Information Technology Systems for Rural Indian Health Care: Implementation and Use of a Commercial Ambulatory Care Electronic Health Record

Inclusive Project Dates: 09/01/04 - 12/31/07

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Structured Abstract

Purpose: An area-wide tribal health board in California partnered with Tribal Health Programs (THP) to implement a commercial ambulatory electronic health record (EHR) and use the EHR for quality improvement of clinical care and reporting of clinical population data.

Scope: THP form the largest sector of Indian Health Service (IHS) providers. Unlike IHS facilities, few THP operate hospitals. Therefore, an ambulatory EHR was judged more likely to be appropriate for THP than the EHR being developed by the IHS.

Methods: Case study of the implementation and use of the NextGen® EHR with three THP in rural California varying in size, organization and location. The THP provide primary care at 12 sites to 12,000 American Indian and additional non-Indian clients.

Results: The EHR was implemented at 8 of 12 sites. Successful implementation teams had expertise in clinical care, clinic management and information technology, and the continual support of executive leadership. Quality improvement of performance measures with extraction and reporting of the measures was successfully achieved at one THP. All THP achieved extraction and reporting of performance measures and other population data. Further development of the EHR, however, is needed by the vendor and a national Users' Group of THP implementing the NextGen EHR was formed to advocate for improvements.

Key Words: American Indians and Alaska Natives; electronic health records; EHR; Indian Health Services; rural health; primary care; ambulatory care; quality improvement; tribal health programs; NextGen®

Final Report

Purpose

The purpose of this project was for a group of Tribal Health Programs (THP) in California to partner with their area-wide tribal health board in order to collectively: 1) implement a commercial ambulatory care Electronic Health Record (EHR); 2) use the EHR to track and improve quality performance of clinical care; and 3) use the EHR for reporting population health care data.

Scope

In recent decades tribes have become increasingly responsible for providing their own health care through THP. Under the 1975 Indian Self-Determination Act (PL 93-638) federally-recognized Indian tribes were granted the opportunity to assume responsibility for the health of their own people under contracts and compacts with Indian Health Service (IHS), and many tribes have chosen to do so. THP have become the largest sector of providers of IHS-funded services. They provide care nationally to more than one-third of the1.8 million American Indian and Alaska Native (AIAN) who obtain services through the IHS.

The use of an EHR has the potential to help rural THP provide better quality ambulatory care that is safer to low income, AIAN populations they serve in ways that no other resource can. An EHR tailored to the ambulatory care that THP provide could transform a handwritten or typed paper medical chart into an electronic real-time interactive prompting, monitoring, ordering, analysis, storage and reporting tool for patient care.

The IHS began field-testing components of its own EHR that was built on its 20-year old legacy computer system for hospital and outpatient clinics (Resource and Patient Management System, RPMS) around 2002. This is an appropriate strategy for IHS providers that include 110 outpatient clinics and 36 hospitals. All federally operated IHS operated facilities were mandated to implement the available EHR components by 2008. THP have had years of experience with the IHS legacy RPMS system and, as a result, THP questioned whether implementing the IHS EHR was the best solution for them. THP had faced a number of drawbacks to RPMS after they were locked into the data input and archiving system for registration and workload data. Arguably the most serious issue was that it took until 2004 for IHS to make available a graphical user interface to reduce the tedium and errors of data input by specialized data entry personnel. The IHS EHR also lacked a graphical user interface when introduced, and made THP wary of how long it would be until the EHR had a user friendly input screen for clinicians.

THP operated by tribes are being offered the IHS EHR components to implement as they are developed and released. THP face a challenging decision of whether or not to implement the IHS EHR. With a total of 378 ambulatory care facilities, and only 15 tribal hospitals, most THP own free-standing primary care clinics and no hospitals. Many functions of the IHS EHR are therefore not needed for sites. Some THP had found the RPMS legacy software hard to use and

maintain. IHS never seemed to have sufficient funds to help THP in training new staff to use and maintain the legacy system. They worried the same problems would plague the IHS EHR. This contributed to the search for software that was easier to use for recording and reporting clinical data.

The alternative to the IHS EHR is for THP to implement a commercial 'off-the-shelf' EHR developed from more recent computer systems for free-standing ambulatory care facilities. THP wondered whether a commercial ambulatory EHR with a widely familiar Windows® graphical user interface would be more appropriate to implement. Such software was available that offered architecture based on ambulatory care tasks and management and included such things as preventive services, drug interaction alerts, and reminders.

For a THP to implement an EHR unsupported by IHS is a risky undertaking. To replace paper medical charts with an electronic system is a highly technical and complex challenge to clinical practice sites. EHR implementations had been known to fail in free-standing clinics, and the clinics had been forced to return to paper medical charts. In California a number of THP began to look to their area-wide tribal health board (CRIHB) for technical assistance and support in implementing first an alternative ambulatory electronic practice management system, and then an EHR that could be integrated with that system. Together they undertook this project. In this report we summarize the participants, tasks completed, the challenges encountered and the lessons learned in introducing a commercial ambulatory EHR into various THP. Our goal is to document our experience so that other area tribal health boards and THP will have information they can use in their own decisions of whether to implement an EHR, and how to implement it.

Context

THP in California began formally looking into commercial EHR for their clinics in 2000. This was two years before the IHS began to field test components of an EHR in 2002, and four years before the President stated in his State of the Union message that he wanted to have an EHR for everyone within 10 years.

EHR implementation in THP. THP had substantial issues with the RPMS legacy computer system of the IHS they had been using since 1995 to meet IHS reporting requirements for registration and workload populations. Thus, when in 2002 there began to be introduction of components of an IHS EHR based on the legacy system many of the issues seemed to be repeated. It was not predictable when the IHS EHR being field tested would become available to THP, and what support there would be for implementing the EHR.

The IHS RPMS legacy system was based on the VA's Veterans Health Information Systems and Technology Architecture (VistA). Like the VA system it began as a hospital inpatient software system (MUMPS coding, UNIX platform). The IHS made RPMS available to all THP at no cost, but for free-standing tribal ambulatory clinics RPMS presented challenges to tailor to comprehensive primary care because it had many capabilities that were not needed outside of hospitals. Its modules eventually included Registration, Scheduling, Pharmacy, Radiology, Laboratory, Immunizations, Reminders (passive), Problem List, Health Summary and Billing. The system standardized data entry of registration and clinical information to be entered from paper registration and encounter forms. It enabled storage of selected patient data for later extraction or export. Population reporting was possible with a trained user of the three different RPMS report-generating systems (Fileman, Pgen and Vgen).

Data entry was command line driven, done by specialized data entry people after clinic visits were completed. The RPMS third party billing system was limited because it handled payments in prescribed ways that did not include a seamless direct billing of Medicaid and Medicare, and instead required a 3 step process. Furthermore the billing system and the accounts receivable module were developed separately, resulting in the need for an interface between the modules, with unintended incompatibilities. Many THP found it easier to use commercial, off-the-shelf software products. As for reporting extracted data stored in RPMS, THP could use three report-generating systems but the same search criteria and database often yielded three different results for reasons that THP staff did not understand.

The difficulties in finding, hiring and keeping RPMS 'super-users' to make RPMS user friendly to the rural THP was a continual challenge. THP RPMS data is entered from the paper forms by a non-technical, non-provider with no medical training. The lack of a user-friendly interface made it difficult for many THP in underserved low income areas to staff and operate RPMS fully and accurately. Even with a graphical user interface, RPMS clerks are not allowed to interpret information on the forms. Data entry clerks are required to read providers' handwriting, learn medical terminology and struggle to remain current with data entry. In order for test or procedure results that come from outside the THP to be documented on the Health Summary, they must be written on an IHS form and given to data entry clerks for input into RPMS. Thus though in RPMS there was a Health Summary reminder, inaccurate information led providers to ignore the summaries.

In 2000 six THP members of the area-wide tribal health board in California (CRIHB) began a systematic three-phase planning process for implementation of an EHR integrated with electronic practice management. In Phase 1 they determined what the THP required in software through a survey of THP directors and staff. These THP administrators highly ranked their desire for systems with the capability of reporting on selected groups of patients to track quality of care and population health issues. THP desired a way to produce their own population health analyses and use them for quality of care improvement of individual patients. For this, they needed an integrated system for individual patient care data from multiple clinics, pharmacies and laboratories in real time. In Phase 2 they ranked the available commercial practice management and EHR software in order of degree of functions that met needs and selected NextGen (a CCHIT[SM] certified ambulatory EHR Product). In Phase 3 they began the adaptation of the NextGen selected software to the requirements of THP. The Health Systems Development Department of the CRIHB hired and trained its own NextGen Project staff to work with NextGen. The Project developed user-defined fields to capture IHS-required data elements that do not exist in any system but RPMS, for example tribal codes (more than 750 codes) and community codes (964 California codes) used to define Clinical Active Patients in GPRA measures and the Active Users for User Population exports. They developed NextGen data tables to capture these items.

EHR and quality improvement of care in THP. Prior to 2000 representatives of the CRIHB and its member THP became involved in Quality Improvement with the Institute for Healthcare Improvement. They began attending trainings in Clinic Redesign before either the IHS EHR or the GPRA extraction system in RPMS was available. They made site visits to the Alaska Native health care sites implementing Institute for Healthcare Improvement innovations, and they hired consultants trained by the Institute in clinic workflow and quality of care improvement. CRIHB produced an annual Quality Improvement conference that featured Institute-based trainings and presentations and preparing for the eventual transition to an EHR.

By 2002 CRIHB member THP began implementing patient-centered workflow changes including such things as primary care provider teams (pods) for patients, assigning individual primary care physicians to individual patients for continuity of care, and starting 'open access' scheduling that allowed same-day or next-day appointments.

Quality Improvement of care in THP through performance measurement was formalized with the introduction of the IHS Diabetes Audit to their Special Diabetes Programs in selected THP. The IHS has repeatedly demonstrated improvements in quality of care with these measures for Diabetes chronic care. Extraction of Diabetic Audit data elements for annual reporting to the IHS began with manual chart audits of randomly selected medical charts. The manual extraction was a labor-intensive, time-consuming process. While the legacy IHS RPMS system allowed some electronic extraction of data for the Diabetes Audit, reporting was still difficult because instead of an RPMS module to compile the measurement indicators, the program chose to use a publicly available statistical software (EpiInfo) to compile, analyze and report the Diabetic Audit measures. None of the THP had staff familiar with the use of statistical software.

A push for the implementation of an EHR for Quality Improvement came in 2001 with the introduction of 'GPRA' measurement to THP by the IHS. The IHS developed a set of clinical measures (IHS GPRA measures) to improve quality and safety of preventive and chronic care. The Government Performance and Results Act (GPRA) is a federal law requiring each federal agency develop an annual performance plan and report. The GPRA clinical measures for IHS Service Units vary and document the need for Quality Improvement of the preventive and chronic care in THP. GPRA measures are aimed at improving safety as well as quality of care by reducing potential system failures of ambulatory care. While the legacy IHS RPMS system allows some GPRA data to be abstracted electronically, it still required a paper chart to be maintained for such things as laboratory results.

In 2003 the possibility of uniform electronic extraction and export of GPRA data elements from an EHR accessed from multiple sites of a THP was set in motion when IHS started releasing annual updates of software program ('Clinical Reporting System') for routine electronic extraction, export and analysis of each year's GPRA measures from RPMS stored data elements. In 2003 the California Area Office of the IHS assumed a national leadership role for GPRA activities with THP. This Area Office of IHS in California is responsible for facilitating data collection and analysis from all IHS areas.

Population health care reporting and EHR in THP. THP were frustrated that the data electronically stored within RPMS was not timely, complete or accurate enough either to inform decisions they needed to make for groups of patients, or to file required routine reports with IHS or state agencies. THP have a number of reports that they are required to export electronically to the IHS. IHS reports include not only quarterly Diabetes Audit and GPRA reports, but monthly patient Registration and Encounter Export and quarterly Childhood Immunization Report. One of the greatest concerns of adopting a commercial ambulatory EHR instead of waiting for the IHS EHR was that the commercial EHR would not be able to export or report population based data to the IHS as required. It was understood that if the THP could meet all the IHS population-based reporting requirements with the commercial EHR, they would also be able to form registries of patients with particular clinical conditions, or particular types of care.

Setting

The rural California THP in this project are not only tribally owned, but also tribally operated through self-determination contracting with IHS (P.L. 93-638 Indian Self Determination and Education Assistance Act). The THP operate 12 clinics in 7 counties in 3 different areas of the state. Together they have an IHS Service Population of nearly 12,000 AIAN and User Population of 9,145 AIAN in 2007. They provide comprehensive primary care and limited public health services.

THP service and user populations. AIAN eligible for IHS services in THP in California have one of three general kinds of federally recognized tribal affiliations: 1) California tribal enrollment (50%), 2) descendant of an Indian who resided in California in 1852 (25%), or 3) enrollment with a non-California tribe (25%). The overall poverty rate for AIAN in the THP service areas is 24%, while overall rate for Whites in the same areas is 9%. Life expectancy for AIAN men who use THP is 6.5 years shorter than for Whites who live in the same counties. Life expectancy for AIAN women users is 3.1 years shorter. The 3 leading causes of death for AIAN population who are users of THP are 1) diseases of the heart, 2) cancers, and 3) diabetes. The death rates due to diabetes are nearly 3.5 times as high for the AIAN users of THP compared to Whites living in the same counties.

THP clinical services. The THP provide comprehensive primary care and limited public health services. They also generally provide general dentistry and behavioral health services at the same sites as the medical services. Medical evaluation and management of disease conditions is generally performed by midlevel practitioners (nurse practitioners or physician assistants), or physicians with a primary care specialty (family practice). There are low level in-house ancillary services that generally include laboratory and pathology services, screenings for cancer, tuberculosis and elevated blood glucose, and Initial assessments for diabetes and pregnancy. Most THP have a limited supply of prescription medications acquired through low cost or no cost federal programs available at no cost to IHS covered AIAN. Prescriptions for other patients and for medications not included in the THP supply must be filled by commercial pharmacies. THP bill Medicaid, Medicare and private insurance companies for services they provide to patients with the public or private insurance coverage. THP manage specialty care and hospitalizations of uninsured AIAN with authorizations as IHS Contract Health Service funds allow. Patients with Medicaid, Medicare, or private insurance coverage obtain specialty care and hospitalizations through private providers. There are no tribal hospitals, IHS clinics or IHS hospitals in California.

California Rural Indian Health Board (CRIHB). CRIHB is the area-wide tribal health board for the California area with a membership of 11 of the 24 THP in California that own and operate clinical facilities. The 11 THP are governed by boards that together represent 34 member tribes. CRIHB, "… is committed to the needs and interests that elevate and promote the health status and social conditions of the Indian People of California. CRIHB does this by providing … shared resources, training and technical assistance that enhance the delivery of quality comprehensive health related services." CRIHB provides its member THP centralized technical assistance in information technology systems, clinical quality improvement and IHS federally required reporting.

The role of CRIHB in this project was to lead and manage the EHR implementation across THP. CRIHB manages a single contract for the purchase of NextGen software which affords THP partners significant discounts. In addition, CRIHB can move licenses between the sites without additional cost. The CRIHB Project Director, Technical Systems Coordinator and Data Base Analyst provided implementation planning, change management coaching, on-site assistance during implementation, and ongoing support for software maintenance and system improvement. They provided second-line information technology and EHR support. They worked to resolve the more complex problems that could not be addressed by the local IT or 'super-users.' They were responsible for vendor relations, and helped start the Users Group of THP implementing NextGen open to all THP nationally.

Participants

Three of the original six THP in rural California that had been involved in the EHR planning process with CRIHB since 2000, had actually implemented the NextGen practice management software and were ready to implement the NextGen EHR as partners when this project began in 2004. The three participating THP are:

United Indian Health Services (UIHS). UIHS is a THP with an IHS Service Population of 7,900 and User Population of 6,911. It was formed in 1970 by a consortium of tribes, and is the primary health provider for American Indian families at 5 sites in north coastal Del Norte and Humboldt counties. Humboldt County has the highest concentration of AIAN in California, 9.1% of the population. The network of care sites has a large center of operations and services in Arcata, and the 4 remaining sites are satellite service sites. Clinical staffing includes 9 physicians, 3 nurse practitioners and physician assistants and 4 RN's, 4 LVN's and 16 Medical Assistants. Its physicians provide obstetric and other hospital inpatient care at local community hospitals. UIHS has 2 full-time IT personnel and a full-time designated EHR IT manager.

Mariposa, Amador, Calaveras and Tuolumne Health Board (MACT). MACT is a THP with an IHS Service Population of 3,800 and User Population of 2,100. It was established in 1969 by a consortium of tribes. MACT provides services at 6 sites to AIAN and their family members who live in Mariposa, Amador, Calaveras and Tuolumne counties in the foothills of the Sierra Mountains. The network of care sites is a web of clinic sites that separately conduct their own operations and services with only limited centralized coordination. MACT provides services to Indian as well as a large number of non-Indian clients (approximately 4,200). Clinical staffing includes 9 physicians, 7 nurse practitioners and physician assistants and 5 RN's, 4 LVN's and 6 Medical Assistants. MACT has 1 full-time IT support person.

Warner Mountain Indian Health Project (WMIHP). WMIHP is a THP with an IHS Service Population of 140 and User Population 126. It was established in 1990, as a result of a single tribe's decision to operate its own health care program for the Fort Bidwell Indian community of northeastern Modoc County. The highest difference in poverty rates between AIAN and Whites occurs in the Warner Mountain service area with a 43% poverty rate for AIAN and 15% for Whites. Operations are conducted at a single site. A physician spends only a few days a month in the clinic itself and relies on telephone relays from the nurse practitioner to make medical decisions during interim periods. The nearest hospital is 25 miles away and has

only 4 acute beds. The nearest tertiary hospital is over 300 miles away. WMIHP does not have IT staff, they rely on CRIHB for IT and EHR support.

Implementation consultants. The GreenField Group provided the only actual prior experience in implementation of an EHR in an ambulatory setting to the project. The group had considerable experience in Ambulatory IT, including practice management, EHR, health system leadership, quality improvement and system redesign. GreenField has been recognized both locally and nationally for their expertise in improving health care quality and innovative medical practice redesign work. Notable citations include those of the Institute for Healthcare Improvement, of which their leading physician is a Fellow. Their implementation consultant made frequent site visits to CRIHB and the THP, and weekly conference calls for the first 18 months of the project.

Methods

The study is a descriptive Case Study in which the domains of description are based on the Specific Aims of the project: 1) EHR Implementation; 2) EHR and Quality Improvement; and 3) EHR and Population Reporting Sub-domains for describing EHR Implementation, 1) teamwork; 2) tactics; and 3) technology.

The team concept focuses on identification of three key members of an EHR implementation team: the provider champion, the Executive Director, and a project manager. The tactics consist of the change management techniques, including the implementation plan, workflow redesign, data transfer/abstraction procedures, and the installation and use of needed hardware/software interfaces, and end-user staff training. Technology refers to the Information Technology (IT) infrastructure, including hardware, software, support and maintenance, and disaster recovery.

Quality Improvement encompasses clinical care performance measurement and reporting to see that health care is provided according to standards. Population reporting encompasses data extraction systems to see that the individual patient care data are integrated, reported and used for population health and health care reporting. Data sources used to document the domains described came from THP site visits made by CRIHB staff, consultants and the project evaluator; technical assistance and training reports; quarterly reports to CRIHB program directors; summary presentations to AHRQ, Tribal Net, and the CRIHB Board; and notes from conference calls with THP team members and implementation consultants.

Results

EHR Implementation

The commercial ambulatory EHR was implemented and continues to be used at 8 of 12 care sites of the three participating THP. EHR implementation is a complex and intensive process that affects every aspect of a clinic's operations and working relationships, and seriously affected

operations and working relationships between the area-wide health board and the THP as well. Substantial challenges were encountered, and the lessons learned fall into three general categories: Teamwork, Tactics and Technology.

Teamwork. Implementation required continual leadership from the executive directors, medical directors and finance directors of the THP. The EHR Implementation only began to succeed when leadership from the executive level of each THP was convinced that they had to personally ready the entire organization for change, and maintain clear support for the continual changes brought on by the Implementation Team members, particularly the Project Manager. CRIHB contracted with nationally recognized consultants who were experienced in EHR Implementation in ambulatory care settings to conduct leadership training for executive directors, medical directors and finance directors of the THP at the beginning of the project (Chuck Kilo, MD, and Jill Arena, MPA). The training was followed by a round of THP site visits with the consultants. Still the executive leadership at every THP, and the area-wide health board, were surprised when months later they were called upon to step in when Implementation was slowed by staff who were reluctant to do what they personally had to do to implement the EHR. CRIHB and the Project Team Managers had to call repeatedly upon executive leaders of the organization to demonstrate tangibly their support for the demands upon organization staff by the EHR implementation, which was not unlike a 'nervous system transplant' of the organization.

Implementation required Project Teams with expertise from primarily three areas: clinical care, clinic management and Information Technology systems. Project Team leaders needed expertise in more than one of the areas, and all three if possible, and they needed seniority in the organization as well. Initially the executive leadership at the THP delegated Project Team leadership to young managers taken from billing, medical records or IT who struggled to gain expertise and respect in areas other than their own that they knew little about. In-depth Project Team manager training sessions were conducted by implementation consultants on site. Weekly conference calls of all Project Team leaders were held to share information and to determine areas in need of technical assistance. The Project Team leaders soon found they needed the authority to require staff to attend meetings so that decisions could be made wisely, and to spend time learning to use the EHR before implementation so that problems could be anticipated and addressed before the system went 'Live.' There were opportunities for powerful professional staff (more senior than the Project Team leader) to influence others to doubt the wisdom of the EHR implementation, demand customizations of the EHR that created delays, or to plead ignorance when they could not use the EHR. This is when executive leadership was called upon to elevate the importance of the EHR Implementation and its demands on staff.

Despite efforts at leadership and management training EHR implementation team leaders at all three of the THP, as well as the original IT and clinical managers of the project at CRIHB, had left their organizations within 18 months because of the project. Only one person continued EHR work elsewhere. The THP and CRIHB went through a reorganization process with a heightened role of the Implementation consultants and redefined and upgraded project management roles. Eventually, when more senior and well-trained replacements were found, the EHR implementation teams regrouped to complete the implementation tasks. As EHR early adaptors, the teams had initially focused on technological adjustments of the 'software' and training 'users.' What was learned was to create more time and resources in an already underfunded clinic system to focus on the "peopleware". The technology could not serve clinic goals without working intensively with people to change.

During a workshop conducted by CRIHB entitled "EHR Implementation: The Agony and The Ecstasy," in June 2006, participants who had implemented the EHR attended by THP shared the following observations:

- EHR is not just an IT project.

- The three legged stool* is needed to support any decision (Clinical, IT and Administrative leadership).

- EHR is a team sport.

- "I already have a full time job" is not an excuse. EHR is a core component of your full time job for the next 6 months/rest of your life.

- EHR changes how everyone does their work.

- If you implement all components of an EHR system at once, everyone will cry.

- Pain is inevitable but suffering is optional.

- A sense of humor and a good support system is required (if you want to survive).

- We will not go back to paper (medical records). (The EHR) is imperfect but still better.

- Clinical staff get outrageously happy when they read accurate reports generated from the system.

During the period of high staff turnover, interim project directors and new project directors' tensions rose, threatening collaborative relationships. By the time the project had hired new staff or reassigned existing staff new roles, there were difficult, limited communications between CRIHB and partner THP, and limited communication among these THP who had helped each other in prior projects. After a formal airing of grievances at a meeting facilitated by a Native professional mediator, it was decided that the partnership like a marriage needed counseling, and not a divorce. Other common interests besides this project were at issue. We would continue this project together and continue to seek funds together for new research. We agreed that the largest and most evolved user of the EHR (UIHS) would create the templates that could then be used by the other THP if they so desired. CRIHB would work on the data extraction programs needed for GPRA and other standardized reports for the clinics. We resolved to work together to standardize the data entry to EHR templates and generate the common goal of IHS reports.

Tactics. Implementation was carried out in six-phases: 1) Preparing for EHR Implementation with leadership, clinical providers, and IT; 2) Establishing clinic workflow changes possible with an electronic interactive system instead of paper tracking system; 3) Establishing IT hardware and connectivity infrastructure; 4) Installing NextGen software and Setting-up Internal Systems with site specific and THP-required data; 5) Setting-up Interfaces – Scanner, Laboratory bi-directional test ordering and results reporting, Exports, Reports, etc; 6) Preparing for 'Go-Live' with training, rehearsing, fixing glitches, and more training; 7) 'Go Live'

and adding functions; 8) Making Post 'Go Live' Adjustments; and 9) Maintaining EHR including managing changes in hardware, software, interfaces, exports, reports. The greatest challenges were in planning, communication and workflow redesign.

It was impossible to plan too much, though it was possible to take too much time planning. Effective planning required a documented implementation plan that was detailed, written out and agreed upon by the participants. CRIHB spent about 3 months with each site within a THP planning and preparing for the Go-Live date. It was necessary to emphasize concrete short-term and long-term goals, scheduling for staff, checklists, and contingency plans. There were frequent team meetings, conference calls, CRIHB WebEx trainings and other methods of communication during the implementation planning phase.

During every phase of implementation most important function of the participants was establishing and maintaining communications. Frequently, the EHR software vendor, the THP management, providers, and IT support staff during the implementation process do not maintain adequate communication. For example, providers and the support staff have the steepest learning curve and usually don't get recognition from other members of the implementation team. Providers are expected to learn EHR quickly and see patients as usual, THP executive director wants revenue to stay the same, the vendor is set to offer some support and then there is the IT staff that is usually understaffed and overworked.

The EHR changes more than removing paper charts, it shines a light on clinic management problems that may already exist resulting in staff frustration. The EHR was expected to record complex medical processes, coordinate medications, orders, tests, results as well as handle provider's patient encounters and phone calls. There were many aspects of clinic workflow to change and 'work arounds' to manage with diverse staff members. CRIHB and the THP spent time discussing these issues with THP staff in the early phases of planning, during the phone conference calls, web-ex trainings, and day trainings. Much has been made of the importance of 'EHR Champions' in implementation. But with THP there was not necessarily an 'EHR champion' at every site when Implementation started. At those sites a champion only began to arise from 'converts' who reluctantly began to use the EHR, and were surprised how much they liked it and wanted to become a super-user. Once organization executive leadership and a respected EHR Champion was on board with the Implementation, change began to happen.

Technology. As the implementation progressed the limitations of the EHR software were becoming more obvious. It took more than a year for the THP as a group to realize that they had become constant 'beta-testers' and even software developers as well as health care providers. The clinics joined with CRIHB initially to get good prices for software, services and upgrades. It took two years to organize on a national level with other tribal NextGen users to pressure the vendor to put Indian clinic projects higher on their priority list.

The tribal clinics met informally at the NextGen Users group meeting in 2006. They formed a User's Group that held their first independent meeting in June 2007 at CRIHB. There were 9 THP represented and about 25 people in attendance, including the NextGen Vice President of Community Clinics. In October 2007 the 'Tribal Health Organizations Implementing NextGen' became a formal organization as an advisory group to the CRIHB Board. The group also had special meetings and advisors at the national NextGen Users Group meeting in November 2007.

The role of CRIHB is to provide organizational support to the new national coalition of users in their efforts to get their needs as users of a commercial EHR addressed both with the vendor

NextGen, and with the IHS who needs to define the standards of acceptable data exports from NextGen software.

EHR and Quality Improvement

The following process was developed to generate Diabetic Audit and GPRA reports from the EHR and use them in Quality Improvement efforts:

1. Identify existing data fields in EHR templates, or create new fields, and assess clinic flow of indicator entry;

2. Write NextGen queries in SQL to extract appropriately entered data;

3. Standardize data entry with staff trainings and change clinic flow if necessary;

4. Test the data extracts every report period for consistency and completeness based on previous reporting;

5. Work with THP to check data gaps and inconsistencies in the extracts;

6. Submit a verified export or report of aggregate data externally as directed by the reporting requirements, and have that report accepted by the agency; and

7. Use the reported results internally to work with clinicians to improve the quality of the delivery of care tracked with the Diabetic Audit and GPRA measures.

Quality Improvement with the Diabetic Audit measures (all 7 steps) was successfully achieved during the project period at one THP. A Diabetes Case Management team and EHR project team at the THP created a special Diabetes Audit data entry template, and CRIHB developed a custom Diabetic Audit SQL query to extract the data entered in the custom template and store the data extracted in a database at the THP. Indicator definition references (codes, lab values, etc.) for the EHR were centralized at CRIHB. The Diabetes Case Management team at the THP use the report generated by EpiInfo from the NextGen database to investigate low performance results, and then clean and verify the data entered. If the low results are not a SQL Program problem, then the Diabetes Case Management team works with clinicians on improving data entry and the delivery of diabetic care as appropriate. The annual update of the Diabetic Audit report is uploaded via a website created by IHS. The IHS is working on some problems they have with receiving the uploaded version of the report.

At the other two THP quality improvement processes have achieved both extraction and reporting of Diabetic Audit performance measures (through step 6), but have not yet been used to improve the delivery of care. At these sites the default NextGen templates are used instead of a customized template, with only minor modifications needed on three of the small 'pop up' templates to enter data needed for the Diabetic Audit. An SQL query was written for the default templates. Diabetic Audit reports can be generated for both THP. The EHR project teams are now working on standardizing data entry to improve the completeness and quality of the reports.

The GPRA report has an annually increasing number of performance measures and is much more complex than the Diabetes Audit. A full GPRA report currently combines over 120 views,

queries and stored procedures, and takes many hours to run. But the same seven steps are being pursued at the THP to submit the report to IHS and use the report internally for quality improvement of care. A customized GPRA Report was written by the CRIHB Technical Systems Coordinator for the one THP that customized its templates. GRPA data has been extracted and reported from that THP. With programming consultants (GGxTech) the CRIHB Technical Assistance Coordinator also developed a GPRA report that works with the default (non-customized) installation of NextGen at the other THP. Again a small number of template modifications were necessary to pull data that was not being gathered in default templates, but those changes were similar to those made for the Diabetic Audit. GPRA reporting is now possible for this installed version of NextGen with only minor changes. Some views, queries and stored procedures of the EHR do need to be changed to bring about greater optimization of the report. In addition, indexes need to be created in specific places that will allow for queries to run more efficiently.

Production of Diabetic Audit and GPRA reports with NextGen requires a high level of skill and a great deal of time. The challenge is to concentrate patient information for the indicators in one place and to lock down indicator fields with standardized nomenclature so they could be searched but not be customized. NextGen report for performance indicators require either the availability of an SQL programmer on staff or the funds to have a custom report written by NextGen. Smaller reports require staff skilled at least in generating Crystal Reports. The EHR project manager at CRIHB worked full time for six months with the CRIHB Technical Systems Coordinator and Data Base Analyst to retrieve and clean the data for the first NextGen Diabetic Audit and GPRA reports. The Diabetic Audit data extracted from the EHR needs to be opened by the DOS-based EpiInfo application so it can then be processed according to IHS-standardized reporting requirements.

EHR and Population Reporting

The THP are now able with CRIHB support to extract data from the commercial ambulatory EHR to prepare electronic exports and reports for the IHS, and have those reports accepted by the IHS. The process to develop and generate the population-based reports is the same as the first 6 steps of Diabetic Audit and GPRA reporting.

Extraction of registration and encounter information from the EHR is fundamental to most clinical population reporting. Reports of Registration and Encounters required by IHS have been generated, verified and accepted by IHS. The encounter export was extremely complex to develop. It required multiple consultants and took close to 2 years to finish. The incremental monthly registration report was also generated and verified as acceptable. NextGen has built a version of the encounter and registration export report, complete with a user-friendly interface. The CRIHB Technical Systems Coordinator worked with them to debug the report, but once it was finished it was determined that it would not easily handle THP clinics with multiple "departments." Major modifications of the application, or a great deal of work by the clinics, is needed to properly document the "department" code that is required by IHS which is not necessarily a required data field in NextGen. The package that CRIHB Technical Systems Coordinator worked on with programming consultants (GGxTech) uses a series of SQL functions to work around that issue. The CRIHB version of the report is being used by two THP, the third THP will be able to use it when they complete their transition from RPMS to NextGen in 2009 and no longer run both systems simultaneously.

Extraction of immunization information is an example of population based reporting that is crucial for THP. To generate Immunization Reports, any of the THP sites can at any time go to a designated web portal and pull a current summary report for the current quarter. They can also obtain a patient list so they can verify the data. Separate reports can be generated for each of the three age groups with specified standards for immunization. An end user-can export the report out of the EHR as either a PDF or Excel formatted file. The THP then has the responsibility of entering that information into the Immunization website hosted by IHS. One THP has issues with accurate population reporting because they still are using both NextGen and the legacy RPMS systems simultaneously until all sites have implemented the EHR. Thus the reports generated by the two different systems need to be consistent and verified against each other, which is difficult. The end-user staff also need more training on standardized data entry for immunization reporting to improve the accuracy and reducing the verification time.

Because reporting of population data with the EHR requires the same first 6 steps that were listed for quality Improvement, The EHR software limitations that plague Quality Improvement measurement also plague Population Reporting in general. The more clinical data desired for the population, the more difficult it is to obtain complete and consistent reporting for the population given the current state of the NextGen EHR.

Discussion & Conclusions

CRIHB and its partner THP not only maintain and use a commercial ambulatory EHR at 8 health care sites, but have begun the implementation of the EHR with the other 4 health care sites that were at first reluctant or unready to change. CRIHB is partnering with other THP to implement the EHR as well. None of 'early adopter' participants in this implementation have expressed a desire to return to paper medical charts or the IHS RPMS data system. To the contrary, THP staff in Behavioral Health and other departments of the THP who do not yet have access to the EHR continually ask to be brought onto the system. These THP have embraced change, and the inevitability of change in health care. The THP have learned that EHR implementation actually never ends as software and clinic flow adjustments evolve and affect routine tasks every day. Whether the changes to the EHR continue to be viewed as an improvement depends on the focus, skills and resources of the EHR management team and the continued involvement of senior leadership in the THP. Everyone now understands that EHR changes how each employee does work in the clinic. No one knows how to change every process or what processes will be changed with software upgrades. It is a process of planning, doing, reevaluating, adjusting the plan and doing it again, while aiming for completed tasks and improved results. It is exciting to some and terrifying to others. It is painful, frustrating and seriously difficult in different ways for all staff. It is only sometimes immediately rewarding. To succeed you have to believe that this technology, these work processes and these work relationships can be improved, or it is too difficult to sustain the immense personal and organizational investment. Encouragement, teamwork, support, and optimism are not optional.

EHR Implementation is a test of commitment for tribal health care partners to each other and to common goals. The collaborative relationships were stressed by being early adaptors of a young technology, but the length, depth and breadth of the collaboration (30 years of advocacy, etc) withstood the length, depth and breadth of the change. The participating partners were led to believe that the EHR would meet THP requirements with little adaptation. We were wrong. We did not understand that we were all beta testers and software developers. Partners had to invest unexpected money and time to adapt the software to be useful to the individual provider and

patient and to produce useful reports. Without the availability of grant support for unexpected costs the EHR might not have been cost effective to implement at so early a stage of EHR development.

For the EHR to be sustainable, two types of improvements sought by THP that had not been obtainable with paper charts and the legacy data storage system needed to be ralized: 1) operational efficiency and safety; and 2) proactive planning for population based care and with a whole view of the patient for individual planned care. THP participants in this project have acknowledged they are beginning to enjoy the former improvements, and trust that the latter improvements are on the way.

Operational Efficiency and Safety

The promises of operational efficiency are being realized by the THP with the EHR that is integrated with a highly functional electronic practice management system. The anticipated loss in income during the implementation period as the number of patients was reduced was soon offset by the savings of dictation costs for transcription of clinical notes, and by the more complete documentation and quicker turnaround time for billing. The elimination of high transcription costs at one THP actually paid for EHR costs.

Clinical staff found that though a little more time was spent in clinical ordering, record-keeping and note-taking during patient visits, they were able to leave the site earlier in the evening because much less time was spent doing these activities done outside the visit. The THP developed same day billing and noted faster turnaround time for processing first refusals of billed claims. Electronic Interfaces needed for Medicaid, Medicare and Private insurance billing were updated promptly. Scheduling patients proved easier, faster and more user friendly for both front-office and clinical staff. The system supported same-day appointment scheduling and open access changes that had been made in clinic workflow before the EHR was implemented. Financial Reporting improved - with more timely data on accounts and productivity indicators for management. Practice management reports were preprogrammed and easily made directly available to administrative, and finance staff. One improvement still in progress is a THP-specific clinical-financial tracking software, the Contract Health Services Module has required more than three years of development and still remain unfinished at the end of the project.

Users of the EHR report that safety in health care delivery does increase through the reduction in the chance of administrative or clinical error, though they worry that unintended software features have their own implications for safety. There are more complete and accessible records (no missing, illegible charts) available to multiple clinicians at multiple sites electronically. There is not only computerized prescription order entry for medications with drug interaction alerts, but current medication lists can be seen by multiple providers at multiple sites for the same patient decreasing chances of contraindications and interactions.

The most extensive improvement occurred for UIHS which has multiple clinic sites separated by 2-3 hour drives. The patients visit any or all of the sites as they travel between family members and jobs in the region. Staff cover 'call' and obstetrics in two hospitals in different counties. For the first time the providers have access to a legible up-to-date chart complete with medications from multiple sites with multiple providers on a twenty four hour basis from home or worksite. Allergy alerts appear on every office visit template. Drug interaction alerts are standard generalized pop-ups that are often overridden by rushed providers, they should be redesigned to carry more patient specific alerts to improve safety (for example: a patient with hepatitis has an automatic diagnosis alert on all meds metabolized by the liver).

Proactive Planning for Population-based Care

The promises of population based care and with a whole view of the patient for individual planned care with the commercial ambulatory EHR have not been fully realized. What was not anticipated in this project was that to support a quality improvement program with the EHR, there were would be inherent limitations of the NextGen software itself. There is a clear need for the EHR to: 1) have standard naming conventions on all templates for all indicators; 2) replicate data entered in designated fields in all other template locations where that data is needed; 3) have data fields used in performance indicators 'locked down' and not customizable; and 4) have data fields and reports structured so that they are verifiable by the IHS for THP customers.

CRIHB and its partner THP selected the EHR software assuming that its reporting functions were mature. The partners thought that that the software could track individual indicators for individual planned care and performance reports for Quality Improvement efforts soon after going 'Live' at the THP sites. The NextGen EHR is still a collection of incompletely integrated parts. NextGen needs further development before it includes the functionality that would support ongoing improvement of the quality of care captured in GPRA measures.

The NextGen EHR needs to be improved for population reporting to be a routine function. To address this gap in the software development, CRIHB and its Partner THP became more effective customer advocates by forming a national NextGen Users Group of THP. The 'Tribal Health Organizations Implementing NextGen' Users Group helps to assure sustained attention of the EHR vendor and the IHS to issues of THP implementing the NextGen EHR. The Users Group so far includes members from California, Utah, Oregon, Washington, Minnesota, Idaho Kansas and Alaska. The Group has monthly conference calls to share information and support eachother as they implement and use the NextGen EHR. In the last year, this group has gained recognition through presentations at tribal and IHS meetings.

CRIHB sponsors an annual conference for the 'Tribal Health Organizations Implementing NextGen' Users Group at its offices in Sacramento. The goal of the Users Group annual meeting is to advocate for the software functionality envisioned as a complete EHR for THP clinics. Attendance at the meeting is 2008 was more than twice as great as in 2007. NextGen sends representatives and trainers to this annual conference. The Users Group makes clear to NextGen representatives its common issues, most important of which is that NextGen software needs to be improved to make it easier and quicker for all users to query for population and performance data. Users also need to be able to query without the cost of specialized report writers for each query.

NextGen has begun to produce a GPRA reporting function in the EHR for THP. The EHR vendor has also begun to create better displays of patient data in subsequent upgrades. Standard office visit templates have been improved to include more information on one scroll down template (fewer clicks) including allergies, Health Care Management, vital signs, laboratory results, chronic condition list, assessment, plan, medication, nursing orders, and patient education. EHR Chronic Disease Management flow charts have been improved to include more information, but need customization and yearly updates for IHS GPRA indicators. Still the flow charts need to be constructed to update laboratory, pharmacy, and vital sign data automatically as it is entered from sites other than the chronic disease template.

The major expectation of the EHR that was not realized is that once implemented in the THP it would become a tool for research and evaluation studies. The large amount of work to customize the EHR to report on study populations made it a resource intensive prospect. CRIHB together with the THP did propose and submit a research proposal to study the impact of

electronic GPRA reporting on improving outcomes of care, but the proposal as not funded. Health services research with the EHR has been deferred until the EHR is reporting population data routinely.

While the use of EHR for Quality Improvement and research by the THP has not met expectations yet, valuable achievements have come out of the experience: Improvement in performance data quality and improved EHR vendor relations for adaptation of the EHR to Quality Improvement needs of THP. The goal of the use of the EHR for Quality Improvement became the tool and the catalyst for improving data quality in Diabetic Audit and GPRA reports. Organizational attention and resources began to focus on data quality and report accuracy.

Staff had to be retrained to enter indicators at the point of data entry, not after the fact. This led to reassessment and redesign of clinic workflow and data entry. Since retrieving some indicators depends on the diagnosis code considerable effort has been expanded on training clinicians in more accurate diagnostic coding. The overall effect has been that over time CRIHB staff now spend more time with nurse managers and clinicians about the importance of data and how to enter specific data in templates in order to be able to track and report Diabetic Audit and GPRA measures.

Implications

The use of commercial ambulatory EHR by THP is a phenomenon that is not likely to disappear. Tribes that operate THP have a choice of whether they use their tribal share funds to implement the IHS EHR, or choose a commercial alternative. There is a growing number of THP that use the NextGen ambulatory EHR as IHS pressures to implement an EHR increase: Fond du Lac in Wisconsin, Shakopee in Minnesota, Puyallup in Washington, Benewah in Idaho and Utah Navajo have already implemented the NextGen EHR. In California both Redding and the Indian Health Council THP are implementing the NextGen EHR.

The Indian Health Council is an example of a THP that had planned to implement the IHS EHR, until they examined its advantages and disadvantages for them. Their experience in the planning process with the IHS EHR led them to look for a commercial alternative better suited to their THP, and they selected NextGen. Since there are hardware and software costs and IHS charges to tribes to implement and support the IHS EHR, each tribe and tribal consortium is carefully examining what EHR is best for their particular situation rather than blindly implementing the IHS EHR. In choosing a commercial EHR and adapting it to THP rather than an IHS EHR, tribes are experimenting with the perceived benefits of self-determination and tribal sovereignty.

CRIHB and its partner THP are among the 'early adopters' of the trend to implement a commercial ambulatory EHR. Their EHR implementation efforts in California are being sustained financially through cost savings with the efficiencies of the EHR, IHS tribal share funds previously used for RPMS support, and various private foundations interested in the expanding the use of EHR. Our progress in implementing NextGen with partner THP has generated interest and encouraged other THP to follow. CRIHB receives numerous telephone calls from THP and other providers wanting to know more about our experience and processes, and asking our advice about streamlining implementation. The IHS has, with CRIHB's permission, hired the Implementation Project Director (Dr. Deborah Carter) to work with them on EHR implementation with THP.

The IHS system of providers including THP has formed a partnership with the Institute of Healthcare Improvement to redesign the whole system of care. The IHS National Innovations in

Planned Care Initiative is an initiative of the IHS director just completing the first year at fourteen pilot sites. This year IHS will be accepting applications from 22 more clinic sites/systems. Our CRIHB clinics now have both the EHR tools and hard won improvement experience as a solid foundation for this system wide transformation. Staff from our clinics may eventually become trainers in the third capacity-building year of the initiative.

List of Publications and Products

Electronic Reports to Indian Health Service from Next Gen

1. Registration Export

2. Enrollment Export

3. Social Security Verification Report

4. Government Performance Results Act Reports

5. Diabetic Audits

6. Immunization Audits

Training/Workshops

1. Quality Improvement Advanced Access Training

2. Data Quality Training

3. CEO Leadership Summit Workshop

4. Program Manager Workshop

5. EMR Implementation Workshop

EMR Readiness Assessment Tool Conferences

1. Tribal Clinics Next Gen Users Group

2. CRIHB Board Advisory Group "Tribal Health Organizations Implementing Next Gen"

3. Other Presentations

   a. AHRQ Panel – Sept. 27, 2007

   b. Tribal Net – Oct. 2007

c. IHS GPRA Diabetes Mellitus Presentations

d. CRIHB Quarterly Meeting Presentations to THP Executive Directors