Grant Final Report

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Colorado Associated Community Health Information Exchange

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Abstract

Purpose: To create a shared quality information system (QIS) to support quality and registry reporting for a collaborative network of federally qualified community health centers (CHCs) in Colorado and to create a shared condition template to improve data collection and documentation in CHC electronic health records.

Scope: Nine of Colorado's fifteen CHCs participated in sessions to define the user requirements for the shared QIS. Four of these sites also participated in a qualitative assessment of their experience with tobacco template creation and implementation.

Methods: Business process analysis (BPA) was used to elucidate CHC experience, including barriers and facilitators, to reporting on the quality of their care and being able to inform and assess their quality improvement interventions by reporting on their own data. Semi-structured interviews were used to assess the resources used and experiences with template creation.

Results: BPA resulted in a comprehensive list of user requirements, which informed the technical specifications of the QIS. This information informed vendor selection, contracting, and the vendor's scope of work. Lessons learned from template implementation include that due to time processes are often time intensive and that use of templates should be judicious. Developing consensus on quality metrics – what to report, and how to define the metrics, should be done prior to template development.

Key Words: None provided.

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Final Report

Purpose

This project, the Colorado Associated Community Health Information Exchange (CACHIE), set out to design, develop, implement, and evaluate an interoperable quality information system (QIS) for a collaborative network of community health centers (CHC) that would permit real-time and synchronous quality reporting to inform patient care, quality interventions, and health policy and advocacy efforts. The initial project outlined the following specific aims:

1. To obtain detailed business and technical requirements for development of 1) a flexible, evidence-based, clinical template system that interoperates with four vendor-based electronic health records (EHR); and 2) a timely and efficient quality information reporting system that aggregates and integrates multiple data sources within and across seven community health centers.

2. To implement a first common evidence-based template into the EHR at each CHC practice, based on the business and technical specifications detailed in SA 1.

3. To guide, support and evaluate each CHC practice to build capacity and monitor associated costs as they independently (e.g., without vendor support) implement a 2nd evidence-based guideline.

4. To implement a quality information system (QIS) across a network of CHCs that aggregates data from various sources (e.g., EHRs, claims, registries) to support quality measure reporting to various stakeholders.

5. To evaluate the usability, utility, accuracy and best methods for incorporating quality measure reporting as a feedback mechanism to providers and practice managers.

By the start of the funding period it became apparent that many of the CHCs with implemented electronic health records (EHRs) were already working independently to create customized templates to support the provision and documentation of guideline-based care for several disease/condition entities, including diabetes, pre-natal obstetrics care, and routine sports physicals. Three health centers evolved as the most active champions in the specific aims of this project, two of whom had already implemented diabetes templates. In addition, in the interim the Colorado Community Health Network (CCHN) acquired a tobacco cessation grant that supported tobacco cessation template implementation for participating health centers. We aligned our agenda with the dominant agenda to address tobacco cessation and to implement a tobacco screening and cessation template across multiple health centers.

This final report includes the following:

- A final report on the business process analysis assessment.
- A final report on the tobacco template resource utilization.
- Quality metric specifications for diabetes mellitus and tobacco cessation.

Business Process Analysis: Design of a Quality Information Reporting System

Scope

Business Process Analysis (BPA), as outlined in "Taking Care of Business" a publication of the Public Health Informatics Institute is a method to assess needs and optimize processes to obtain or achieve a specific business objective. BPA explicitly defines the business processes and user needs prior to embarking on design or redesign initiatives. Collaborative business process analysis requires that we:

1. Define our goals and objectives;
2. Model the context of the work;
3. Identify business rules;
4. Describe tasks and workflow; and
5. Identify common task sets.

BPA output is typically a set of documents that when delivered to technical experts can serve as the basis for logical design, architectural blueprints and a physical implementation plan. BPA was central to initial steps in developing the Colorado Associated Community Health Information Exchange (CACHIE). This report describes and disseminates the findings of CACHIE BPA efforts including use case scenarios, and technical specifications.

Methods

Although seven CHCs initially agree to participate in the CACHIE funded aspects of this project, it quickly became apparent that there was broad interest among all the Colorado CHCs in CACHIE participation. Hence even CHCs that were not participating in the immediate implementation of the CACHIE Quality Information System (QIS), i.e., the technologic aspects of CACHIE, desired participation in the planning aspects, such as determining the user requirements, selecting quality metrics, and defining quality metrics. The PI, Arthur Davidson,

or the co-investigator, Lisa Schilling, or both, visited nine of fifteen Colorado CHCs, along with staff from the Colorado Community Managed Care Network. The purpose of these site visits was to (1) educate CHC providers and staff about the goals of the CACHIE project, specifically the potential benefits of the QIS system, (2) conduct business process analysis regarding current quality improvement processes, (3) gain a better understand of current or planned EHR use, including EHR selection and (4) gain a better understanding of their health information technology experience with clinical decision support, templates, registries, quality reports, and the ability to get information out of their EHR systems to support these endeavors. The results of the BPA are presented here.

From the original grant application there was a tentative plan for the topics to be discussed in the focus groups. Proposed topics are described in Table 1.

Table 1.

Type	Topic	Example
	Overview	Process of conducting redesign within a practice or clinic system
	Overview/orientation of the BPA	● Description of BPA and notations
	Review goals of project and specific aims	● Expected written outputs and examples from prior projects
Evidence-based Guideline/ Template Use	Review DM and other templates currently in use by CHCs	● Review actual template(s) and process of use ● Do most providers use the template? ● Is any clinical decision support currently provided with use of the template? ● Do the templates allow documentation of “exclusions”, where relevant for certain quality measures
Evidence-based Guideline/ Template Use	Address benefits and pitfalls of current template use for patient care and as far as quality measurements	● Does use allow codified documentation of patient refusals or patient exclusions? ● Do the templates auto-populate? ● Do they allow easy access to prior history or incorporate information temporally?
Evidence-based Guideline/ Template Use	Address desired template functionalities	● Is the template automatically loaded for appropriate patients (Passive provider activation)? ● If so, is this system accurate? ● Is the template easily deactivated when inappropriate? ● Is the template automatically populated with data (EHR or other), when appropriate?
Evidence-based Guideline/ Template Use	Define the workflow for template/documentation	● Who enters information into the templates? Is it done by providers only or by other staff too? ● Is clinical documentation in the template efficient?
Evidence-based Guideline/ Template Use	Address concerns around the use of “multiple” templates for the care of patients with multiple template needs	● What are user expectations regarding the need to incorporate multiple chronic disease and preventive templates for a single visit encounter?
Evidence-based Guideline/ Template Use	Clinical guideline selection & transformation into templates	● What will be the process for developing consensus for selecting guidelines to inform template content? ● What is the process for transforming guidelines into templates that capture necessary data elements to both inform/document care and to measure quality accurately?
Evidence-based Guideline/ Template Use	Use of standardized vocabularies	● Do the EHRs and templates support the use of standardized vocabularies? ● Will common vocabulary engines be required to standardize data prior to entry into the Quality Information System (QIR)?

Table 1. (continued)

Type	Topic	Example
Evidence-based Guideline/ Template Use	Interoperability standards	● Does the use of templates within the EHR conform to or support interoperability standards? ● What are the interoperability requirements that need to be met? ● How does this impact our design?
Template Maintenance/ Sustainability	Flexibility	● What type of flexibility is necessary for templates, given the requirements of reuse and modularity? ● What topic components of a template should constitute a module? ● How will modules be defined? ● What process will be put in place to ensure that templates are up to date?
Template Maintenance/ Sustainability	Center's ability to create templates	● Have the centers created their own templates or modified existing templates? ● What are their experiences with this? ● What were the costs? ● Is it more economic for centers do it themselves or pay EHR vendors to do it? ● What type of support do vendors supply to do-it-yourselfers (training, on-going support)?
Template Maintenance/ Sustainability	Modifying/updating templates	● How will modules requiring updating be identified? ● What is the mechanism of updating/modifying templates and how does this affect other EHR functions? ● Has the Center had any experience in needing to modify a template due to a guideline change?
Template Maintenance/ Sustainability	Changing guidelines	● How are Centers notified, or how do they become aware of a significant guideline change?
Template Maintenance/ Sustainability	Define benefits of Center collaboration on evidence-based templates knowledge-base	● Can Centers collaborate on the knowledge-base supporting the templates? ● What processes are necessary to develop consensus and maintain guideline knowledge-bases?
Quality Information System	Current quality reports	● What are current quality reports and how are these measures used by the Centers? ● What types of quality projects do the Centers currently have experience with? ● What are limitations and benefits of current report generating mechanisms? ● How is the data gathered? ● How and by whom is it analyzed? Is this information meaningful to stakeholders?
Quality Information System	Desired quality reports	● Review NCQA, AQA and NQF diabetes measures. ● What would make this information more meaningful? If additional data is required, how can the EHR and/or templates assist in collecting the data? ● What type of reports would stakeholders like to generate? At what level (patient, provider, etc)? ● What type of temporal information is important? ● How can quality measures such as patient experience/satisfaction be captured with this system?
Quality Information System	Functional requirements	● How will stakeholders generate reports? ● Will they be able to do simple reporting through a convenient user interface? ● Will this be web-based? ● How often will various types of data be transmitted to the system – in real time, every 24 hrs, etc?

Table 1. (continued)

Type	Topic	Example
Quality Information System	Data transmission	● How are various types of data transmitted to the QIS? ● Is it set up to occur automatically or does the QIS request data on instruction? How often is this done? ● What are requirements for efficiency?
Quality Information System	Required data elements	● What data is needed to meet the requirements for AQA DM quality measures? ● Optimally, what clinical information/data would improve the utility of the QIS (medication fulfillment, durable medical equipment fulfillment) beyond current quality measure recommendations? ● What types of non-clinical data are desired beyond demographic (e.g. census tract, quality of life indicators, health resource indicators) ● Review temporal needs for data. ● Where does this data reside? What are the concerns to obtaining various data types?
Quality Information System	Security/Privacy	● Data transmission, data storage as pertains to patients. ● Should providers be able to generate reports detailing other providers?
Quality Information System	Sustainability/ Maintenance	● How flexible is the system to change? What happens when quality measures are changed?
Quality Information System	Translation to standardized vocabularies	● How is idiosyncratic data transmitted to the QIS? Does data need to be standardized via a common vocabulary engine prior to storage?
Quality Information System	User authentication	● What are the requirements? How can this be updated/modified for new users or canceling access for prior users?
Quality Information System	Audit capabilities	● What are the business rules for this? ● Should any audit features be automatic?
Quality Information System	User interface	● What are the user interface requirements? Are there times when Centers might need to enter data manually? How will this be accomplished without risk of altering data transmitted and stored automatically? ● How are reports generated? ● Is this Web-based?
Quality Information System	Rules engine for calculating quality measures from clinical data	● How easily is this modified as guidelines change or new quality measures are developed?
Quality Information System	Interoperability standards	● How does the QIS conform to interoperability standards (http://www.hitsp.org)? What are the requirements that need to be met? How does this impact our design?

This list of topics is very extensive. We constrained our emphasis with these focus groups to concentrate on the clinical aspects but when available captured many of the technical issues. A development team worked to define the required materials (e.g., background on BPA, topical material and handouts) for a planned series of user focus groups. Once developed, nine distinct community health center networks affiliated with the Colorado Community Managed Care Network (CCMCN) were each visited for in-depth discussion. After orientation to the concept of BPA, the objectives for this project were reiterated and the user focus groups were tasked with addressing the following:

Setting the Stage.

1. Review how care is provided to patients with diabetes who are seen in your clinic.

2. Review how care is documented in the electronic medical record (EMR) or on paper.

3. Define the process how data are collected for quality metrics.

4. Define how the data might be abstracted and aggregated for data analysis.

5. Define how the data are reported.

6. Define the processes by which data are then used to improve care delivered.

Business Process Redesign. Given the six steps above (e.g., collection of data and definition of specific quality improvement efforts) the clinic was asked to rethink the process to maximize efforts to provide guideline concordant care (provision and documentation) for diabetes mellitus (DM), and other conditions, through modification of EMR systems, including guideline-concordant template implementation, and to design a quality information system that collects relevant data elements and facilitates quality reporting for various stakeholders.

Use Case Scenario Development and Conduct of Business Process analysis (BPA). Each community health clinic (CHC) was visited for a one-day, on-site focus group. The focus group consisted on clinic staff, providers, information systems managers, quality improvement specialists and management. The group was introduced to the purpose of BPA and then a discussion of how the goal of this process was to find commonality across the CHC systems to develop a quality improvement reporting system that would support multiple CHC systems. Only through the review with each of the clinics was it possible to refine and validate the findings for the BPA across all the clinic systems. In particular, there was an effort to identify any important differences in methods for quality improvement reporting so that any system that CACHIE were to build would be capable of bridging those differences.

Population Level Analysis. Populations are defined by categories such as diagnoses, demographics, provider, site of care, prescribed medications, immunizations, payer class, and pre-determined definitions of complexity or by combining 2 or more categories. We wish to analyze clinical processes and outcomes measures at the population level to be able to compare measures across providers, sites/organizations, payer class, and compare trends in these measures over time. Trending outcomes over time and comparing outcomes among providers, sites and organizations allows us to identify best practices and to measure the effectiveness of a community health center's quality improvement processes.

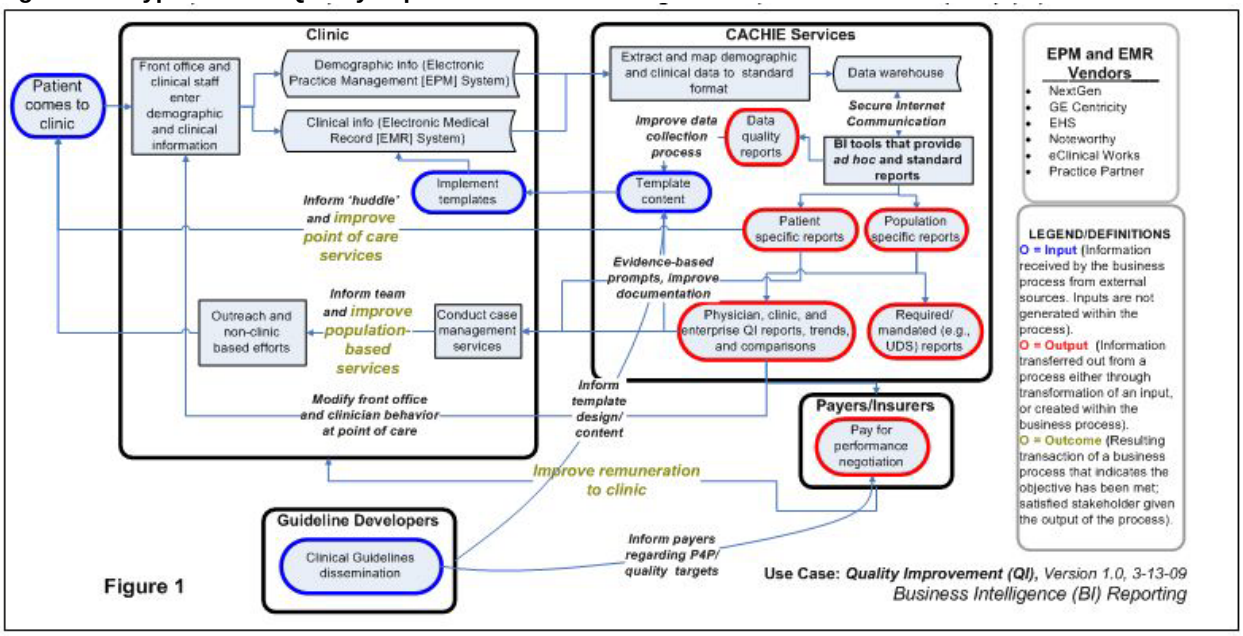
Patient Level Reports. The tool must deliver patient-level reports that include actionable information (based on clinical guidelines) to the provider, the care team and/or the case manager. Patient-level reports can be run for a single patient to include much of the patient's guideline-influenced care or patient-level reports can focus on a single disease condition and include all the patients in the practice with that disease/condition (i.e., a registry). Patient level reports provide

a near real time view of what is currently due for the patient so that the provider doesn't have to search for the information. Case managers use the reports to inform patient outreach and recall efforts. To date, most of the EMR implementations have found EMR functionality falls short of the desired reporting at the patient level, thus the need for CACHIE to provide greater value through reporting.

Development of Mandated Reports for the Health Centers. Uniform Data Systems (UDS) reporting is an annual, time consuming and federally mandated task for CHCs. Offloading this responsibility to CACHIE is something that the CHCs have collectively agreed would be valuable to them. CACHIE can display near real time UDS progress to the health center throughout the year while comparing those scores to in-house Key Performance Indicators (KPI) and historical data. CACHIE could also provide this function for other recurring reports like those required by HRSA for Primary Care Grant applications and renewals.

Figure 1 describes a hypothetical "Quality Improvement" Use Case. Opportunities for improvement are identified throughout the work cycle and are highlighted on this figure. There are opportunities to improve data collection and documentation, point of care services, population services and even the remuneration for services. Based on conversations with the clinics, a graphical representation emerged to describe the quality improvement use case. The figure hypothetically describes the relationship between 2 entities, the clinic and CACHIE services, when a patient presents for care to a clinic. The items in red are outputs from the quality improvement business intelligence system. These items represent the report functionalities identified during use case presentation: data quality, population- and patient-level reports, UDS reports, and quality improvement reports (e.g., physician, clinic, and enterprise) that demonstrate trends and allow comparisons. The items in blue are the inputs required to collect the necessary information. These are key sources for data acquisition and require methods to assure quality data collection and input.

Figure 1. A hypothetical "Quality Improvement" use case

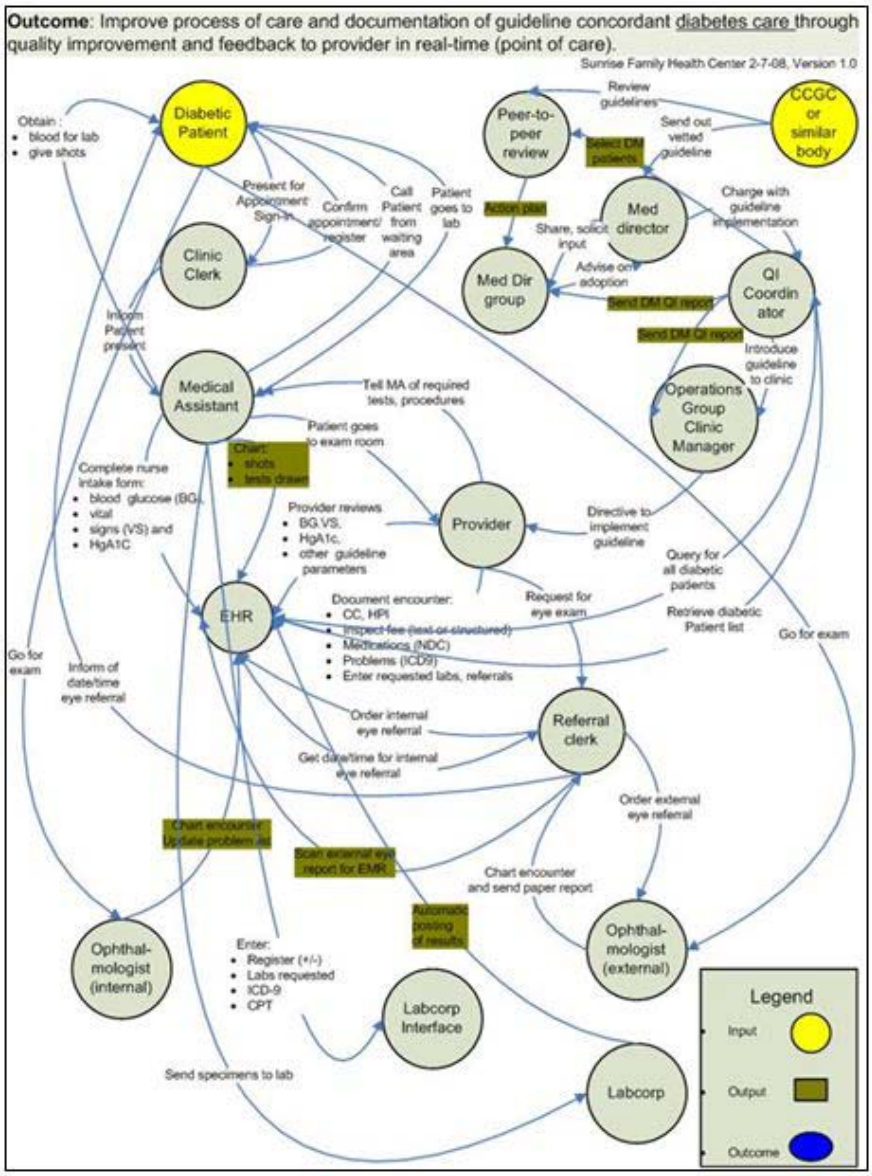


Results

BPA output is typically a set of documents that when delivered to technical experts can serve as the basis for logical design, architectural blueprints and a physical implementation plan. The following sections describe the highlights of the documents developed by CACHIE based on a diabetes mellitus use case/scenario.

Model the Context of the Work. Over the course of the nine visits to distinct CHCs, there were consistent themes of what the context was for the quality improvement systems and reporting. With regard to the DM use case there was ready agreement about the general reason for and purpose in performing quality improvement efforts. The context is represented in the following figure:

Figure 2. How quality improvement and provider feedback process



Identify Business Rules. An extensive list of business rules was identified. These are incorporated below in the functional requirements section (see BPA Appendix) and served to help develop the request for information (RFI) and request for proposal (RFP) documents.

Describe Tasks and Workflow. After extensive discussions with focus group participants, the following task and work flow figures were developed to diagram several perspectives: the medical assistant, the provider, and the quality improvement coordinator. Please the BPA appendix for the task and work flow diagrams.

Identify Common Task Sets. A set of common tasks were identified. These laid the groundwork for developing a request for information (RFI) and subsequently a request for proposals (RFP).

Informational Deliverables. A fundamental objective of this project was to collect both the functional and non-functional requirements. These need to be kept in balance and harmony, and most importantly not compromised as the project progresses.

The functional and non-functional requirements are in the BPA Appendix.

Conclusions

The development of Use Case Scenarios through the BPA allowed this group of distinct CHC to collaboratively develop a set of requirements to collect, aggregate, and analyze DM quality data elements/measures to generate a report to inform quality improvement. The outcome of this analysis was a detailed set of specific objectives that were included in a request for proposals. These items guided the development of a reporting tool that currently services 2 of the CHC with a third site soon to be added. Most important is that the collaborative BPA allowed all sites to identify their similarities and make a commitment to continue to work together through the Clinical Advisory Work Group which has expanded beyond the DM use case to many other clinical domains, including:

- Depression screening and treatment.
- Asthma.
- Ischemic vascular disease.
- Pain management.
- Immunizations: children.
- Adult cancer screening.
- Tobacco cessation.

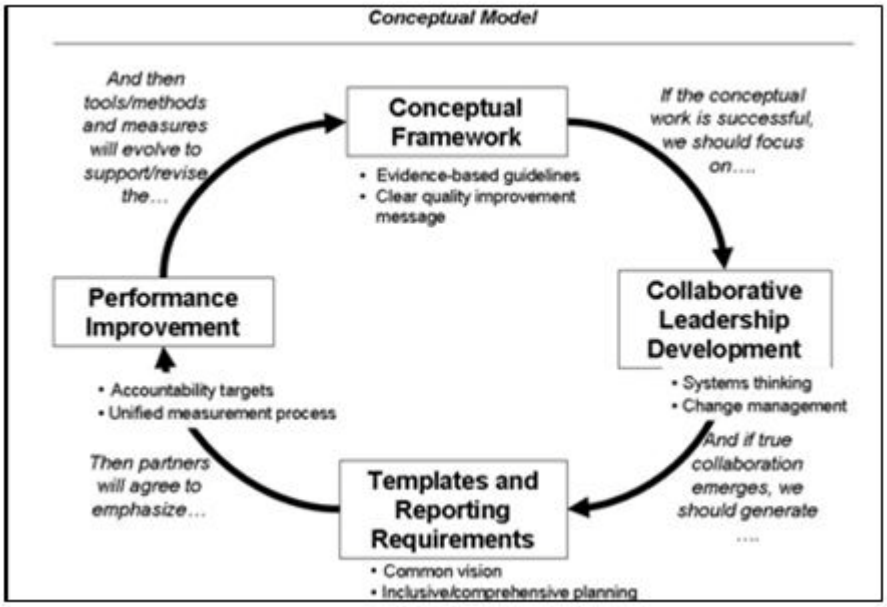
From a series of brain storming sessions with interdisciplinary groups at each of the clinics there was significant emphasis on methods to: 1) assure data integrity (including accuracy and

completeness); 2) create increased value to the person(s) entering the data or documenting care; 3) defining methods to account for and deal with patient factors (e.g., treatment plan non-adherence, absence of follow up); and 4) how to integrate these quality improvement efforts with current work flows process and how some information to be collected and reported will be easy (e.g., HbA1c) vs. more difficult (e.g., patient self-care plan).

The focus groups emphasized successful and efficient data input into the EMR for use in reporting for multiple uses (e.g., direct patient care and quality improvement). The goals were to support provider care and documentation , enhance provision of guideline concordant care for all DM patients, identify methods to include other system providers – social workers, navigators, define tools that may support improved care/improved systems, generate QI reports, inform interventions and clinic operations, report on outcomes/assess interventions, and provide methods to support motivational feedback to patients.

As stated previously BPA output offers a set of documents that when delivered to technical experts can serve as the basis for logical design, architectural blueprints and a physical implementation plan. As proposed in the grant application to AHRQ, using our conceptual model (see below), this project used the evidence-based guidelines to drive a collaborative leadership process that defined a common vision for quality reporting system that can drive performance improvement and provide additional evidence to inform quality improvement efforts for these CHC.

Figure 3. Conceptual model diagram



Lessons Learned from a Tobacco Template Implementation at Four Federally Qualified Health Centers in Colorado

Scope

Using qualitative methods we focused on our efforts on describing the CHC experiences with template implementation and the resource utilization regarding the tobacco cessation project. This report details the lessons learned regarding the tobacco template implementation.

Methods

Site Selection. The four CHCs that had completed the tobacco template implementation were selected to complete qualitative interviews regarding resource utilization, barriers, and overall experience with tobacco template implementation.

Data Collection. Template qualitative interviews used a semi-structured interview guide to gather select information on the following topics:

- Time period of tobacco template creation and implementation.
- Number of hours dedicated to planning, implementation, testing/validation and user training.
- Personnel types participating in each task, along with their estimated hours per task.
- Vendor support, task supported, hours required, and invoiced cost.
- Vendor training of CHC staff and description of any transferred knowledge.
- Equipment costs.
- Software or hardware downtime due to template implementation.
- Lessons learned.
- Examples of data use or reports resulting from the template.

These qualitative interviews were conducted by CCMCN staff, who coordinated the Tobacco Cessation Project, with the appropriate CHC staff at each site that was responsible for this project.

Results

Site Summaries.

Table 2. Summary characteristics of participating sites for tobacco template implementation

Site	Number of Locations, (Number of Providers*)	EHR Vendor (Date of Initial Deployment)	Tobacco Template Implementation Dates	Creating Tobacco Reports and Registries
Site 1	4 (39)	NextGen 5.4.8 (Dec 2006)	4/2007 – 11/2008	Yes, both
Site 2	2 (11)	NextGen 7.8 (Dec 2007)	9/2009 –2/2010	Yes, reports Registry; has capacity, not yet using
Site 3	4 (6)	EHS 5.0j.113 (Feb 2007)	7/2007 – 5/2008	Yes, both
Site 4	14 (30)	GE Centricity 8.0.3224 (Feb 2007)	12/2008 – 4/2009	No, not yet created

*Total number of full and part-time providers

CHC, CCMNC and Consultant Hours. All sites received coordination support from CCMCN staff members who were involved with coordinating the tobacco cessation project at numerous CHCs. CCMCN staff served as consultants regarding tobacco guideline content and state and federal recommended quality metrics, conducted baseline assessments of current tobacco cessation processes, assisted with workflow redesign, and assisted with template design.

Sites 1, 3, and 4 completed all aspects of the tobacco template development and implementation internally, without any outside vendor support. The CHCs relied upon training received at the time of EHR implementation and therefore did not require any specific EHR vendor support for this implementation. Site 2 contracted for 20 hrs of non-EHR vendor support at a cost of $2,000 to assist with integration of the template into the EHR. Training of the staff (providers, medical assistants, and nurses) took approximately 2 hours of each trainee's time. But, for the most part, staff members were trained in groups at each sites' locations and not individually.

Table 3. CHC estimated hours for tobacco template implementation and report/registry development

Title, position	Degree, training	Site 1 (hrs)	Site 2 (hrs)	Site 3 (hrs)	Site 4 (hrs)
Chief Medical Information Office, Chief of Clinical Affairs	MD	55	35.5	0	
EHR Coordinator	PA				32
Chief Operating Office	Masters, MBA			6	
Database Analyst, Systems Analyst	BS, MS	26			8
Case Manager, QI Director, Health Educator	RN, MS, BS			8	
Software trainer, applications adm	BS, MS				40

Table 4. CCMCN estimated hours for tobacco template implementation by CHC

Table 4a. CHC Coordination-needs assessment/gap analysis-baseline and follow-up, work flow analysis education

CCMCN Job Description/Position	Site 1 (hrs)	Site 2 (hrs)	Site 3 (hrs)	Site 3 (hrs)
CCMCN Director of Clinical Programming & Development	50	0	40 (includes 27 hrs travel for 3 trips)	0
Tobacco Cessation Program Manager	5	0	15	0

Table 4b. CHC provider/staff education-re: guideline implementation, documentation, training

CCMCN Job Description/Position	Site 1 (hrs)	Site 2 (hrs)	Site 3 (hrs)	Site 3 (hrs)
CCMCN Director of Clinical Programming & Development	32	3*	27 (18 hrs travel for 2 trips)	14
Tobacco Cessation Program Manager	15	0	0	0

* This time was spent with the vendor who built the template, regarding tobacco cessation guidelines

Equipment Cost. Equipment, including hardware and/or software, was not required by any of the sites.

Data Quality Assessments—Site 1. Site 1 did not have data quality issues specifically, but they did have the opportunity to review and improve the reports that were generated from data documented via the template. This led to some minor template revisions, but mainly to revisions in the tobacco quality report, including modifications to metric specifications. An initial quality report was created in the summer of 2008. In this report, the data measured both actual numbers and reporting percentages of: Patients (Pts) that were 'Asked', 'Advised', 'Assessed', 'Assisted', and a ' Quit Rate' with 'Self Management' being added in December of 2008 (See Appendix – Report Tobacco Outcomes, Site 1, a single location, August 27,2008) . There were some errors found in the way the denominator was being calculated and compared, as well as some inconsistencies in the timeframes used to report data, these discrepancies were later corrected (See Appendix – Report Tobacco Outcomes, Site 1, all locations, Feb 25, 2009). Later via meetings with Clinical Advisory Work Group it was decided that tobacco cessation should be measured at both the patient and encounter level, as it was felt that tobacco cessation activities should occur at virtually every patient encounter. A third report including both patient and encounter level outcomes is available in the Tobacco Template Appendix.

Data Quality Assessments—Site 2. Data quality assessments have not yet been completed.

Data Quality Assessments—Site 3. Site 3 states that there were no issues with data quality. They did though report the following modifications to address barriers to provider use of the template. The early reports had greater “Ask” and “Refer” rates than “Advise” rates. Since “Referral” follows “Advising” in the tobacco cessation process, this anomaly was investigated. It was determined that providers were responsible for documenting the “Advise” portion of the process, while a medical assistant queried and documented the “Ask” component and a health educator typically documented the “Referral” component. Discussions with providers uncovered that the “Ask” documentation was set up in an area of the electronic chart which was not used by providers, but was typically used by medical assistants to document vital signs. The “Ask” component was moved to a provider section of the electronic clinical note, i.e. the progress note, with a resulting increased in the documentation rate.

Data Quality Assessments—Site 4. Data quality has not yet been assessed, at the time of this report.

Unintended Consequences. None of the sites had any unintended consequences, such as administrative or clinical information system downtime.

Template Use & Impact—Site 1. Data from the Tobacco Template is generated and reviewed on an on-going fashion in keeping with Site 1's overall quality improvement efforts. *The Total Quality Management (TQM) meeting occurs on a monthly basis and includes representatives from all departments and sites*. The information is shared with each site Medical Director and their teams and then worked in slightly different formats.

The initial work around the Tobacco Template included adding an assessment for tobacco use to the existing Vital Signs Template. It involved creating extensive embedded clinical decision support based on the current Colorado Clinical Guidelines Collaborative tobacco cessation guidelines recommendations and pharmacology table. A flow sheet grid was also developed to best optimize provider use and tracking of smoking cessation interventions over time.

An audit of one location belonging to Site 1 demonstrated that baseline rates of the "% of patients asked about tobacco use" prior to the template implementation and education was 9% (n=67), post-implementation this rate had increased to 90% (n=60).

Template Use & Impact—Site 2. Site 2 has not yet created any reports for distribution at the time of this assessment.

Template Use & Impact—Site 3. Site 3 uses the documented information for real-time care at the patient level on a daily basis, such that if a patient requiring "Assistance" is in the office, outreach can be made by a health educator. Monthly reports have not been run and trending information is not available at this time.

An audit of all locations combined indicated no change in the proportion of patients asked about tobacco use, which remained at 99% (n=82 and 80), but there was an increase from 20% (n=20 users) to 40% (n=28 users) of current users who were advised to quit, and from 0% to 11% in the number referred to a tobacco cessation resource.

Template Use & Impact—Site 4. Site 4 has not yet created any reports for distribution at the time of this assessment.

Lessons Learned. The Clinical Advisory Work Group, which was initiated as part of this project, developed consensus on tobacco quality metrics mid-way through the tobacco template implementation. This work greatly facilitated remaining template implementations by informing the data that needed to be collected based on what metrics providers wanted to report and how they wanted to define those metrics.

Lessons Learned—Site 1. Creating and refining templates was an incredibly time intensive process. Individualized templates also do not always align with EHR upgrades as seamlessly as might be expected. These two reasons have contributed to the reassessment and reduction of the amount of template creation at Site 1 and have prompted greater selectivity in template creation.

Provider template adoption is more effective when education regarding clinical guideline content is combined with EHR/template training use. The combined education format seems to be more effective than having these trainings separately or relying on self-directed learning.

Template use is facilitated when alerts to ask about Tobacco use or reminders to follow-up with current tobacco users are available within the EHR.

Lessons Learned—Site 2. The biggest challenge encountered had to do with the complexity of managing the numerous versions. While Site 2 was in the process of developing their Tobacco Template version, they found out that NextGen was coming out with their own version, which would be available to Site 2. Site 2 decided to use the customized template over NextGen's as they felt it was more comprehensive and provided more clinical decision support.

Lessons Learned—Site 3. See Data Quality above, for an example of how template design must be concordant with workflow processes.

Combining guideline training and EHR training together seemed more effective than having the trainings separately. CCMCN was able to coordinate two trainings, one as an introduction to the premise and guidelines, and the second after the template had been created which served as a 'refresher' course to the tobacco guidelines and an opportunity to share numbers and solicit feedback.

In general when working with a CHC system to develop and implement an EHR template it is important to align EHR report development that supports both UDS measures and quality improvement outcome measures. The ability to create clinical decision support and task reminders, such as follow-up with a patient, an alert to ask about tobacco use, etc. contributes to the ease and effectiveness of quality patient care.

Lessons Learned—Site 4. The tobacco cessation template content was integrated into a template with content for two additional areas: depression screening and Screening, Brief Intervention, Referral to Treatment (SBIRT). The combined implementation of these complex areas at one time posed some barriers to uptake. Site 4 considered the tobacco cessation piece to be the more straightforward content, but it was impossible to separate out the impact of the tobacco content specifically. It also worth noting that Site 4's entire EHR implementation was relatively new at the time of the newly created template use. All of these factors contributed to decreased provider productivity during this time, but again, this can be specifically attributed to the tobacco template implementation.

Report Examples. Recent tobacco cessation quality reports are available from the CACHIE system for Sites 1 and 2 (See Tobacco Template Appendix). It should be noted that for Site 2 the tobacco template had only been in use for ~ 3 months at the time the report was run. Reports are not available for Sites 3 and 4.

Reports demonstrating the trend in the percentage of eligible patients asked about tobacco use at the last visit are included for Site 1.

Summary. Three of the four participating sites completed their tobacco template implementation, including required modification of their EHR without any outside vendor support. This included customizing a template to allow documentation of tobacco cessation steps and linking templates to relevant flow sheets. For some sites, it also included the building of

queries and reports to evaluate the impact of tobacco cessation interventions. The site that hired a vendor spent a relatively small amount of money ($2,000) on vendor support.

The investment of staff and provider time was substantial for most sites. For three of the sites a medical provider (MD or PA) devoted an estimated 32 to 55 hours to tobacco template and reporting implementation. Site 3 spent substantially less time (6 hrs of Chief Operations Officer time and no provider time), likely due to their use of an EHR system that easily allows reports to be generated using an integrated business intelligence tool. With the exception of Site 2, who used an outside vendor, and Site 3, the other two sites required either a database analyst or software applications administrator for 26 to 40 hours for implementation.

CCMCN staff members who assisted with content review, gap analysis, education, and training invested anywhere from 3 to 102 hours with the sites. A number of factors likely contributed to this site's use of resources, including that it was the first site to initiate the project and it is the largest participating site. Many of the decisions made by Site 1 informed future processes for other sites, hence making their work and the work of CCMCN much more efficient.

Sites did not report any downtime or unintended consequences, but they did recognize that the process of creating EHR templates and quality reports is time consuming, and that the addition of new topics must be judicious. Sites also recognized the importance of understanding workflow process and roles when considering EHR documentation modifications, the importance of making sure that improved documentation results in improved automated assistance (e.g., alerts, ability to create registries) and the value of considering other impending reporting needs.

BPA Appendix

1. BPA Appendix Task and Work Flow Diagrams (BPA_Appendix_Task_Work Flow Diagrams.pdf);

2. Functional and Technical Requirements (BPA Appendix_Functional and Technical Requirements and Data Elements.pdf);

3. Required data elements for QIS (Same as above).

Tobacco Template Appendix

1. Tobacco Outcome Report, Site 1, Aug 2008 and Feb 2009 – both in 1 PDF document. Please note that the later report is presented first in the PDF (Tobacco Outcome Report Site 1_Aug 2008 and Feb 2009 examples.pdf);

2. Tobacco Cessation Reports: Sites 1 and 2, run via the CACHIE system (Tobacco_Site 1 and 2_OutcomesApril 2010.pdf);

3. Site 1: Reports demonstrating the trend of "Percentage of Population ≥15 years of age who were asked about tobacco use at their most recent (aka last) visit". (Tobacco_Last_Asked_Graphs_Site 1.pdf).

List of Publications and Products

None to date.