreed upon moving select data to eCW during the transition. The two EHRs capture and structure data in very different formats. Thus, only a set of vital demographic, clinical, and allied data were identified for transfer to eCW, so as to increase confidence in data quality. In order to access past patient notes and charts in the field, CHF created a secure, web-based system for providers to look up read-only (PDF) versions of patient records.

Customizing Content

As previously outlined, content changes for eCW are ongoing and were not initiated until after the initial six-week implementation period. This is because providers often have a difficult time distinguishing between their level of comfort with a new software system and the efficacy of the medical components. The content evaluation process looks at three essential aspects of the system. First, NYCHP users evaluate whether the new system is capturing all essential information. Second, CHF evaluators focus on larger systems issues such as whether clinical content is organized in a meaningful way. Third, clinical support systems are analyzed to determine whether parameters such as those used to alert providers to specific patient needs are working well. The evaluation of clinical content and development of templates are ongoing processes.

Overall Approach

On the whole, NYCHP and CHF employed a supportive and encouraging approach to training. Training was scheduled for one week—all sites were closed during that time and staff attended classes as a whole team—to create a cohesive learning environment and as little disruption to patient care as possible. Naturally, NYCHP and CHF projected an initial deceleration in provider productivity and expect that efficient use of the system will increase over time. After going live, staff met weekly to troubleshoot any concerns and questions that came up over the course of the clinical week. Later, the implementation

team, program leadership and staff felt the meetings could occur, as previously mentioned, on a monthly basis. Weekly updates via email still are ongoing.

IX. Progress/Performance: Value, Impact, Outcomes, and Lessons Learned

Fulfilling an Organizational Mission

Increase access to care: In an environment that is fraught with instability, the NYCHP serves as a dependable, comprehensive resource for homeless children, adults, and youth across New York City. Drawing on a medical home approach, NYCHP provides not only primary medical care, but also addresses mental health needs, assists with necessities such as food, and meets head-on community health crises through innovative programming such as the Childhood Asthma Initiative to target the disproportionate burden of asthma seen among homeless children. As outlined by the American Academy of Pediatrics, information technology should add to the medical home by ensuring that care—delivered at the best possible performance level—is available whenever and wherever it is required.³ At the NYCHP, implementation of an electronic health record system eliminated cumbersome paper charts and enhances the health care team's ability to provide consistent, full care for homeless families at whichever shelter they present for care and at any time services are required. Multiple sites and limited space on mobile medical units made use of paper charts difficult. With an electronic record system, care is no longer impeded when an unexpected patient arrives or a family seeks out care at a different shelter or the NYCHP's affiliated community health center; providers access the wireless system in the field and quickly refer to complete medical records rather than rely on office-based staff to prepare paper charts or provide patient information.

Improve quality of care: For a transient patient population it is imperative to provide access to multiple services in a single, convenient location. Homeless families access many services—primary care, women's health, mental health, case management, specialty referral management, nutrition, smoking cessation, and more—through the NYCHP, where 100% of the multidisciplinary staff utilize the electronic health record system. Implementation of an electronic record allows the program to practice better medicine and improve coordination of care. Providers are better able to cover each other's appointments and can avoid the difficulties associated with deciphering handwriting and searching for paper records. Because eClinicalWorks allows for simultaneous multiple users, staff time is used more efficiently and patient flow has been improved. EHR has also been invaluable in improving the quality of care provided to NYCHP's patients; by using eCW, providers can practice better medicine by minimizing errors through built-in medicine interaction alerts and other precautionary warnings. Furthermore, the EHR provides a stable home for medical records in a transient situation: records are easily accessible for if and when homeless families and street youth leave the system (or streets) and find themselves in a more stable living situation.

Enhance data quality and reporting: NYCHP utilizes electronic health technology to generate data for clinical and programmatic purposes. As a grant funded program, NYCHP relies heavily on data in order to demonstrate results; EHR makes data collection less time and labor intensive. Both quantitative and qualitative data are retrieved and tracked utilizing EHR at the NYCHP. Weekly and monthly reports are generated by the NYCHP Program Director and are disseminated to Senior Management for program performance review. Clinical qualitative data, the demonstration of performance improvement, and outcome measures are gathered and reported primarily through the work of Special Initiatives and the continuous quality improvement committee at NYCHP. Importantly, feedback is given to providers about their clinic care via these outcome reports. The NYCHP's Quality Improvement Program uses this data consistently in their activities and to make key changes in program design and delivery of care. Careful construction and evaluation of customized clinical content and templates are crucial to the quality

³ American Academy of Pediatrics. (2007). Joint Principles of the Patient-Centered Medical Home. Retrieved May 20, 2008 from: <http://www.medicalhomeinfo.org>.

of data for reporting. One of the primary reasons CHF decided to implement eCW at NYCHP and throughout its National Network is the system's customizable format that allows for development of pediatric and Special Initiative templates to meet reporting needs.

X. Practice: Other Aspects that Describe Your Story and Model Practice Initiatives

Lead the Way in Pediatrics

One area in which the power of EHR technology remains largely untapped is pediatrics. Although EHRs are gaining in popularity, today the majority of computerized ambulatory health care data is not captured until adulthood. By supporting the development of pediatric health information systems, providers of care will have quality data beginning in childhood: immunization records can be monitored for quality and compliance; chronic conditions including diabetes and asthma, and other risk factors such as obesity, can be recorded and integrated into a life-long portable health record. American Academy of Pediatrics' Bright Futures Guidelines for the Health Supervision of Infants, Children and Adolescents, 3rd Edition supports the development of EHR to advance the delivery of health care to children.

Despite the growing presence of EHR systems among New York health care organizations, pediatric providers have been slow to adopt the technology. A 2007 report by American Academy of Pediatrics states that, "child health care providers often find that clinical information systems have limited usefulness in pediatrics, because they seem to be designed for adult care."⁴ Few comprehensive EHR programs that focus on the needs of children exist, and even fewer help address the complex health care issues that disproportionately impact homeless and very low-income children. EHR systems typically do not have pediatric quality indicators, appropriate clinical decision support, developmental screens, medication dosing by body weight, or dose-range testing.

NYCHP and CHF's implementation of eCW seeks to tackle these issues by: 1) working to develop clinical content specific to pediatric care and 2) creating templates for Special Initiatives that include nationally-recognized pediatric clinical recommendations. As part of the implementation of eCW at community health centers across New York City, DOHMH is in the process of creating pediatric content in its public health focused eCW build—NYCHP and CHF work closely with the DOHMH, sharing experiences and lending pediatric expertise. In the end, by developing pediatric functionalities for EHR, the potential cost savings are significant, as medical errors are reduced and chronic diseases, such as asthma, are better managed. A recent study found significant cost savings associated with a childhood asthma intervention (at CHF program sites, including NYCHP) that incorporates NHLBI guidelines into community-based pediatric care. The annual program savings was 11 times that of the intervention cost, with an annual savings of \$4,525 for each patient.⁵ Moreover, as more pediatric providers utilize EHR, private insurers and Medicaid will be able to make more meaningful measurements of physicians' performance.

Health Initiatives and Outcome Data

The NYCHP offers unique, comprehensive programming—Special Initiatives and Programs—to respond to complex health conditions of the patient population. Multidisciplinary in approach, these initiatives focus on key health conditions and community needs. Quality of care indicators and health outcomes are tracked to determine program effectiveness and quality improvement priorities. State-of-the-art electronic health systems are integral to the NYCHP's initiatives: provider tools include EHR templates that incorporate best practice guidelines into the primary care setting.

⁴ Spenner, S.A., and the Council on Information Technology. (2007). Clinical Report: Special Requirements of Electronic Health Records Systems in Pediatrics [Electronic Version]. *Pediatrics*, 119, 3, 631-637.

⁵ Grant, R., Bowen, S.K., Neidell, M., Prinz, T., Redlener, I.E. (2008). Under review.

The Childhood Asthma Initiative's Asthma Toolbox, previously described in Section IV, is an exceptionally effective tool to guide providers in the appropriate management of asthma. The Childhood Asthma Initiative (CAI) is a unique, effective, and replicable model of care that aims to reduce asthma severity and hospital use among homeless and low-income children. Its team-centered approach includes clinical care, on-site allergy testing, continuing medical education, parent/family education, and psychosocial services. In August 2008, the CAI team conducted a chart review to evaluate provider documentation in eClinicalWorks and compliance with NHLBI guidelines. Results are as follows:

- 96% of asthmatics had documented severity or control scores;
- 98% of persistent asthmatics were prescribed controller medications, markedly better than the national average of 87% (2007 Medicaid HEDIS data)⁶.

The Co-Directors of CAI comment that the EHR system is tremendously beneficial to this important initiative: provider documentation is uniform across the program, and this in turn increases ease and accuracy of data collection.

The CPP's Starting Right Initiative (SRI) addresses escalating rates of obesity among underserved low-income children. SRI has developed pediatric-specific protocols to identify overweight/obesity in patients and devised an algorithm to prompt providers to document BMI and BMI percentile and to assess for risks associated with obesity. The algorithm has been incorporated into eClinicalWorks and providers recently received training on this system enhancement. At the end of 2008, the SRI team will examine whether providers have utilized the appropriate templates to comply with best-practice guidelines.

Through American Legacy Foundation support, NYCHP established the Smoking Cessation program to reduce smoking among homeless parents living with their children in the New York City family shelter system. The NYCHP provides counseling, nicotine replacement and adjunct medical therapy, as well as health education materials. Additionally, Smoking Cessation increases the focus on screening and intervention and provides continuing medical education for staff. A review of clinical documentation from November 2007 through April 2008, extracted from eClinicalWorks, shows that 92% of smokers were assessed for stage of readiness to quit and received at least brief counseling—results which surpass the 2007 national Medicaid HEDIS average of 68% of patients advised to quit⁷. During the same time period, 20% of NYCHP patients who are smokers received a prescription for medications to quit. Evidence shows that the most effective treatment to end tobacco dependence is a combination of medication and counseling.⁸

Staff Impact

By and large, the clinical and administrative teams at the Project express satisfaction with the implementation of eClinicalWorks. One pediatrician comments: "In an organization such as ours, the EHR improves my ability to cover for other providers and take care of their patients." Her colleague, a nurse practitioner, remarks that "When patients come for follow up or show up unexpectedly, without the EHR it was very tough to know everything that was done at the last visit. Follow up is so much easier now." They note that improvements over the previous system allow them to work more efficiently and cohesively. With eCW, multiple users have the capability to access the same patient's record at the same time, which significantly improves continuity of care between providers and departments. A "dashboard"

⁶ *The State of Health Care Quality 2007*. National Committee for Quality Assurance. Washington, D.C., 2007. Available at: http://www.ncqa.org/Portals/0/Publications/Resource%20Library/SOHC/SOHC_07.pdf.

⁷ Ibid.

⁸ Fiore M.C., Jaén C.R., Baker T.B., et al. (2008). *Treating Tobacco Use and Dependence: 2008 Update*. Rockville, MD: U.S. Department of Health and Human Services.

feature permits staff to open multiple patient records at once without having to close one record to access another—a great convenience and time-saver for busy physicians and nurses. Providers also comment that the ability to observe additions and deletions to the schedule in real-time enables them to work more efficiently. Lastly, teams in the field express appreciation for the responsiveness of the Information Systems and Technology staff during the implementation, as the ability to call on support at a moment's notice is invaluable to health care providers and administrative staff working on mobile units and at shelter clinics.

Patient Impact: Stories from the Field

“Mary”: Mary is a 32 year old homeless patient, who lived in a Bronx domestic violence shelter, where she accessed routine medical care provided by the NYCHP. Mary's recent Pap test revealed a high-grade pre-cancerous lesion. Before Mary could return for the results, she was transferred to another shelter. Fortunately, NYCHP also provides services at this site, though with a different medical team. Several months elapsed until Mary returned for a visit. Through eClinicalWorks, Mary's new NYCHP primary care provider was able to quickly locate her records, access the results of her Pap test, and refer her for a colposcopy.

Mary's case illustrates how EHR is invaluable in assuring continuity of care, particularly among a transient homeless population, serviced on mobile medical units in distinct locations. Unlike paper charts, EHR allows NYCHP providers immediate access to medical records—whenever and wherever a patient arrives. Furthermore, EHR facilitates the NYCHP's team approach to care, as multiple providers at different sites access patient records with ease.

“JB”: JB is a six month old boy seen by different NYCHP providers at various homeless shelters. At a recent visit, he presented with a severe rash and ear infection. By referencing the built-in growth chart in eClinicalWorks, JB's doctor observed significant weight loss since his previous visit at a different site, noting the percentile curve for his age had decreased from 12% to <1%. Such dramatic and seemingly unexplained weight loss prompted JB's doctor to involve an off-site social worker and nutritionist in his care. Although JB returned for weekly visits with these different NYCHP providers at their distinct locations, he exhibited only mild weight gain. After speaking further with JB's mother, his provider discovered he had undergone a surgical procedure when he was 2.5 months old. Through hospital discharge documents, JB's doctor discovered that part of his intestines had been removed during surgery. He was switched to a special formula that was easier to digest, and within a week his weight increased and his rash improved.

eClinicalWorks was instrumental in providing complete care for this baby. JB was seen by many providers at different service sites, and usually in these cases transfer of information is less than optimal when paper charts are used. When JB showed up unexpectedly with the rash, a paper chart would normally not have been available on the mobile medical unit for such a sick visit. However, through EHR, not only was JB's entire medical record available from every site where he was serviced, a comprehensive summary and growth chart was accessed in eCW as well, facilitating diagnosis of his issues. Moreover, the EHR provides a vehicle for excellent, timely provider collaboration: when other NYCHP providers became involved in this case, each was able to see the complete and up-to-date medical record at their various locations. All told, EHR supports NYCHP in its mission to provide high quality, efficient care for the patient.

“Dennis”: Dennis is an 18 year old living in a shelter in Harlem. He first visited the NYCHP's mobile medical unit with complaints of an extensive facial rash. Dennis also disclosed that he had been diagnosed with HIV a year ago, but had never received medical care. Physical examination and lab work revealed advanced HIV disease, and Dennis was referred to Community Pediatric Program's community health center, the South Bronx Health Center for Children and Families (SBHCCF), which also serves as

the hub site for NYCHP. There, an HIV specialist was able to access Dennis's entire medical record through the web-based EHR. Dennis was immediately started on a treatment plan. Over the course of a few months it became apparent that Dennis had poor compliance with follow-up visits to the health center, although he continued to access health care services provided by NYCHP at the Harlem shelter. Utilizing eClinicalWorks, the medical teams at the shelter and health center developed a plan to co-manage this patient. Dennis began to show improvements in his health status in a short period of time. Changes in medication regimens due to side effects and trends in laboratory data were efficiently monitored via the EHR—not easily achieved in the era of paper records.

This case illustrates the value of an EHR when caring for a patient with complicated medical issues, whose care is also managed by multiple providers at different sites. Immediate access to medical records, including lab results and medication regimens, facilitates a more flexible approach to caring for patients—vital when providing medical care for homeless individuals and families, who often face tremendous instability and overwhelmingly difficult circumstances.

Conclusion

Over the course of twenty years, the NYCHP with the support of CHF has embraced advances in health technology and led the way in use of EHR in a complex health care environment. The implementation of eClinicalWorks in 2007 was a significant advance for the Project—the transition from a basic EHR to eCW improves quality of care, bringing EHRs for homeless children and families to the next level.

To sum up, key successes of the eCW implementation include:

- “Go-live” in a remarkably short six week period;
- 100% use of EHR by staff onboard mobile medical units and at on-site clinics across New York City;
- Strong support from Senior Management and Program Leadership, making themselves readily available to staff in the field to address concerns, instruct and encourage;
- Through the help of an implementation team made up of end users, staff buy-in was generated;
- Successful data replication to ensure that each of NYCHP's 13 service sites has complete and updated electronic records;
- Improved coordination of care and increased access for transient homeless patients; and
- Successful collaboration with CHF.

Results and successes, as well as challenges encountered during the eCW implementation at NYCHP, will contribute to development of best practice models for dissemination both in New York City and across the CHF National Network. Collaboration with the DOHMH presents an opportunity for the NYCHP to inform public health and electronic health systems dialogue, specifically in the areas of pediatric and adolescent care. Ultimately, the implementation of eClinicalWorks has allowed the NYCHP to better realize its mission to provide comprehensive medical care for homeless children and families—often the most in need among the poor in New York City, and for whom the NYCHP bridges the gap between need and access.

Appendix: Training

Clinical scenarios play a significant role in the training success NYCHP experienced during the implementation of eClinicalWorks. Scenario-based training offers a number of benefits. First, technology is presented and practiced in a context meaningful to users’ day-to-day practice. Second, trainees observe in familiar terms how data capture and presentation issues are addressed by the system. Finally, staff present concerns constructively and recognize that solutions are possible.

The NYCHP and CHF do not draw on standard scenarios in the training environment. The following table summarizes the NYCHP’s approach to scenario-based training, summarizing valuable actions and learning pearls acquired over many years of implementing EHR systems.

<i>Preparatory Tasks That Should Precede Training</i>	
<ol style="list-style-type: none"> 1. Work directly with the vendor, examine vendor documentation, and engage other organizations currently using the product in order to identify specific functions, processes, and tasks that need to be covered during the training program. 2. Next, have the training team document operations flow from the arrival of a patient through the terminal aspects of information collection and processing. 3. Create a training schedule in which groups representing all practice functions are brought together. Multiple teams should be made up of individuals who work together during the same shifts or in the same clinic environments. 	<ul style="list-style-type: none"> ✓ Use an integrated team approach during training, as it allows the users to learn to depend on each other for support right from the start. ✓ A team approach educates everyone about the functional role and challenges each team member faces in performing their tasks.
<i>Incorporate Clinical Scenarios into Technical Training</i>	
<ol style="list-style-type: none"> 1. Begin with the general and overall technical introduction. 2. Quickly shift the training to an integrated team-based scenario model. 3. The trainer should lead the group through a complete patient encounter by assuming the role of a patient. 4. After successfully completing a round, a trainee begins to play the patient role so that the trainer can step back to answer questions, to find workarounds, and to identify and emphasize areas that need greater and lesser amounts of attention and review. 	<ul style="list-style-type: none"> ✓ Encourage team members to use examples drawn from their most memorable patient and data processing experiences, and this will introduce both familiar and difficult scenarios. ✓ Scenarios can demonstrate that solutions are possible as well as lighten the morale and attitude of the team members. ✓ Teams will learn to rely on each other to identify solutions and share information.