

Creating a Model for Electronic Medical Record Integration with Community Based Clinics: A Demonstration
Project Utilizing the Obstetric Medical Record

by

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Title of Study: Creating a Model for Electronic Medical Record Integration with Community Based Clinics:
A Demonstration Project Utilizing the Obstetric Medical Record

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STRUCTURED ABSTRACT

Significant shortcomings in the system of information exchange and data gathering pervade virtually all sectors of the nation's healthcare system. These shortcomings significantly undermine efforts to improve the quality of healthcare, to inform public policy, and to optimize access of at-risk populations to high quality specialty care.

These shortcomings are particularly evident in the complex and high-risk system of perinatal care, and especially so in complex care delivery systems such as the perinatal care region served by UNC Healthcare.

Though limited data is available to guide the adoption of health information technology in such settings, current evidence and expert opinion indicate that significant improvements in care quality and efficiency can be realized with widespread adoption of this technology and its meaningful integration. The system of information exchange and integration among the providers in our care region is currently inadequate - perpetuating inefficiency, unnecessary work, suboptimal access to care, and inability to generate meaningful data at both the patient and population levels.

The long-range goal of this project is to develop a model for transforming the exchange of patient information between UNC Hospitals and community-based providers through the use of compatible electronic medical records – in essence, establishing a health information network for our entire perinatal care region. Electronic patient records (EPR) and health records (EHR) offer an opportunity to improve quality of care, reduce health care costs, speed dissemination of new clinical discoveries to the community and cement partnerships. In addition, data captured within the EPR can be extracted and analyzed to become a powerful tool for clinical research, tactical and strategic planning, and quality monitoring while facilitating the monitoring of factors and outcomes critical to the public's health. UNC Healthcare, recognizing the advantages of the EPR, has been a pioneer in developing a system, web based clinical information system (WebCIS), to meet the needs of

providers and patients *within* the organization. To build on this achievement and extend this technology to our partners in the community is in direct concert with the mission of the of the School of Medicine “to better serve the people of North Carolina and beyond,” furthering the UNC goal to become the leading public academic medical center in the United States.

The model will be built on the experiences and achievements of this demonstration project which aims to introduce and evaluate the integration of electronic health records between the NC Women’s Hospitals’ Perinatal Program and the 16 public clinics in its region. These clinics provide prenatal care to 40% of the deliveries at NC Women’s Hospital. The intensity of the relationship between these clinics and UNC Healthcare provides an ideal opportunity to develop and test the processes of the electronic transfer of information between organizationally separate but interrelated health care programs. Success with these clinics will set a foundation for larger and larger networks of providers integrating their electronic records.

The aims of this program will be achieved by identifying and addressing barriers to electronic interconnectivity at the local clinics, supporting infrastructure growth to support interconnectivity, monitoring acceptability and functionality of the interconnectedness, including quality of data shared to and from the clinics, progress toward institutionalization and unintended consequences and unexpected benefits of the move to the paperless care of prenatal patients.

Specific aims

1. Transform the sharing of clinical obstetrical information between community health centers (Piedmont Health Services) and the UNC Healthcare System by crafting exchange between disparate EMR products (GE Centricity and WebCIS)

- Define and address potential barriers to the interface

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- Develop infrastructure and process for the interface and, concurrently
- Test acceptability, accessibility and positive and negative consequences of data sharing.

2: Transform the sharing of clinical information between local health department obstetric programs and the UNC Healthcare System by introducing the WebCIS electronic obstetric medical record into local health departments.

- Define and address potential barriers to placing WebCIS in local health departments.
- Develop infrastructure and processes for WebCIS utilization at selected local health department prenatal care programs.
- Test acceptability and accessibility of EMR in LHDs

3: Establish processes to successfully and accurately mine data coming from various EMR systems and administratively independent clinic sites to support quality of care and clinical and population-based research functions.

Background

As highlighted throughout the public health literature, including *The Future of the Public's Health* (Institute of Medicine, 2003) and *Healthy People 2010* (Dept. of Health and Human Services, 2000), significant shortcomings in the system of information exchange and data gathering pervade virtually all sectors of the nation's healthcare system. Given the limited acceptance of current and emerging technologies for the exchange of health information, little is known about the potential impact of such networks on the delivery and quality of patient care. There is substantial anecdotal evidence, and limited data, that suggests adoption of these technologies and their carefully designed deployment can lead to substantial improvements with regards to quality of patient care and safety, efficiency of healthcare delivery, education of the public and healthcare sectors, and generation of meaningful data on health systems and outcomes, a critical tool in the process of continuous quality improvement. The current system of fractured, proprietary, and isolated systems for

recording, assimilating, and exchanging patient and population data seriously hinders the processes of quality improvement, workflow efficiency, information dissemination, and research.

The problem of lack of availability of a patient's clinical information is especially pronounced in the field of obstetrics, where a given patient may undergo multiple transitions between outpatient, inpatient, and other care venues. Similarly, within a single clinic setting, a given patient may be seen by several different providers. Attributes such as these, in addition to the litigious nature of obstetrical practice, make it an ideal specialty in which to pilot an effective platform of interoperable patient records (Miller and West, 2007). The problems of access to patient data are magnified further in the perinatal care region served by the University of North Carolina (UNC) Healthcare System. This system, detailed in subsequent paragraphs, entails multiple complex interactions between several local health departments (LHD), community health centers (CHC), UNC outpatient clinics, laboratories, imaging services, and more.

Preliminary Work – Regionalized Perinatal Care in North Carolina

For the last 25 years, public prenatal providers in the counties surrounding Chapel Hill have partnered with UNC Hospitals around the care of their pregnant patients. The formalization of the relationships was the result of the state's pioneering work in promoting perinatal regionalization as an approach to reduce the state's excess infant mortality. Under regionalization, tertiary centers across the state were designated to accept high-risk neonates and women at risk of having high-risk infants. In addition to neonatal intensive care units and state of the art labor and delivery facilities, high-risk antenatal clinics were established across the state. Each of the 100 county local health department maternity programs was assigned to a specific, geographically accessible high-risk clinic which agreed to care for their high risk patients. The counties specifically assigned to UNC for neonatal, labor and delivery and high-risk prenatal care are: Alamance, Caswell, Chatham, Lee, Orange and Randolph.

To identify women at risk for poor pregnancy outcomes, the Department of Obstetrics and Gynecology, with funding from the state, hired a perinatal outreach coordinator (Moos) to work with the public programs of prenatal care to assure that state of the science prenatal care and screening for high risk conditions was provided to women receiving care at these health departments and that appropriate referral appointments and follow-up was provided by UNC Hospitals. Because Piedmont Health Services was, and continues to be, the largest provider of public prenatal care in the six-county area, it was included in the outreach education and coordination efforts. Today, the 16 clinics included in the outreach program are responsible for the prenatal care of 40% of the total deliveries at UNC, which translates to 1500 women annually. The clinics and the numbers of deliveries they contributed to the total deliveries in 2005 are displayed in attachment A. Here after, these clinics will be referred to as the affiliated clinics. Each year the number and percentage increases. Without these clinics providing prenatal care, either the number of deliveries at UNC would drop dramatically, affecting the medical school and residency education programs, its own prenatal clinics would be overwhelmed by the volume of 1500 additional patients needing care, and access and quality of care would certainly suffer. The diminished access to care would also lead to decreased utilization of prenatal care services. On the other hand, without UNC Hospitals to provide high risk and delivery services, the affiliated clinics would not be able to provide prenatal care. The relationships between the clinics and the hospital are mutually beneficial; as importantly, they serve the needs of women and families by allowing them to receive most of their care close to home. By providing care to these women, as seamlessly as possible, we are meeting the mission of the hospital to care for the residents of the state.

To make the relationship as workable and safe for patients and providers as possible, the clinics function under screening and referral protocols, they adhere to our administrative requirements regarding preregistration, scheduling, etc, and they all use the University of North Carolina Hospitals Perinatal Record.

Points of interface between UNC Hospitals and the prenatal patients being cared for at one of the affiliated clinics include the following:

- Fetal testing such as the quad screen (prenatal aneuploidy screening)
- Routine and high risk ultrasound
- Genetic counseling
- Consultation for conditions identified through UNC screening protocols
- Consultation with OB and other UNC specialists for complex or high risk conditions
- Labor and delivery triage visits for acute conditions
- Labor and delivery triage visits to assess for onset of active labor
- Labor and delivery and postpartum inpatient stays
- Postpartum visits for medically complex women

Each of these points of interface requires the exchange of information back and forth between the hospital and the affiliated clinics. The present system, while often effective, is both antiquated and labor intensive for the UNC Healthcare System and the affiliated clinics.

Current and complete antepartum data is essential to the provision of quality care for an expectant mother and her newborn. To illustrate the cumbersome processes necessary for information flow without an integrated electronic record, the following steps are in place to assure that information is available to labor and delivery care providers in a timely manner:

- After initiation of prenatal care and the recording of all early prenatal labs at the local prenatal care clinic, the record is stamped with the name of the clinic of origin and a copy of the record is made and sent to the Department of Obstetrics and Gynecology.

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- Twice a week all records are filed alphabetically by clinic name in labor and delivery by a staff member in the Department of OB/GYN so that when the patient presents her record can be retrieved. If she is discharged without delivery, her record is re-filed alphabetically under the clinic's name.
- At 24 weeks and at 36 weeks, another copy of the record is made locally and sent to the Department of Obstetrics and Gynecology, again to be filed in the proper place in labor and delivery. These updated records are merged with the existing records in an attempt to minimize redundancy of information.
- If a patient has an important laboratory result returned to the local clinic after 36 weeks, it is faxed to the Department of Obstetrics and Gynecology and taken within 48 hours to Labor and Delivery and filed with the rest of the patient's record.
- If a patient is sent to Labor and Delivery for evaluation because of problems identified at the local level, she is to arrive with an updated record so that the medical and nursing staff will have the most current information.
- If the patient arrives without an up-to-date record, the clinic is contacted by labor and delivery staff and the needed updates are faxed, during business hours.
- If a patient is seen in triage and discharged without delivery, a staff member of the Department of OB/GYN notifies the patient's clinic of the evaluation and the recommended follow-up.
- If a patient is admitted undelivered to the hospital, a staff member of the Department of OB/GYN advises the affiliated clinic by phone or fax of her progress regularly and notifies it when the patient is discharged and recommendations for follow-up.
- When a woman delivers, a discharge summary is created by manually abstracting the prenatal and perinatal records for the woman, which is then sent by auto-fax to the clinic of origin. The discharge summary includes important information for follow-up

These complicated systems are in place to provide assurance that patient care is safe and coordinated between provider systems and is efficient for the patient, the Hospital's nurses and physicians. To achieve these goals,

inefficiencies and related costs are born by staffs at the local clinics, in the Department of OB/GYN and at NC Women's Hospital. For instance, if one considers that each record is copied three times and that the copying involves a minimum of 7 pages, approximately 31,500 pieces of paper flowed between the affiliated clinics and Labor and Delivery in 2005. The local clinic cost is significant in terms of sorting, copying and mailing. The UNC Healthcare costs are great in terms of filing, retrieving, re-filing and recovering misfiled papers. Cost in terms of medical errors because records were not available or retrieved is unknown but in a litigious specialty, the potential costs are great. The time required to ask again for information previously obtained or to reorder tests already performed adds additional costs. A further burden to UNC Healthcare resources is that every 4-6 months all of the files in Labor and Delivery must be reviewed to determine if records are still being held on women who are no longer pregnant. This occurs frequently because women arrived but their files were not located or pulled (making the previous labor involved in the transfer of information pointless) or they delivered at different facilities. These potentially obsolete records then must be reviewed to determine if UNC providers have made any entries in the prenatal record. If so, the file is sent to medical record; if not, the file is shredded.

As noted, transfer of information to and from Labor and Delivery is not the only interaction around medical records for prenatal patients receiving portions of their care at both the affiliated clinics and UNC Healthcare. Each time a patient receives aneuploidy screening, an ultrasound, fetal / antenatal testing or a high-risk referral, another complex series of information exchanges is required.

Electronic medical records (EMR), and ultimately EHRs, offer an opportunity to improve quality of care, reduce health care costs and cement partnerships. UNC Healthcare, recognizing these advantages, has been a pioneer in developing a system, WebCIS (Web-based Clinical Information System), to meet the needs of the organization, its providers and, importantly, its patients through improved quality of care. WebCIS has not yet risen to the next level: electronic interoperability with non-UNC health care organizations so that patient care information is available on an as-needed basis to the referring agencies as well as the consultants. The

advantages of interactivity between organizations caring for the same patients include: enhanced access to specialty care; support for quality improvement; dissemination of best practices; time sensitive transfer of information; increased continuity in care; decrease in redundant testing; increased patient safety; clarity regarding reasons for referral and recommended follow-up; and cost efficiencies for all parties involved. In addition, population-based research would be facilitated, as would the accuracy and timeliness of populating public health registries.

Health Information Technology – An Overview

From the time they were first introduced in concept form, electronic medical records have been lauded by their proponents as having great capacity to transform healthcare. To date, such a transformation has yet to be realized. Early versions of electronic records were little more than paper-based records made visible on computer monitors. Over many years, electronic records have evolved to include discrete data points, decision support, abilities to populate relational databases, and web-accessibility. However, numerous disparate vendors, specialty-specific records, absent or differing data standards, and inadequate plans for data governance have yielded countless silos and continue to inhibit meaningful integration. Such fragmented systems of data acquisition and management pervade even single health systems, hospitals, departments, and clinics, and have the very real capacity to further strengthen the silos that already exist (Brailer, 2005).

Current market penetration of electronic records into the healthcare system is estimated at approximately 15-20% (Fonkych, 2005). Many of the reasons cited above remain as obstacles, real and perceived, to rapid adoption of such technologies by providers and health systems. Research publications on the impact of health information technology often further compound these issues, demonstrating impaired workflow with IT ‘solutions’, and little impact on care quality. In this regard, little has changed from McDonald’s early assessment of HIT in 1976, describing increased and decreased costs, hindered workflow, improved care, and

increased and decreased provider satisfaction, similar to later reviews (Balas, et al, 1996; Tierney, et al, 1993).

A systematic review identified higher quality research publications on the impact of information technology in healthcare, sixteen of which had as their main focus the financial impact of its adoption. Only four studies focused primarily on quality of care issues. Nineteen of twenty papers demonstrated positive financial benefits, and all four papers on quality showed improvement (Uslu, et al, 2008). However, most studies on quality have focused on accuracy and availability of data, and not on improvements in care processes or outcomes, thus offering little information to inform health policy (Brender, et al, 2000). The quality of available data is highly varied, with very few randomized or controlled trials, limited follow up time, and numbers of subjects that are often too small to demonstrate marginal improvements. Further, few large-scale implementation projects have been undertaken with methods of evaluation incorporated into their planning and deployment. Thus, many of the points of resistance issued by providers and administrators persist, or have not been adequately addressed. As concluded in a review ordered by the Agency for Healthcare Quality and Research, there is little information to guide or empower stakeholders to judge the financial effects of adopting information technology. They further conclude that much research is needed to evaluate the use and impact of commercial systems in community settings, influence on workflow and human factors, interoperability, and on establishing uniform standards for reporting research in this area (Chaudry, et al, 2006; Shekelle, 2006). Alternatively, a broader perspective is offered by Hillestad, et al, (2005) who performed mathematical modeling on the potential national impact of widespread adoption of HIT. They concluded that national spending on healthcare could be reduced by \$346 – \$813 billion annually, with a minimum reduction of \$77 billion. In this model, the primary beneficiaries would be Medicaid, Medicare, and private payers, while providers may experience a net loss, offering potential conflict between mission and business directives. They go on to conclude that many of the critical elements for such a system are currently absent, including strong competition on quality and cost, substantial investments in IT systems, infrastructure to support future demand, champions, and integration.

Several issues serve to further compound the debate over the value of adopting healthcare information technology (HIT). Perhaps chief among these is lack of uniformity – in definitions of HIT, data standards, research design, clinical venues / geography, follow up, and components of cost versus financial benefit (Hayrinen, et al, 2008; Balas, et al, 1996; Chaudry, et al, 2006; Uslu, et al, 2008). Uniformity of data and research standards, HIT definitions, follow up time, and costs are critical to demonstrating the real impact of technology adoption. Waegemann has offered a straightforward scheme of describing various aspects of HIT, described as “Development Levels of Electronic Patient Records:” (1999)

1. Automated Medical Record: paper-based patient record with and additional part of documents which is computer-generated.
2. Computerized Medical Record: medical record, which was made completely electronically available via scanning of all non-computerized documents, with same content and structure as first stage.
3. Electronic Medical Record: medical record which was obtained from the second stage by restructuring and optimized for computer processing with same contents as the 1st two stages by hospital-wide interoperability of all documentation systems.
4. Electronic Patient Record: patient-centered record with information about different supplying facilities and thus considerably extended contents.
5. Electronic Health Record: relevant data of the patient extended record, which is obtained from the fourth stage.

For the purposes of this proposal, the focus will be on levels 4 and 5, electronic patient records and electronic health records, towards the development of an integrated perinatal health information network.

New data sources are emerging demonstrating the potential value of this degree of HIT deployment and integration, both for integration in general and the practice of obstetrics in particular. In a prospective study at Montefiore Health System, researchers found scant data on quality improvement through HIT in the obstetrical literature. Primary outcomes of their study included the availability of patient charts on labor

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and delivery for patients receiving care in various components of their care system, and the time from the most recent update of clinical data available. Prior to implementation, 16% of patient charts were missing at the time of admission, and the last clinical update averaged 36 days prior. After 'go-live', the number of missing charts fell to 2%, and the time from the most recent update fell to 4 days (Bernstein, et al, 2005). Data on integrated information systems are also coming to fruition, but with similar limitations. Study environments have varied from single health systems and hospitals, to limited regional partnerships, while real-world examples of integrated systems number very few (Hayrinen, et al, 2008). Regional Health Information Organizations (RHIOs) are a prime example of newer models of limited integration, but without interoperability. The majority of these systems allow read-only access to patient data among a defined set of partners. The data available is frequently limited to demographics, laboratory data, medication lists, and, in a few, provider encounters. There is no central repository for patient data and no option for modifying clinical data that can fully integrate and 'follow' the patient. Successes have been realized, though, through such organizations, particularly as measured by timely access to some important patient information (Martin, et al, 2007; Hagland, et al, 2007; Binns, 2004). Other models have been demonstrated in pilot form for populating specific public health registries from EMRs, offering a glimpse into the potential impact of such integration, and into the possibilities of the currently available technologies (Miller, 2007; Orlova, 2005; Knaup, 2006). However, the experience offered by six federal community health centers demonstrated substantial improvement in the quality of care, but it failed to show financial benefit, highlighting the need for policies supporting partnerships and external funding toward improving patient care (Miller, et al, 2007).

Public health functions to collect and evaluate data about community health, to develop policy in response and then to implement these policies to provide public health services.¹ These core functions are difficult, if not impossible, without the use of an integrated framework, which details and tracks patient data and outcomes, and which is accessible to providers, including those involved in all levels of patient care provision and

administration. As highlighted above and through everyday experiences, the technology for this framework already exists. Not only does it exist, it can offer immediate access to patient information no matter where this patient seeks healthcare, improving efficiency, quality of patient care and raising the standards for patient safety, while still preserving patient confidentiality. Furthermore, the applications for this flow of information in the areas of research, public health policy, individual and community health and provider and patient education, literally surpass one's imagination. Indeed, we cannot afford to ignore the growing power and prevalence of the internet, a force formidable enough to introduce new terminology into our vocabulary. E-health, according to the World Health Organization (WHO), is the "combined use of electronic communication and information technology in the health sector." The WHO charges us to develop a health informatics framework.ⁱⁱ The Department of Health and Human Services recognizes that the private sector has certainly taken advantage of web-based technologies to distribute their health-related products and information.ⁱⁱⁱ The Centers for Disease Control and Prevention identifies that the key to directed preventive health measures is better information flow. They particularly target the need for better internet access in public health agencies at all levels.^{iv} The National Committee on Vital and Health Statistics calls on the nation to build a health support system for widespread information distribution.^v

The missing link necessary to utilizing this technology for the benefit of our surrounding community lies only in planning: i.e careful, thoughtful extension of the structural and functional framework, collaborative and open intercourse among the vested providers and administrators and then specific instruction and education about its uses. Indeed, the most frequently cited factors in failure or difficulties in deployment of such systems are inadequate *infrastructure* (computer hardware, connectivity), negative / unreceptive *culture*, inadequate *training and support*, and poor *leadership* (lack of incentives and accountability).

Geographical location, one of the many factors contributing to health care disparities, no longer has to be a rate-limiting factor in quality and access to healthcare. The hope is not to detract from community-based care, but

instead to broaden our conventional healthcare community to incorporate all resources available, ultimately enabling free, but secure, exchange of accurate data, evidence-based treatment advisories for providers and accurate education for patients, in order to enhance clinical decision-making. However, the familiarity of regionally based consortia may provide a more streamlined mechanism for deploying such integrative strategies on a broader scale.

Dr. Bill Roper, dean of the UNC School of Medicine, noted in his electronic column on March 2nd, 2006 the following: "Electronic medical records hold great promise for improving quality of care. Development of a national electronic health records system, however, is progressing slowly. Today, less than ten percent of physician practices use an electronic medical record. It surprises me that some health care professionals still question the benefit of moving from paper to computerized records. It's time all health care providers – large and small – embrace and invest in medical records technology for the benefit of their patients." (This entry was posted on Thursday, March 2nd, 2006 at 1:20 pm and is filed under [UNC Health Care](#), [Health Policy](#), [Health Care Quality](#), [Health Care Finance](#).) This proposal is designed to engage community partners in exchanging critical patient care information with UNC Healthcare by introducing the UNC WebCIS EMR into area local health department prenatal clinics and by developing a system of electronic interconnectivity between the prenatal programs of the Piedmont Health Services community health clinics which will be introducing the GE Centricity EMR into their clinical systems within the next few months.

Health care professionals are reluctant to accept EMR for a variety of reasons including an inability to see the advantages in the short or long term, the difficulty in committing resources to build the system, the fear of purchasing a system which is deemed obsolete in the short term and a fear of not being able to use the system successfully. This proposal will help clinics overcome each of these obstacles.

The intersection of opportunity and need related to the electronic exchange of prenatal and intrapartum data for both UNC Healthcare and the affiliated public prenatal clinics make this an ideal time to support an

interconnectivity initiative. National initiatives to move to electronic record keeping as the norm rather than the exception make this an opportune time for UNC Healthcare to demonstrate its commitment and success in partnering with community based public health agencies to create a seamless exchange of information for shared patients, thereby enhancing its reputation as a leading public academic medical center in the nation and its role in improving care for the people of North Carolina.

Recent and Current Program Activities

It is an ideal time to undertake this initiative for a variety of reasons: WebCIS is currently creating the obstetrical module for the UNC electronic medical record; Piedmont Health Services recently purchased the GE Centricity system (specifically Practice Solutions 06) for its electronic medical record and administrative processes. It is eager, due to the large interface it has with the UNC Obstetrical program to work with us to assure that the systems will be compatible (email and personal communication A. Zellmer, Piedmont Health Services). Local health departments in our affiliated obstetrical clinic network have no electronic medical record capacity or plans at this time to purchase a system. However, they have all recently been wired with high-speed internet access due to the requirements for Homeland Security and pandemic preparation.

As mentioned previously, WebCIS is being expanded to include prenatal, inpatient, and postpartum modules. In preparation for this advancement, a consortium of key stakeholders will meet over the course of several months to design and program content and appearance of an electronic perinatal record. This process has been taking place since November 2007. Stakeholders include Tom Ivester, program director, Raj Gopalan and Robert Berger from the UNC Healthcare Information Services division, Merry K Moos, chief obstetrical liaison to the affiliated clinics, Marcia Swartz, representing Piedmont Health Services, Kenneth Moise, Jr., former Director, UNC Maternal-Fetal Medicine, Kate Menard from Maternal-Fetal medicine, provider representatives from UNC Family Medicine, the UNC midwifery division, the UNC prenatal clinic and other key obstetrical providers. The initial design was built upon a level of artificial intelligence in excess of current capabilities

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which has since be achieved. Recently, plans were unveiled by Robert Berger, MD, J.P. Kichak, and Raj Gopalan, of the UNC Healthcare Information Services Division (ISD), to move forward with transition of the existing perinatal record to a paperless EMR system supported by WebCIS. This work, built on the recommendations of the consortium, will be carried out in consultation with Tom Ivester, M.D. who will provide medical consultation on the design and content of the specific screens. The module will include artificial intelligence to prompt adherence to evidence-based obstetrical standards. Dr. Berger notes that the electronic record needs around obstetrical services are different from the needs of other medical specialties because nearly 100% of the OB patients will transition from outpatient to inpatient and back to outpatient within a relatively standard and predictable time period. Also, the biological processes of pregnancy are predictable for the vast majority of their patients. In addition, there are federal and state reporting requirements which require aggregation of individual patient occurrences into population based reports with standard report parameters.

Work is underway to use the existing "forms tool" in WebCIS to modify and adapt forms in WEBCIS (Consult, H&P, Procedures, etc) to meet the immediate needs to move the Obstetrical program of UNC Hospitals to a paperless system. Obstetric charting lends itself well to an electronic format because the vast majority of data can be charted via pull own menus. Populating the EMR in this manner will result in data collection that is well suited to extraction and analysis. Each phase of the pregnancy (e.g. prenatal, intrapartum, postpartum) will bring forward the data from the previous phase into a new, tailored form. In addition, data from the maternal record will be brought forward to populate the newborn record. The existing "Health Maintenance" section of WebCIS that contains population based "disease prevention" will be adapted for required perinatal reminders using our existing engine with data supplied by Maternal/Fetal Medicine in the form of Excel spreadsheets in standard formats as done already for other departments that use this feature. Similarly, disease management algorithms established by Maternal/Fetal medicine will be used as input for the disease management section of Healthcare Maintenance (an example would be proper reminders for tests and drugs for the pregnant diabetic).

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The interim visit data such as fundal height etc. will be entered using the existing vital signs" forms with specific data points pertinent to pregnancy. This data will be used to create an electronic spreadsheet with the ability to enter text for a given visit as a brief progress note. A longer "progress" note can be generated for a given visit for a complex patient using a tailored electronic outpatient note form similar to the rest of the institution. Ad hoc reports will be generated from the WebCIS data collected within the forms and flow sheets as requested by Maternal/Fetal for research or regulatory purposes. Eventually, data (both textual and fielded) from the electronic obstetrical record forms will be transferred to the planned Institutional Data Warehouse. Natural language based query tools will be available for ad hoc queries by end users with potential for direct electronic transfer to regulatory agencies. This capability is probably 2 years away.

As mentioned, Piedmont Health Services has chosen to implement a commercial EMR. Discussion between UNC Healthcare's ISD, representatives of the Department of Obstetrics and Gynecology, and representatives of Piedmont Health Services support the opportunity and timing to establish a two-way interchange of standardized electronic patient data with the Piedmont system. This standard interchange would adhere to the developing national standards for data exchange between disparate EMR products and would serve as the pilot for WebCIS and the entire UNC Healthcare System. The ISD also supports the proposal that WebCIS be introduced into the local health department affiliate clinics as the standard approach for recording and exchanging perinatal information. This extension of WebCIS to non-UNC owned or operated clinics would be the first such expansion and would serve as the pilot for the entire UNC Healthcare System.

Program plan / Methods:

1. Transform the sharing of clinical obstetrical information between community health centers (Piedmont Health Services) and the UNC Healthcare System by crafting exchange between disparate EMR products (GE Centricity and WebCIS)

- Define and address potential barriers to the interface

A longstanding and positive relationship between the maternity program at Piedmont Health Services and the Department of Obstetrics and Gynecology chief obstetrical liaison and other faculty will facilitate open and honest discussion about perceived barriers and opportunities to establishing a system of interconnectivity between WebCIS and the Piedmont EMR. Barriers will be identified in a meeting of IT people from the two organizations, which will be facilitated by Moos. An action plan for each barrier will be developed. It is expected that the Piedmont EMR will become fully functional in 2007. Full functionality will be occurring at the same time the WebCIS maternity module is being launched. In as much as possible, full information on status of implementation, content and provider and administrative concerns will be shared between the two agencies through face-to-face meetings held no less often than quarterly. Other interactions and tracking of progress regarding resolution of barriers will be communicated via email.

- Develop infrastructure and process for the interface and, concurrently test acceptability, accessibility and positive and negative consequences of data sharing.

Beginning late in year 1, specific processes for interconnectivity required by each of the institutions will be outlined and those requiring specific actions will be addressed. Early in year 2, UNC's Information Services Division will contract with an integration programmer to construct, test and implement the upfront interface between Piedmont's EMR (GE Centricity) and WebCIS. The transfer of information between one of the Piedmont Health Services clinics and the UNC maternity program will be initiated (preliminary choice is Carrboro Clinic because of proximity in case there are IT issues which need to be addressed by UNC Healthcare staff). Necessary training will take place at the community clinic. Records transmitted by this clinic will be monitored to assure readability, completeness, timeliness of transfer, accurate integration into WebCIS and usability by providers. Information transmitted back to the community clinic will be monitored for readability, completeness, timeliness of transfer, accurate integration into GE Centricity and usability by providers. Over

three months, problems with transfer will be identified and addressed. After three months, the other 5 Piedmont Clinics will begin interface with a new clinic coming on at approximately 2 week intervals so that transfer of information back and forth between the two systems can be tracked for the characteristics identified above. Significant problems will delay initiation by the next clinic in line while solutions are identified and implemented. Before each clinic comes into the system, an onsite educational session will be held at the clinic. After each clinic has had electronic interface for 4-6 weeks, another onsite session will be held to identify any unintended consequences. These sessions will include clinicians, IT personnel from Piedmont and UNC and the chief perinatal liaison. Once the transmission of routine prenatal information has been accomplished, we will begin to introduce systems whereby non-routine visits are also transmitted electronically between the two systems (e.g. triage visits and ability to have up-to-date prenatal record at fingertips at UNC and ability for the home clinic to have online triage notes and associated lab work at fingertips locally. Again, this will be monitored closely to assure intent, quality of transmissions and unintended consequences.

Aim 2: Transform the sharing of clinical information between local health department obstetric programs and the UNC Healthcare System by introducing the WebCIS electronic obstetric medical record into local health departments.

- Define and address potential barriers to placing WebCIS in local health departments.

As the WebCIS prenatal module reaches fruition, a forum for administrators and clinicians at the local health departments will be held in Year 1 to introduce them to the content and appearance of the WebCIS product. Such forums are commonplace for representatives of the affiliated clinics as they come together at UNC a minimum of twice a year for a meeting to share concerns and learn about new UNC Healthcare initiatives. This Local Health Department EMR (LHD-EMR) meeting will be held at UNC so that demonstrations of the

product can be offered, and so that many perspectives from a variety of local health departments can be heard simultaneously using a facilitated focus group process. Advantages of moving away from the current, labor intensive approach to copying the same records repeatedly will be solicited as will potential barriers to placing WebCIS in local health departments. Some barriers have already been identified: state prenatal care documentation requirements in excess of traditional obstetrical forms; limited local comfort regarding computer use; little local infrastructure for use of computers in examining rooms; complexities of getting individuals credentialed to use WebCIS; and the variety of providers in a local health department that interface with the prenatal record (e.g. nurses, social workers, nutritionists, outreach workers, advanced practice nurses, physicians, health educators, etc). For these and all other barriers, an action plan will be developed and committees established, where appropriate, to effect the plan. A schedule of follow-up meetings will be established. The first follow-up meeting will be held within 3-4 weeks at which time the UNC Healthcare IT people and others, as appropriate, will address shared concerns of the group. Thereafter, it is anticipated that the meetings will be no less frequent than every three months and possibly more frequently. Because of travel and time constraints, as much communication as possible will be done through email and related attachments. Subsequent meetings and communication is likely to involve representatives of DHHS Maternal Child Health Section, a section of the state health department with which the chief perinatal liaison works closely around a variety of programming initiatives for local health departments, clinicians from UNC obstetrical program, and UNC Healthcare IT personnel.

Following this first LHD-EMR meeting, three health departments will be solicited to pilot the placement of WebCIS in their agency for the purposes of transferring and receiving perinatal care records. Because of their usual willingness to pioneer innovations between the UNC Perinatal program and local health department practices and because of the number of deliveries they provide to the UNC Obstetrical program annually the preliminary choices include any three of the following: Alamance County Health Department; Randolph County Health Department, Orange County Health Department (two sites) and the Chatham County Health

Department. To gauge readiness, an inventory will be designed to address local resources and attitudes including assessment of physical infrastructure (clinic space, connectivity, patient flow, perceived barriers), administrative concerns (integrating this initiative with the state health department's requirements for record keeping, HIPAA issues around electronic medical records, etc) and personnel concerns (lack of computer literacy, attitudes toward EMRs, training needs, etc).

- Develop infrastructure and processes for WebCIS utilization at selected local health department prenatal care programs.
- Test acceptability and accessibility of EMR in LHDs

In early year 2, the results of the above-described inventory will be used to prepare each of the selected local health departments for local implementation of WebCIS. Grant funds will be utilized to address physical infrastructure needs (such as upgrades to internet connections, installation of wireless routers, and supplementing the local computer resources such as notebook and desktop PC's, printing and scanning capabilities, etc.), in partnership with the state health department, administrative issues will be addressed and individualized plans for each department will be created to address personnel barriers. (e.g. wariness about EMRs, difficulties in meeting requirements for individual WebCIS access, supplement clinic funds).

In the midpoint of year 2, the chosen pilot sites will begin to use WebCIS locally, with one site being added every 8-10 weeks. Necessary training will take place at each of the local health departments for all staff members. During the first week that each site becomes active, a representative from the UNC obstetrical program will be continuously on site to trouble shoot any problems with navigating WebCIS. Entries made by this clinic will be monitored to assure readability, completeness and availability of data at NC Hospitals.

Information needed by the local health department to provide continuity of care will be monitored for accessibility, readability, completeness and timeliness. At a minimum, each clinic obstetrical staff will have a

staff forum to reflect on the advantages and problems with utilizing WebCIS at 6 weeks post implementation, again at 3 months, and every 3 months thereafter, as necessary. At these meetings identified problems will be matched with an action plan, a time line for implementing the action plan and outcomes for assessing success determined.

During the remainder of the three year project, additional local health department sites will be brought onto the WebCIS network, expansion of WebCIS use for pediatric services at these same health departments will be explored (a natural next step since most of the women delivering at UNC Hospitals from these clinics take their babies to the clinics for well baby care and are referred to UNC for sick baby care) and the ability of participating local health departments to meet state health department reporting requirements will be monitored.

Aim 3: Establish processes to successfully and accurately mine data coming from various EMR systems and administratively independent clinic sites to support quality of care and research functions of UNC Healthcare.

In year 3, the focus will move from initiating and supporting EMR connectivity between the affiliated clinics and UNC Hospitals to using the information to answer queries regarding quality of care, aggregate outcomes, outcomes by prenatal care sites, etc. This will be made possible by the planned Institutional Data Warehouse, which is scheduled by IT to be launched in the next 2 years. This aim will be achieved by a forum of all the affiliated clinics, managers of the Institutional Data Warehouse and clinicians at UNC to identify data retrieval needs. The affiliate clinics will serve to field-test the accuracy of the processes of the Institutional Data Warehouse and will allow fine-tuning of those processes to maximize usefulness as the Data Warehouse supports larger efforts within UNC Healthcare.

Evaluation

The timeline for this project extends over 3 years with the first year primarily devoted to preliminary work, the second year to implementation and the third year to expansion and to assessing the ability of shared records to result in integrated data. Given the pioneering efforts in transforming the exchange of medical information between organizationally distinct but interrelated agencies, most of the evaluation will be focused on process. Specific areas which will be monitored include problems in adoption, problems in utilization, end-user satisfaction to include users at UNC Hospitals regarding the quality and usefulness of information transmitted and users at the at the local clinics regarding the processes of transmission and satisfaction with information received in return and the amount of time the system (whether WebCIS or the commercial product being used at Piedmont Health Services) is off-line for whatever reason. Using qualitative methodologies, staff from the affiliated clinics will be queried about concerns before the project is implemented and about the lessons learned throughout the project as it draws to a close. An important assessment point will be the degree to which the processes necessary to support interconnectivity are institutionalized at the local level. Benchmarks will include changes in orientation of new staff at local level to use or link with WebCIS, new administrative functions to support use of WebCIS connectivity and approximations regarding cost savings or losses, and impact on local budget of having moved to an EMR for the sharing of prenatal and perinatal information. Finally, qualitative data will be obtained through queries of WebCIS and of the Institutional Data Warehouse to measure the quality of the data transmitted and the degree to which it is useful.

Congruence with the UNC-NIH Clinical and Translational Science Award

Linking UNC's Obstetric electronic medical record and database with community-affiliated clinics can be a first step in transforming how our Health System manages information beyond the confines of our campus. As stated in our mission, UNC Healthcare serves as the safety net provider for North Carolina and is committed to providing the highest quality of care. By investing in this demonstration project which aims to connect UNC Hospitals around the exchange of patient care information with community providers, UNC Healthcare will

clearly exhibit its commitment to developing meaningful partnerships around the safe, effective and efficient care of patients throughout the region and ultimately the state. By starting the transformation with perinatal records, UNC Healthcare will be building on a long lived, mutually dependent and collegial relationship with its 16 community based prenatal clinics which are already engaged in a highly scripted approach to the sharing of medical records. The intensity of the medical record interactions around perinatal patients will provide UNC Healthcare with a rich opportunity to develop processes of interactivity for other specialties within UNC Hospitals and community partners. National initiatives to move to electronic record keeping as the norm rather than the exception make this an opportune time for UNC Healthcare to demonstrate its commitment and success in partnering with community based public health agencies to create a seamless exchange of information for shared patients, thereby enhancing its reputation as the leading public academic medical center in the nation.

This project is in concert with the proposed CTSA. This is a true collaboration between UNC Healthcare and the community that we serve. Improved “connectivity” will hasten the dissemination of current evidence based practices. In addition, this integrated database will be a rich source of data for quality and outcomes research.

This proposal encompasses four of the six stated areas of focus for the Investment in the Future Initiative. They are:

- 1) Enhancing quality of care and patient safety
- 2) Building on UNC’s already outstanding women’s health program
- 3) Enhancing subspecialty outreach across North Carolina
- 4) Improving access to and quality of care to uninsured and under-served populations in our state.

This project is a sound “Investment in the Future” of UNC Healthcare and School of Medicine. At the completion and evaluation of this pilot project, the work will be sustainable without continued investment. Significant savings will be realized in need for personnel to manage medial records. In addition, if the project is successful, UNC will have the model of a “salable” service to extend to other healthcare partners, both public

and private. Improved information systems will improve quality, efficiency, and access to care while bolstering sustainable partnerships among the community of healthcare providers.

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Appendix A

Timeline of key activities

Year 1:

- Complete development of the WebCIS perinatal module; train UNC providers on its use; become paperless in care of obstetrical patients who initiate prenatal care at UNC before the end of the year.

Health Department Initiative:

- As the WebCIS perinatal module takes shape, a forum for local health department (LHD) affiliate clinics will be held to solicit their input on the record and to gather perspectives about potential barriers to placing WebCIS in the local health departments to aid in the care of pregnant patients.
- Develop action plans to address potential barriers which engage LHDs in finding workable solutions.
- Identify three local health departments to pilot placement of WebCIS in their prenatal programs
- Collect inventory of infrastructure, administrative and staff readiness to initiate local use of WebCIS at all three of the designated pilot sites

Piedmont Health Services Initiative:

- By midyear, arrange and facilitate a meeting of the IT specialists at Piedmont Health Services with the UNC Healthcare IT Division to discuss process and potential barriers to establishing interconnectivity between WebCIS and the commercial EMR purchased by Piedmont
- Outline specific requirements to achieve interconnectivity needed at Piedmont and at UNC Healthcare and address requirements

Year 2:

Health Department Initiative

Principal Investigator/Program Director : Ivester, Thomas S.

- Using the infrastructure, administrative and staff readiness inventories from each of the health departments, develop and implement a program to prepare each of the departments for successful implementation of WebCIS.
- Arrange for local health department staff members to be credentialed to use WebCIS.
- In midyear, initiate WebCIS at one of the pilot health departments; provide training of all involved staff on using WebCIS and on using the maternity module. Outpost a UNC Healthcare employee at the health department for one week to trouble shoot any problems with navigating WebCIS.
- Every 8-10 weeks, add an additional clinic
- Conduct staff forums at each clinic after 6 weeks, 3 months and 6 months to identify problems using WebCIS, unexpected consequences and potential solutions

Piedmont Health Services Initiative

- Early in year two, begin interconnectivity between one Piedmont clinic and UNC Hospitals—monitor for problems and address.
- Once connectivity functional and reliable, add additional clinics at 2-4 week intervals until all 5 Piedmont clinics are using electronic medical record transfer to send and receive information to and from UNC Hospitals for prenatal and postpartum patients.
- When all 5 of the Piedmont Health Service clinics are transmitting and receiving routine data for prenatal and intrapartum patient care needs, expand the transmission to include transmission around non-routine visits such as triage visits or antenatal hospitalizations.
- Throughout the implementation phase, monitor user satisfaction and unintended consequences of the interconnectivity through formal and informal exchanges. Conduct staff forums at each clinic after 6 weeks, 3 months and 6 months to identify problems using WebCIS, unexpected consequences and potential solutions.

Principal Investigator/Program Director : Ivester, Thomas S.

- Monitor readability, completeness, timeliness of transfer, accurate integration into WebCIS and into GE Centricity and usability by providers and address problems through the IT specialists in the two organizations.

Year 3:

Health Department Initiative

- Extend to all affiliated health departments
- Explore extension to pediatric clinics in same health departments
- Determine problems with state mandated reporting of maternity related data and address
- Determine degree and rate of institutionalization of WebCIS in each local health department as a marker for sustainability

Piedmont Health Services Initiative

- Extend interconnectivity to other specialties at Piedmont Health Services (e.g. pediatrics, internal medicine, etc) as Piedmont Health Services is one of the main sources of patients seen at UNC Hospitals.

UNC Health Care System

- Test capabilities of the Institutional Data Warehouse to aggregate data coming from a variety of sources
- Prepare a document summarizing the lessons learned from this project to guide UNC Healthcare as it extends WebCIS or other approaches to interconnectivity to additional community and state partners
- Prepare journal articles detailing the experience and prepare abstracts for national meetings to showcase the work of UNC Healthcare in reaching out to community based providers to assure safe, coordinated and integrated care through the EMR interconnectivity.

Appendix B

UNC Healthcare Obstetrical Service Relationships

Affiliated Clinics n=16

Health Departments N=6

Alamance County
Burlington, NC (115*)

Caswell County
Yanceyville, NC (29)

Chatham County
Siler City, NC (138)

Lee County
Sanford, NC (4)

Orange County
Chapel Hill, NC (76)

Randolph County
Asheboro, NC (108)



Community Health Centers N=10

Anderson Creek Medical Ctr
Springlake, NC (0)

Benhaven Medical Center
Cameron, NC (0)

Boone Trail Medical Center
Mamers, NC (4)

*Carrboro PHS***
Carrboro, NC (320)

Caswell Family Medical Center
Yanceyville, NC (2)

*Charles Drew Clinic PHS***
Burlington, NC (45)

*Haywood-Moncure PHS***
Moncure, NC (269)

*Prospect Hill PHS***
Prospect Hill, NC (159)

*Siler City Community Health Center***
Siler City, NC (144)

Tri-County Community Health Ctr
Newton Grove, NC (17)

*number of deliveries, 2005

**part of Piedmont Health Services

Appendix C: Detailed Budget

				FROM	THROUGH	
PERSONNEL				DOLLAR AMOUNT REQUESTED		
NAME	ROLE ON PROJECT	% EFFORT	INST. BASE SALARY	SALARY REQUESTED	FRINGE BENEFITS	TOTAL
Thomas S. Ivester	Project Director	20.0	185,400	37,080	10,215	47,295
Merry-K Moos	Co-investigator	10.0	100,270	10,027	3,033	13,060
M. Kathryn Menard	Co-Investigator	10.0	314,150	31,415	8,263	39,678
J.P. Kichak	Collaborator	0				
Robert Berger	Collaborator	0				
Raj Gopalan	Collaborator	0				
SUBTOTALS →				78,522	21,511	100,033
CONSULTANT COSTS						
PC analyst: 160 hours at \$45.00/hour set up						\$7,200
EQUIPMENT (Itemize)						
SUPPLIES (Itemize by category)						
Laptop PC's with stand – 4 sites, 4 per site @\$1,600 each = \$25,600						
Printer – 1 per site @\$500 each = \$2,000						
Cisco Router – 1 per site @\$3,000 each = \$12,000						
Wireless network hardware at each site @ 1,500 each = \$6,000						\$45,600
TRAVEL						
Presentation at AHRQ or other Quality forum (2 travelers)						1,500
OTHER EXPENSES (Itemize by category)						
CONTRACTUAL COSTS				DIRECT COSTS ONLY ALLOWED		
TOTAL DIRECT COSTS FOR YEAR 1 (NO INDIRECT COSTS ALLOWED)						\$ 154,333

YEAR 2 DETAILED BUDGET DIRECT COSTS ONLY ALLOWED				FROM	THROUGH	
PERSONNEL			DOLLAR AMOUNT REQUESTED			
NAME	ROLE ON PROJECT	% EFFORT	INST. BASE SALARY	SALARY REQUESTED	FRINGE BENEFITS	TOTAL
Thomas S. Ivester	Project Director	20.0	190,962	38,192	10,312	48,504
Merry-K Moos	Co-investigator	30.0	103,278	30,983	8,365	39,348
M. Kathryn Menard	Co-Investigator	10.0	323,574	32,357	8,736	41,093
J.P. Kichak and Robert Berger	Collaborators	0				
Dennis Rodriguez	Programmer	20%	66,950	13,390	3,615	17,005
To be named	Integration programmer	50%	\$80,000	\$40,000	10,800	50,800
Raj Gopalan	Collaborator	0				
				154,922	41,828	196,750
CONSULTANT COSTS						
PC analyst: 5 hours per week support @ \$45.00/hr						\$11,700
EQUIPMENT (<i>Itemize</i>)						
SUPPLIES (<i>Itemize by category</i>)						
TRAVEL						
Presentation at AHRQ or other Quality forum (2 travelers)						\$1,500
OTHER EXPENSES (<i>Itemize by category</i>)						
Internet service provider connection: \$100/month/site = \$4,800						
Personnel needed for training providers in off site locations will be offered "in kind" by the Information Services Division of UNC's Healthcare System						
						4,800
CONTRACTUAL COSTS			DIRECT COSTS ONLY ALLOWED			
TOTAL DIRECT COSTS FOR YEAR 2 (NO INDIRECT COSTS ALLOWED)						\$ 214,750

YEAR 3 DETAILED BUDGET DIRECT COSTS ONLY ALLOWED				FROM	THROUGH		
PERSONNEL				DOLLAR AMOUNT REQUESTED			
NAME	ROLE ON PROJECT	% EFFORT	INST. BASE SALARY	SALARY REQUESTED	FRINGE BENEFITS	TOTAL	
Thomas S. Ivester	Project Director	20.0	196,690	39,338	10,621	49,959	
Merry-K Moos	Co-investigator	30.0	106,376	31,913	8,616	40,529	
M. Kathryn Menard	Co-Investigator	10.0	333,281	33,328	8,999	42,327	
J.P. Kichak and Robert Berger	Collaborators	0					
Dennis Rodriguez	Programmer	20%	68,958	13,792	3,724	17,516	
Raj Gopalan	Collaborator	0					
SUBTOTALS →				118,371	31,960	150,331	
CONSULTANT COSTS							
PC analyst: 10 hours per week support = 520 hours @ 45.00/hour.						\$23,400	
EQUIPMENT (Itemize)							
SUPPLIES (Itemize by category)							
Laptop PC's with stand – 2 sites, 4 per site? @\$1,600 each = \$25,600							
Printer – 1 per site @\$500 each = \$2,000							
Cisco Router – 1 per site @\$3,000 each = \$12,000							
Wireless network hardware at each site @ 1,500 each = \$6,000						\$22,800	
TRAVEL							
Presentation at national meeting (2 travelers)						\$1,500	
OTHER EXPENSES (Itemize by category)							
Internet service provider connection: \$100/month/site = \$4,800							
Database programmer: 160 hours @ \$90.00/hour							
						\$4,800	
CONTRACTUAL COSTS				DIRECT COSTS ONLY ALLOWED			
TOTAL DIRECT COSTS FOR YEAR 3 (NO INDIRECT COSTS ALLOWED)						\$ 203,096	

**BUDGET FOR ENTIRE PROPOSED PROJECT PERIOD
DIRECT COSTS ONLY ALLOWED**

BUDGET CATEGORY TOTALS	YEAR 1	YEAR 2	YEAR 3	TOTAL
PERSONNEL: <i>UNC Salary and fringe benefits.</i>	100,033	196,750	150,331	447,114
CONSULTANT COSTS	7,200	11,700	23,400	42,300
EQUIPMENT				
SUPPLIES	45,600		22,800	68,400
TRAVEL	1,500	1,500	1,500	4,500
OTHER EXPENSES		4,800	4,800	9,600
CONSORTIUM/ CONTRACTUAL				
TOTAL DIRECT COSTS	154,333	214,750	202,831	571,914
TOTAL DIRECT COSTS FOR ENTIRE PROPOSED PROJECT PERIOD (NO INDIRECT COSTS ALLOWED)				\$ 571,914

JUSTIFICATION: CONTINUE ON ADDITIONAL PAGES. IF A SUBCONTRACT IS INVOLVED, SCAN SIGNED LETTER OF AGREEMENT AND INSERT AT END OF THE FULL PROSOSAL.

Thomas S. Ivester, MD will serve as the project medical director. He will direct the expert content of the EMR and the rules engines to drive decision support. He will be responsible for bridging the clinical and IT interface of this project, for coordinating and facilitating communication between UNC IT services, local IT personnel and clinical needs at the various sites, for monitoring the quality and timeliness of the transmissions and for troubleshooting any problems in the delivery of clinical care created during transition to the integrated EMR system. He will lead the effort to test the processes of data aggregation, data retrieval and analyses using the Institutional Data Warehouse.

M. Kathryn Menard, MD, MPH is Vice Chairman for Obstetrics and Co-Director for the Center for Maternal and Infant Health. She will serve as the senior advisor for this project. She will serve as a resource to Dr. Ivester during the implementation phase. She will direct the development of a system for data acquisition from the integrated EMR. She will oversee the development of tools for outcomes surveillance, continuous quality improvement and outcomes based research.

Merry-K Moos, RN, FNP, MPH is the Director of Perinatal Outreach and Director of the UNC Hospitals' Women's Health Information Center. She also is the Director of the Women's Health Training Collaborative which is funded by the state Department of Health and Human Services to educate public health department nurses and other employees in all 100 counties in the state around the provision of quality prenatal and family planning care. Her responsibilities will include project design, organization and implementation as it relates to the community clinics. She will be directly responsible for coordination and communication with community partners. With her wealth of experience serving as liaison between the affiliated obstetrical

BUDGET JUSTIFICATION (continued)

undertake systems work to overcome those barriers. She will develop, in collaboration with Ivester and the UNC Healthcare System IT division, the implementation manual for local health departments and other written guidance. She will work with the state health departments around documentation requirements for local health departments and with the community health centers around report needs for their federal funders.

JP Kichak, Chief Information Officer of UNC Hospitals will serve as co-director of the project. His responsibility will be for the technical aspects of the planning and implantation, hardware and programming needs. He will direct all programming activities through the hospital department of information technology.

Robert Berger, MD, Dr Robert Berger, Professor of Medicine, and the Director of Medical Informatics will work as a liaison between the departments of Maternal and Fetal Medicine and the Department of Information Services and engage the above personnel to come up with a design to develop the obstetric module in WebCIS, that aligns well with the workflow of the division of maternal and fetal medicine and the LHDs, that supports the data flow between the WebCIS main core application and the obstetric module or between WebCIS and the GE Centricity application as the case may be to support the continuum of care.

Raj Gopalan, MD., MSIS Dr Raj Gopalan, is the Director of WebCIS and Ancillary clinical applications at the Department of Information Services. He will be working closely with the clinical team and the development team to workout the details of the functional requirement for this project, and to direct the development, testing and implementation of the solution.

Dennis Rodriguez, Database programmer and analyst for the Center for Maternal and Infant Health will serve as the data manager for this project. He will receive the data that is extracted from the database of the integrated electronic medical record. He will program reports, run and distribute reports on service volume, outcomes and quality indicators. (Year 3)

Other personnel:

Integration programmer will be appointed on short term contract through the UNC Healthcare's Information Services Division. This individual will construct, test and implement the upfront interface between Piedmont health center's electronic record (GE Centricity) and UNC's WebCIS obstetric EMR. The continuity of care records standards will be incorporated. This work is budgeted in the second year. We anticipate that Piedmont's GE system will be functional by the end of our first year.

A PC analyst will be utilized on an hourly basis for 1) installation of internet network in the 4 health department sites, 2) installation and set up of computer hardware and software on site, and 3) ongoing technical support to the 4 sites. The time to install the equipment is budgeted in the first year (anticipating end of first year). Hours for ongoing support are budgeted in years 2 and 3.

Database programmer will be appointed through the UNC Healthcare's Information Services Division to extract data from the integrated obstetric and neonatal medical record database. Programs will be developed to generate reports on service volume, outcomes and quality indicators.

WebCIS training personnel will be supplied "in kind" by the Information Services Division.

Equipment needs:

Each of 4 health department sites will be equipped with high speed internet service with adequate bandwidth to service a network of 4 WebCIS work stations. The work stations will be portable wireless laptops. The wireless laptop option was chosen to provide maximum flexibility.

ⁱ US Department of Health and Human Services. Health People 2010: Understanding and Improving Health. 2nd ed. Washington, DC: US Government Printing Office, November 2000.

ⁱⁱ Health and Medical Informatics Focal Points. E-Health Development Plan. World Health Organization. May 2001. (Accessed April 21, 2004 at <http://www.emro.who.int/his/ehealth/ehealthPlan.htm>)

ⁱⁱⁱ Office of Disease Prevention and Health Promotion, US Department of Health and Human Services. Healthy People 2010: Health Communication. 2nd ed. Washington, DC: US Government Printing Office, November 2000. (Accessed on April 9, 2004 at <http://www.healthypeople.gov/Document/HTML/Volume1/11HealthCom.htm>)

^{iv} Centers for Disease Control and Prevention, Health Resources and Services Administration, US Department of Health and Human Services. Healthy People 2010. : Public Health Infrastructure. 2nd ed. Washington, DC: US Government Printing Office, November 2000. (Accessed on April 9, 2004 at <http://www.healthypeople.gov/Document/HTML/Volume2/23PHI.htm>)

^v Committee on Assuring the Health of the Public in the 21st Century , Board on Health Promotion and Disease Prevention, Institute of Medicine. The Health Care Delivery System in The Future of the Public's Health in the 21st Century. Washington DC: The National Academies Press. 217-274

Appendix D

Proposed Flow of Project Implementation

