Project Title: Distance Management of High-Risk Obstetrical Patients

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Organization: Woman's Hospital, Baton Rouge, Louisiana

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I. STRUCTURED ABSTRACT

Purpose: The purpose of this THQIT Planning Grant was to develop a technology plan to improve access to maternal-fetal medicine (MFM) services provided on Woman's Hospital's main campus and at clinic locations at other hospitals throughout the state.
Scope: The project utilized existing relationships with two smaller hospitals to address differences in readiness and organizational structure. It focused on developing telemedicine capabilities for real-time remote diagnostic ultrasound and consult services to women with high-risk pregnancies to increase physician and patient access and reduce physician travel time and costs.
Methods: Representatives from partners and Woman's Hospital guided the project and were organized in three teams, tasked with exploring clinical, technological, and financial issues. Four Planning Meetings were designed to assess progress, review plans, and direct additional activities.
Results: The technical, manpower, clinical, and financial readiness of each partner was determined. Successful proof of concept was established for an electronic consult with attached patient data from referring hospitals' information systems and for transmission of real-time ultrasound imaging. Policies and procedures governing high-risk obstetrical telemedicine and other administrative parameters were established. Clinical outcomes measurements, a survey tool, and protocols were identified.
Keywords: maternal-fetal medicine, remote ultrasound imaging, high-risk OB, telemedicine

II. PURPOSE

The purpose of this THQIT Planning Grant was to develop a technology plan to improve access to maternal-fetal medicine (MFM) services provided at the Woman's Hospital main campus and at clinic locations at other hospitals throughout the state. The intent was to

1) increase remote physician and patient access to diagnostic ultrasound and consultative services
2) reduce travel costs incurred when the hospital's MFM specialists travel by plane or car to remote locations, and
3) increase the amount of time MFM specialists spend giving care, not traveling.

Guiding this project was the common goal among Woman's Hospital and its partners to cost effectively improve access to needed high-risk obstetrical services while maintaining the highest level of clinical care. To meet this goal, three teams were identified: a clinical team, a technology team, and a finance team. Each team was composed of representatives from Woman's Hospital and its partners. The activities of these teams were overseen by members of Woman's Hospital Planning Committee.

The Specific Aims (Long-term Goals) of the proposal were to use these teams and partnerships

1) to determine telemedicine pathways and protocols for patient care;
2) to develop measurements and methods to assess efficacy, outcomes, and satisfaction related to these pathways and protocols;
3) to identify the technological readiness and needs of each institution;

4) to determine educational needs at each institution in order to establish a remote MFM service;
5) to determine equipment and staffing needs of each institution;
6) to identify payor issues and ways to address these issues;
7) to address billing and collections requirements;
8) to determine the overall cost to Woman's Hospital and its partners to initiate and maintain the services; and
9) to develop a detailed implementation plan for a remote MFM service.

The strong relationship between Woman's Hospital and its partners, which was a result of onsite clinics provided by Woman's MFM physician staff, allowed a unique partnership that supported completion of these long-term goals.

III. SCOPE

Background:

The planning effort focused on the Maternal-Fetal Medicine (MFM) Center at Woman's Hospital. Staffed by four board-certified specialists, the center provides services to women with high-risk pregnancies. All patients seen by the MFM specialists are referred by their ob/gyn physicians for medical complications during pregnancy or other risk factors, such as advanced maternal age, multiple gestation, and recurrent history of preterm labor or pregnancy.

The MFM Center provides specialized prenatal diagnostic testing, including high-resolution obstetrical ultrasound, biophysical profile, non-stress test, contraction stress test, fetal echocardiography, amniocentesis, umbilical blood sampling, and chorionic villus sampling. Patient education and counseling services are available for a number of genetic conditions. The center also houses a board-certified genetics counselor.

Throughout the state, socioeconomic, demographic, and financial factors act as significant barriers to these services for those in greatest need. Woman's Hospital began offering statewide maternal-fetal medicine services in late 1996. Patients are referred by their primary care ob/gyn physician to Woman's Hospital MFM physicians to address these needs (references were not provided in the final report; please contact grantee for more information if needed):

- In 2001, Louisiana had the 3rd highest neonatal death rate (deaths of infants 0-27 days) in the United States.
- In that same year, the state ranked lowest in the United States for very low birthweight as a percent of live births.
- In 2001, Louisiana ranked 2nd highest in the United States for very low birthweight as a percent of live births.
- In 2001, Louisiana ranked 9th in the nation for birth rate for teenagers (15-19 years of age/1000).
- Louisiana has the second highest percent of births to African American women in the US (41% vs. 15% nationwide).

Context:

As a result of these disparities, the demand for Woman's Hospital MFM services has grown steadily over the past 5 years, with an increase in the number of patients seen by Woman's Hospital and its statewide partners:

Table 1. Maternal-Fetal Medicine Physician Visits

	Fiscal Year (10/1 – 9/30)						
Locations	1999	2000	2001	2002	2003	2004	% Change
Woman's Hospital, Main Campus, Baton Rouge	6267	7460	7489	7480	8472	8758	39.8%
Current Partnerships:							
Women and Children's Hospital, Lake Charles	1310	1372	1371	1305	1450	1467	12.0%
Lake Charles Memorial Hospital, Lake Charles	1076	1342	1260	1134	1183	1424	32.3%
St. Francis Medical Center, Monroe	194	664	782	968	1039	1228	533.0%
Thibodaux Regional Medical Center, Thibodaux	503	478	509	600	611	624	24.1%
North Oaks Medical Center, Hammond	705	751	764	710	846	832	18.0%
Total Maternal-Fetal Medicine Physician Visits at Partnering Hospitals	3788	4607	4686	4717	5129	5575	47.2%
Total Maternal-Fetal Medicine Physician Visits	10,055	12,067	12,175	12,197	13,601	14,333	42.6%
Partnership % of Total	37.7%	38.2%	38.5%	38.7%	37.7%	38.9%	

The increase in MFM services during this period of time is a manifestation of the growing need for these services. The socioeconomic conditions in the state of Louisiana strongly suggested that a mechanism other than face-to-face services would be beneficial in delivering the needed MFM services.

Settings:

In order to provide this existing level of MFM services, Woman's Hospital had developed formal relationships with six hospitals in the state. In 2002 there were 15,920 live births at Woman's and current/past partnering hospitals, representing 25 percent of all live births in Louisiana. Although most of these hospitals are located in Metropolitan Statistical Areas (MSAs), many of the obstetrical patients served by these efforts reside in the rural areas of the state.

In addition to providing clinical services, the MFM physicians participate in partnering facilities' quality assurance and case review activities and engage in formal and informal education programs for ob/gyn, neonatal, and pediatric physicians. Woman's Hospital's MFM physicians are credentialed members of each partnering hospital's medical staff.

Each hospital that Woman's Hospital partners with provides front office staff to schedule appointments from referring physicians within their facility, a registered nurse to perform patient assessments, a licensed sonographer, and an exam room with high-quality ultrasound equipment. The partners maintain the medical records of patients seen in the clinics and are

also responsible for billing and collections. Contractual agreements are in place that specify a flat fee paid to Woman's Hospital for each clinic day. The partners are also responsible for paying for all travel expenses that the MFM physicians incur.

Woman's Hospital's Maternal-Fetal Medicine specialists have developed strong relationships with ob/gyn physicians throughout the state, who refer patients to the closest MFM clinic. An MFM physician is on call and physically present at Woman's Hospital 24 hours a day, seven days a week. Referring physicians can access consultative services over the phone at any time. Although physicians in the group feel that their presence on Woman's Hospital campus at all hours has unquestionably saved lives, they lacked the ability to provide real-time, time-critical diagnostic services to referring physicians in other locations. They needed the ability to perform remote ultrasound examinations. There was also the expectation that remote ultrasound diagnostic imaging capabilities might present opportunities to reduce costs by lowering transportation expenses and the amount of time MFM physicians spent traveling, time that would be better spent providing patient care.

Participants:

The lead partner for the activities was Woman's Hospital, a 225-bed, not-for-profit, women's and infants' specialty hospital located in Baton Rouge, Louisiana. With over 8000 live births each year, it is one of the largest obstetrical services in the United States. Accredited by The Joint Commission, Woman's Hospital is an acute-care facility offering level-III regional obstetrics and neonatal intensive care and a range of services, including gynecologic oncology, reproductive endocrinology, and home healthcare. Woman's performs more than 7000 surgeries each year (inpatient and outpatient gynecological, plastic, and general surgery), performs over 40,000 breast procedures, and processes over 80,000 Pap smears. In compliance with EMTALA requirements, it treats patients who present with injuries, stabilizing them and, when necessary, transporting them to an appropriate facility. The hospital's 72-bed neonatal intensive care unit, currently expanding to 90 beds, has more than 1000 discharges a year. Its pediatric subspecialty clinics see over 1000 outpatients each year.

The planning effort focused on the Maternal-Fetal Medicine (MFM) Center at Woman's Hospital. Staffed by four board-certified specialists, the center provides services to women with high-risk pregnancies. All patients seen by the MFM specialists are referred by their ob/gyn physicians for medical complications during pregnancy or other risk factors, such as advanced maternal age, multiple gestation, recurrent history of preterm labor, or pregnancy loss.

Woman's Hospital selected two hospitals to participate in the planning process. Both have been receiving Woman's Hospital's MFM services for over 5 years under formal contracts, and each signed a Memorandum of Understanding as partners in the planning project.

Women and Children's Hospital, LLC, Lake Charles, LA. This small hospital has 93 licensed and 67 staffed beds. In 2003, it had 3967 acute discharges and 1688 live births. Contracted for MFM services since 9/20/1999, it currently holds eight clinics per month; an average of 15 patients is seen at each.

Thibodaux Regional Medical Center, Thibodaux, LA. Classified as rural, this hospital has 149 licensed and 140 staffed beds. In 2003, it had 7163 acute discharges and 667 live births. Contracted for MFM services since 8/1/2001, it now holds four clinics per month; an average of 13 patients is seen per clinic.

In the planning activities, Woman's Hospital built upon its existing partnership base for MFM services and its strong and positive experience in formalizing and operationalizing relationships with community-based hospitals and physicians. This allowed the project team to focus on the complexities of the planning process without having to build relationships from the ground up.

Incidence and Prevalence:

The above description highlights the potential impact of establishing a successful MFM program extension using telemedicine and remote ultrasound imaging. This planning grant was designed to determine the feasibility of such a program and to outline the criteria necessary for its implementation.

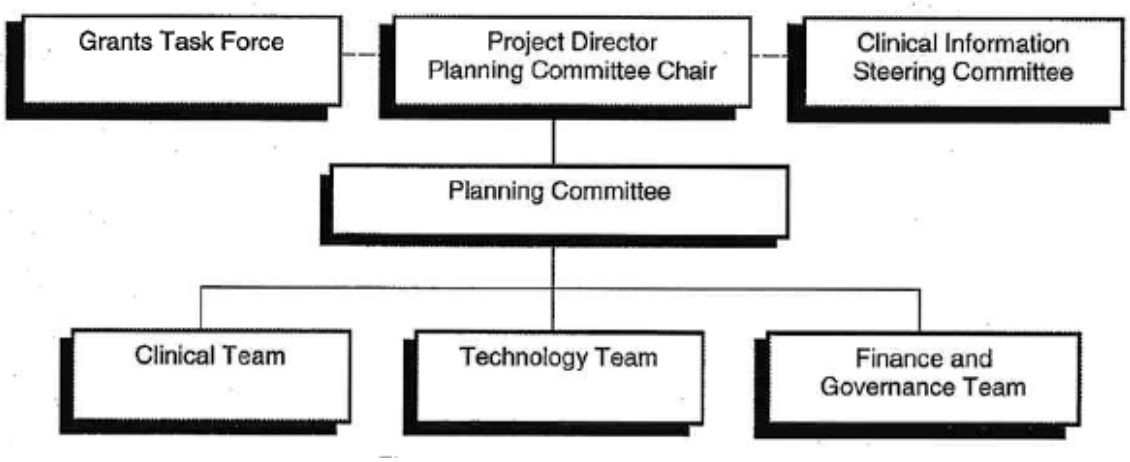
IV. METHODS:

The project was consistent with goals established by the hospital's 2002 strategic plan, which included a commitment to further advance information technology and begin development of an electronic medical record. This plan also included the establishment of a Clinical Information Steering Committee and a 3-year tactical plan for implementation. Activities related to the project were overseen by Woman's Hospital External Funding Committee, which ensures that any grants awarded to the Hospital receives full administrative support and the resources needed for compliant and timely completion. The committee, chaired by the Hospital's Vice President of Operation, includes several key members of the project's staff, including the Project Manager. The status of the project was reviewed at each monthly meeting of this committee to ensure that any issues received the highest level of support and problem resolution.

Study Design:

The project relied on a multidisciplinary and collaborative effort across partners, with comparable participation from all three. Work effort was distributed across three teams with equal representation from all partners. These teams reflected the broad scope of the project parameters: the clinical team, the technology, team and the finance team, and all three addressed issues related to governance at various stages of the project. The Woman's Hospital's Chief Strategist, who was selected as the initial Project Manager, relocated several months into the project and was replaced by the hospital's Grants Administrator for the remainder of the project. The Project Manager was responsible for facilitating meetings, helping committee members reach consensus, identifying and minimizing barriers to the success of the project, and helping teams achieve goals and tasks to meet required deadlines.

PROJECT ORGANIZATION



The Project Manager was also chair of the Planning Committee, leading all quarterly Planning Meetings, which involved Woman's Hospital and its partners and served as the forum for team reports and updates. The Planning Committee consisted of eight members with representation from Woman's Hospital and its two partners. In addition to the Project Manager, membership from Woman's Hospital included the Medical Director of the Woman's Hospital Maternal Fetal Medicine Center; the Vice President of Diversified Services, of which the MFM Center is a part; and the Vice President and Chief Information Officer. Thibodaux Regional Medical Center representation came from the Chief Operating Officer, the Director of Radiology, and the Chief Information Officer. Representation from Women and Children's Hospital, Lake Charles, was provided by the Chief Nursing Officer, the Director of Information Systems, and the Nurse Clinician for the MFM Clinic.

The three teams identified above were originally led by Woman's Hospital members of the Planning Committee. As the project developed, the leadership was modified to better reflect the responsibilities assumed by the partners, to more evenly distribute workload and participation and to more fully support the accomplishment of specific goals and subsequent implementation plans. With this change, the clinical team leadership was provided by the Chief Nursing Officer of Women and Children's Hospital, Lake Charles; the technology team, by the Chief Information Officer of Thibodaux Regional Medical Center; and the finance team, by the Vice President of Diversified Services of Woman's Hospital. Each team leader and their group members were responsible for addressing the issues defined in the basic project parameters (see section II, Purpose, Specific Goals), identifying additional areas to be addressed, gathering information, and recommending solutions. The team leaders were also responsible for facilitating group processes and progress and timely completion of tasks, with assistance as needed from the Project Director. Leaders reported on the progress of their group at each of four Planning Meetings. Between Planning Meetings, each of the three teams communicated primarily through conference calls, teleconferences, and email. However, site visits to other

healthcare facilities, either utilizing telemedicine clinical services or developing this capability, included the University of Arkansas ANGELS Program and Tulane University. The University of Maryland was consulted via telephone conferences. To further facilitate planning, communication between teams became paramount, particularly in the latter stages of the project. This was accomplished not only through the methods described above but also through site visits between partners.

In addition to the Medical Director of the MFM Center, other clinical physicians provided input on the design of specific technology developed in the project. This physician group worked closely with the Information Systems staff at Woman's Hospital and the partner hospitals, acting as a sounding board for the development of the electronic consult and ultrasound imaging transmission.

Dr. Jane Khoury, Assistant Professor, University of Cincinnati, Division of Epidemiology and Biostatistics, served on the Planning Committee to identify issues related to the measurement of clinical outcomes. Dr. Khoury and Dr. Jaekle, Medical Director of the MFM Center, built on past collaborations at the University of Cincinnati to identify specific measures of maternal and infant health and ensure that the data elements required for outcomes measurements were included in the identification of information needs. Dr. Khoury worked with the clinical team to design a randomized controlled clinical trial to evaluate the effectiveness of "technology-assisted care." This included identifying outcomes measurements to evaluate the efficacy of remote ultrasound examination and consultative services, developing a tool for measuring patient and physician satisfaction with telemedicine services, and conducting a Woman's Hospital IRB-approved pilot study to evaluate the clinical trial design.

Data Collection and Measures:

A pilot study was designed to assess survey methodology for evaluating remote imaging in a clinical setting. Because of time limitations in the grant period, a shortened version of the Woman's Hospital established patient satisfaction survey was employed. The purpose of the study was to determine whether or not there were differences between surveys administered by caregivers and non-caregivers. The surveys were administered to patients receiving remote ultrasound physician consultation through the Woman's Hospital's MFM Center in-hospital telemedicine service already in place. The pilot study was a randomized controlled study of 50 patient surveys administered over a 9-month period. Demographic patient data as well as survey responses were collected on each patient participating in the study. These data were sent to Dr. Khoury, who analyzed and reported the results at the final Planning Meeting in May 2005.

Additionally, each partner hospital completed a survey designed by Dr. Khoury to determine which predetermined clinical outcomes measures could be collected from the information systems of all three partners. These data were collected to identify which clinical metrics could be used to assess the impact of telemedicine on maternal-fetal outcomes. Dr. Khoury analyzed and presented the results of her findings at the final Planning Meeting. She also analyzed 1 clinical year of retrospective clinical discharge data from the Woman's Hospital

information system to assess the quality of the data and to determine if there were any inherent biases present.

Limitations, Interventions and Opportunities:

The impact of Hurricane Katrina and Hurricane Rita affected all three partners. During Hurricane Katrina, Woman's Hospital acted as the "clearinghouse" for all mothers and infants evacuated from New Orleans, triaging patients to various hospitals throughout the state, including partner hospitals, and to selected locations out of state. The most seriously ill infants remained at Woman's Hospital. Hurricane Rita had a devastating impact on Women and Children's Hospital in Lake Charles, which resulted in MFM staff triaging patients at that facility and air transporting the more seriously ill to Woman's Hospital. Despite the physical damage to the Lake Charles Hospital and the lack of available staff, this small hospital operated as the only emergency hospital in Southwest Louisiana for several weeks.

The hurricanes clearly presented obstacles to the project: the increased clinical volume at Woman's Hospital (which still continues due to relocation of the New Orleans population to Baton Rouge and surrounding areas) drained or redirected technical and manpower resources for many months. This, along with the physical damage to the partner hospitals and lost staff, required that the project be place on hold until necessary resources were again available. However, during this time it became clear to all involved that Woman's Hospital would play an increasing role in the health and well-being of mothers and infants in Louisiana and that telemedicine capability among the partner hospitals would have been invaluable during the hurricanes. Remote, real-time ultrasound imaging and videoconferencing would have facilitated the triage process, provided additional information for clinical decision making for evacuation, and allowed the MFM Center staff to provide more support to the clinical staff at the partner hospitals for patient management. Not only did the clinical staff recognize this, but Tandberg, the manufacturer of the telemedicine equipment that had been selected by the clinical and technical teams on the project, also recognized this need. As a result, the company loaned the partnership three videoconferencing units for 4 months in order to trial-test remote ultrasound imaging using existing ultrasound equipment at each institution. This proved to be invaluable to the project.

Technical capabilities, both in terms of equipment and technical expertise, varied widely, and one of the partners was limited by the proprietary constraints of their parent company. This meant that each technical hurdle might require more than one solution. This was particularly apparent in addressing an electronic consult system that would allow physicians at partner hospitals to *electronically* request MFM consults, abstract patient data from the hospital information system, and electronically send it to the MFM staff. The need for proof of concept was apparent; although the project became more technically hands on than originally intended, the technical solutions for both the electronic consult and the remote ultrasound imaging truly work.

V. RESULTS

Principal Findings:

Through the planning process, we identified and addressed the major obstacles to the telemedicine clinical consult service:

- **Clinical Barriers:**

  1) Differing views among partners about appropriate use of remote MFM consult services: A consensus was reached that services would be used only in emergency situations or as routine follow-up only, to free up space to allow a new patient to be seen at the next onsite clinic.
  2) Inconsistent referring physicians' acceptance of remote MFM services: To address concerns voiced by referring physicians, telemedicine services would be used to complement, not replace, existing in-person visits. Policies and procedures were designed to encourage contacts via electronic consultation while continuing to support consultation via the existing 800 number.
  3) Training needs conflicted with partner staffing needs: Training policies were designed so that one person at each partner hospital would be designated the Telemedicine Coordinator. He/she would be trained by Woman's Hospital staff and be responsible for training and maintaining skill levels of his/her staff.
  4) Availability of 24/7 coverage: Woman's Hospital currently provides in-house 24/7 coverage. Partner Hospitals would provide on-call staff.

- **Technical Barriers:**

  1) Disparities among partners' technical expertise: Experience during trial testing of remote ultrasound imaging demonstrated that gaps in technical expertise could be remedied through Woman's Hospital IT staff site visits.
  2) Proprietary limitations to technology solutions for transmitting patient data: Women and Children's Hospital, Lake Charles, is an HCA hospital, and we were unable in the short time available to get permission to break through their internet firewall. Our only option was to use a broadband (cable – at 1.5 mbps) internet connection back to Woman's Hospital in Baton Rouge. Normally, we would set up a connection with guaranteed bandwidth.

     We used Tandberg videoconferencing equipment attached to the Siemens Acuson ultrasound equipment with S-video analog input. The analog-to-digital conversion degrades the image quality. The audio/video is encrypted via the Tandberg equipment.
  3) HIPPA constraints to transmitting patient data: In videoconferencing and image transmission, patient data are protected via the encryption on the Tandberg equipment. In the electronic consult, the request is created by a Meditech custom NPR report that uses an encrypted fax program to fax the request for a consult to the Woman's Hospital MFM Center.

4) Inadequate ultrasound image acuity from analog output ultrasound machines: The Tandberg units accept various types of input from an analog S-video to a digital VGX. We found the VGX output on the GE ultrasound system at Thibodaux Regional Medical Center to be far superior to the analog output on the Siemens ultrasound equipment. Although Siemens claimed to have a VGX output, it did not function; in working with the Siemens service technicians, we were able to prove this. Siemens has no solution to the digital signal problems at this time.

- **Financial Barriers:**

1) Inconsistent coverage of telemedicine services by third-party payors: A finance team survey of all major HMOs indicated that two thirds reimburse for telemedicine services at the same level as face-to-face encounters. Others were uncertain. Louisiana law seems to require that telemedicine services are covered similar to that of a face-to-face encounter.
2) Undefined billing policies: Consensus was reached among partners that telemedicine billing procedures would continue with the existing clinic model: as a flat rate. Partners will manage claims and reimbursement from third-party payors.
3) Equipment cost: Partner hospitals do not have the financial resources to purchase videoconferencing equipment. Alternative funding will need to be located through state or private funding sources. The estimate of the total cost of equipment for the partnership is $150,000, if Siemens can address the video digital output inoperability of their ultrasound units.
4) Internet access costs: Internet connections using the public network would be the least expensive approach, ranging from $400 to $800 per month. Private networking options range from $900 to $2000 per month. Connection fees can be waved with long-term agreements of 2 to 5 years. Connectivity equipment will cost approximately $1000 per location, excluding labor for site surveys and wiring.

- **Research Barriers:**

1) Identification of reliable clinical outcomes measurements that could be collected from all three partners without requiring a medical record review: A number of maternal demographic, health and pregnancy, and neonatal outcomes measures were identified by the clinical team and Dr. Khoury. These variables were identified as sensitive to global clinical improvement so that they could be used to evaluate the impact of telemedicine. It was required that these variables be easily extracted from current electronically available databases within each hospital information system and recorded in the same or very similar way at each partner hospital.
2) Identification of a reliable patient satisfaction survey tool that would also meet the reading levels of rural populations: Review of various survey tools and

collaboration with researchers at the University of Michigan resulted in the development of a survey tool specific to this project.

3) The needs of survey data collection interfered with caregiver responsibilities: The pilot survey study established that no differences were detected in the results of surveys administered by caregiver versus non-caregiver; therefore, patient satisfaction surveys could be administered by non-caregivers.

Outcomes:

- **Policies and Procedures for the Telemedicine Service:**
  The establishment of a Memorandum of Understanding (MOU) with the University of Arkansas' ANGELS (Antenatal and Neonatal Guidelines, Education and Learning Systems) program provided for the use of the ANGELS policies and procedures as a template for the development of policies and procedures for the Woman's Hospital telemedicine service. Through a series of conference calls among team members and selected ANGELS staff members, a full set of telemedicine procedures was developed. These are available from AHRQ upon request.

- **Electronic Consult System – Proof of Concept:**
  With input from the MFM physicians, an electronic consult form was created that employed the report writer software utilized by each hospital's health information system (i.e. Meditech NPR), which would allow the electronic signature of a requesting physician. The electronic consult system was designed so that, after the form was created, a digital fax would be sent to Woman's Hospital MFM Center to be reviewed and acted upon. The use of an encrypted fax program satisfied HIPAA requirements.

- **Selection of videoconferencing equipment and determination of internet protocols (IP):**
  After investigating several commercially available videoconferencing systems as well as a system in development at Tulane University, the technology team selected the Tandberg 990 MXP set top unit with a mobile medical cart. The team determined that an IP-based system provided better control, used digital encryption, and allowed the use of the internet for data transmission.
- **Real-time diagnostic ultrasound image transmission – Proof of Concept**
  The technology team was able to successfully transmit an image from Women and Children's Hospital, Lake Charles, to Woman's Hospital in Baton Rouge. Soon after, an image from Thibodaux Regional Medical Center to Woman's Hospital was successfully transmitted and, by taking advantage of the digital output from the GE ultrasound unit at that location, proved to be an approximately 80% improvement over the image from the Lake Charles partner.

- **Patient Satisfaction Survey Tool (Addendum 1):**

    4) Members of the clinical team worked with researchers at the University of Michigan, using the American Customer Satisfaction Index (ACSI) survey methodology to modify and adapt their survey tool to this project. This survey tool has been in use for approximately 10 years by various entities, including Veterans Administration hospitals. Though the modified survey has not yet been trial-tested for this project, an advantage of this approach is the ability to benchmark findings to satisfaction scores achieved by other healthcare organizations that also have used it. The project-specific survey tool is available from AHRQ upon request.

- **Identification of Clinical Outcomes Measurements:**
  Each partner hospital was sent an Excel file that contained all of the potential variables that could measure the impact of telemedicine on clinical outcomes. The availability of each variable was recorded as either currently available electronically or only available through chart review. A summary of the variables and their availability status at all three hospitals is shown in Table 1.

Conclusions, Significance and Implications:

The Specific Aims of this Planning Grant were accomplished. Though Hurricanes Katrina and Rita resulted in delays in the planning process, they, along with the leadership role assumed by Woman's Hospital during the storms, made clear the critical role that telemedicine could have played in these disasters. This realization provided the partnership with the opportunity to achieve an additional milestone: trial-testing of remote, real-time image transmission among partners. This testing and the efforts related to the electronic consult clarified the technical and manpower readiness of the partners and provided the basis for establishing a future telemedicine service. From this and the other activities of the planning process we learned

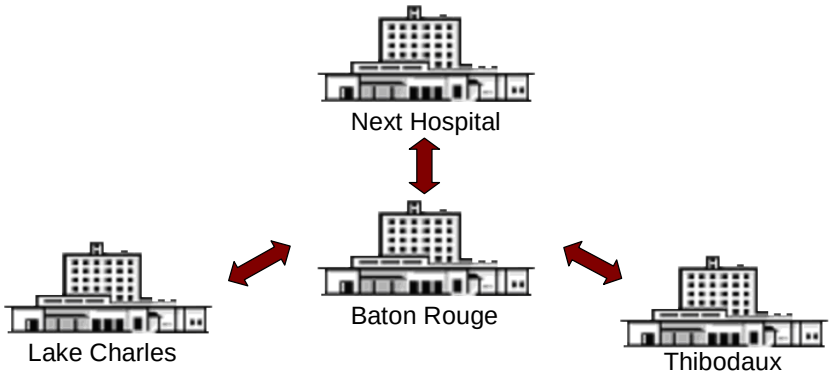
1) that plans must be built on *tested* ideas and solutions, not on inspired concepts;
2) that digital video ultrasound output and bandwidth play a key role in the resolution of a transmitted ultrasound image;
3) that disparities in technical readiness can be overcome through site visits by Woman's Hospital IS staff;
4) that proprietary obstacles can be overcome;
5) that acceptance of telemedicine by referring physicians can be achieved by listening to and respecting their concerns and by making clear that telemedicine is a support to their practice, not a replacement;
6) that costs related to equipment acquisition and possibly internet access will require additional outside funding, particularly for the partner hospitals;

7) that third-party payor coverage concerns may not be as significant as originally considered;
8) that other institutions, particularly major medical centers, are pushing for the integration of ob/gyn telemedicine care to rural locations and discussions of establishing a network of ob/gyn telemedicine providers are in the early stages;
9) that a survey tool that is reliable, that provides useful and usable patient and physician satisfaction data, and that can be accepted by those with a 3rd to 8th grade level of education or less is still developmental;
10) that clinical outcomes measures common to three very disparate hospitals can be identified;
11) that, despite the number, most obstacles were overcome; and
12) that partner buy-in to the value and benefits of telemedicine increased as the planning process evolved, so that, after funding is identified, the telemedicine service can be established.

APPENDIX 1

Electronic Physician Consult System

Process Map



Local Provider Request Consult

Fills out Consult Document

* Meditech's Form A
* Web Portal
* Manual Form

Faxed
FTP'd

Returned
Protocol from Consult Document

MFM Provider – Baton Rouge

Receives & Logs Consult Document

* Log Document
* Contact MFM Provider
* Acknowledge Request to Local Provider

Table 1

Outcomes Data Survey for Partner Hospitals

Maternal demographic and health variables	Variable Subsets	All 3
Year of delivery		Yes
Seen by MFM		Yes
ICD discharge codes		Yes
Age		Yes
Race/ethnicity		Yes
Smoking		No
Alcohol abuse		No
Drug abuse		No
Prenatal care	none	No
	week begun	No
Insurance status (Medicaid, private, none)		Yes
Hypertension	chronic	Yes
	pregnancy-induced	Yes
	pre-eclampsia	Yes
	toxemia	Yes
	HELLP syndrome	Yes
Diabetes	type 1	Yes
	type 2	Yes
	pre-gestational	Yes
	gestational	Yes
	White class	No
Kidney disease – diabetic nephropathy		Yes
Eye disease – diabetic retinopathy		Yes
Heart disease		Yes
Hyperemesis		Yes
Pre-delivery hospital length of stay		Yes
Maternal pregnancy outcome		
Premature labor		Yes
Premature rupture of membranes		Yes
Labor	spontaneous	No
	induced	No
	stimulated	No
	none	No
Length of labor	1st stage	No
	2nd stage	No
	3rd stage	No
	total	No
Anesthesia	none	No
	epidural	No
	spinal	No
	other	No

Table 1
Outcomes Data Survey for Partner Hospitals -Continued

Maternal Pregnancy Outcome -Continued	Variable Subsets	All 3
Type of delivery	c-section	Yes
	vaginal - spontaneous	Yes
	vaginal - forceps	Yes
	vaginal - other	Yes
Gestation at delivery	from LMP	No
	by examination	No
	by sonogram	No
Fetal distress		Yes
Placental abruption		Yes
Multiple gestation – number of fetuses		Yes
Antepartum hemorrhage		Yes
Post-partum length of stay		Yes
Maternal death		Yes
Stillbirth		Yes
Neonatal outcome		
ICD discharge codes		Yes
Weight at delivery		Yes
Length at delivery		No
Head circumference at delivery		No
Race/ethnicity		Yes
Gender		Yes
Neonatal death		Yes
Major congenital malformation		Yes
Respiratory distress		Yes
Hypoglycemia	yes / no	Yes
	glucose level within 4 hours of life	No
Jaundice/hyperbilirubinemia	yes / no	Yes
	highest bilirubin level	No
Pneumonia		Yes
Periventricular hemorrhage	yes / no	Yes
	level	No
Intracranial hemorrhage		Yes
Necrotizing enterocolitis		Yes
Gestational age by examination		No
APGAR score	1 minute	No
	5 minute	No
Total length of stay	hours	Yes
Hours in neonatal intensive care unit		No
Hours in step-down nursery		No