Program for Health Care to Underserved Populations – Final Report
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Part I: The Consulting Situation

Organization

The administrative office of Program for Health Care to Underserved Populations (PHCUP) is housed within the Division of General Internal Medicine in Oakland at Montefiore University Hospital. The program operates five free health clinics located throughout the Pittsburgh area. PHCUP's mission is to improve the lives of those individuals who need health care but lack appropriate access to health services. It seeks to do this through partnering innovatively with communities in need, catalyzing a spirit of service and volunteerism within the health profession, and articulating the individual, health system, and societal benefits of the unique models of service and care that result.

In addition to its affiliation with the University of Pittsburgh Montefiore University Hospital, PHCUP collaborates with Healthcare for the Homeless, which provides some pharmaceuticals and supplies, at a wholesale price. PHCUP in return provides data from patient encounters. Patient care across all clinics is provided by an exclusively volunteer staff of physicians, pharmacists, and medical students. PHCUP is supported in part by the Division of General Internal Medicine, Health Care for the Homeless, and periodic small grants. Because of the small budget of the Program for Health Care to Underserved Populations, efficient and effective data analysis of its patients' information is necessary in order to receive additional money in the form of grants. Technology greatly improves the quality of work in this area.

Facilities

Every worker in the Oakland office has her own computer because they are necessary for administrative uses. UPMC upgrades its doctors' computers every two years, and after some pass-me-downs, employees at PHCUP receive their computers at a rate of four years after the initial purchase. Mary Herbert, Clinical Coordinator's computer is the most advanced in the office as it was purchased in September of 2002 with money from a grant.

All of PHCUP's data are stored on a public drive internal to the Division of General Internal Medicine under UPMC. Members of the division may access the data freely, but the data is not visible to anyone outside of the Division of General Internal Medicine.

Programs

All of PHCUP's medical records are kept on paper and stored on-site at each individual clinic in locked cabinets. Only PHCUP staff and volunteer medical providers have access to these records. PHCUP uses a Microsoft Access database to store some patients' information, but it is not the main source when looking up a patient's medical history. The database does not contain very detailed information because there are no computers in the clinics to look up information stored in the database. The main purpose of the database is not for doctors' use at the clinics, but to produce reports used for dissemination to the Division of Internal Medicine, the PHCUP Advisory Board and Working Committee, as well as to assess outcomes for funding initiatives.

Two new AmeriCorps members are transferred into the office every year hence the type and amount of computer usage must be extremely straightforward and easy to learn. This way, the AmeriCorps members, who consist of almost half of the office workers, can make a smoother transition into their roles at PHCUP and reduce the amount of mistakes made.

Some of the major problems PHCUP experienced with its Microsoft Access database include the following:

- The report generator did not seem to pick up on case sensitive words. Therefore, inaccurate analysis of patients' data was produced.
- All records of referrals were not adequately stored in the computer because the form had many malfunctioning features. This caused patients' medical histories to be hard to trace, and at times impaired the judgment of the diagnosis for these patients.
- The database did not correctly handle multiple people under the same name. The previous method for distinguishing between two identical names was to physically append a number after the last name when entering the information into the database. In order to effectively search for the correct patient, the system needed to allow searches under various criteria, not just based on the first and last names.
- Visit records for each patient were stored in the order they were entered, and not in chronological order. This made browsing of records difficult, and sometimes caused errors in data interpretation.

One of the biggest problems involving technology at Program for Health Care to Underserved Populations is that not all problems can be realistically solved under the organization's constrained budget and space.

Staff

The main people who interact with the database are AmeriCorps members Melissa Montlack, and Joy Haynes, and Mary Herbert, Clinical Coordinator. Melissa and Joy are mostly responsible for entering data retrospectively from the Patient Encounter Form into the database. The encounter form is a set of demographic information and diagnoses collected from patients at some of the clinics. Mary, in turn, uses the information entered by Melissa and Joy to generate reports that may be used for funding purposes. Joyce Holl, Program Administrator, and Autumn Komorowski, Program Assistant, are involved with the more administrative aspects of the organization and do not interact regularly with the database.

Each computer at the office contains a set of standard office software. There are two main sources of training available to the AmeriCorps members concerning the database. The main source comes from Mary, who demonstrates the uses of the database personally to the two AmeriCorps members. There is also a reference manual produced with the help of Michael Burlando, a former student from Technology Consulting in the Community, that the two members may use as a guide. However, the manual does not adequately cover all situations and possible room for errors. Therefore, it is often up to the AmeriCorps members themselves to learn the database by doing, and discover certain functionalities along the way. The training available regarding the database is definitely less than sufficient.

Joy and Melissa have only been with Program for Health Care to Underserved Populations since the beginning of September. Mary has taken a weekend class in Microsoft Access, intended to improve her skills in modifying and maintaining the existing database. Autumn also has some background knowledge on general Access usage, although she does not regularly interact with the database. All the staff members are extremely willing to learn in order to improve their technical skills during their stay with the

organization. They are also interested in learning and exploring new methods that can improve the rate of learning for future AmeriCorps members.

Technical Environment

The computers used at the office are about four years behind the time they were first purchased. In addition to Mary's new computer, she has a laptop that others have access to as well. The breakdown of computers in the administrative office is:

- 1 Gateway 2000 Pentium 1 computer running Windows NT
- 3 Gateway 2000 Pentium 2 computers running Windows NT
- 1 Gateway Pentium 4 computer running Windows NT

Currently, the clinics do not have any computers. Mary's old computer will be going to the Birmingham Free Clinic to help with its pharmaceutical needs. All of the computers at the administrative office are connected to the UPMC Division of General Internal Medicine network and staff members are able to receive emails and Internet connection via the UPMC network. Each computer is loaded with basic Microsoft Office, Publisher, and Adobe Acrobat. Additionally, Melissa's computer has Macromedia Dreamweaver installed. In addition to the computers, there is one Hewlett Packard Business Inkjet color printer, and one Hewlett Packard LaserJet5 black and white printer.

Technology Management

Program for Health Care to Underserved Populations receives all of its technical support from UPMC Division of General Internal Medicine. All the administrative tasks and accesses are under the responsibility of Don Grimm from the Division of General Internal Medicine. Staff at the office cannot install software onto the computer without going through Don. All problems get reported to him, and he is responsible for solving, fixing, and logging the problems. Don is the only person responsible for the maintenance of equipment. Flavia Laun, another member of the Division of General Internal Medicine, recently designed the current web page for PHCUP according to regulations and standards from the Division of General Internal Medicine.

It is extremely convenient for PHCUP to have the technical support provided by UPMC Division of General Internal Medicine. But since Don is the only person responsible for the entire division, it is sometimes difficult for him to resolve all the problems that arise in a timely manner. PHCUP would greatly appreciate having someone on staff or as a volunteer who has greater knowledge of Access. Don is the tech-support person, but he does not specifically work with Microsoft Access. Mary is the person in the group who is most well-versed in Microsoft Access.

Technology Planning

Joyce Holl, the program administrator, oversees the planning and budgeting for the program's technical environment. The current Microsoft Access database was developed by a previous AmeriCorps member in 1995. Two years ago, Michael Burlando, another student from Technology Consulting in the Community, came and fixed a series of problems that improved the performance of the database. He also helped produce a manual that is now used to help train the AmeriCorps members on the usage of the database. PHCUP is slowly integrating technical aspects into the organization. With its limited amount of funds, there is not really a faster way for the integration to proceed. There is no monetary support for technical hardware, software, or expertise. The only plan is to solve the technical problems as they arise.

Internal & External Communications

The database files are shared internally within UPMC Division of General Internal Medicine. All the computers are left logged in, and the username and password for each computer are pasted on the monitor. It is necessary for the staff members to be able to access each other's computers because that is the only method of file sharing. Therefore, the only real security is the office door, which is kept locked at all times when there are no staff members present. Once someone gets inside the office, he will have access to all the information. The staff members have Internet email accounts from UPMC and are able to access the web via UPMC's Ethernet network.

PHCUP recently put up a web site supporting its mission and programs with the help of Flavia from Division of General Internal Medicine. PHCUP's basic patients' information is kept in the Access database. The contact information of its volunteers is stored in an Excel spreadsheet. Information regarding specific grants is under the sole responsibility of Mary and is stored on her computer.

Information Management

All the demographics for PHCUP's clientele are extremely critical to best care practices, funding opportunities, and reports. It is important to be able to show the grant agencies how their money is used. The organization also needs to keep track of other organizations PHCUP refers to and works with. Patients' diagnosis and medications are used to identify and analyze the medication usage patterns, and restock the pharmacy more efficiently. All of the information is kept on paper via the patient charts kept at individual clinics. However, information from the encounter forms and referral log sheets from both the Birmingham Free Clinic and Hub Clinic is stored in the Access database. Information regarding grants agencies and volunteers is stored in Excel. Melissa and Joy are responsible for entering the patients' information into the database while information analysis is generated by Mary.

The staff members have very limited access to patients' previous medical charts, from other offices. Full confidentiality is observed for every patient. Any data that is taken from the patient to put in the database is with the consent of the patient, as per his/her signature on the encounter form and/or a "release information" form. The only tool used for managing finances for the organization is Microsoft Excel. The database and emails are two main technical ways used to manage information. A fair amount of information such as patient data and reports flows from one staff to another via email. Although information for the database is only entered once, its reliability for information analysis may not be as accurate as it could be that data might have been entered incorrectly, or the database might not have functioned perfectly.

Scope of Work #1: Case Sensitivity in Data Analysis

Whenever a person goes to enter a diagnosis into the database, s/he may have a different style of entering the data. It was previously believed that the report generator in Microsoft access did not pick up on case sensitive words. The consulting task is to change the way data is compared when conducting data analysis. While comparing two strings, s1 and s2, in the database to see if they are the same diagnosis, temporarily convert both strings to all upper case and then compare. Rather than comparing s1 and s2 directly, compare ALL_CAPS(s1) and ALL_CAPS(s2). This way, any combination of cases in a data field will not matter. ALL_CAPS can either be an existing function in Microsoft Access or a function written by the student consultant.

Planned Approach:
- Melissa will explain the current database to the student consultant
- Find out the behind-the-scene aspects of the database. This refers to the codes and commands behind the graphical user interface
- Present an overview of using and modifying the current database in Microsoft Access to Melissa
- Identify all instances in the database that compares two data of diagnoses
- Research into whether or not Microsoft Access has a function that converts a string to all upper case
- If there is no such function that already exists in Microsoft Access, write the function
- Teach Melissa ways to change all instances of diagnoses comparison in the database to first convert the data to all upper case before comparing

Expected Outcomes:
- The database will no longer treat data with the same spelling but different cases as different words when doing data analysis
- Mary will no longer spend the time to manually fix those mistakes in the report-generating tool that exists in the database
- Melissa will have a better understanding of how Access works
- Melissa will have an introductory knowledge of SQL
- Melissa will be able to make minor changes to the Access database and update certain fields if necessary
- Melissa and Mary will have a clear understanding of the changes the student consultant made to the database

Expected Impact on Capacity:
The database will produce more accurate reports as a result of achieving the above outcomes. The database will no longer make the mistake of treating data with the same values but different cases as different information when conducting data analysis. Therefore, Mary will no longer need to spend the time manually locating such errors, and then updating the report generated with the fixed data. This will help both Melissa and Mary with shifting their time to other aspects of the organization. Without having to seek out this mistake by hand, the amount of error will be reduced. Melissa and Mary will also have more time to fulfill the organization's mission to help, serve, and provide medical services to underserved populations.

Scope of Work #2: Referral Form

Previously, all records of referrals were not adequately stored in the computer using the database. The referral form has many areas that simply did not work. As a result, staff members did not attempt to enter referral information into the database. This problem with the referral form caused patients' medical histories to be hard to trace, and at times impaired the judgment of the diagnosis for these patients. The student consultant's goal is to fix the outcomes portion of the referral form. This way, staff members from PHCUP can have a record of whether or not a patient actually attended an appointment made via the referral. In addition, the student consultant needs to make sure that the outcomes section can record reason(s) why a patient missed an appointment. Also, add the option on the form to enter free text under "counselor". This refers to a person external to PHCUP who is responsible for the patient. This way, even if records of the patient's referral history and follow-up patterns were not available, a staff member from PHCUP can call up the counselor and find out information about the patient. All these are information in the Activity Log. Ideally, the goal is be to make the referral section look like the Activity Log so that staff members have an easier time recording the information.

Planned Approach:
- Go over the Activity Log with Melissa and determines what information is collected, and which sections are not used
- Design the layout of the referral section, without giving considerations to the current layout of the form
- Compare the new design with the old design and figure out all the recyclable parts
- Determine the data type for all the new fields and fields whose data type should be changed
- Determine the choices for drop-down fields
- Redo the referrals section using the information obtained and for fields that require a certain format, such as the date, make sure to display the expected format
- User-test the new referrals sections
- Update the referrals using results from the user-testing

Expected Outcomes:
- The new referrals section will look very similar to the Activity Log.
- The rate at which staff members enter referral section into the database will increase because the form is more intuitive and follows logically from the Activity Log
- The follow up section will function correctly so that the staff members can identify patients' patterns of following up their appointments
- The staff members will have a better idea of whether to make an appointment for a patient (if s/he has a good history of following through with his/her appointments) or give the referral number to the patient for him/her to make the appointment himself
- The staff members will have a better idea of what has been done to help the patients in the past, or what other staff members have referred in the past
- Fields that expects a certain format will have more intuitive and clear directions

Expected Impact on Capacity:
If the referral section functions correctly, the staff members will be able to put it to better use. This section was rarely used due to its many malfunctioning parts. However, information this section collects can be extremely vital to the organization. PHCUP collaborates with other organizations when making referrals for its patients. If patients do not attend appointments made at PHCUP's partnering organizations, then the partnership with other organizations could be jeopardized. Therefore, having this form will help PHCUP develop more trusting relationship with its partnering organizations. With this section implemented and functional, staff members will be able to easily view a patient's past history without having to search through binders of papers. This will increase the productivity and efficiency at the office. Also, with the information stored in an Access database, Mary may find it useful when generating reports in the future, which may results in more funding and resources that directly help the patients. In addition, the community partner will develop a much better understanding of Microsoft Access from working to improve this section and can use this asset to make future modifications to the database, or help other office members improve their Access skills.

Scope of Work #3: Search by Multiple Fields

Previously, the Microsoft Access form searched for a patient by first asking for the patient's first name, and then the last name. The problem appeared when multiple patients have the exact same name. The database was not able to handle that, and although there were patients on record with the searched name, it did not return the relevant information. Prior to working with the student consultant, all patients with

the same name had assigned numbers appended to their last names to distinguish between them. The consulting goal is to add additional search options that would allow staff ways to distinguish between patients with the same names. At the first graphical user screen, there was only one button that allowed the staff members to search for patients by first and last name. The consulting goal is to change this button to first ask for last name, then first name because that followed the layout of the Encounter Form. In addition, add another button on the first screen that allows searches by the patient's social security number. Then, add a third button on the same screen that allows searches by the patient's date of birth.

Planned Approach:
- Go through the Access database and figure out how the current buttons functions to search for patients
- Teach Melissa the steps to reverse the first and last name order when prompting for a search string
- Mimic the behavior of the first button to create another button that searches for a patient whose social security number matches that of the search string, make sure to note the expected format the search query should be entered in
- Use a similar approach to create a third button that searches for patient(s) whose date of birth matches that of the search string, make sure to note the expected format the search query should be entered in
- User-test the three search buttons
- Update with any changes from results of the user-testing

Expected Outcomes:
- Patients who have the same name will not cause confusion for the staff members
- After implementing these additional search options, the previous method of appending numbers to last names will no longer be necessary
- If one type of information for a specific patient is not available, the staff members will still be able to search for the patient by other means
- Melissa will have a much better understanding of Microsoft Access' forms and queries

Expected Impact on Capacity:
After implementing these additional search options, the previous method of appending numbers to last names will no longer be necessary. If one type of information for a specific patient is not available, the staff members will still be able to search for the patient by other means. This means staff members will not have to manually enter numbers after certain patients' last names. This will reduce room for error because appending the number can cause a lot of confusion to someone new to the organization, and since two new AmeriCorps members join the organization every year, the turn over rate for staff is very high, which results in higher probability for human error. In addition, patients' data will be more accurately stored, which will help Mary generate more precise reports. This in turn, will help the organization produce better information to give to grant agencies, its advisory board, and the Division of General Internal Medicine.

Outcomes for Consulting Task #1: Case Sensitivity in Data Analysis

After doing research and examining the database closely, the student consultant realized that Microsoft Access should not actually have the case sensitivity problem. Microsoft Access is designed in such a way that two strings, when compared, treat upper and lower case as the same thing. So as long as the spelling is the same, two strings of various cases are treated as the same. This realization helped the organization to identify the source of past errors, and come to the conclusion that perceived case sensitivity errors of this sort was actually caused by human spelling error.

Program for Healthcare to Underserved Populations (PHCUP)'s mission is to provide health care to uninsured and homeless population. Because support from the health system and the University is minimal, accurate reports regarding patient encounters are critical to pursuing additional funding.

Since the database did not treat data with the same spelling but different cases as different words when doing data analysis, the organization is able to identity the source of the problem being spelling errors, and watch out for future occurrences of the problem. Melissa gained a fundamental understanding of how Access works, along with some knowledge of SQL. She could now make minor changes to the Access database and update certain fields if necessary.

One time, Joy spotted a malfunctioning button in the database, and Melissa was able to determine what exactly caused the problem. Even though she could not solve the problem, knowing the source of the problem is the first step in being educated in Microsoft Access. Even though Melissa gained a better understanding of Access, other members of the office did not have the opportunity to improve in this area. If Melissa happened to be elsewhere when a problem occurs, then the rest of the staff members at the office might have trouble figuring out what is going on behind-the-scenes in the Access database.

The outcome has taken advantage of the student consultant's technological expertise to realize the root cause of the problem, instead of another problem that appeared to be true on the surface. This experience may help the organization reduce its number of human spelling errors in the future, which in turn results in more accurate reports.

Recommendation for Consulting Task #1: Case Sensitivity in Data Analysis

The confusion over the problem was in part due to lacking of understanding of Microsoft Access' capabilities. Even though Melissa now has a better understanding of Access, there is a lot more to learn. Other staff members of the office could also benefit from learning more about Microsoft Access. Because the current PHCUP patients' database is stored in Microsoft Access data, the staff members should have some background knowledge of what goes on behind the database interface. Even if the staff members are not expected to fix complicated Access problems, it is crucial to know what parts of the database are causing certain problems, and have an idea of some possible solutions.

There are different ways of learning more about Access. One way is to do what Mary did and take a weekend class from the local community. However, this might be a bit expensive, especially if everyone in the office is to go through this training. Therefore, an alternative solution is to learn Access individually from a free source. Since Mary has had some Access training, and Melissa learned more over the course of this semester, they might serve as advisors to others while learning Access.

http://www.fgcu.edu/support/office2000/access/ is an Access 2000 tutorial from Florida Gulf Coast University. It goes into detail about the fundamental ideas and concepts of Access and database design. This tutorial is a good place for a beginner.

http://mis.bus.sfu.ca/tutorials/MSAccess/tutorials.html is a web-based Microsoft Access Tutorial from Simon Fraser University. It covers many areas of Access, including the more advanced topics. It also includes some basic database design ideas, which is useful if the database ever needs to be modified.

Outcomes for Consulting Task #2: Referral Form

The original goal was to model the referral section exactly after the paper form. However, due to time constraints, only the most important sections and broken sections were modified. The fields for recording patients' attendance, reasons for not attending an appointment, rescheduled appointment, and referral were removed. The steps for removing such fields are in *Appendix 1: Removing Old Outcome Section*. A new follow-up/outcome drop-down box was created that contains choices from the paper form, with procedures in *Appendix 2: Adding Follow-Up/Outcome Drop-Down Box*. In addition, a new notes text box was added to allow recording of free notes, with details in *Appendix 3: Adding Notes Text Box*.

Since the referral section is now fully functional and user-friendly, staff members are actually beginning to input data into the section. With referrals data growing every day, there developed a need for generating outcome reports that help determine the general behavior or patterns of referrals within a time period. With the aid of the student consultant's guide as show in *Appendix 4: Generating Outcomes Report*, Melissa implemented the report generator into the database.

The mission of the PHCUP is to meet the needs of its patients, not just medically, but socially as well. Patients have needs such as childcare, housing, or food. In these cases, the AmeriCorps members are responsible for referring these patients to the right agencies. PHCUP believes that treating sickness itself is not enough. It should help out the patients in any way possible. Additionally, social needs relate to medical needs. If a person has no money to buy food, then s/he will suffer from malnutrition. By putting the person on food assistance, PHCUP is aiding the patient medically as well. If a woman is pregnant, and she is referred to the right program, she will increase her chances of having a healthier baby.

By providing a way to more accurately log referrals, AmeriCorps members gained a better tracking system so that they could work better as a team. This way, one AmeriCorps member could simply look at the database to see what has been done to aid the patient in the past. Since new AmeriCorps members join the organization every year, having one storage place for all this data ensures that information is passed along in an extremely effective manner. As a result, the staff members at PHCUP work better together and help the patients more efficiently. Fixing the outcomes portion of the referral form to work helped staff members from PHCUP to have a record of what a patient did with a referral, and record miscellaneous notes. By making the referral section have choices available from the paper form titled Activity Log, the database ensures that staff members have an easier time recording the information.

The organization's goals include utilizing its resources and finding the best way to serve its patients. Therefore, it is important to be able to find out if patients are taking advantage of the referrals, and whether or not the referrals are useful at all. Having this feature working properly helped PHCUP staff to relate to patients on a more personal basis. When PHCUP made referrals on behalf of its patients, it is partnering up with another organization. It is important for PHCUP to maintain this relationship, and part of that involves making sure that the appointments made for its patients are followed through. If a partnering organization keeps receiving no-shows from PHCUP's referrals, then the relationship might be

jeopardized. If a patient is identified as having a pattern of no-shows, then the best solution might be for him to make the appointment himself, because in that case he will be more motivated to actually attend the appointment.

The only way to fix this problem was through the use of technology to improve the Access database. Not only has the database been improved, but the community partner was able to incorporate the skills she acquired from this work task to make an entire form in Access by herself without directions from the student consultant.

Because these sections have been tested and permanently added to the database, there is no need for maintenance. Every day use of a database does not change the behavior of a database. Therefore there is no reason why this section should cease to work in the future. By using technology to create a referral section that mimics the paper form titled Activity Log, PHCUP obtained a new way of efficiently looking up patient data that incorporates information from its paper form.

Recommendation for Consulting Task #2: Referral Form

This has been the second semester of which a student consultant from Carnegie Mellon University has helped PHCUP improve its database. At this point, there are still sections that are not fully functional, or ideal. The referral section, most ideally, would mimic the Activity Log in information and in form. This requires some time because that whole section of the database needs to be redesigned. There are also other minor problems within the database that could not be fixed within the time of this semester.

By having problems with the database, the staff members are inefficiently using their time because the database can cause frustration and can also delay certain tasks. The productivity of the whole organization could improve when the database, a tool for looking up and analyze patient information, is improved. Hence, the student consultant recommends hiring a technical/database intern whose main responsibility is to improve the functionality and the design of the database to as ideally a state as possible.

Hiring an intern has benefits over hiring a regular employee. There is a program called Federal Community Service Work-Study Program (FCS)[1] where a community organization can hire a college student on work-study as an intern. Under this program, the organization is only responsible for 25% of the total gross wages paid to the students, and the remaining 75% is federally responsible. Local Pittsburgh colleges such as Carnegie Mellon University, University of Pittsburgh, and Chatham College all participate in this program.

The contact person for this program at Carnegie Mellon University is Patricia Kravetz [pk13@andrew.cmu.edu]. The Federal Work-Study Office at University of Pittsburgh coordinates this program as well, and can be reached at wrkstdy@oafa.pitt.edu. More information about this program can be found at The Pennsylvania Higher Education Assistance Agency (PHEAA) [http://www.pheaa.org/employers/]. http://www.pheaa.org/employers/comm_guide.pdf points to the Off-Campus Community Service Program Guidelines, which must be followed by PHCUP if it chooses to participate in FCS.

Outcomes for Consulting Task #3: Search by Multiple Fields

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[1] The student consultant learned of the Federal Community Service Work-Study Program (FCS) from another consultant in the class, Sandra Gani. She recommended a similar approach for her organization.

At the first graphical user screen, there was only one button that allowed the staff members to search for patients by first entering the patient's first name, followed by his/her last name. The consultant helped Melissa change this button to first ask for last name, then first name because that followed the layout of the Patient Encounter Form. The consultant also developed a guide to help Melissa add another button on the first screen that allowed searches by the patient's social security number, as well as a third button on the same screen that allowed searches by the patient's date of birth. After the student consultant determined ways to implement these changes, she developed a guideline for implemented these changes, as shown in *Appendix 5: Search by SSN and DOB*. The guide also explained the importance and purpose of each step. The community partner than took the guide, and with the help of student consultant, implemented the changes in the database.

By correctly identifying the patient using multiple search criteria, the staff members do not view irrelevant information or add duplicate information to the database. This in turn helps Mary produce more accurate reports for the organization. These reports are used for funding from grant agencies and helped PHCUP improve its serves and facilities. This problem was only able to be fixed using the student consultant's technology skills, specifically for Microsoft Access. By eliminating this problem, staff members can obtain patient information more efficiently, and duplicate information is also handled correctly.

Since these working outcomes are now built into the overall design of the database, and working properly, it does not require any sort of maintenance. Even if someone happened to change the code to the outcome, Melissa will know how to fix it based on her acquired Access knowledge. In the case of this task, technology has helped the organization behave more efficiently as a whole by providing multiple ways of obtaining patient information.

Recommendation for Consulting Task #3: Search by Multiple Fields

Even though there are now three search methods, and social security number is unique, there still exists the problem of duplication. Not all patients have their social security numbers on file, and when that happens, it is possible that two patients without social security numbers on file will have the same name. And in the rare case that these patients' dates of birth are also not on file, then the problem of multiple patients with the same name occur once again. The only really unique information that every patient has is the patient ID number. This number is assigned automatically by the database every time a new patient is entered into the database.

The student consultant recommends that on the paper form for the patient, this patient ID is recorded, so that when a patient returns to the clinic in the future, the PHCUP staff member can look up his/her patient ID number and search by that number.

The patient ID number is already visible on the first page of the patient's form, and the procedure to implement a search by patient ID is extremely similar to the directions in *Appendix 5: Search by SSN and DOB*. The only exception is that the SQL query is:

SELECT PtIDInfo.PtID, PtIDInfo.LastName, PtIDInfo.FirstName, PtIDInfo.MiddleName, PtIDInfo.Suffix, PtIDInfo.Alias, PtIDInfo.Birthdate, PtIDInfo.SocialSecurityNumber, PtIDInfo.[Usual Place of Care], PtIDInfo.Sex, PtIDInfo.[Race/Ethnicity], PtIDInfo.Age, PtIDInfo.[Contact Person], PtIDInfo.[Acute Problems], PtIDInfo.Treatments, PtIDInfo.[Hospitalizations/surgeries], PtIDInfo.[Chronic Conditions], PtIDInfo.Immunizations, PtIDInfo.[Allergies/Response],

PtIDInfo.Medications, PtIDInfo.SocialMemo, [Birm Pt List 1999].Insurance1, PtIDInfo.[Street Address], PtIDInfo.City, PtIDInfo.State, PtIDInfo.Zip, PtIDInfo.[Housing type], PtIDInfo.[Common Residence], PtIDInfo.[Financial resources], PtIDInfo.[Family size], PtIDInfo.[Family income], PtIDInfo.[Family type], PtIDInfo.[Phone num], Medications.*, [Birm Pt List 1999].[Pt ID], *
FROM PtIDInfo LEFT JOIN (Medications RIGHT JOIN [Birm Pt List 1999] ON Medications.VisitNumber = [Birm Pt List 1999].VisitNumber) ON PtIDInfo.PtID = [Birm Pt List 1999].[Pt ID]
WHERE (((PtIDInfo.PtID)=[Enter Patient ID]) OR (([Enter Patient ID]) Is Null));

Other Recommendation: Implement a Backup System

With the number of patients growing every day, PHCUP relies heavily on the Microsoft Access database to store and analyze its patients' information. Therefore, PHCUP needs a stable backup system that will maintain productivity in case of emergency.

Some of the uses of database include but are not limited to:
- Passing patient information from one generation of AmeriCorps members to the next
- Easily storable and searchable data
- Generate reports that will help the organization obtain more funding
- Generate reports that will help the organization serve its patients better

Right now, there is no method of backup system that I am aware of. It is likely that since PHCUP sits under UPMC's Division of General Internal Medicine, there is some sort of hospital wide backup system. However, if anything goes wrong, for example, if the database crashes for some reason, or a human error occurs that caused the database to lose some of its vital information, then PHCUP staff members immediately lose an important source of data.

There are several ways of backing up the data. But due to the budget and facility constraints for PHCUP, the backup system is preferably limited to resources already available to the organization. One very simple but inexpensive way is to use the "Scheduled Task" option that comes standard in Windows and make a copy of the database every night and/or week. This way, if anything goes wrong, there will be one recent copy of the database available.

"How to use the Windows Task Scheduler: Introduction, Installation, Use, and Problem Solution" [http://www.iopus.com/guides/winscheduler.htm] provides a comprehensive guide to setting up a task that automatically backs up the database file every night. This is a rather advantageous method for the organization because:
- It uses Windows' capabilities, which is "free" in the sense that it does not require any additional funds
- It is relatively simple to set up and that causes the backup system to be easily maintainable and modifiable
- It does not rely on storage space, since it makes only a very limited number of copy/copies of the database

There are two sources for the destination of the backup database file. The file can be either backed up onto a local computer, somewhere else on the network drive, or write to a CDRW that is left in the CDRW-drive.

One drawback to this solution is that it is not a professional backup system that maintains copies of the database across several months. But considering the organization's technological and financial position, this is probably the most feasible and probable solution.

Part III: About the Consultant

Jennifer Li is a third year student at Carnegie Mellon University. She is pursuing a Bachelor of Science degree in Computer Science with minors in Business Administration and Multimedia Production. Jennifer is not only interested in the technology behind computer science, but its applications toward everyday life as well as other professional fields. She is hoping to enter into a career path with a mixture of computer science and business applications post graduation.

Appendix 1: Removing Old Outcome Section

Forms: ReferralAppt
>Erase everything in that section, including:
>- Attendance
>- Reason not attended
>- Rescheduled
>- Referral

Appendix 2: Adding Follow-Up/Outcome Drop-Down Box

Tables: FollowUp
>Click on *New* and select *Design View* to create a new table called *FollowUp*. Table *FollowUp* will have two fields: ID and Outcome.
>
>In the first row, type in *ID* under *Field Name*. Then under *Data Type*, select *AutoNumber*. Select the whole row and right click on the arrow in the left most box, and select *Primary Key*. In the second row, type in *Outcome* under *Field Name*. Then under *Data Type*, select *Text*.
>
>You have now created a new table which will store all the follow-up / outcome selections. So go ahead and save the new table and call it *FollowUp*, then close it.

Forms: ReferralAppt
>Open up *ReferralAppt* under *Design View*. The functionality of the new drop down box will be very similar to that of *Diagnosis*. You can save a few steps by copying and pasting the *Diagnosis* information and pasting it.
>
>Under the *All* tab, make sure the following are all correct:
>*Name*: Outcome
>*Control Source*: Outcome
>*Row Source*: SELECT DISTINCTROW [FollowUp].[ID], [FollowUp].[Outcome] FROM [FollowUp];

Tables: Appointments
>You will see that an additional column called *Outcome* has been added to the table.

Appendix 3: Adding Notes Text Box

Tables: Appointments
>Open up *Appointments* in design view. Add a new section at the bottom called *Notes*, with its type being *text*.

Forms: ReferralAppt
>Open up *ReferralAppt* under *Design View*. The functionality of the new text box will be very similar to that of *Location*. You can save a few steps by copying and pasting the *Location* information and pasting it.
>
>Under the *All* tab, make sure the following are all correct:

Name: Notes
Control Source: Notes

Appendix 4: Generating Outcomes Report

The data you are trying to analyze is stored at *Table: Appointments.Outcome*, now following the following steps to produce the report generator:

1. Under Tables, open up *Appointments* in Design View, change *Outcome*'s Data Type to *Number*
2. Create a new Query called *OutcomeReportQuery* with the following:
   SELECT FollowUp.Outcome, Count(FollowUp.Outcome)
   FROM Appointments INNER JOIN FollowUp ON Appointments.Outcome = FollowUp.ID
   WHERE (((Appointments.[Appt Date]) Between [Start Date] And [End Date]))
   GROUP BY FollowUp.Outcome;
3. Create a new Query called *OutcomeTotal* with the following:
   SELECT Sum([Expr1001]) AS Expr1
   FROM OutcomeReportQuery;
4. Create a new Query called *OutcomeReportQueryComp* with the following:
   SELECT OutcomeReportQuery.Outcome, OutcomeReportQuery.Expr1001 AS Encounter,
   OutcomeReportQuery.Expr1001/OutcomeTotal.Expr1*100 AS Percentage
   FROM OutcomeReportQuery, OutcomeTotal;
5. Under *Reports*, double click on *Create report by using wizard*
6. Under Tables/Queries, select *Query: OutcomeReportQueryComp*
7. Double click on everything in *Available Fields* to move them to *Selected Fields*. This tells the wizard that you would like to put these fields into the report.
8. Click Finish
9. Rename *OutcomeReportQueryComp* to *OutcomeReportSubreport*
10. Open up *OutcomeReport Subreport* under Design View and make sure all the headings are correct, make any modifications that you would like.
11. Insert this sub-report into report *MonthlyStats*

Appendix 5: Search by SSN and DOB

Directions
1. Make sure to *make a backup copy first* and practice this on the backup copy before implementing the feature on the actual database
2. Be sure to *save along each step*

Queries
Make a new query called *Birm SSN*. The easy way to do this is to select Query *Birm*, press ctrl-C to copy, then press ctrl-V to paste. It will then ask you *Paste As Query Name:* and type in *Birm SSN* then press enter.
Note: Birm is the current query that allows you to search by first and last name.

Now that you have created a new query called *Birm SSN*, the next step is to modify it so that it allows you to search by social security number rather than first and last name.

Here is what new query should look like:

PARAMETERS [Enter SSN of patient] Text (9);
SELECT PtIDInfo.PtID, PtIDInfo.LastName, PtIDInfo.FirstName, PtIDInfo.MiddleName,
PtIDInfo.Suffix, PtIDInfo.Alias, PtIDInfo.Birthdate, PtIDInfo.SocialSecurityNumber,
PtIDInfo.[Usual Place of Care], PtIDInfo.Sex, PtIDInfo.[Race/Ethnicity], PtIDInfo.Age,
PtIDInfo.[Contact Person], PtIDInfo.[Acute Problems], PtIDInfo.Treatments,
PtIDInfo.[Hospitalizations/surgeries], PtIDInfo.[Chronic Conditions], PtIDInfo.Immunizations,
PtIDInfo.[Allergies/Response], PtIDInfo.Medications, PtIDInfo.SocialMemo, [Birm Pt List
1999].Insurance1, PtIDInfo.[Street Address], PtIDInfo.City, PtIDInfo.State, PtIDInfo.Zip,
PtIDInfo.[Housing type], PtIDInfo.[Common Residence], PtIDInfo.[Financial resources],
PtIDInfo.[Family size], PtIDInfo.[Family income], PtIDInfo.[Family type], PtIDInfo.[Phone
num], Medications.*, [Birm Pt List 1999].[Pt ID], *
FROM PtIDInfo LEFT JOIN (Medications RIGHT JOIN [Birm Pt List 1999] ON
Medications.VisitNumber = [Birm Pt List 1999].VisitNumber) ON PtIDInfo.PtID = [Birm Pt List
1999].[Pt ID]
WHERE (((PtIDInfo.SocialSecurityNumber)=[Enter SSN of patient]) OR ((([Enter SSN of
patient]) Is Null));

Notice the only difference exist at the first and the last lines.

Note: SSN should be entered in the form of #########, with no dashes in between the numbers.

Forms: Birm Form SSN

We are now going to create a form called Birm Form SSN that's displayed after a search is
complete. You want this form to look exactly like:

Once again, this form looks extremely similar to *Birm Form*, so we can just copy and paste that.
Do so and call the new form *Birm Form SSN*.

Now we are going to modify the internal code behind *Birm Form SSN*. Open *Birm Form SSN* in

Design View, and then click on ⬚ which takes you to *Properties*.

Click on the tab titled *All*, and under that section, change the following:
      OrderBy: *Birm SSN.ClinicDate DESC*
      RecordSource: *Birm SSN*

Macros

    toPtForm is currently the Macro that is used to search a patient by his/her first and last name, you are once again going to copy that and paste it as a starting point for creating a new Macro. Call the new Macro *toPtFormSSN*.

    What *toPtFormSSN* does is that it opens the form called Birm Form SSN and places all the information retrieved by the query into the form.

    Right click on *toPtFormSSN* and click on *Design View*. Since it is currently an exact copy of toPtForm, we want to modify it so that instead of calling the form *Birm Form*, we call *Birm Form SSN*.

    Under *Form Name*, change *Birm Form* to *Birm Form SSN*.

Forms: main page

    Now you will modify the main page form to add a button for this new feature.

    Copy and paste the current button for *Enter or View Patient Information*.

    Right click on the new button and select *Properties*. Change the following information:
      Name: *to_ssn*
      On Click: *toPtFormSSN*
Now go ahead and close the *Properties* box.

    Right click on the new button and select *Build Event…*. Make sure the action specified is *Open Form* where *Form Name* is specified as *Birm Form SSN*.

Final Step

    Now you are ready to use the new button! Close everything and open up the database, and click the new button. Make sure to enter the social security number in the format of #########.

    Now you may move the button around and add additional text, and decorate it =)

    Given the above steps, can you make another button that allows you to search by date of birth (DOB)? Here is the Query statement:
SELECT PtIDInfo.PtID, PtIDInfo.LastName, PtIDInfo.FirstName, PtIDInfo.MiddleName, PtIDInfo.Suffix, PtIDInfo.Alias, PtIDInfo.Birthdate, PtIDInfo.SocialSecurityNumber, PtIDInfo.[Usual Place of Care], PtIDInfo.Sex, PtIDInfo.[Race/Ethnicity], PtIDInfo.Age, PtIDInfo.[Contact Person], PtIDInfo.[Acute Problems], PtIDInfo.Treatments, PtIDInfo.[Hospitalizations/surgeries], PtIDInfo.[Chronic Conditions], PtIDInfo.Immunizations, PtIDInfo.[Allergies/Response], PtIDInfo.Medications, PtIDInfo.SocialMemo, [Birm Pt List

1999].Insurance1, PtIDInfo.[Street Address], PtIDInfo.City, PtIDInfo.State, PtIDInfo.Zip, PtIDInfo.[Housing type], PtIDInfo.[Common Residence], PtIDInfo.[Financial resources], PtIDInfo.[Family size], PtIDInfo.[Family income], PtIDInfo.[Family type], PtIDInfo.[Phone num], Medications.*, [Birm Pt List 1999].[Pt ID], *
FROM PtIDInfo LEFT JOIN (Medications RIGHT JOIN [Birm Pt List 1999] ON Medications.VisitNumber = [Birm Pt List 1999].VisitNumber) ON PtIDInfo.PtID = [Birm Pt List 1999].[Pt ID]
WHERE (((PtIDInfo.Birthdate) Between [Enter DOB of patient] AND [Enter DOB of patient]) OR (([Enter DOB of patient]) Is Null));

Note: the first line defining the parameters is gone, and the only modification is the last line under the *WHERE* clause.