A PERSONAL PRENATAL HEALTH RECORD FOR A CULTURALLY DIVERSE URBAN COMMUNITY

By Michael R. Berman, M.D., FACOG

A CAPSTONE PROJECT

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CERTIFICATE OF APPROVAL

This is to certify that the Master's Capstone Project of

Michael R. Berman, M.D.

A Personal Prenatal Health Record for
a Medically Underserved, Urban Community

Has been approved

Michael Chiang, M.D.
Capstone Advisor

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ABSTRACT

This paper describes a unique, new software program: a portable, secure and interactive electronic personal health record, designed specifically for pregnant women in underserved, urban communities. Many women in urban, underserved communities do not have readily accessible and continuous access to pre-natal care, may get fragmented care at multiple facilities ("unregistered" patients) and may present to a provider in one or more of those facilities who is unfamiliar with her health history, family history and her prior physical examinations and findings, knowledge of which would contribute to a higher quality and safer prenatal visit / encounter. A portable, mobile, secure and interactive personal health record, designed specifically for pregnant women could replace the commonly used handwritten "paper card" format to record pre-natal care information. Such a card carried by the patient, sometimes referred to as a "Pregnancy Passport," is sub-optimal in today's contemporary healthcare and health information technology environment. A readily available Internet-based program / mobile smart phone / tablet application to collect, store and access personal prenatal healthcare information, designed specifically for the target population, could improve the quality of the point-of-service encounter for transient and "unregistered" patients arriving for pregnancy related care. As perinatal morbidity, mortality and prematurity rates are higher in urban, underserved, minority communities, it should be prudent to utilize the many advantages of health information technologies to improve storage, access and retrieval to this important information as well as disseminate pregnancy related information based on decision support algorithms and the users' current needs. Central to this project is the interface design including the web-portal, the development of the code

and the design of the SQL database.

As this project is a new software platform, an evaluation to determine the optimal usability of the interface/portal, input modules, information retrieval modules, reliability of the database and queries, the extent of multi-browser support, and appropriate security controls were carried out. The usability of the program was evaluated using a 10 question, Likert scale survey. Obstetrics and Gynecology House staff, Nurse Mid-Wives, and a Nurse Practitioner practicing in an urban University Teaching Hospital were asked to review the program and complete the survey. The results of the survey were over all positive and encouraging.

The project is an exercise in computer programming, SQL database development, usability testing, website (portal) design and evaluation, and ultimately a beta implementation into a community health network of pregnant women and their providers. The acceptance of the program designed for the project into the community, albeit limited in scope, was positive. Outcome studies on maternal and fetal benefits are lengthy in time and not within the scope of this Capstone Project but will be considered as successive iterations of the application are rolled out further into the community.

INTRODUCTION

Background

Many women in urban, underserved communities do not have readily accessible and continuous access to pre-natal care, may get fragmented care at multiple facilities ("unregistered" patients) and may lack a primary pre-natal healthcare provider who is familiar with the patient, her health history and family history, her prior physical examinations and her laboratory/Ultrasound findings. Providers of care to pregnant women in urban settings often see patients in an emergency setting such as the labor floor or emergency room without access to prenatal visit information such as their pregnancy / medical history, prior examinations and laboratory and imaging findings. This renders the emergency visit suboptimal and oftentimes unsafe. Thus, there is a need for a reliable and immediately available prenatal health record in order to provide improved quality of the prenatal visit.

The research problem of this project examines whether a new website and software program, easily useable and always accessible as a mobile, Internet-based application, intended for a specific target population of urban underserved pregnant women, can be designed to collect, store and permit access to personal prenatal healthcare information so as to improve the quality of the point-of-service encounter for transient and "unregistered" patients arriving for pregnancy related care. Such a program must be designed to be culturally and health-literacy appropriate, and be shown to be more effective than current attempts for target population to arrive at a healthcare facility with their pre-natal information; i.e. paper card. (Appendix A) Furthermore, it must be accepted by providers and patients alike, and render value in providing improved prenatal care in an effort to improve the health of their pregnancy.

This program, entitled *Ombudu:prenatal*©[1] is a pregnancy-specific electronic *Prenatal Personal Health Record* (PPHR). "An electronic Personal Health Record (PHR) is a universally accessible, layperson comprehensible, lifelong tool for managing relevant health information, promoting health maintenance and assisting with chronic disease management via an interactive, common data set of electronic health information and e-health tools."[2] Among the issues that drive the need for a PHR program designed specifically for pregnant women include:

1. Higher rates of perinatal morbidity, mortality and prematurity in urban, underserved, minority communities
2. Coincident disparities in access to prenatal healthcare services and access to and use of available health information technologies. (This division becomes particularly concerning as health information technologies play a greater role in the personal health of the patient / consumer in the general population.)
3. An outdated currently utilized "paper chart format" for maintaining pre-natal care information ("Pregnancy Passport")
4. A compelling need to address and improve compliance with accepted prenatal care standards and procedures and patient education needs via the use of innovative, multiple platforms and approaches

Among the many contemporary tenets incorporated in a "Digital Health" milieu, two are overarching: a persistence of what has been called the "digital divide" and an available, accessible and widely accepted "patient-centered record" that goes "everywhere the patient goes."[3] Detmer et al[4] have proposed a concise yet elegant

characterization of what is the "digital divide." They define the digital divide as the disparity between those with and those without "the ability to effectively use digital information technology." Major contributors to the digital divide include:

- Racial and social disparities
- Heath illiteracy
- Special needs
- Lack of financial resources for health care safety net organizations [3]

And although there has been "concern over this form of inequality" since 1995 "when just 3 percent of Americans had ever used the World Wide Web (Pew Center 1995)," Dimaggio and Hargittai proposed that there remain a continuing and expanded focus on the "Digital Divide between 'haves' and 'have-nots' (or between users and non-users)" and this should include attention to a "full range of digital inequality in equipment, autonomy, skill, support, and scope of use among people who are already on-line."[5] A current (2014) review of twenty-five years of the internet has documented a significant increase in availability and use of the Internet for all users (Figure 1).[6]

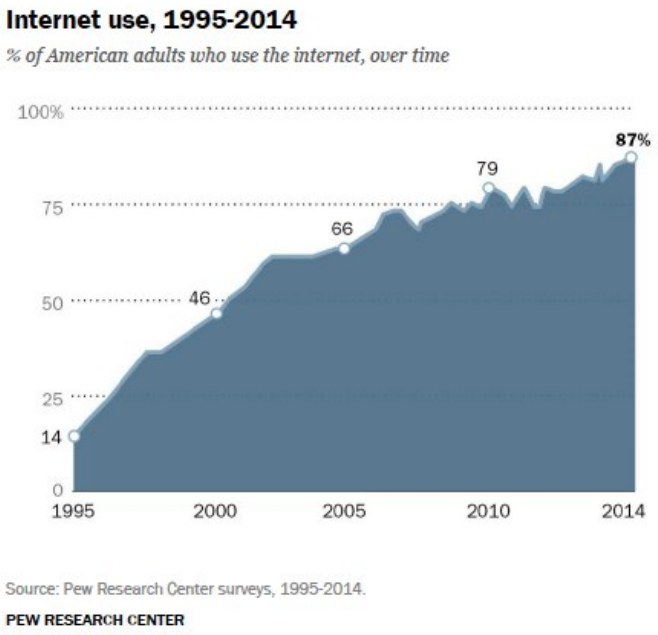


Figure 1. Availability and use of the Internet

Results from 2014 survey by the Pew Research Center describe current use / adoption rates as:

> "87% of American adults now use the internet, with near-saturation usage among those living in households earning $75,000 or more (99%), young adults ages 18-29 (97%), and those with college degrees (97%). Fully 68% of adults connect to the internet with mobile devices like smartphones or tablet computers."

Yet, further analysis of this data reveals a decreased use of Internet technologies among several population subsets: those of lower grade levels of education, lower incomes and those of Hispanic and African American Race / Ethnicities (Figure 2) .[6]

Among adults, the % who use computers at workplace, school, home, elsewhere

		Use computers
	All adults	**81%**
	Sex	
a	Men	80
b	Women	81
	Race/ethnicity	
a	White	83[c]
b	African-American*	77
c	Hispanic	71
	Age group	
a	18-29	89[d]
b	30-49	86[d]
c	50-64	84[d]
d	65+	56
	Education level	
a	High school grad or less	66
b	Some college	89[a]
c	College+	94[ab]
	Household income	
a	Less than $30,000/yr	65
b	$30,000-$49,999	84[a]
c	$50,000-$74,999	92[ab]
d	$75,000+	96[abc]
	Community type	
a	Urban	81
b	Suburban	81
c	Rural	79

Source, Pew Research Center Internet Project Survey, January 9-12, 2014. N=1,006 adults.
Note: Percentages marked with a superscript letter (e.g., [a]) indicate a statistically significant difference between that row and the row designated by that superscript letter, among categories of each demographic characteristic (e.g., age).
* n=94 for African-Americans

PEW RESEARCH CENTER

Figure 2. Pew Research Internet Survey

Analyses of Perinatal Morbidity and Mortality rates reveal a parallel disparity among divergent populations, particularly African Americans.[7] Conclusive explanations for these disparities are not clear, but one factor that may contribute to better pregnancy outcomes is the availability, utilization and timing of prenatal care[8] (Figures 3,4). "Lack of adherence to prenatal care schedules in vulnerable, hard to reach, urban, poor women is associated with high infant mortality, particularly for women who abuse substances,

are homeless, or live in communities having high poverty and high infant mortality".[9] Handler has proposed that "if all women of all racial/ethnic groups have access to early and excellent high quality prenatal care, there will be an impact on infant mortality by a:

- Reduction in behavioral risks (e.g. smoking, alcohol, substance abuse, appropriate weight gain)
- Reduction in the impact of pre-existing morbidities
- The provision of social support to reduce stress
- Linkage to high-risk delivery system and appropriate levels of care for delivery
- Linkage to postpartum care, inter-conception care, family planning [10]

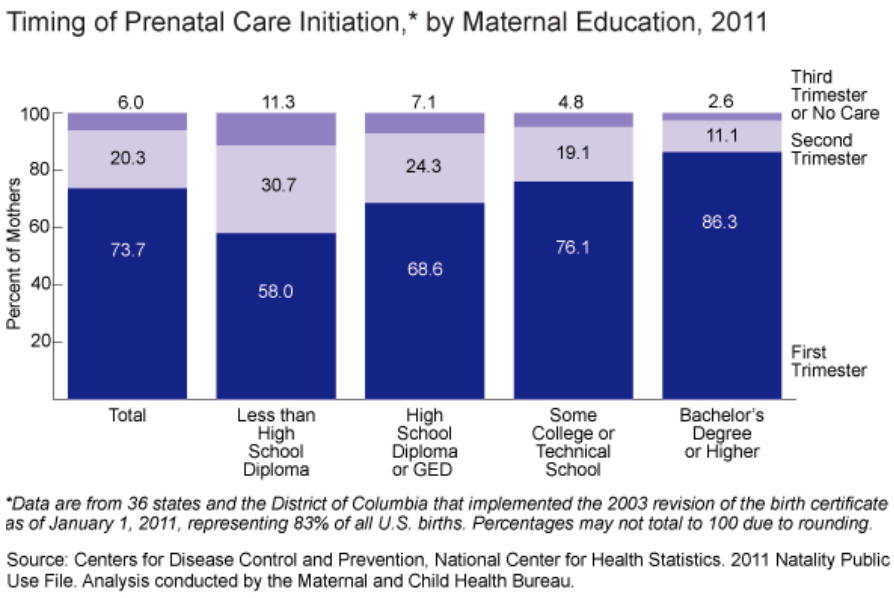


Figure 3. Timing of Prenatal Care Initiation

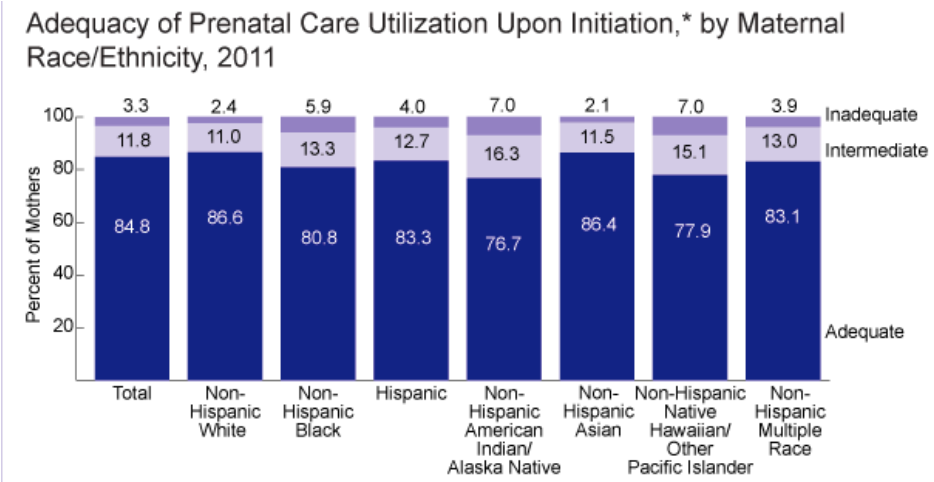


Figure 4. Adequacy of Prenatal Care by Maternal Race / Ethnicity, 2011

Operational Framework

The *operational framework* of this PPHR project that addresses the aforementioned issues requires the design and development of an easily useable web interface / portal that is specific for the needs of the target population, a knowledge by the designer of the content requirements for the program, a cognizance of the optimal work flow for the providers of pre-natal care, a structured query language / relational database program, MySql[11], form / interface-PHP Hypertext Preprocessor (PHP)[12] to the database, and algorithms and calculations for date calculations and decision support. The programming architecture that will be subsequently described is hosted on a Secure Socket Layer (SSL) Server, with 128 bit encryption. The program is designed for use by the general public without a "business association" with a "covered entity," thus obviating the need for HIPAA compliance. However, although HIPAA rules do not

apply to the general program, the usability testing of the program in a hospital and outpatient setting for this *capstone project* requires careful and full compliance with HIPAA regulations. Thus, patient identifiers are not utilized and the users of the program are entirely anonymous and the information is inaccessible to all but the users themselves.

Research Framework

The *research framework* of evaluation and assessment that this project represents is important, for a review of the availability of current programs and applications specific to the purpose of this PPHR reveals a limited number of specific programs to address the stated problems.[13] There is however a large body of research regarding the implementation and evaluation of Electronic Medical Records (EMRs) and their components such as data entry and retrieval, computerized provider order entry (CPOE) and clinical decision support (CDS).[14] There is also an abundance of research and evidenced – based literature about the implementation and use of Personal Health Records,[15] the digital divide [16] and the incidence of perinatal mortality and morbidity in urban populations.[17] Thus, as the scope of the problem for accessibility and quality of prenatal care is of importance to the target population,[18,19] new paradigms and interventions for the care of this population become increasingly more pertinent.

Lay Language Summary[20]

To best describe this project to the lay person (Readability Method used: Flesch-Kincaid (English). Flesch-Kincaid Grade level: 8-9 Flesch-Kincaid Reading Ease score: 61), the following summary was developed:

The purpose of this project is to determine if a personal online prenatal health record can help women who are pregnant get better pre natal health care. Some pregnant women do not go to the same clinic or hospital for each of their visits. This is common in an urban setting. It is very important to have all of the pre natal care records for a patient available when a doctor sees a pregnant woman for her visit. This project will make it very easy for the patient and her doctor to have all of her records, all the time. The project uses the Internet to get the information and store it online. The patient can add her own prenatal medical history and the healthcare provider can add the findings at the time of the visits. The program can be used on a computer or a smart cell phone or tablet. The information is safe. Only the patient can get or give permission to get the chart information. The program should help the patient get the best care for her and her baby. The project evaluation study has two types of subjects: a patient subject and a doctor nurse mid wife subject. The leader of the project team is a doctor who takes care of pregnant women. The doctor works with a team of other doctors. The doctor will ask 5 other doctors and nurse mid wife subjects, who take care of pregnant patients and work at a large city hospital, to use the program. The doctors and nurse mid wife subjects will ask their patients if they want to use this program for a 2 months test time. The pregnant patient subjects will need to have a computer or a smart phone. The pregnant patient subjects will be shown how to use the program. They will be shown how to add their medical history to their chart and how they can get to the information that is in their chart. The doctor and the nurse mid wife subjects will also be shown how to add the examination findings. The program will be tested and used in the office /clinic setting and on the labor floor. Both the doctor and the nurse mid wife subjects and the patient subjects will be

asked to report how they feel about using the program. The subjects will be asked to rank their answers. The questions will ask the subjects how easy the program is to use, if it was helpful, if they felt comfortable using it and do they think it improved their care. The doctor nurse mid wife subjects will be asked similar questions. There will also be focus groups to further discuss the program and get more ideas about how the program helped or did not help the users. The director of the project will observe the subjects using the system. The answers to the questions will be reviewed. Results from the focus group(s) discussions will be reviewed. Suggestions from the subjects about how the program works and how the users like the program will be evaluated. The program may then be changed using these suggestions. The answers to the questions for the project should help determine if the program will help improve pre natal health care and learning.

Terms

A, Personal Health Record

"An electronic Personal Health Record ("PHR") is a universally accessible, layperson comprehensible, lifelong tool for managing relevant health information, promoting health maintenance and assisting with chronic disease management via an interactive, common data set of electronic health information and e-health tools.[21]

B. Disparities in Access to Healthcare and HIT i.e. Digital Divide

The digital divide can been defined as "the gap in making use of opportunities available from the digital revolution due to insufficient access, capacity, and content. "[22] Despite increasing Internet availability, racial/ethnic minority patients adopted a PHR less frequently than white patients [23] "Healthcare

disparity exists when there is unequal access to health information or treatment and prevention services, but there is a presumably equal or demonstrably greater clinical need for them." [24]

C. Perinatal Morbidity and Mortality

Perinatal moribidity- a complication or abnormal condition of the newborn which occurs as a result of complications of the fetus during the pregnancy and/or the infant during the first 28 days of life

Perinatal mortality-fetal or neonatal death from 20 weeks of gestation through the first 28 days of neonatal life

Critical Assumptions for the Program

1. Access to this proposed technology will make a significant difference in pregnancy care and outcomes. [14]
2. Patients in the target population will be willing to use this program.
3. Providers providing care to the target population will be willing to participate.
4. Patients will have the tools to utilize the program(s).
    i. Internet access
    ii. Desk top / laptop computers
    iii. Smart phones / Tablets
5. Program will be understandable and useable ("user-friendly")
    i. A need to utilize appropriate Health literacy level (8^{th} - 10^{th} grade level)
    ii. Multinational Language(s) support
        a. English, Spanish, Asian
        b. Help and readily available support

MATERIALS AND METHODS

Research Problem

Pregnant patients in urban, underserved areas may obtain fragmented prenatal care at multiple sites with multiple providers without access to continuous prenatal health records. A readily available Internet-based program / mobile smart phone / tablet application to collect, store and access personal prenatal healthcare information, designed specifically for the target population, can improve the quality of the point-of-service encounter for transient and "unregistered" patients arriving for pregnancy related care.

Sub problems

1. There are definable disparities in access to healthcare services which need to be addressed.

    1.1. Justification: There is a significant increased incidence of prematurity and high perinatal morbidity and mortality rates in urban, underserved, minority communities (the target population).

2. Coincident with disparities in access to prenatal healthcare services are identifiable disparities in access to and use of available health information technologies**.** This division becomes particularly concerning as health information technologies play a greater role in the personal health of the patient / consumer.

    2.1. Justification: There is a lingering prevalence of the "digital divide" and a continuing albeit urgent need to address this.

3. Arrival at an Emergency room or labor floor unregistered / unknown without the availability of accurate prenatal care data is unsafe.

3.1. Justification: This is a very common problem in urban hospitals including those with already established Electronic Medical Records.

4. A portable, secure and interactive personal health record, designed specifically for pregnant women in underserved, urban communities is needed.

4.1. Justification: The current commonly used "paper chart format" for pre-natal care information (e.g. a "Pregnancy Passport") is outdated in today's contemporary healthcare environment.

4.2. Justification: There are currently available enterprise systems for PHR's (for example MyChart ® Epic Systems Corporation[25]) and ongoing efforts to connect disparate systems via Health Information Exchanges[26] among unrelated hospitals and medical centers / clinics. However, utilization of these programs is low, expenses are high, interoperability remains a problem and thus expected implementation in urban areas is not imminent. [27]

5. There needs to be improved compliance with accepted prenatal care standards and procedures.

5.1. Justification: Patient education needs to be addressed via multiple platforms and approaches.

Design

The creation of an original computer program to serve as a Personal Health Record requires the study and an understanding of the reasons the program is needed, the workflow of the providers and a knowledge of the programming languages to carry out the needs of the system. This *PPHR*, designed in stages, involves the integration of the elements of:

1. Website design / user interface
2. A robust database
3. An interface between the input forms elements of the portal and the database
4. Algorithms for computation and decision support
5. Data content:
    a. Structured elements such as pregnancy history, prenatal visit findings, demographics, laboratory testing and diagnostic imaging, data collection such as the documentation of fetal kick counts (movements), vital signs, and antepartum testing[28]
    b. Narrative text elements for
        i. Additional information and comments
        ii. Diary/journal narratives
        iii. Contact information / help text boxes
        iv. Resources for patient education and access to prenatal care
6. Integration of all the aforementioned elements into a functional system
7. Login and security
8. Usability evaluation of the PPHR System by

a. Provider

b. User

A. Website Design

It is imperative to design the website using accepted usability guidelines. The concepts developed by Neilson for good website / homepage design were mostly used in the development of this program. These elements, enumerated below form the acronym HOMERUN.[29] Nielsen states that these are the elements most wanted by users of a website:

1. **H**igh Quality content
2. **O**ften Updated
3. **M**inimal download time
4. **E**ase of use
5. **R**elevant to users' needs
6. **U**nique to the online medium
7. **N**et-centric corporate culture

Using these points as a guide, this PPHR design specifically employs many of the elements as suggested Nielsen: [30,31]

i. An original high-resolution logo design which is present in the upper left corner of each web page and contains a link to the home page

ii. A navigation system that is clear, simple and requires only 1 click to destination page.

1. uses links that tell the user where "they've **been**, where they **are**, and where they can **go** (past, present, and future)."[32]

2. Does not use "flashy' cascading style sheet menus (CSS menus)
3. Does use basic html hyperlinks which are multi-browser compatible and useable on mobile device platforms

iii. A tag line to summarize the purpose at the beginning of the site

iv. A clearly marked window title

v. A clear link to a page describing what the website is "About"

1. The site's "top high-priority tasks" are well defined after the login. The login (starting point) is clear for both new users and return users.
2. The link names are self-explanatory.

vi. There is a minimal but meaningful use of graphics.

B. Robust database

The database selected for this project is MySQL,[12] server version:5.1.55 hosted on an Apache/1.3.37 (Unix) web server. This is available as an open source program of the *Yahoo Small Business Services*© as is the phpMyAdmin interface which will be discussed below. "MySQL, the most popular Open Source SQL database management system, is developed, distributed, and supported by Oracle Corporation. MySQL is a relational database and as such stores data in separate tables." The database management used to access databases is controlled by a standardized language, *Structured Query Language(SQL)*.[33] For this project, the SQL statements are embedded into a code (PHP). There are 15 tables which contain the inputted data of the program. There are a total of 175 fields. (Appendix B)

C. The data input, data base storage and data retrieval interface

The data input is processed by PHP code. PHP is a "general-purpose scripting language that is especially suited to server-side web development where PHP generally runs on a web server." The code is interpreted by a web server and the PHP commands can be embedded directly into an HTML source document rather than calling an external file to process data." In this project, it serves as the interface language between the input forms and the MySQL database.[34]

D. Algorithms for computation and decision support

The design of the program requires specific formulas to calculate date differences and algorithms for decision support modules of the program. Furthermore, customization of the PHP and HTML code is necessary to format many of the PPHR program-specific data view result pages into spreadsheet format as well as narrative format. Samples of these calculations and code modifications can be found in Appendix C.

Decision support is an important component for this PPHR. As the ultimate intent of the program is to improve the health and education of the pregnant patient who is the user of the program, decision support algorithms can direct patients to education materials, life style changes and notify them as to when they should call their healthcare provider. The decision support for this PPHR is a basic system of reminders as described by Goodman.[35] The "reminder system" reminds the user to contact her provider when a lab value or symptom complex is abnormal. The PPHR reminder system is activated if a laboratory value such as *hemoglobin* is recorded below a pre-set value. This value is set at 10 gm/dL. Any value reported as less than 10 gm/dL. will trigger an *alert box* which will direct the user to a patient education module about nutrition and anemia in

pregnancy. Other decision support algorithms trigger alerts when users express some concerns when they make an entry into the provided online journal / diary or when they are using a fetal movement counter ("kick-counter") and the number of fetal movements is below the threshold for normal. For example, if the user reports in her diary that she is having some bleeding, she will be prompted to call her provider. Similarly, if the fetal kick count is seven kicks in two hours which is below the threshold of ten kicks in two hours, an alert window would appear to advise the user to contact her provider.

5. Data Content

Most prenatal health records contain standardized data as defined by the American Congress of Obstetricians and Gynecologists.[36] The input forms in this PPHR permit both the user and the provider to enter history, physical findings at each visit, laboratory and imaging results and antenatal testing reports directly into the database for retrieval at a later time. These are archived and always available. The inputted data is also formatted into problem, allergy and medication lists. Screen shots examples of these forms and view screens are found in Appendix D.

6. Integrating the programming code into a functional system

Because this project is an original operational project, it is necessary to uphold the highest standards of integrity and originality in the design of both the website and the programming architecture. Building on a long experience in HTML coding and a newly acquired basic background in JAVA and Database Management obtained through the curriculum of the Masters of Biomedical Informatics Program at Oregon Health and

Science University, the entire code of this PPHR was written using a text editor. This editor is part of the Yahoo Small Business Suite[37] of programs. (Figure 5)

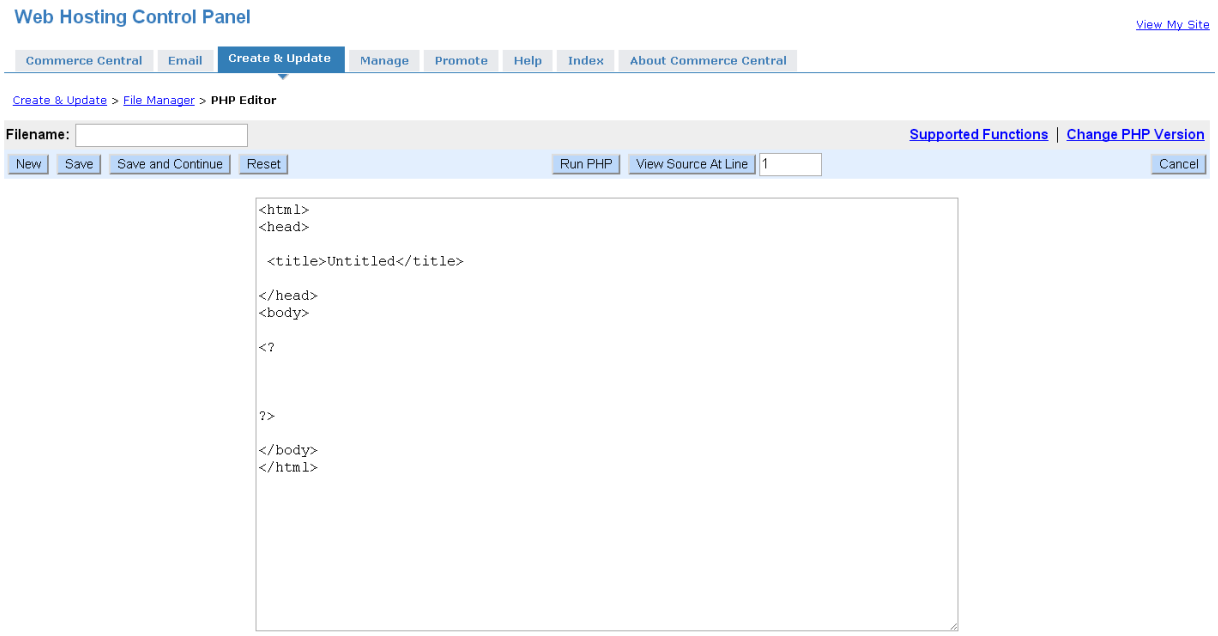


Figure 5. Yahoo Text Editor

I selected this approach to assure that the basic fundamentals of programming were followed. This also permitted the modification of the many 'snippets' of open source code to adapt to the coding needs of the program. Open source code "refers to a computer program in which the source code is available to the general public for use and/or modification from its original design. …Open-source culture is the creative practice of appropriation and free sharing of found and created content. …Participants in the culture can modify those products and redistribute them back into the community or other organizations." [38]When the code is written for an individual module of the project, it is saved directly to the server and then viewed on the web browser. This obviates the need to upload files with a file transfer protocol (FTP) program as the code editor resides

directly on the server and is immediately active online. Graphics and PDF files, when utilized are uploaded to the server using the open source FTP program, Filezilla.[39]

MySQL requires an interface to the webpage though PHP. Many modifications of the code for query and echo statements have been made in order to achieve the results required by the PPHR. A sample of the code for an insert statement and a Query statement are shown in Appendix D. A sample date calculation demonstrates the composition of this calculation code utilizing the *Strtotime* function. This function uses an inputted string which contains a date format and attempts to "parse that format into a Unix timestamp (the number of seconds since January 1 1970 00:00:00 GMT), relative to the timestamp given in $now, or the current time if $now is not supplied."[40] This permits mathematical functions to be performed on date input. Decision support as described above is achieved by the use of *if…else statements*. The Kick Counter uses a counting code / timer as well as a button widget.

The layout of the website was designed to be a simple graphic user interface. There is generous use of white space and the overall appearance and placement of the input and viewing screens is accomplished using the html elements of , cascading style sheets (css) and iframes. The graphically designed logo is clearly prominent on every screen. (Figure 6)

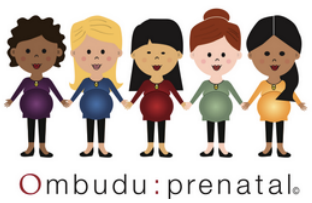


Figure 6. Logo Design

Each module of the program was designed and tested independently. All input pages were processed by PHP and displayed in either a "narrative chart" format or a "spreadsheet" format. Each module went through testing, revisions and many iterations until the final input / output screens were complete. The final product represented the basic prenatal history and physical information, a problems list, an allergy list and a personal homepage that the registered user can use as a portal to the remaining parts of the program. This homepage will announce new programs, updates, resources and news. Each page was optimized for viewing on all web browsers as well as android and IOS platforms. Pages that would benefit from printing, such as the full health record, have a print icon button that will permit printing of that specific page.

7. Security and privacy and Login

An Internet program that collects personal information of any kind needs to store the data securely. This information must be protected from breeches by non-authorized users. The data needs to be transmitted to the data storage server equally secure and the access to the program must maintain privacy for the user. This PPHR project has in place standard measures to assure that all of the above mentioned concerns are addressed. Additionally, because the PPHR project is being evaluated in a healthcare setting that is a healthcare "covered entity," HIPAA compliance was necessary and the project needed to be vetted and approved by the Hospital Information Technology Team. Additional measures were incorporated into the design of the PPHR that enabled the program to function fully compliant with HIPAA rules.[41] (Appendix E)

Following are the measures taken by the PPHR to protect its users' privacy. These are phrased as questions and are clearly posted on the PPHR website:

A. Can I be identified as the user of the program?

   a. No. There are no user identifiers collected or stored in this project: only a User Name and a Password. When the user registers, she is asked to create a unique user name that does not contain any link to their I.D. such as initials, birth dates, relatives, etc. (see information about PHI below).
      i. An anonymous user name is requested
      ii. A unique password is created which is encrypted using MD5 encryption. "MD5 is an algorithm that is used to verify data integrity through the creation of a 128-bit message digest from data input (which may be a message of any length) that is claimed to be as unique to that specific data as a fingerprint is to the specific individual."[42] When this password is stored in the PPHR database, it is stored as a random 32 digit number which cannot be restored into the original password. (Appendix F)

B. Is the information that is stored safe?

   a. Yes. The entire program resides on a server using secure socket Layer technology (SSL) and the information that is transmitted is encrypted. (Appendix G)
   b. Only the user can control who has access to the program by sharing her *Username* and *Password* combination.

C. Is the technology to obtain the Data appropriate for what is being collected?

Yes. This Personal Prenatal Health Record uses a mobile, cross-browser, cloud-based platform to collect and store relevant information for pregnant women so access to this information is always available should the woman's provider not have access to the records. The interface is simple to use. A cloud-based infrastructure provides universal accessibility for the users.

D. What clinical data will be collected?

a. The clinical data collected will be general medical and obstetrical history, symptoms, vital signs, obstetrical visit findings, assessments, plans for care, medications and drug allergies.

E. Exactly how will clinical data be collected using this tool?

a. The pregnant woman user information will be collected by the pregnant woman entering her data into the system through a form using both structured elements and free text (user history).
b. The prenatal care provider enters objective findings, assessments and plans.
    i. Drop down menu choices and text boxes are used.
        1. Clinical data is inserted into a MySQL database using PHP Hypertext Preprocessor scripting language
    ii. The scripts will be executed on a secure SSL server.

F. How will the data be viewed and used in clinical encounters using this tool?

a. For this project, the only user-provider encounters will be by the co-investigators (senior ob-gyn resident and attending Certified Nurse Mid-wife).
b. The data is only accessible by the pregnant woman registered user, co-investigators and the PI.
    i. The user may view the data stored in her PPHR record at any time.
    ii. The provider can view and enter findings in the record only when the pregnant woman user enters her username and password in the presence of the user.
        1. Providers will not have access to the record unless the user is present.

G. How will the PI ensure that data is not re-identified?

    i. There will be no re-identification of data.
    ii. There will be no sharing of username and passwords.

H. How will data be handled at the end of the project?

    i. The data will be evaluated as described, anonymously, to determine the usefulness,

usability and functionality of the Personal Prenatal Health Record.

ii. At the completion of the short evaluation research project, the clinical data will be removed from the online database and not be accessible.

iii. Access to the program by the user will be cancelled.

8. Usability evaluation of the PPHR

Ideally, usability testing should be carried out on all user types of the proposed system. The PPHR has two categories of users: The pregnant woman / consumer user and the healthcare provider user. The original intent to evaluate this program was to use a thorough, combined (mixed) qualitative methodology. However, because of time constraints and difficulty obtaining patient /users in a busy outpatient prenatal center, the proposed usability methods were modified and abbreviated. I was able to recruit five provider users for the provider user survey, which should provide valid results. However, only three patient / users could be recruited to participate. A third survey, a pre-evaluation survey was completed by three patient / users. (Figure 7). The actual utilized survey and results are reported below. Following is the original proposal for evaluating this project that is presented for informational purposes and the actual usability study

Proposed Usability Study

1. Ethnographic – The principle investigator (PI) observes and interacts with subjects in the "field" ("settings"). The "settings" for the evaluation would be the outpatient prenatal clinic at a large urban university hospital and the Labor and Delivery Floor of the same hospital. The subject (stakeholder) Categories for evaluation will be the pregnant patient user, and the provider users: Ob-Gyn Residents and Certified Nurse Mid-wives (CNM's). The time for user testing will be 3 months with a sample size of

5 test subjects from each stakeholder category (patient users, residents, CNM's) and 5 test subjects from each setting category (Clinic, Labor Floor). The Validity and Verification plan is proposed as follows:

- Unit testing carried out by PI to "verify that the code does what it is intended to do"
- Integration testing carried out to evaluate the interaction between software and hardware
- Location verification:
    - Study to be conducted in "real life" settings (Clinic and Labor Floor # 1)
    - Representative samples of population (users) to be selected
    - Study to be later replicated in different venue (Clinic and Labor Floor # 2)
    - User subjects observed and interviewed by PI

2. Surveys and questionnaires

The outcome questions and measures to be evaluated are:

I. Ease of use (usability)

a. Does the portal / graphical user interface employ good design principles?

b. Is the health literacy level appropriate for all level of users?

c. Is the comfort level of the participants using an online health record appropriate?

d. Are the participants concerned about their security and privacy?
e. What is the confidence level of the participants in valuing the program?
f. What is the reliability of the software and the interface?
g. What is the overall acceptance of the program?

Actual Usability Study

The actual usability study uses an *online survey*. In keeping with the original programming tenets of the project, a survey tool was "coded" de novo for this project using the MySQL database. This permitted direct collection and analysis of the survey results without the need for an external program such as *Survey Monkey*©[43], a commonly used collection tool. Following are screen shots of the PPHR survey tool. (The results of the surveys will be reported in the results section of this paper.)

1. I know what a Personal Health Record is?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

2. I know what an Electronic Health Record is?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

3. My Prenatal healthcare record is now kept in a paper chart?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

4. It will be helpful for me to have access to information about my pregnancy available for me at any time?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

5. It will be important for my Healthcare provider to have access to information about my pregnancy whenever I am seen.
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

6. I always go to the same office or clinic for my prenatal care?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

7. I always go to the same Hospital or Emergency Room for my pregnancy emergency care?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

8. I would like to have educational materials and information about my pregnancy and any problems with my pregnancy easily available for me?
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

9. I have a smart phone / tablet
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

10. I have access to the Internet
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

Figure 7. Pre-test Evaluation Survey-for Patient User

1. This program is easy to use
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

2. I can understand what to do and how to use the program
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

3. This program empowers me to take charge of my health care
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

4. This program can help me learn more about my pregnancy
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

5. I am worried about the privacy of my health information kept in this program
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

6. I believe this program will help me get better care during my pregnancy
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

7. I would always use this program for my pre natal health care
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

8. I found the program very difficult to use.
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

9. I liked the design and look of the program
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

10. I would recommend this program to my friends and family
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

Figure 8. Post-test Evaluation Survey-for Patient Use

1. I found this program easy to use
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

2. I think that I would like to use this system frequently
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

3. I would imagine that most people would learn to use this system very quickly
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

4. This program adversely affects my work flow
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

5. This program gives me useful patient information
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

6. I found the various functions in this system were well integrated.
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

7. I believe this program will help me provide better care
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

8. I found the system very cumbersome to use.
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

9. I liked the design and the interface of the system
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

10. I would recommend this program to my patients and colleagues
Strongly Disagree ○ Disagree ○ Undecided ○ Agree ○ Strongly Agree ○

Figure 9. Post-test Evaluation Survey-for Provider User

RESULTS

This section describes the results of the usability evaluation. Information and questions for the survey instrument for the usability study were adopted from concepts outlined by Marchionini et. al.[44] As already mentioned, there were difficulties in recruiting the participation of pregnant women users. This was primarily related to time constraints of the provider users to explain and teach the users how to participate. They needed to balance the business of the prenatal visit and the recruitment of the patients for the study. The few patients who did participate completed a pre study evaluation. Five providers used the program and submitted provider evaluations. Usability studies have shown that 5 participants should provide statistically valid results.[45] The results of five provider users are reported here. For completion, the raw results of the patient users will be reported but not considered in the statistical assessment / validity of the study.

There are different ways of reporting results from a Likert Scale Survey.[46] I have selected a technique described by Sauro.[47] The steps to perform these calculations can be performed on a spreadsheet and then graphed if desired.

i. Compute mean and standard deviation.

ii. Calculate "Percent Agree," which summarizes the percent of respondents who agreed to the question (agree + strongly agree).

iii. Calculate "Top-Box" or "Top Two Box" scoring: "For 5-point scales the top box is strongly agree. The top-two box score is the same as the agree score."

iv. Calculate "Net Top Box": the number of respondents that select the top choice (strongly agree) minus the number that select the bottom choice (strongly Disagree choice).

v. Calculate a "Z-Score to Percentile Rank"
("This is a Six-Sigma technique. It converts the raw score into a normal score-because rating scale means often follow a normal or close to normal distribution. What is needed is a "reasonable benchmark to compare the mean

to 80% of the number of points in a scale is considered appropriate For a 5 point scale such as is used in this project, a "4" (5*.80=4) is the calculated value.")

These following steps calculate the z score:

a. Subtract the benchmark from the mean.

b. Divide the difference by the standard deviation: this is called a z-score (or normal score) and tells us how many standard deviations a score falls above or below the benchmark.

c. Convert the z-score to a percentile rank: Using the properties of the normal curve we find out what percent of area falls below the standard deviations above the mean using a calculator or lookup table.

vi. Coefficient of Variation (CV): The standard deviation is the most common way to express variability, but it is difficult to interpret, especially when you use a mix of scale points (e.g. 5 and 7). The CV makes interpreting a bit easier by dividing the standard deviation by the mean. Higher values indicate higher variability. The CV is a measure of variability, unlike the first four that are measures of the central tendency, so it can be used in addition to the other approaches.

1. Statistical Analysis of the results of the provider–user post test survey

(See Appendix H for spreadsheet calculations)

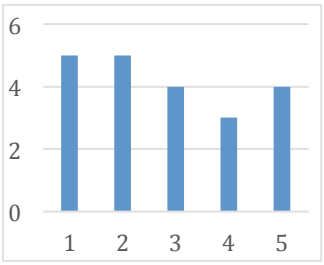
a. Overview of raw data

Pre test Survey Patient Users										Post test Survey Patient Users										Post test Survey **Provider Users**									
q1	q2	q3	q4	q5	q6	q7	q8	q9	q	q1	q2	q3	q4	q5	q6	q7	q8	q9	q	q1	q2	q3	q4	q5	q6	q7	q8	q9	q
1	1	4	4	4	3	3	4	5		0	0	0	0	0	0	0	0	0		5	3	5	3	5	0	5	2	4	
4	4	5	5	5	5	4	5	0		4	4	3	4	2	3	4	1	4		5	5	4	2	4	4	5	1	4	
5	5	4	4	4	4	2	5	0												4	4	4	3	4	4	4	2	4	
																				3	4	4	2	4	4	4	1	3	
																				4	4	4	4	4	4	4	1	5	

Figure 10. PPHR Survey Results-Raw Data of all surveys

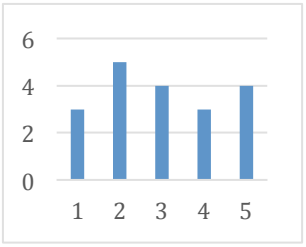
b. Survey Questions and Responses of the provider–users

1. I found this program easy to use.



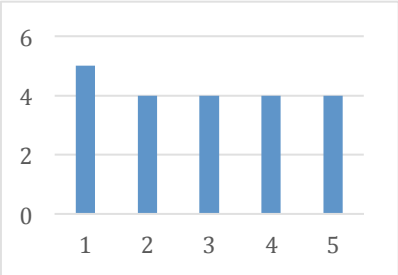
Percent Agree	80%
Top-2-Box	80%
Top-Box	40%
Net Top Box	40%
Z-Score to %	59.4%
CV	20%

2. I think that I would like to use this system frequently.



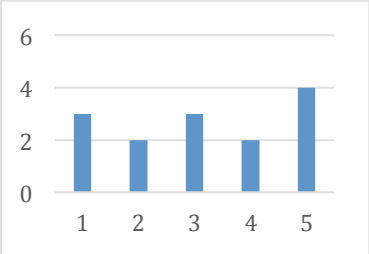
Percent Agree	60%
Top-2-Box	60%
Top-Box	20%
Net Top Box	20%
Z-Score to %	40.6%
CV	22%

3. I would imagine that most people would learn to use this system very quickly.



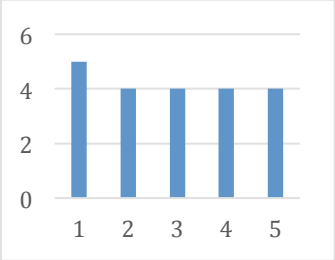
Percent Agree	100%
Top-2-Box	100%
Top-Box	20%
Net Top Box	20%
Z-Score to %	67.3%
CV	11%

4. This program adversely affects my work flow.



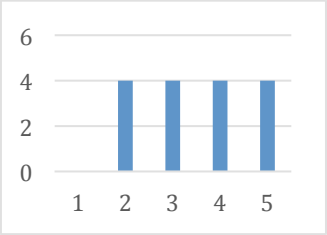
Percent Agree	20%
Top-2-Box	20%
Top-Box	0%
Net Top Box	0%
Z-Score to %	7.6%
CV	30%

5. This program gives me useful patient information.



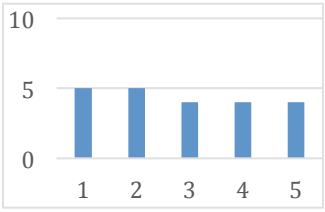
Percent Agree	100%
Top-2-Box	100%
Top-Box	20%
Net Top Box	20%
Z-Score to %	67.3%
CV	11%

6. I found the various functions in this system were well integrated.



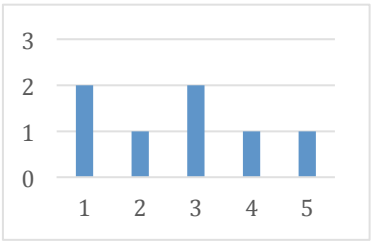
Percent Agree	80%
Top-2-Box	80%
Top-Box	0%
Net Top Box	-20%
Z-Score to %	32.7%
CV	56%

7. I believe this program will help me provide better care.



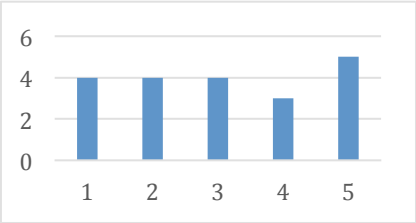
Percent Agree	100%
Top-2-Box	100%
Top-Box	40%
Net Top Box	40%
Z-Score to %	76.7%
CV	12%

8. I found the system very cumbersome to use.



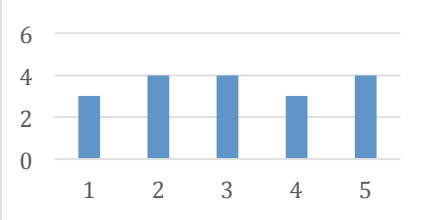
Percent Agree	0%
Top-2-Box	0%
Top-Box	0%
Net Top Box	-60%
Z-Score to %	0%
CV	39%

9. I liked the design and the interface of the system.



Percent Agree	80%
Top-2-Box	80%
Top-Box	20%
Net Top Box	20%
Z-Score to %	50%
CV	18%

10. I would recommend this program to my patients and colleagues.



Percent Agree	60%
Top-2-Box	60%
Top-Box	0%
Net Top Box	0%
Z-Score to %	23.3%
CV	15%

To further analyze the overall evaluation of the PPHR program I observed the "positive" questions –those that asked a favorable question about the program. The negative questions: *Number 4*: "This program adversely affects my work flow" and *Number 8*: "I found the system very cumbersome to use" scored 0% for strongly agree / agree and 20% for strongly agree / agree respectively. This observation is an overall positive result for the program. Below is the graph (Figure 11), which plots the percent of "agree" responses. The mean value for positive (strongly agree /agree) comment responses was **82.5% : Positive Questions n=8 | Mean 82.5 | SD 16.6905 | CV 20%**

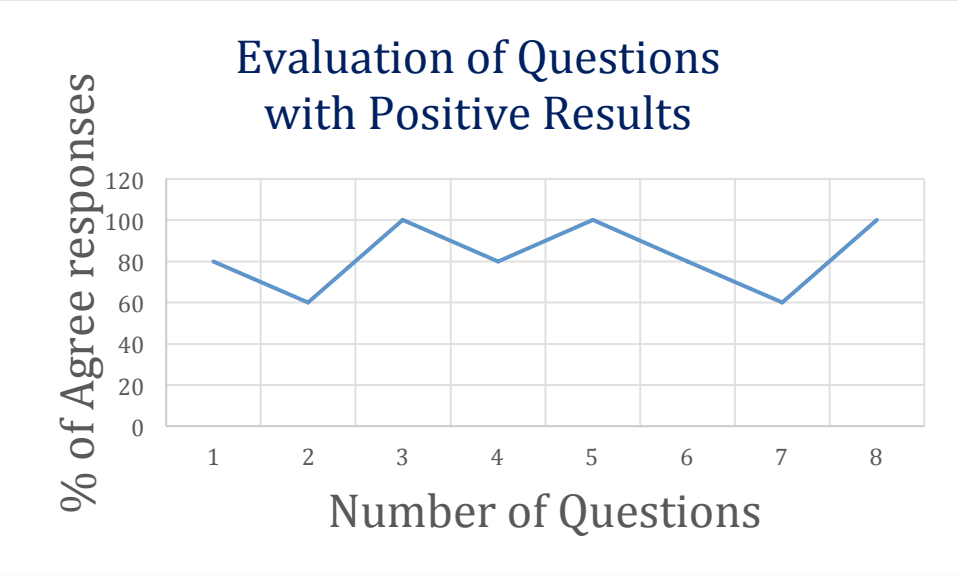


Figure 11. Evaluations of Questions with Positive Results

DISCUSSION

The development of a new Personal Health Record specific for underserved urban women receiving prenatal care could enhance the point of care health and overall health education of this population. The design and function of this new PPHR project could successfully be utilized for this purpose. Although the concept for this program was conceived more than two years ago, the actual design and programming began over ten months prior to completion of this Capstone Project submission. The coding of the program was complex for a physician, non-professional programmer, and required multiple iterations, code modifications and adaptations and many trials of interface / portal designs. The programming was done solely by the author. The ability to write the original code was enhanced by prior experience with HTML coding, self-taught PHP coding, and newly acquired knowledge of Java and SQL Database programming learned through the curriculum for the Masters Degree in Biomedical Informatics at Oregon Health and Science University. Working with the code to optimize the function of the overall program was a learning experience in itself. Much effort was placed into the content of the program; the structured data optimal for prenatal care and to the algorithms needed to store, calculate and display this data to further optimize the function and thus the purpose of the program.

There are many prototypes and platforms for general PHR designs, and there are some basic concepts upon which this PPHR was designed. These have been clearly outlined in a HIMSS presentation by Donald T. Mon.[48] Many of these desired elements have been addressed in this PPHR, designated below as "*available.*" The use of the MySQL database architecture will enable future enhancements, designated below as

"*planned.*" Such enhancements will utilize a HL7 interface[49] to facilitate interfaces with email, faxes, images including ultrasounds, sensor data such as blood pressure, glucose monitoring, electronic fetal monitoring data, inflow of laboratory values and pharmacy information.

Desired Elements of a PHR

a) PHRs should address a fundamentally different record and system purpose than electronic health records (EHRs)-*available*

b) PHRs have some structure and content similarities to EHRs and EHR-Systems-*available*

c) PHRs must address privacy and security issues- *available*

d) PHRs must address access, use, and control issues –*available*

e) PHRs must contain longitudinal, yet pertinent data –*available*

f) PHR Systems must be interoperable with other PHR system models, EHR-Systems, and HIEs -*planned*

g) PHR information must be portable -*available*

Furthermore, other features either *available* now, incorporated into the PPHR at present, or those *planned* to be incorporated as suggested by Kernisan[50] include:

a) Enhanced provider-user communication-*planned*

b) Internal search engine capabilities-*planned*

c) Ability to:
   i. Summarize and print / export reports-*available*
   ii. Maintain a list of all prenatal visits-*available*
   iii. Maintain a problem list-*available*
   iv. Maintain an allergy list-*available*
   v. Maintain a medication list-*available*

CONCLUSIONS

An original Personal Prenatal Health Record was conceived, designed, programmed and evaluated. This PPHR is designed for urban, underserved pregnant women and their providers. It can enhance the prenatal care experience by providing contemporary technology to replace the obsolete paper "pregnancy passport." Furthermore, by the use of decision support algorithms, this PPHR can alert users to abnormal laboratory results, signs or symptoms, prompting the user to contact her provider. The design of the PPHR focuses on a clear, easy to use interface / portal and is secure, private, and equally functional on desktop computers, smart phones (iOS, Android, Windows Mobile) and tablets. The results of the usability evaluation by the providers and interviews of the patient users by the providers, albeit small in number, are encouraging that this PPHR will serve the purpose for which it is intended.

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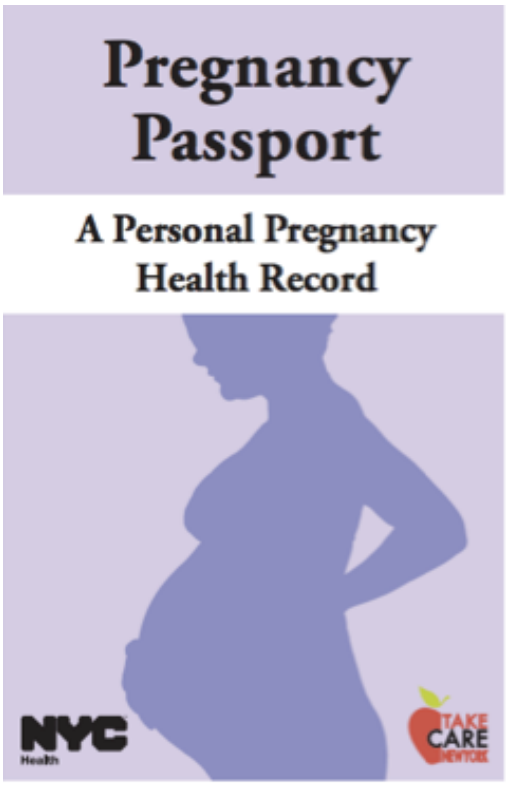
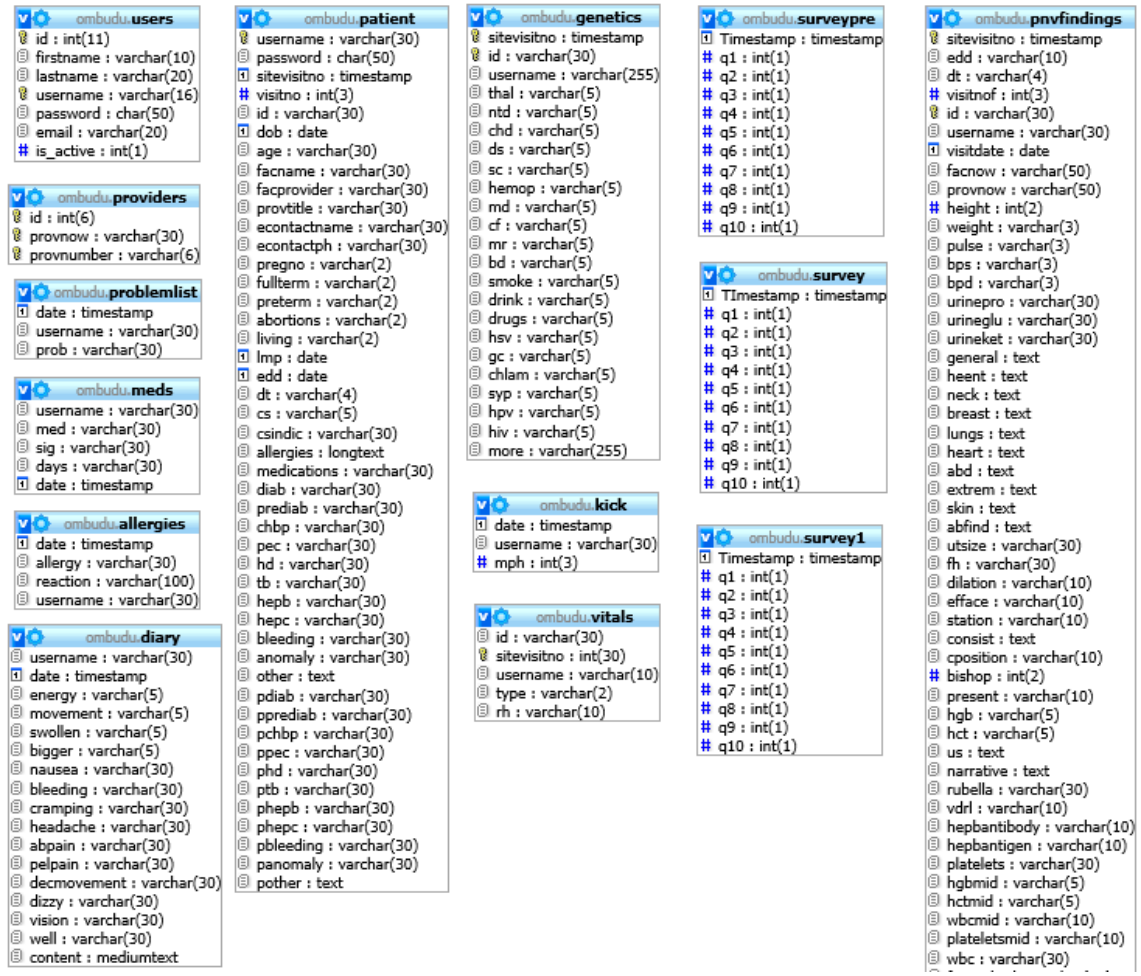
APPENDICIES

APPENDIX A: The Pregnancy Passport

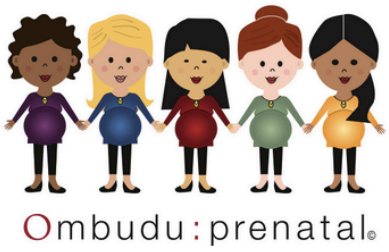


www.nyc.gov/html/doh/downloads/pdf/ms/Prenatal-Passport.pdf - 3k - 2014-01-24 -

APPENDIX B: Database Tables and Columns



APPENDIX C: Query / Spreadsheet View /Calculations for Findings



enter history
view history
enter findings
view findings
enter problems
view problems
enter meds
view meds
enter allergies
view allergies
journal entry
view journal
enter kick count
view kick count
learn at ombudu

sign out

Visit Findings For test

Access Date: Apr-20-2014

Uterine Size	Fetal Heart Rate	Hgb	Hct	Ultrasound	Ultrasound Findings
30	135	11	31	NORMAL	
	155				
			28		

```
$query3 = "SELECT *, round(40-(DATEDIFF(edd,pnvfindings.sitevisitno))/7,1) AS DiffDate
FROM pnvfindings,patient
WHERE
pnvfindings.username='{$_SESSION['user']}'
and
patient.username='{$_SESSION['user']}'
ORDER BY pnvfindings.sitevisitno ASC
";
$result3 = mysql_query($query3) or die(mysql_error());
Example 3: Gesatational aage calculation using to str to time function
echo '<br></font><font color=#000000>My Gestation Age <u>today</u> is:  </b><font color=#009900>'.
round(((((strtotime(today) - strtotime($row["edd"]))/86400)+280)/7),1)."</td>";
echo"</div>";

$result3 = mysql_query($query3) or die(mysql_error());

//--------------end query

ECHO"<HR/>";

echo"<p align='left'>";
Echo "<b><font color=#000000 size='3pt'>Ombudu:Prenatal<small>&copy</small>";
Echo "<br>The Personal Mobile Prenatal Health Record for:  </font><font
color=#d242a7 size='3pt'>". $_SESSION['user']  ;
Echo "<br></font><font color=#000000 font face=calibri>Access Date: </font><font color=#000000 font face=calibri>";
echo date("M-d-Y") . "";

function mysql_evaluate($query3, $default_value="undefined") {
   $result3 = mysql_query($query3);
   if (mysql_num_rows($result)==0)
      return $default_value;
   else
      return mysql_result($result3,0);
```

```
echo "<p class=\"sample\">";
}


//echo mysql_result($result,0); // outputs third employee's name
ECHO"</font><font color=#000000 font face=calibri><HR/>";

//===========================================

echo "<div style='height:50%; overflow:scroll;overflow-y: scroll;overflow-x: scroll'>";
echo "<p class=\"sample\">";
echo "<center>";
echo "<center><table width='100%'><tr><td>";

//echo"<tr><td>";

echo"<tr><td>";

//========chart view========

//$current_date = date("Y-m-d");
//$sitevisitno=$current_date;
echo "<center>";
echo "<center><table width='100%' ><tr><td>";
echo"<tr><td>";

echo "<p class=\"sample\">";
echo "<tr bgcolor='#CFCFCF'>

<td>Visit Number                
        </td>

<td>Visit Provider    </td>
<td>Gestational Age    </td>
<td>New History / Comments           &n
bsp;                 &nbs
p;                  
   </td>
<td>Height    </td>
<td>Weight    </td>
<td>Pulse    </td>
<td>Blood Pressure     </td>

<td>Urine Protein    </td>
<td>Urine Glucose    </td>
<td>Urine Ketones    </td>
<td>Uterine Size    </td>
<td>Fetal Heart Rate    </td>
<td>Hgb  </td>
<td>Hct  </td>

<td>Ultrasound                
                  &
nbsp;       </td>
<td>Ultrasound
Findings                 
                  &
nbsp;     </td>
<td>Biophysical Profile     </td>
<td>Non&nbspStress Testing    </td>
</tr>";
echo "<tr>";



$color="1";
while ($row = mysql_fetch_array($result3)) {
```

```
 if($color==1){
   echo '<tr bgcolor="#EFE1D4">';
   $color="2";
 } else {
   echo '<tr bgcolor="#DADAF6">';
   $color="1";

 }

echo "<td style='vertical-align:top;text-align:left;'>" . $row["visitnof"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["provnow"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["DiffDate"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["narrative"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["height"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["weight"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["pulse"] . "</td>";

echo "<td style='vertical-align:top;text-align:left;'>" . $row["bps"]." / " .$row["bpd"] . "</td>";

echo "<td style='vertical-align:top;text-align:left;'>" . $row["urinepro"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["urineglu"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["urineket"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["utsize"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["fh"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["hgb"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["hct"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["anatomyscan"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["asfindings"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["bpp"] . "</td>";
echo "<td style='vertical-align:top;text-align:left;'>" . $row["efm"] . "</td>";

echo "</tr>";


//==========================end add chart view_1



}
echo "</table>";
echo "</div>";



?>


</body>
</html>
```

APPENDIX D: Screen Shots and Sample Code

APPENDIX D.1 : Homepage and Code

Ombudu:prenatal

login

join

about

project

privacy

terms

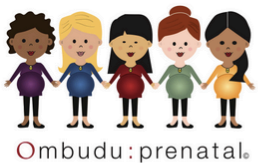
getcare

a personal prenatal

health record to help you

get the healthcare you deserve

APPENDIX D.2: User's Personal Homepage



Ombudu:prenatal

view full chart

enter history
view history

enter findings
view findings

enter problems
view problems

enter meds
view meds

enter allergies
view allergies

journal entry
view journal

enter kick count
view kick count

learn at ombudu

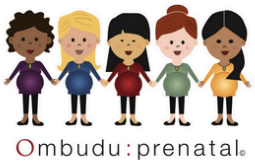
THIS IS THE PERSONAL PRENATAL HEALTH RECORD FOR USER: test

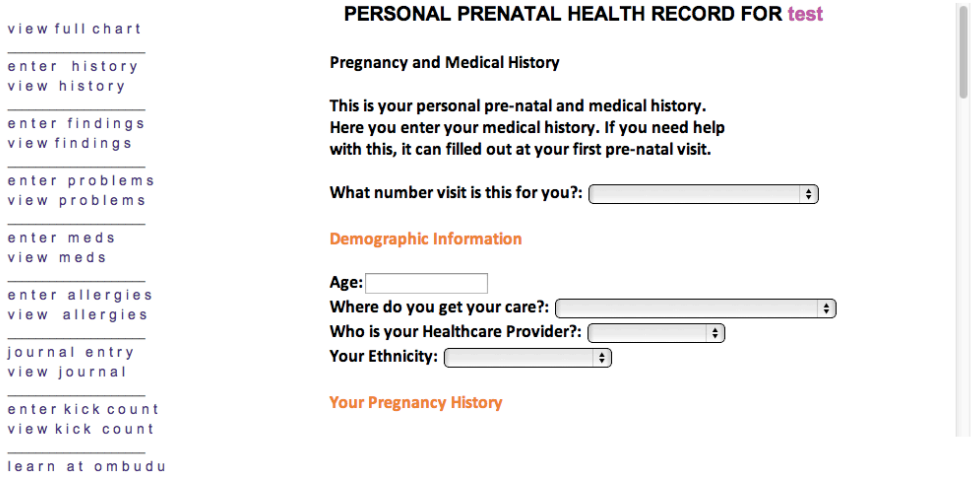
Welcome to Ombudu:Prenatal, a Personal Prenatal Health Record (PPHR) designed for you and available to you at anytime. It will help you and your health care provider keep track of your pregnancy, your maternal and baby health history, and the findings at each prenatal visit. Ombudu: Prenatal will also help you learn more about your pregnancy and suggest where you might go for prenatal care if you do not have a provider.

Michael R. Berman, M.D.
Founder, Ombudu©

I am user: test
I get my Prenatal Care At: Beth Israel Medical Center-PAC
My Provider is: Midwifery Practice
My assigned "Due Date" is: 2014-05-01
My Gestation Age today is: 40.3

APPENDIX D.3: User Insert History Form and Script





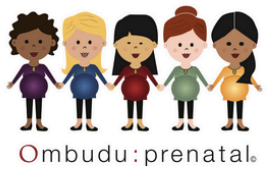

```
<?php
echo "<font color='gray' face='calibri'>";
echo"<CENTER>";
session_start();
 ECHO "You are signed in as user:  ". $_SESSION['user'];

?>
<html>
<head>

 <title>Untitled</title>

</head>
<body>

<?php

mysql_connect('mysql', 'mrbmdompn', '2017627683')
   or die("cannot connect to database\n");

mysql_select_db("ombudu") or die(mysql_error());

//mysql_query("SET AUTOCOMMIT=0");
//mysql_query("START TRANSACTION");

$r1 = mysql_query("INSERT INTO pnvfindings
(
id,
username,
visitdate,
facnow,
provnow,
height,
weight,
```

```
pulse,
bps,
bpd,
urinepro,
urineglu,
urineket,
general,
heent,
neck,
breast,
lungs,
heart,
abd,
extrem,
skin,
abfind,
utsize,
fh,
dilation,
efface,
station,
consist,
cposition,
bishop,
present,
hgb,
hct,
us,
narrative,
type,
rh,
rubella,
vdrl,
hepbantibody,
hepbantigen,
platelets,
wbc,
ftsmethod,
ftsresult,
afp,
anatomyscan,
asfindings,
bpp,
efm,
gluscreen,
gtt,
hiv
)
VALUES
('$_POST[id]',
'. $_SESSION['user'];,
'$_POST[visitdate]',
'$_POST[facnow]',
'$_POST[provnow]',
'$_POST[height]',
'$_POST[weight]',
'$_POST[pulse]',
'$_POST[bps]',
'$_POST[bpd]',
'$_POST[urinepro]',
'$_POST[urineglu]',
'$_POST[urineket]',
'$_POST[general]',
'$_POST[heent]',
'$_POST[neck]',
'$_POST[breast]',
'$_POST[lungs]',
'$_POST[heart]',
```

```
'$_POST[abd]',
'$_POST[extrem]',
'$_POST[skin]',
'$_POST[abfind]',
'$_POST[utsize]',
'$_POST[fh]',
'$_POST[dilation]',
'$_POST[efface]',
'$_POST[station]',
'$_POST[consist]',
'$_POST[cposition]',
'$_POST[bishop]',
'$_POST[present]',
'$_POST[hgb]',
'$_POST[hct]',
'$_POST[us]',
'$_POST[narrative]',
'$_POST[type]',
'$_POST[rh]',
'$_POST[rubella]',
'$_POST[vdrl]',
'$_POST[hepbantibody]',
'$_POST[hepbantigen]',
'$_POST[platelets]',
'$_POST[wbc]',
'$_POST[ftsmethod]',
'$_POST[ftsresult]',
'$_POST[afp]',
'$_POST[anatomyscan]',
'$_POST[asfindings]',
'$_POST[bpp]',
'$_POST[efm]',
'$_POST[gluscreen]',
'$_POST[gtt]',
'$_POST[hiv]'



)
")or die(mysql_error());
/*
$r2 = mysql_query("INSERT INTO tests
(
id,
username
hgb,
hct,
us


)
VALUES
('$_POST[id]',
'$_POST[hgb]',
'$_POST[hct]',
'$_POST[us]'
)
")or die(mysql_error());


if ($r1 and $r2) {
   mysql_query("COMMIT");
} else {
   mysql_query("ROLLBACK");
}
*/
mysql_close();
```

```
?>
<br>
<br>
<center><b>Visit Findings and Tests Entered<b><br>

<META HTTP-EQUIV="REFRESH"
CONTENT="1;URL=menu.php" target="iframe">

</body>
</html>
```

APPENDIX D.4: Query / Chart View for History




```
Echo "</b><font
color=#000000 size='3pt'><b>The Initial History and Registration for:  </font><font
color=#d242a7 size='4pt'>". $_SESSION['user']  ;
Echo "<BR></font></b></b><br></font><font color=#000000>Viewing date: </font><font color=#000000>";
echo date("M-d-Y");

echo '   </font><font color=#000000>visitno:  <font color=#543BF5>'.$row["visitno"] . "</td>";
//echo '</font><br><br> Id:  </b><font color=#543BF5>'.$row['id']."</td>";
//echo '</font>   DOB:  </b><font color=#543BF5>'.$row["dob"] . "</td>";
echo '</font>    Age  </b><font color=#543BF5>'.$row["age"] . "</td>";
echo '</font><br/> Primary Facility:  </b><font color=#543BF5>'.$row["facname"] . "</td>";
echo '</font><br>Primary Provider:  </b><font color=#543BF5>'.$row["facprovider"] . "</td>";
//echo '</font>  Provider Title:  </b><font color=#543BF5>'.$row["provtitle"] . </td>";
//echo '<br></font>  Emergency Contact Person:  </b><font //color=#543BF5>'.$row["econtactname"] . "</td>";
//echo '<br></font>  Emergency Contact Phone:  </b><font //color=#543BF5>'.$row["econtactph"] . "</td>";

//echo '</font><br/><br> Allergies:  </b><b><font color=#FF0000>'.$row["allergies"] . "</td>";
//echo '<br></b></font>Medications:  <b><font color=#FF0000>'.$row["medications"] . "</b></td>";


echo '</font><br/><br><b><font color=#000000><u>Current Pregnancy</u></b>';
```

```
echo '</font><br/>';

//echo '</font><font color=#000000><br/> LMP:  </b><font color=#543BF5>'.$row["lmp"] . "</td>";
echo '</font><font color=#000000>EDD:  </b><font color=#543BF5>'.$row["edd"] . "</td>";

echo '</font><br><br/></b>Pregnancy Number:  </b><font color=#543BF5>'.$row["pregno"] . "</td>";
echo '<br></font> Full Term:  </b><font color=#543BF5>'.$row["fullterm"] . "</td>";
echo '</font>  Pre Term:  </b><font color=#543BF5>'.$row["preterm"] . "</td>";
echo '</font>  Abortions:  </b><font color=#543BF5>'.$row["abortions"] . "</td>";
echo '</font>  Living:  </b><font color=#543BF5>'.$row["living"] . "</td>";


echo '</font><br><br>C-Sections:  </b><font color=#543BF5>'.$row["cs"] . "</td>";
echo '</font><br>Reason for C-Sections:  </b><font color=#543BF5>'.$row["csindic"] . "</td>";



echo ' </font><br/><br><font color=#000000><b><u>Medical History</u></b>';

echo '</font><br><br/> Gestational Diabetes:  </b><font color=#33CC33>'.$row["diab"] . "</td>";
echo '</font><br/> Pre-Diabetes:  </b><font color=#33CC33>'.$row["prediab"] . "</td>";

echo '</font><br/> Chronic Hypertension:  </b><font color=#33CC33>'.$row["chbp"] . "</td>";
echo '</font><br/> Pre Eclapmpsia:  </b><font color=#33CC33>'.$row["pec"] . "</td>";

echo '</font><br/> Heart Disease:  </b><font color=#33CC33>'.$row["hd"] . "</td>";
echo '</font><br/> TB:  </b><font color=#33CC33>'.$row["tb"] . "</td>";

echo '</font><br/> Hepatitis B:  </b><font color=#33CC33>'.$row["hepb"] . "</td>";
echo '</font><br/> Hepatitis C:  </b><font color=#33CC33>'.$row["hepc"] . "</td>";
echo '</font><br/> Bleeding:  </b><font color=#33CC33>'.$row["bleeding"] . "</td>";

echo '</font><br> Known Fetal Anomaly:  </b><font color=#33CC33>'.$row["anomaly"] . "</td>";
echo ' </font><br> Other:  </b><font color=#33CC33>'.$row["other"] . "</td>";

/*
echo ' </font><br/><br><br><font color=#000000><b><u>Past Medical History</u></b>';


echo '<br/>';
echo '</font>  <br/> History of Diabetes:  </b><font color=#33CC33>'.$row["pdiab"] . "</td>";
echo '</font> <br/> History of Pre Diabetes:  </b><font color=#33CC33>'.$row["pprediab"] . "</td>";
echo ' </font><br/> History Hypertension:  </b><font color=#33CC33>'.$row["pchbp"] . "</td>";
echo ' </font><br/> History Pre Eclampsia:  </b><font color=#33CC33>'.$row["ppec"] . "</td>";
echo ' </font><br/> History Heart Disease:  </b><font color=#33CC33>'.$row["phd"] . "</td>";
echo '</font> <br/> History of TB:  </b><font color=#000000>'.$row["ptb"] . "</td>";
echo '</font> <br/> History of Hepatitis B:  </b><font color=#33CC33>'.$row["phepb"] . "</td>";
echo '</font> <br/> History of Hepatitis C:  </b><font color=#33CC33>'.$row["phepc"] . "</td>";
echo '</font> <br/> History Abnormal Bleeding:  </b><font color=#33CC33>'.$row["pbleeding"] . "</td>";
echo '</font> <br/> History  Fetal Anomaly:  </b><font color=#33CC33>'.$row["panomaly"] . "</td>";
echo '</font> <br/> Other:  </b><font color=#000000>'.$row["pother"] . "

</td>";

*/
echo ' </font><br/><br><font color=#000000><b><U>Other History </U></b>';

echo '<br/>';
echo '</font>  <br/> Thalessemia:  </b><font color=#33CC33>'.$row["thal"] . "</td>";
echo '</font>  <br/> NTD:  </b><font color=#33CC33>'.$row["ntd"] . "</td>";

echo '</font>  <br/> Congenital Heart Disease:  </b><font color=#33CC33>'.$row["chd"] . "</td>";

echo '</font>  <br/>Down Syndrome:  </b><font color=#33CC33>'.$row["ds"] . "</td>";
echo '</font>  <br/> Sickle Cell Disease:  </b><font color=#33CC33>'.$row["sc"] . "</td>";
echo '</font>  <br/> Hemophilia:  </b><font color=#33CC33>'.$row["hemop"] . "</td>";

echo '</font>  <br/> Muscular Dystrophy:  </b><font color=#33CC33>'.$row["md"] . "</td>";
```

```
echo '</font>  <br/> Mental Retardation:  </b><font color=#33CC33>'.$row["mr"] . "</td>";


echo '</font>  <br/> Other Birth Defects:  </b><font color=#33CC33>'.$row["bd"] . "</td>";
echo '</font>  <br/> Smoke cigarettes:  </b><font color=#33CC33>'.$row["smoke"] . "</td>";

echo '</font>  <br/> Drink alcohol:  </b><font color=#33CC33>'.$row["drink"] . "</td>";
echo '</font>  <br/> Used street drugs:  </b><font color=#33CC33>'.$row["drugs"] . "</td>";
echo '</font>  <br/> HSV(Herpes)infection:  </b><font color=#33CC33>'.$row["hsv"] . "</td>";
echo '</font>  <br/> Gonnorhea:  </b><font color=#33CC33>'.$row["gc"] . "</td>";

echo '</font>  <br/> Chlamydia infection:  </b><font color=#33CC33>'.$row["chlam"] . "</td>";

echo '</font>  <br/> Syphillis:  </b><font color=#33CC33>'.$row["syp"] . "</td>";

echo '</font>  <br/> HPV(Warts):  </b><font color=#33CC33>'.$row["hpv"] . "</td>";
echo '</font>  <br/> HIV Inection:  </b><font color=#33CC33>'.$row["hiv"] . "</td>";

echo '</font>  <br/> Other Information:  </b><font color=#33CC33>'.$row["more"] . "
```

APPENDIX E: What are Covered Entities?

From
http://www.hrsa.gov/healthit/toolbox/HealthITAdoptiontoolbox/PrivacyandSecurity/entityhipaa.html

Health Care Providers
This includes all health care providers, regardless of practice size, provided that they transmit health information electronically. The specific electronic transactions subject to this rule are those that are covered under the HIPAA Transactions Rule. Providers subject to the Privacy rule include:

Doctors,
o Clinics,
o Psychologists,
o Dentists,
o Chiropractors,
o Nursing Homes, and,
o Pharmacies.

Health Plans

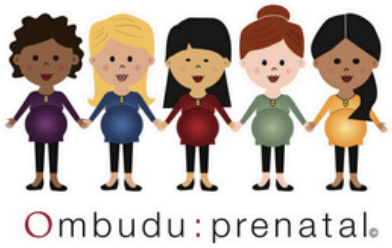
- Medical, Dental, and Vision Plans
- HMOs
- Medicare and Medicaid
- Medicare+Choice and Medicare Supplement Insurers
- Long-Term Care Insurers (excluding nursing home fixed-indemnity policies)
- Veterans Health Plans
- Company Health Plans
  Exceptions include:
  o A group health plan with less than 50 participants that is administered solely by the employer that established and maintains the plan is not a covered entity;
  o Government-funded programs whose principal purpose is not providing or paying the cost of health care;
  o Government-funded programs whose principal activity is directly providing health care or the making of grants to fund the direct provision of health care; and,

o Certain types of insurance entities such as those providing only workers' compensation, automobile insurance, and property and casualty insurance.

Health Care Clearinghouses

- Entities that process nonstandard health information they receive from another entity into a standard (i.e., standard electronic format or data content), or vice versa. This includes:
  o Billing Services,
  o Repricing Companies,
  o Community Health Management Information Systems, and,
  o Value-added networks and switches if these entities perform clearinghouse functions.

APPENDIX F1: Login Script



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Log In

Ombudu Username

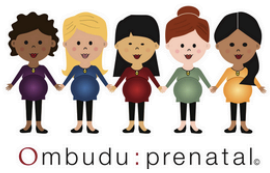
Ombudu Password

Log In

```
<?php
if(isset($_POST) && !empty($_POST))
{
session_start();
include("config.php"); //including config.php in our file
$username = mysql_real_escape_string(stripslashes($_POST['username'])); //Storing username in $username variable.
$password = mysql_real_escape_string(stripslashes(md5($_POST['password']))); //Storing password in $password variable.
$match = "select id from $table where username = '".$username."' and password = '".$password."';";
$qry = mysql_query($match);
$num_rows = mysql_num_rows($qry);
if ($num_rows <= 0) {
echo "<font face='CALIBRI'>";
echo "<font color='orange'>";
echo "<br><center>Welcome to Ombudu:Prenatal.";
echo "<br><br></font>";
echo "<font face='CALIBRI'>";
echo "<br><center>Sorry, there is no username $username with the specified password.";
echo '<br><br><center><a href="login.php">Click here to try another username / password combination</a>';
exit;
} else {
$_SESSION['user']= $_POST["username"];
echo("<script language=\"javascript\">");
echo("window.top.location.href = \"indexpassword.php\";");
echo("</script>");
// It is the page where you want to redirect user after login.
}
}else{
?>
<html>
```

```
<head>
<body>
<CENTER>
<html>
<head>
</style>
<title>Login</title>
<link rel="stylesheet" type="text/css" href="style.css" />
</head>
<body>
<center>
</div>
<div align="left">
 <div class="container login">
<form action="<?php $_SERVER['PHP_SELF'] ?>" method="post" class="form-signin" id = "login_form" >
<font face="calibri" size="-1"><big><b><font
color="#666666" face="Georgia"><font
color="#000000"><b><font
color="#666666" face="calibri"><font
color="#cc6600">
<font color="#D242A7"><big><big><b><h2 class="form-signin-heading">Log In</h2>
<input type="text" name="username" size="20" placeholder="Ombudu Username"><br>
<input type="password" name="password" size="20" placeholder="Ombudu Password"></br>
<input type="submit" value="Log In" class="btn btn-large btn-primary"><br><br><br>
</form>
<!--echo("top.location.href = \"indexpassword.php\";"); -->
</div>
</div>
</font></font></body>
<br>
<br>
</html><?php}?>
```

APPENDIX F2
Sign Up (Join) Script



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Before you register and use Ombudu, please fill out this quick survey

User name and password are case-sensitive

Do not use your initials, name, birthdate or other identifying characters

Select a Username(6-20 characters): Select Ombudu User nar

Select Your Password(6-20 characters): Select Ombudu Passwor

Sign Up

```
<?php
echo "<font color='gray' face='calibri'>";
```

```
session_start();
?>
<?php
include("config.php");
//including config.php in our file
if(!empty($_POST['username']) && !empty($_POST['password'])
)
{
// Now checking user name and password is entered or not.
$first_name= mysql_real_escape_string($_POST['firstname']);
$last_name= mysql_real_escape_string($_POST['lastname']);
$username = mysql_real_escape_string(stripslashes($_POST['username']));
$password = mysql_real_escape_string(stripslashes(md5($_POST['password'])));
$mail = mysql_real_escape_string($_POST['email']);
$check = "SELECT * from users where username = '".$username."'";
$qry = mysql_query($check);
$num_rows = mysql_num_rows($qry);
if($num_rows > 0){
// Here we are checking if username is already exist or not.

echo "<center>The username you have entered already exists. <br><br>Please try another username.";
echo '<br><a href="signup.php">Try Again</a>';
exit;
}
// Now inserting record in database.
$query = "INSERT INTO users (firstname,lastname,username,password,email,is_active) VALUES
('".$first_name."','".$last_name."','".$username."','".$password."','".$mail."','1');";
mysql_query($query);
echo "<center><big><b>Thank You for Joining Ombudu: Prenatal";
echo "<meta http-equiv='Refresh' content='3; URL=login.php'><br><br>";
echo "<br><br><img src='wait_animation.gif'>";
exit;
}
?>
<html>
<head>
<body>
<CENTER>
<html>

<head>
<center>
<title>Registration Page | Simple login form</title>
<link rel="stylesheet" type="text/css" href="style.css" />
<script type="text/javascript">
		//initialize the 3 popup css class names - create more if needed
		var matchClass=['popup1','popup2','popup3'];
		//Set your 3 basic sizes and other options for the class names above - create more if needed
		var popup1 = 'width=400,height=300,toolbar=0,menubar=0,location=0,status=1,scrollbars=1,resizable=1,left=20,top=20';
		var popup2 = 'width=800,height=600,toolbar=0,menubar=0,location=0,status=1,scrollbars=1,resizable=1,left=20,top=20';
		var popup3 = 'width=1000,height=750,toolbar=0,menubar=0,location=0,status=1,scrollbars=1,resizable=1,left=20,top=20';
		//When the link is clicked, this event handler function is triggered which creates the pop-up windows
		function eventHandler() {
				var x = 0;
				var popupSpecs;
				//figure out what popup size, etc to apply to the click
				while(x < matchClass.length){
						if((" "+this.className+" ").indexOf(" "+matchClass[x]+" ") > -1){
								popupSpecs = matchClass[x];
								var popurl = this.href;
						}
				x++;
				}
			//Create a "unique" name for the window using a random number
			var popupName = Math.floor(Math.random()*10000001);
			//Opens the pop-up window according to the specified specs
			newwindow=window.open(popurl,popupName,eval(popupSpecs));
			return false;
```

```
        }
        //Attach the onclick event to all your links that have the specified CSS class names
        function attachPopup(){
                var linkElems = document.getElementsByTagName('a'),i;
                for (i in linkElems){
                        var x = 0;
                        while(x < matchClass.length){
                                if((" "+linkElems[i].className+" ").indexOf(" "+matchClass[x]+" ") > -1){
                                        linkElems[i].onclick = eventHandler;
                                }
                        x++;
                        }
                }
        }

        //Call the function when the page loads
        window.onload = function (){
           attachPopup();
        }
</script>
</head>
<body>
<div align="center">
<center>
</div>
<font face="calibri" size="-1"><big><b><font
color="#666666" face="Georgia"><font
color="#000000"><b><font
color="#666666" face="calibri"><font
color="#cc6600">
<div id="containt" align="left">
<form action="<?php $_SERVER['PHP_SELF']?>" method="post" class="form-signup">
<div id="header"><font color="#D242A7"><big><big><big><b>Join Ombudu
</big><br>
<br>
<a href="survey.pre.likert.php" class="popup2"><img alt="Survey" src="surveyx.png"
border="0" height="74" width="73"></a><br>
<font face="calibri" size="-1" color="black">Before you register <br>
and use Ombudu, <br>
please fill out<br> <a href="survey.pre.likert.php" class="popup2">this
quick survey</a><br>
<br>
<br>
</font>
User name and password are case-sensitive <br>
<br>Do not use your initials, name, birthdate<br> or other identifying characters <br>
</font>
<br></div>
 <table>
   <tr>
     <td>Select a Username(6-20 characters):</td>
     <td> <input type="text" name="username" size="24" placeholder="Select Ombudu User name"><span
class="required"></span></td>
   </tr>

   <tr>
     <td>Select Your Password(6-20 characters):</td>
     <td><input type="password" name="password" size="24" placeholder="Select Ombudu Password"><span
class="required"></span></td>
    </tr>
 <tr>
      <td><input type="submit" value="Sign Up" class="btn btn-large btn-primary"></td>
    </tr> </table></form>
</div>
```

APPENDIX G: HIPAA Criteria

HIPAA PHI: List of 18 Identifiers and Definition of PHI Adopted from http://cphs.berkeley.edu/hipaa/hipaa18.html

List of 18 Identifiers

1. Names;
2. All geographical subdivisions smaller than a State, including street address, city, county, precinct, zip code, and their equivalent geocodes, except for the initial three digits of a zip code, if according to the current publicly available data from the Bureau of the Census: (1) The geographic unit formed by combining all zip codes with the same three initial digits contains more than 20,000 people; and (2) The initial three digits of a zip code for all such geographic units containing 20,000 or fewer people is changed to 000.
3. All elements of dates (except year) for dates directly related to an individual, including birth date, admission date, discharge date, date of death; and all ages over 89 and all elements of dates (including year) indicative of such age, except that such ages and elements may be aggregated into a single category of age 90 or older;
4. Phone numbers;
5. Fax numbers;
6. Electronic mail addresses;
7. Social Security numbers;
8. Medical record numbers;
9. Health plan beneficiary numbers;
10. Account numbers;
11. Certificate/license numbers;
12. Vehicle identifiers and serial numbers, including license plate numbers;
13. Device identifiers and serial numbers;
14. Web Universal Resource Locators (URLs);
15. Internet Protocol (IP) address numbers;
16. Biometric identifiers, including finger and voice prints;
17. Full face photographic images and any comparable images; and
18. Any other unique identifying number, characteristic, or code (note this does not mean the unique code assigned by the investigator to code the data)

APPENDIX H: Spreadsheet Calculations for Analysis of Provider Usability Testing

q1	Enter Data
	5
	5
	4
	3
	4

N	5
Mean	4.2
SD	0.8367
Spec	4
Z	0.239
%	59.4%
CV	20%

	Number	Percent
Top Box	2	40.0%
Top 2 Box	4	80.0%
Agree	4	80.0%
Net Top Box	2	40.0%

q2	Enter Data
	3
	5
	4
	3
	4

N	5
Mean	3.8
SD	0.8367
Spec	4
Z	-0.239
%	40.6%
CV	22%

	Number	Percent
Top Box	1	20.0%
Top 2 Box	3	60.0%
Agree	3	60.0%
Net Top Box	1	20.0%

q3	Enter Data
	5
	4
	4
	4
	4

N	5
Mean	4.2
SD	0.4472
Spec	4
Z	0.4472
%	67.3%
CV	11%

	Number	Percent
Top Box	1	20.0%
Top 2 Box	5	100.0%
Agree	5	100.0%
Net Top Box	1	20.0%

q4	Enter Data
	3
	2
	3
	2
	4

N	5
Mean	2.8
SD	0.8367
Spec	4
Z	-1.4343
%	7.6%
CV	30%

	Number	Percent
Top Box	-	0.0%
Top 2 Box	1	20.0%
Agree	1	20.0%
Net Top Box	-	0.0%

q5	Enter Data
	5
	4
	4
	4
	4

N	5
Mean	4.2
SD	0.4472
Spec	4
Z	0.4472
%	67.3%
CV	11%

	Number	Percent
Top Box	1	20.0%
Top 2 Box	5	100.0%
Agree	5	100.0%
Net Top Box	1	20.0%

q6	Enter Data
	0
	4
	4
	4
	4

N	5
Mean	3.2
SD	1.7889
Spec	4
Z	-0.4472
%	32.7%
CV	56%

	Number	Percent
Top Box	-	0.0%
Top 2 Box	4	80.0%
Agree	4	80.0%
Net Top Box	(1)	-20.0%

q7	Enter Data
	5
	5
	4
	4
	4

N	5
Mean	4.4
SD	0.5477
Spec	4
Z	0.7303
%	76.7%
CV	12%

	Number	Percent
Top Box	2	40.0%
Top 2 Box	5	100.0%
Agree	5	100.0%
Net Top Box	2	40.0%

q8	Enter Data
	2
	1
	2
	1
	1

N	5
Mean	1.4
SD	0.5477
Spec	4
Z	-4.7469
%	0.0%
CV	39%

	Number	Percent
Top Box	-	0.0%
Top 2 Box	-	0.0%
Agree	-	0.0%
Net Top Box	(3)	-60.0%

q9	Enter Data
	4
	4
	4
	3
	5

N	5
Mean	4
SD	0.7071
Spec	4
Z	0
%	50.0%
CV	18%

	Number	Percent
Top Box	1	20.0%
Top 2 Box	4	80.0%
Agree	4	80.0%
Net Top Box	1	20.0%

q10	Enter Data
	3
	4
	4
	3
	4

N	5
Mean	3.6
SD	0.5477
Spec	4
Z	-0.7303
%	23.3%
CV	15%

	Number	Percent
Top Box	-	0.0%
Top 2 Box	3	60.0%
Agree	3	60.0%
Net Top Box	-	0.0%