

Grant Final Report

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**Creating Online NICU Networks to Educate, Consult,
and Team (Project CONNECT)**

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Abstract

Purpose: The purpose of Project CONNECT was to develop, implement, and evaluate a variety of technology-based strategies to improve care to neonates at hospitals, follow-up rural physician offices, and in emergency rooms.

Scope: 1) Evaluate the use of multimedia portable Personal Developmental/Health Records. 2) Evaluate interagency communication related to an interoperable system for electronic sharing of medical records. 3) Evaluate the use of telemedicine technologies (secure peer-to-peer videoconferencing and training DVDs) for training, technical assistance, and consultation among medical and applicable medically-related staff. 4) Evaluate multimedia Web-based resources that serve as a Decision Support System containing developmental surveillance information regarding preterm infants.

Methods: This was a Health Information Technology “Implementation” Project which demonstrated two major technology-based strategies to improve healthcare – interoperability and Personal Developmental Health Records. This descriptive qualitative study used interviews, focus groups, and questionnaires for data collection.

Results: Project CONNECT successfully implemented and tested the Misys Connect interoperable system for sharing electronic health information, developed and tested Personal Developmental Health Records for high-risk neonates being discharged from the NICU, and developed a Web-based decision support tool (Preterm Developmental Check)..

Key Words: personal/portable health records, interoperability, electronic sharing of medical records, telemedicine, decision support system

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Final Report

Purpose

Objectives of Study

Evaluation of the CONNECT Implementation project consisted of a series of evaluation questions in three areas: clinical benefits, patient/family benefits, and organizational/financial benefits. In the area of clinical benefits, evaluation questions addressed issues such as improvements in quality of patient care, improved patient outcomes, improved access to information for healthcare providers, and better monitoring of developmental progress of high risk infants. Patient/family benefits were reflected in evaluation questions addressing issues such as improved follow-up care of high risk infants. Organizational/financial benefits were addressed in evaluation questions which measured developmental care attitudes, knowledge, and use. Measures related to information technology addressed Personal Developmental/Health Records for parents and primary care practitioners, sharing of electronic health records for targeted infants across agencies, nurse training and bedside consultation via IVN, and Web-based decision support for neurodevelopmental referrals. Organizational risk mitigation, cost and use of health information technology, and satisfaction with technological advances were also measured.

Scope

Background

In 2004, a group of organizations in the southern region of Mississippi recognized the need for better coordination of medical services for high-risk patients; The University of Southern Mississippi, Forrest General Hospital, Hattiesburg Clinic, Southern Mississippi Neonatology and South Mississippi Rural Health Initiative. The resulting partnership was awarded planning and implementation federal grants totaling approximately \$1.5 million dollars from the Agency for Health Care Research and Quality. Through this grant, CONNECT (Creating Online NICU Networks to Educate, Consult, and Team), the organizations expanded interagency interoperability as well as developed a portable health record for preterm neonates. The intended goal of this project was to provide neonates, a high risk population, who reside in the southern part of the state, benefits from the true interoperability of healthcare.

The Obama administration has set a goal of computerizing medical records within five years as a means of improving efficiency, quality, and safety, such as interoperable electronic health records. A growing number of professionals support an extension of electronic health records, in the form of personal health records, as a means to a better partnership between physicians and the patients they serve. Accessibility to personal medical information will facilitate informed decision making and contribution by the varying members of a medical system. Accessibility is

considered the primary benefit of a personal health record. Moreover, patient's control over sharing his/her medical information could ensure better medical care from the multiple physicians, particularly specialists, seen for various conditions.

While it is known that electronic health records (EHRs) can result in increased workflow efficiency in hospitals and clinicians' offices and a higher quality of clinical care for patients, the majority of clinicians in the U.S. have not adopted electronic health records. In 2004 it was estimated that fewer than 10% of physicians were using electronic medical records (American Medical Association). Although EHRs are being implemented at larger institutions, smaller practices often remain strictly paper-based.

Adopting an EHR system does not insure information sharing to promote quality of clinical care. Unless EHR systems can communicate, they are merely islands of data with no seamless flow of data from between clinical settings. Each clinical setting may purchase a system from a different vendor resulting in record systems which may not be compatible with one another. An interoperable system based upon a common architecture is critical in order for patient records to be available at every medical encounter.

Innovations in technology are emerging which will give patients electronic access to their own health record as well as the ability to gather specific information regarding their specific illness/health condition. Personal Health Records (PHRs) represent a concept which will empower patients to maintain their own health record, identify specific information tailored to their health condition, avoid duplication of tests, and synthesize an abundance of health information into a searchable personal health database.

Because Mississippi is a primarily rural state, there is a maldistribution of generalists and specialist physicians. Unequal access to healthcare often requires Mississippi residents to seek medical services more than an hour away from their home. Similarly, the rate of chronic diseases, and often co-morbidities, across the state requires residents to seek treatment from a range of specialist physicians which are primarily located in the metropolitan areas of the state. A range of technological advances, such as electronic health records and portable health records, are critical to managing Mississippians' healthcare information. Management of patient medical records is essential to providing quality care, particularly when some form of medical care is being sought outside of county of residence by many Mississippians.

Context

Interoperability. Three of the partner organizations currently had EHRs in their organizations which included 29 separate sites across 18 counties. Forrest General Hospitals is 537-bed acute care non-profit hospital accredited by the Joint Commission on Accreditation of Healthcare Organizations. FGH serves as the hub of health care for a 17-county area in South Mississippi. It has the second highest number of newborn deliveries in the state of Mississippi. FGH has a level two NICU which is attended by neonatologists from Southern Mississippi Neonatology Group (SMN). Hattiesburg Clinic, is the largest multi-specialty clinic in the state, including a central clinic (six-story, 225,000 sq. ft. building) and 28 satellite clinics. Hattiesburg Clinic utilizes a group practice model and employs more than 190 physicians representing numerous medical specialties. The Clinic provides primary care through 18 family medicine and pediatric clinics located throughout the south Mississippi region surrounding Hattiesburg.

Through Project CONNECT, these sites implemented a front-end interface technology platform with their medical record systems to retrieve identified neonatal patient records from

disparate clinical systems in real-time, displayed through a web browser. Interfacing allowed interoperability among the three separate organizations as well as allowed health providers to transmit medical records in order to populate portable Personal Developmental/ Health Records, by which collaborative and integrated health care delivery can be achieved for preterm infants.

Personal Developmental Health Records (PDHR). Personal developmental health records were determined as an appropriate method to share medical records among medical specialists for infants who received neonatal care at Forrest General Hospital. The history of medical care and treatment provided by physicians and staff at Forrest General Hospital was provided in the portable health record in the form of a CD to parents of preterm infants upon discharge from the hospital. In addition, records resulting from medical appointments through Hattiesburg Clinic could also be burned onto the CD. This additional information supplemented the initial birth data by providing data on follow-up medical visit. Caregivers were encouraged to share the personal developmental health record with their child's health provider(s) at all medical and medically-related appointments. It was hypothesized that a portable, up-to-date health record would result in a more seamless transition of care from the specialists to the primary care provider. As a result, care would be more timely and appropriate, and medical tests would be duplicated less. The personal developmental health record was also directly mailed to the neonate's primary care physicians, usually a pediatrician. Participation in the project was voluntary and only parents who signed appropriate authorizations were provided portable health records.

Settings

Interoperability and Portable Developmental Health Records (PDHRs). The collaboration to accomplish the project goals included the following: The University of Southern Mississippi (USM); one county acute care 527 bed county hospital, Forrest General Hospital; a private neonatology practice of four neonatologists, Southern Mississippi Neonatology Group; Hattiesburg Clinic, the largest multi-specialty clinic in the state with 190 physicians and 18 family medicine and pediatric sites in south Mississippi; and Southeast Mississippi Rural Health Initiative and its 9 community health clinics which serve the medically-underserved communities of south Mississippi.

Participants

Interoperability. Hospital Administrators, Primary Care Providers (Neonatologists), Technology and Medical Records staff

Portable Developmental Health Records (PDHRs). Parents, Hospital Administrators, Primary Care Providers, Technology and Medical Records staff

Methods

Study Design

Project CONNECT was a Health Information Technology “Implementation” Project which demonstrated two major technology-based strategies to improve healthcare – interoperability and Personal Developmental Health Records. Research conducted on the implementation was designed as a descriptive qualitative study.

Because of the exploratory, as opposed to confirmatory, nature of this project, qualitative methods were deemed an appropriate initial step to evaluation. Quotes provided in the Findings of this project are presented in the words of participants of the focus group or interviews. The focus group transcript and notes from caregiver interviews were reviewed line-by-line and analyzed for recurring themes. Data were analyzed following the strategy of grounded theory or constant comparative methodology, beginning with open coding, followed by composing categories of codes and designating the interrelationship of codes. Qualitative Solutions and Research Non-numerical Unstructured Data Indexing Searching and Theorizing software program (QSR NVIVO) was used to facilitate data management and to enhance the systematic organization and examination of the data. Data was analyzed by an external evaluator.

Interoperability and Personal Developmental Health Records

Data Sources/Collection Interoperability. To evaluate the process of adopting an interoperable system, as well as barriers and concerns related to electronic record sharing, a focus group was conducted with hospital employees who were familiar with the CONNECT project. Through the focus group, project staff members were able to investigate how hospital personnel, including administrators and physicians, perceived the usefulness of an interoperable system. Moreover, the focus group provided data on how participants perceived interoperable systems contributing to the medical care provided to neonates.

A two-hour focus group was held with hospital administrators, staff, and a physician who had played an active role in developing or implementing the project. Seven questions were presented at the focus group. The focus group was facilitated by an external evaluator. The focus group discussion was audio-tape recorded and transcribed for analysis.

Personal Developmental Health Record (PDHR). To evaluate the use of portable, personal developmental health records, a focus group with hospital employees who were familiar with the CONNECT project and semi-structured interviews with parents or caregivers of babies who were discharged from the neonatal intensive care unit at Forrest General hospital were conducted. Through the focus group and interviews, researchers were able to investigate how caregivers and hospital personnel, including administrators and physicians, perceived the usefulness of personal developmental health records. Moreover, the focus group and interviews provided data on how participants perceived personal developmental health records contributing to the medical care provided to neonates.

A two-hour focus group was held with hospital administrators, staff, and a physician who had played an active role in developing or implementing the process of generating personal

developmental health records for neonates. Hospital employees were recruited based on their involvement with the development, production, or management of personal developmental health records. Six questions were presented at the focus group to explore the anticipated outcomes from the CONNECT project, and specifically the benefits and barriers to the use of personal developmental health records. The focus group was facilitated by an external evaluator. The focus group discussion was audio-tape recorded and transcribed for analysis.

The second form of data collection, caregiver interviews, investigated similar questions related to benefits and barriers to the use of personal developmental health records. Fifteen parents who received a personal developmental health record for a neonate over the last two years participated in a 15 minute telephone or face-to-face interview. Beginning in August 2008, a member of the CONNECT team invited caregivers to participate in a telephone interview. If the caregiver agreed to participate, the team member asked six questions about their experience with the personal developmental health record. In order to increase the number of participants, face-to-face interviews were also conducted with parent or caregivers who had not participated in the telephone interview. Caregivers who agreed to participate in the face-to-face discussion were interviewed while they waited for their child to be examined by a neonatologist at a follow-up visit at Forrest General Hospital. Detailed notes were taken during the telephone and face-to-face interviews and typed for analysis.

Interoperability and Personal Developmental Health Record (PDHR). The collection of qualitative data was determined to be the method of choice for this project as a means of eliciting the benefits and challenges of using personal developmental health records in the exact words of hospital staff and caregivers of neonates who had been affected by CONNECT. Because of the exploratory, as opposed to confirmatory, nature of this project, qualitative methods were deemed an appropriate initial step to evaluation. The focus group transcript and notes from caregiver interviews were reviewed line-by-line and analyzed for recurring themes. Data were analyzed following the strategy of grounded theory or constant comparative methodology, beginning with open coding, followed by composing categories of codes and designating the interrelationship of codes. Qualitative Solutions and Research Non-numerical Unstructured Data Indexing Searching and Theorizing software program (QSR NVIVO) was used to facilitate data management and to enhance the systematic organization and examination of the data. Data was analyzed by an external evaluator.

Interventions

Interoperability. Forrest General Hospital hired a vendor to build a product to allow interoperability between the hospital and Hattiesburg Clinic, a large physician practice group. This product was also used to provide the electronic health information to be saved onto portable personal health records for neonates. Initially a consultant was brought in to meet with a large hospital committee, which was narrowed down to a steering committee that oversaw the implementation of the interoperable system, Misys Connect.

Personal Developmental Health Records. A significant accomplishment of the CONNECT Project was the development of a prototype for a multimedia portable Personal Developmental/ Health Record (PDHR) for selected infants born prematurely with complex medical needs and at risk for neurodevelopmental problems. The portable PDHR was tested

with infants discharged from the FGH NICU and was used to share medical/neruodevelopmental records as the infant received medical and health-related services.

In order to routinely develop multimedia portable PDHRs, the health data information is accessible through a secure web portal from the internet. The organizations used Misys Connect to access the health data from each organization. Each patient's PDHR is populated by medical records from query storage of interfaced medical records from a community hospital, a for-profit large multi-specialty clinic and a private neonatatology group. Patient records were deposited into specific sections of the PDHR within the broad categories of: Birth Records, Community Specialty Clinics, Primary Care Provider, Hospital In Patient/Outpatient, and Medications. PDHRs are updated upon parent request from either the community hospital or the multi-specialty clinic.

PDHRs have been successful for parents as well as the medical professionals receiving the health data in the portable format.

Measures

The measures used for this study were

- A 10-item questionnaire using a 7 point Likert scale
- A structured interview script developed by the evaluation consultant
- A structured script for leading focus groups

Limitations

As a descriptive study causal or correlational conclusions cannot be drawn.

Results

Principal Findings

Interoperable Systems. Hospital administrators and personnel could easily identify the potential benefits of having an interoperable system to use when treating neonates. Most participants agreed that in the ideal situation, interoperable systems could help physicians provide better medical care to patients. Timely and appropriate care could be provided by having the ability to easily retrieve patient information that is made available through interoperable systems.

Despite the promise of interoperable systems, most of the discussion focused on concerns with interoperable systems. These concerns ranged from the financial and legal responsibilities of a health care institution or facility maintaining a system, to ensuring patients information is consistently reported. As hospital personnel and administrators reported, there is a great divide between the potential of a system and the experience of using the system. Put simply, how the system performs is not reflective of what an interoperable system could do.

Interfacing various interoperable systems used by a range of health care providers was identified as a key challenge. When discussing how one system “talks with another system”, a physician stated, “In the dream world it would work smoothly with no flaws.” Yet, health care is not delivered in the dream world. In fact, effectively navigating the various systems was identified as a challenge that must be addressed before the full potential of interoperable systems can be attained. The lack of speed when connecting systems, when ensuring patients’ information is completed consistently by various facilities, and when matching neonates’ information was related to effectively navigating various systems.

Matching neonates’ information was a key problem discussed in great detail. This problem results because social security numbers are not generally issued until weeks after birth. By the time social security numbers are issued, neonates have generally been released from the hospital. It becomes even harder to match a neonate’s records if the name of the patient changes. As one administrator said, “with NICU babies you almost always have to manually match.” This takes time and makes the process vulnerable to human error.

Additional problems can result because patients (patient’s caregivers) have the ability to choose whether they want medical information shared electronically. At times, a patient (patient’s caregiver) might choose for their information to be reported in an electronic database. Yet, this same patient (patient’s caregiver) at a doctor’s visit at another facility might choose not to have their information reported. Inconsistently reporting information results in an incomplete record of patient care. With an incomplete patient record, physicians are less likely to be able to make a comprehensive assessment of the patient’s needs.

Personal Developmental Health Records (PDHR). Hospital personnel described the potential of personal health records, including personal developmental health records, in improving care provided at their facility and care from physicians once patients were released from their hospital. Similarly, caregivers spoke of the benefits to their neonate because his/her information was provided on a personal developmental health record.

Benefits—Caregiver’s Perspective

Although not all of the parents or caregivers had used the personal developmental health record generated by Forrest General Hospital, all perceived it to be an important addition to their child’s health care. Most respondents had not yet needed to share the personal developmental health record with another physician. Of the three respondents who had taken their child to receive medical care at a facility other than the hospital, all had shared the personal developmental health record with the physician treating their child. Of the remaining 12 respondents who had not yet used the record most stated that they kept it with other important papers in case of an emergency, or were planning to share it with their doctor in the future.

Most respondents felt that having the medical records on CD gave them an increased feeling of control because it was easy to keep up with, great for emergencies and for doctors who do not usually treat their child. One respondent stated that it gave her “much, much control.” She went on to state, “I have three kids. I can’t remember specifics about their medical treatment.” Similarly, another respondent stated that it increased the feelings of control because “I wouldn’t have known what to tell them about his care.” Numerous parents reported that the record provides physicians with information that parents might be unable to relay to various medical

professionals. None of the respondents stated that it decreased their feelings of control over their child's medical care.

Almost all respondents believe that health records protected patients' safety. One caregiver stated, "Assuming it [all the information] is all correct, yes, and safety of CD is better than not having any records." According to these participants the CD format was an improvement over paper-based medical records. The CD format of a personal developmental health record provided relevant information in a format that is easier to locate and store at their home. Many of the caregivers reported that the record had become part of the family's important documents. One caregiver stated, "Papers get lost. My husband and I keep this CD where we keep all important papers."

Of the parents or caregivers who shared the personal developmental health record with their child's medical provider, many told of positive experiences when using the CD. For example, several shared how the information prevented him/her from having tests or procedures repeated unnecessarily. One caregiver provided the following example, "Only one test had to be done at Ochsner [Hospital] because the MD said all records/tests he needed were on the CD. So Ochsner [Hospital] only had to do biopsy of colon- no other tests were needed." Another parent said, "the health department was going to give shots and I showed them on the CD where she already had them done in Hattiesburg." Another parent had a similar story. She stated, "[I] gave the MD the CD. It was all the information he needed."

Even those caregivers who could not identify advantages from personal experiences stated the personal developmental health record would be beneficial when the time came to use it. Caregivers who planned to use it in the future were pleased with the CD format because the medical records were easier to retain as compared to paper-based record, the CD kept the information in one place, and having the information recorded electronically relieved the pressure of having to recall and report his/her child's medical history with medical providers.

Benefits—Medical Institution Perspective

Hospital administrators and personnel could similarly identify benefits of providing personal developmental health records to the family of neonates. Due to risk factors associated with preterm birth, these babies often have increased health care needs requiring treatment above routine care as compared to full term infants. Neonates have a greater likelihood of requiring emergency room treatment once released from the neonatal intensive care unit compared to babies born at full term. Emergency room physicians, as well as pediatricians, can benefit from the personal developmental health records on neonates. As one participant from the hospital stated, "there are very few things that make most people more nervous than seeing neonates coming into the ER. The information assembled on [the CD] can prevent a lot of problems and facilitate care of that baby." Later, a physician concurred by stating, "Our neonates that have a pretty extensive history need these PDHRs, versus a normal term baby that you know has a few colds as a child." Hospital administrators perceived neonates to be a particular type of patient that greatly benefited from the use of a personal developmental health record.

Many of the benefits identified by caregivers were similarly identified by hospital personnel. For example, focus group participants reported that the health record could help emergency room physicians make quicker decisions and limit the number of tests that needed to be conducted at each visit. One administrator stated, "I think that we had parents that lived 30 miles away. They went to the ER and the doctor reviewed the disk and made quicker decisions and got back in

touch with the neonatologist here.” Another participant added, “On that same visit... the ER physician was able to save four hours of time and did not have to redo tests.” Saving time and reducing duplication of test directly relates to cost saving which is of great importance to hospital administrators. One participant stated, “in the long run, you are not repeating a lot of tests. This is a patient safety issue, but also cost-saving issue.”

A physician in the focus group clearly stated how the health record was used to at a high risk clinic and indicated that a key prevention strategy had not been used. He stated, “I was seeing the patient, and we found that four of eight patients had not had eye exams. That’s huge because these children are at high risk for blindness; and blindness if you catch it is preventable.” Once the personal developmental health record revealed that the eye screening was needed, the screening was performed. For some reason, these patient’s eye exams had not been performed before they left the hospital or in the pediatricians office. The health record was a benefit to the neonatologist at the hospital, not only the family doctor in the community.

Increased caregiver involvement in the child’s care was also identified as a benefit of personal developmental health records. It was reported that many parents were taking “ownership” of the health record on the CD. Because the personal developmental health record contained their child’s medical history in their hands, caregivers expressed an increased sense of responsibility and control over the child’s care. For example, one participant stated, “It’s like, ‘this [information] is mine. Update it.’ [when they go to the doctor’s office]. Even though the parent can not necessarily interpret the medical information on the CD, hospital staff report that simply having possession of the information “has been an enforcer to have the parents be responsible for their child’s healthcare.”

Challenges—Caregiver’s Perspective

The majority of respondents did not perceive any disadvantages to their child’s physician or nurse using the CD containing his/her medical information. The only challenge was protecting the integrity of the CD. For example, the CD could be lost or become unreadable if it is scratched. Although not directly a disadvantage to the health record, several caregivers who had not shared the health record with the family physician reported they had simply “forgotten” to take the CD to the doctor’s visit. The caregivers who had not previously shared the record reported intent to take the health record to the next visit.

Challenges—Medical Institution Perspective

The only challenge identified by caregivers was echoed by hospital personnel. One participant stated, “Currently, personal developmental health records are on a CD. It can be lost or damaged.” Moreover, hospital personnel have the additional concern as to whether the most recent information is reflected on the personal developmental health record. In order to provide the best care, providers have to be assured that latest information is reflected on the personal developmental health record.

As compared to caregivers, hospital administrators and personnel could more easily identify challenges with developing, adopting, and maintaining a system that creates portable health records. Personnel in the health information management department clearly stated, “just producing the CD is costing in labor because it is not the easiest thing to do. It is very time-consuming. It is not as easy as it should be.” She told how laborious it was to create a health

record, especially considering that personal developmental health records need to be updated after each doctor's visit. A great deal of staff time could be required to maintain a system that creates health records for patients.

Administrators, on the other hand, described a different systematic problem, incompatible language or format among software vendors. For example, the software that the PDHR was created in might not be readable by another software program at a clinic outside of the hospital, making the PDHR inapplicable to patient care. As one administrator described, "one of the biggest [challenges] is non-communication between all these software vendors. Everyone wants their own proprietary language...it is a nightmare to try to interface with all of the different programs." The group was unaware of how difficult it was going to be to get cooperation from various software companies so that patients could get the care they needed.

Outcomes

Interoperable Systems and Personal Developmental Health Record (PDHR). The CONNECT partnership created an interagency communication related to an interoperable system for electronic sharing of medical records among Forrest General Hospital (FGH), Southern Mississippi Neonatology, and Hattiesburg Clinic to ensure timely and accurate diagnosis and treatment of neonatal infants post-discharge as well as to provide electronic access to health information which populates the patient's portable Personal Developmental/Health Record (PDHR). PDHRs are in the form of a CD, which was the only portable technology during development that could hold health information and not be altered. These interoperable system and creation of PDHRs are completely functional and are in place within the organizations.

Discussion/Conclusions

Interoperability and Personal Developmental Health Record (PDHR). Innovative technologies for managing health information could enhance the delivery of healthcare in Mississippi. There are certain high-risk populations who might benefit from portable personal medical records used to increase continuity of care between specialist and primary care physicians. As data analysis from the CONNECT study suggests, portable medical records can increase caregivers sense of empowerment by providing them with a medical record to share with their medical providers. Similarly, physicians can provide higher quality care by gaining access to patients' health information through a portable medical record. Overall, the enhanced communication between the medical providers of high-risk patients will result in improved medical outcomes.

Despite the promise of technology, certain issues remain with portable health records. Personal developmental health records, such as those developed through the CONNECT project, must not only be accessed by physicians. Various health care professionals and organizations along the continuum of care need to have the ability to contribute, or add to, health information in a portable format. The personal developmental health records created through the CONNECT project contained medical information from three health organizations providing services to neonates. These three organizations have business agreements that facilitate and support updating patients' medical records with appropriate patient consent. Organizations outside the three participating organizations also provide health care to the patient but do not share similar data sharing agreements. These organizations have valuable information that should be included

to ensure a comprehensive medical history is reflected on the portable health records. As previously discussed, contributions are not always possible due to technology challenges as well as communication among agencies. Future research should explore how continuity of care can be further enhanced by making the personal developmental health record writable by all contributing to the healthcare of the patient. Moreover, future research should investigate what other high-risk populations would benefit from a portable health record.

Significance

Through the CONNECT project, portable developmental health records (in the form of a CD) were developed as a particular type of personal health records for a special patient population, babies who were treated in a neonatal intensive care unit. In order to populate each PDHR an interoperable system was required among three organizations which would allow the data to be queried, selected, and burned to the CD. The benefits discussed for [portable] personal health records could be reaped for other special populations who undergo intensive specialized treatment, that are later released to their community doctors with only limited check-ups from specialists. For example, individuals who receive intensive treatment at Level I or II trauma centers in Mississippi would be one such population. Cancer patients who receive special treatment at one of the regional cancer centers who are then released to their local physicians to continue treatment or care would comprise another such population. This multi-directional exchange of information, between physicians, hospitals, and ancillary services, such as labs, is fundamental to a well designed health information system.

The idea of a portable health record is particularly important to regions of the country at risk of a natural disaster, such as the Gulf Coast. Health information management departments of hospitals have begun discussing procedures for sending medical records with patients as they are evacuated to a different medical facility. Many, however, would argue that those policies would serve a purpose for improving medical care even before a storm hits the Gulf South region. Patients across Mississippi could benefit from portable personal health records, just as neonates in south Mississippi benefited, while the infrastructure of a statewide information exchange system is established.

The healthcare landscape of Mississippi provides a suitable context for pursuing and implementing innovative technology to manage patients' health information. Issues that result from being predominantly rural, as well as threats of natural disasters, specifically hurricanes, make Mississippi an appropriate location for exploring the benefits of healthcare information technology. Being a predominantly rural state that faces the threat of natural disasters is not unique to Mississippi. Many surrounding states, including Alabama and Louisiana, would benefit from lessons learned as practitioners explore the adoption and dissemination of healthcare information technology.

Implications

Each organization reported during the evaluation that not only were the goals and objectives of the grant achieved, but by virtue of participating in the collaboration, each medical organization catapulted their technology capabilities. As a result of the project:

1. SMRHI was awarded a grant (for hardware and software) from the vender used for the interoperability and PDHRs and they now have EHRs.
2. Southern Mississippi Neonatology and Forrest General Hospital bridged EMRs to send data from the outpatient developmental follow-up clinic to FGH EMR so that the data is viewable through the interoperable side of the technology as well as can be placed on the PDHR.
3. Highland Hospital has instituted electronic record sharing with Forrest General Hospital and has expanded their EMRs.

List of Publications and Products

Atkinson, TE, Daniels, TH, Prehn, J, Rachal, V, et al.
Monitoring preterm infant motor development: Web-based
decision support. *Neonatology Today*. March 2009: 5-6.

Prehn, J, Atkinson, T, Daniels, T, et al. Preterm
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Garrison, S., Connecting patients and healthcare providers
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A manuscript has been submitted and is under review at the *Journal of the Mississippi State Medical Association*.