



## **Executive Summary**

Student Consultants, Steven Maher and Gopal Patel  
Development Partner, David Rykken, MPH

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### **I. Background Information**

The consultants, Steven Maher and Gopal Patel, worked with development partner, David Rykken, MPH, at the Ministry of Health (MOH), Republic of Palau. David is the Chief of Ancillary Services at MOH. MOH's mission is *to take positive actions to: attain healthful environment, promote health and social welfare, protect family and health safety, and provide health care services throughout the Republic of Palau*. MOH's main facility is the Belau National Hospital (BNH).

The consultants were part of The Technology Consulting in the Global Community (TCinGC) program. TCinGC is a Carnegie Mellon University (CMU) sponsored collaborative partnership between CMU students and faculty and governmental and non-governmental organizations throughout the world. A select group of CMU students travel abroad each summer to enhance their own technical, management, and communication skills by developing locally sustainable uses for information and communications technology. An overview of the TCinGC program can be found at: <http://www.techbridgeworld.org/tcingc/overview.html>.

### **II. Consulting Tasks**

The partnership involved working with several departments at BNH, most of which were within the Ancillary Services division. The scope of work was to develop various tracking departmental databases while training personnel on their design, usage, and analysis.

The consultants partnered with the following department heads to develop patient encounter tracking databases specific to each department's needs:

- Jason Nolan of Physical Therapy
- Jesse Rechelluul of Radiology
- Dr. Selaima Lalabalavu of the Inpatient Wards
- Dr. Greg Dever of Pediatrics
- Francis Termeteet of Laboratory
- Dr. Robert Maddison of Emergency Room

The consultants also worked with:

- Nick Ngwal of Maintenance to develop an asset tracking database
- Jullie Tellei, Darren Skilang, and Elizabeth Kyota to develop a human resources database that tracks hospital employees, their education levels and training, continuing medical education events, and licensing requirements

- Biribo Tekanene to upgrade an older database to better track inventory in the pharmacy's dispensary

General training sessions on Microsoft Excel and Access were held every Friday to demonstrate proper data collection, analysis, and reporting. These were attended by Dr. Selaima Lalabalavu, Dr. Yuri Becheserrak, Dr. Catherine Decherong, Dr. Angie Marcel, and Dr. Robert Maddison. More extensive training with Belinda Eungel of Infection Control led to a reorganization of her hospital environmental surveillance data.

### III. Outcomes Analysis and Recommendations

The main outcome of the consulting partnership was that increased technical capacity within MOH was achieved, meaning each department has improved its ability to record and report data with a view towards improving services to patients. Various department heads and personnel's capacity as database developers has been increased. They know how to create and edit tables, queries, and forms in Microsoft Access and have done so themselves. They have been able to export the new data to Microsoft Excel for analysis and reporting. These databases allow the MOH to make its departmental information more easily queried to provide statistical information for purposes of grant stipulations and general information. By using this information, MOH will be able to better meet their mission of attaining a healthful environment. These databases are sustainable in that they were built in conjunction with the department heads. Also, David and Mindy Sugiyama, a member of MOH's IT staff, have been trained in the maintenance of the databases. If the department heads and personnel leave the MOH, it has been recommended that their replacements be trained to use Microsoft Access and the departmental database.

In order to prevent the departmental databases from losing their utility, it has been recommended that data entry and monthly reporting be included in the job duties of the employees and supervisors. To provide more technology training opportunities, typing tutorials and a yearly technology workshop are recommended. It has also been recommended that the MOH further develops their website to serve as another means of both internal and external communication. For external communication, the website can post jobs, needs, and goals, since the MOH recruits employees internationally and gathers a large amount of funding from international grants. It was also recommended that the MOH creates a technology committee to help them expand the role that technology can play within their organization, since they are currently lacking formalized communication between the departmental heads and the IT staff.

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#### Development Partner

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#### About the Consultants

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He plans on pursuing a master's degree  
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## **Final Consulting Report**

Student Consultants, Steven Maher and Gopal Patel  
Development Partner, David Rykken, MPH

### **I. About the Organization**

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#### **Organization**

The Ministry of Health in Palau is a governmental agency that also encompasses Belau National Hospital, built in 1991. Their vision is “Healthy Palau in Healthful Environment.” Their mission states, *the Ministry of Health shall take positive actions to:*

- 1. Attain healthful environment*
- 2. Promote health and social welfare*
- 3. Protect family and health safety*
- 4. Provide health care services throughout the Republic of Palau.*

One of the Ministry of Health’s program objectives is to make quality care accessible to persons who need restoration to health through:

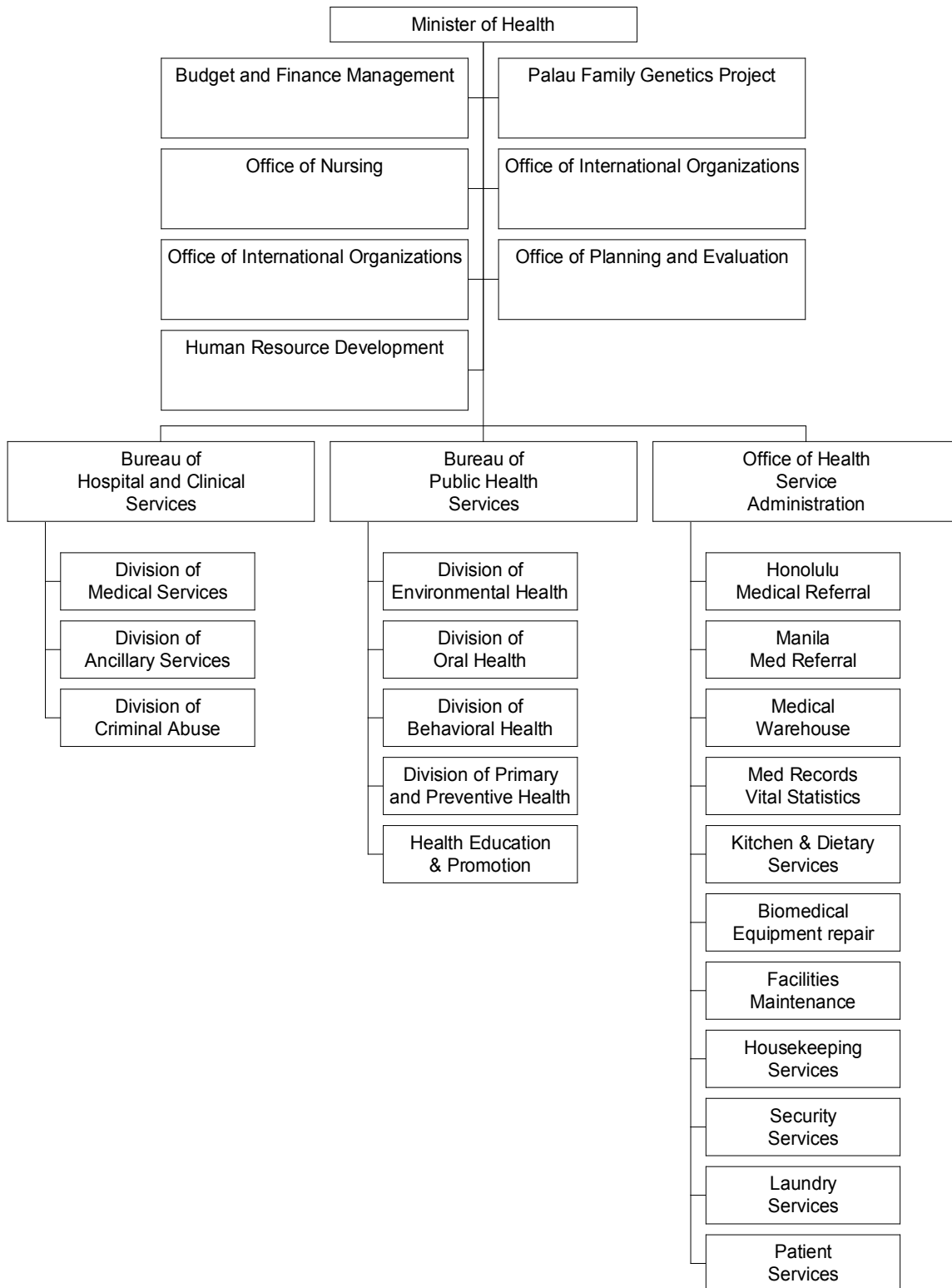
- Development of health facilities including equipment and supplies
- Development of referral and consultation systems
- Building of skills and capacity of health providers
- Efficient utilization of resources.

#### **Facilities**

The Ministry of Health (MOH) serves the entire population of Palau – 19,129 according to the 2000 census. About 12,000 Palauans live in Koror State, where Belau National Hospital (BNH) is located. BNH has 80 beds and services approximately 100,000 outpatient encounters per year. The other 7,000 Palauans are scattered amongst the other islands of Palau and have access to the MOH’s 16 remote dispensaries. The dispensaries offer mostly pharmaceutical services, but some have a resident doctor, beds, and examination rooms.

## Departments

MoH Organizational Chart



The consultants worked under the Division of Ancillary Services, which has nine departments:

1. Hospital Preparedness
2. Pharmacy
3. Radiology
4. Laboratory
5. Dive Medicine
6. Hemodialysis
7. Physical Therapy (Rehabilitation)
8. Continuing Education
9. Infection Prevention and Control

The MOH operates on about a \$14 million per year budget, with about half coming from federal grants and the rest from local funding. These grants come from a variety of organizations, including the Center of Disease Control (CDC), the United States Department of Interior (DOI), the World Health Organization (WHO), the Health Resources and Services Administration (HRSA), the Substance Abuse and Mental Health Service Administration (SAMHSA), and other countries, such as Taiwan, Japan, and India. About 90% of Palauans' health care is subsidized by the government. As part of grant stipulations, the MOH must gather various forms of aggregated data.

## **Staff**

The MOH is comprised of over 350 employees of whom 26 are physicians. The Minister of Health is Dr. Victor Yano. Most employees have basic computer knowledge – office software, email, using databases for data entry. Almost all employees use email within the organization to communicate and share files. There is no formal IT training for employees, so most have learned on their own. Some have found the Microsoft Office help files very useful in helping them when they ran into difficulties.

David Rykken, MPH, our development partner, is the Chief of Ancillary Services. He is an American expatriate with a Masters in Public Health and is working on his doctorate. He is currently developing a five-year strategic plan for the nine departments within Ancillary Services. This requires information on how the departments are running so that he can better assess the situation and implement appropriate quality controls. All of the departments have large amounts of manually collected data, but is unfortunately difficult to analyze.

The MOH has an IT department, but this department does not fall under the Ancillary Services, which is our sponsoring division and main responsibility. It consists of two full-time employees: Everett Belelai is the Information Systems Manager and Mindy Sugiyama is the Network Engineer. They are responsible for all IT-related work in the MOH including troubleshooting, maintenance, procurement proposals, and development on discrete projects. Mindy is paid under the hospital preparedness grant and will be assigned to maintain the databases built by the consultants.

The Bureau of Public Health Services also has an IT staff member, Toshi, who does not fall under Ancillary Services. Toshi's role is to build Access databases for Public Health, including one for the Emergency Room.

## Technical Environment

The Belau National Hospital (BNH) has about 100 operating computers, all of which run Microsoft Windows XP with Microsoft Office 2000 or 2003 and AVG anti-virus software. Most of the computers are fairly new Dells and Microns, purchased within the past few years. All of the computers are part of BNH's extensive wired and wireless network with 9 access points. These access points are linked together by a fiber optic backbone. Although the internal network is fast, the external connection to the internet is slow. BNH internet access comes through a dedicated 384 kbps connection provided via an 802.11-based uplink transmitting almost 1.5 miles away using a unidirectional antenna and high-frequency transponder. The uplink site is connected to the global internet via a pair of satellites. Latency is on the order of above 1 second for connections to the United States and reliability drops off during the day when usage increases.

Two servers are responsible for email, file sharing, storing anti-virus updates, serving the Ministry's *palau-health.net* website, and running the hospital's Health Information System server application. A Dell PowerVault system is used for server backups.

A paging system provides paging facility in a 25 mile radius. 40 pagers are currently used by first responders, on-call doctors, IT, maintenance, directors, and the minister.

Most of the remote dispensaries have a single computer with dial-up modem access to BNH as well as a fax machine for sending documents.

## Technology Management

The IT department is responsible for all technology management. They face two main problems, funding and lack of staff. There is no steady formal budget. Money is procured on an as-needed basis from local funds and occasionally from leftover portions of grants. With only two staff members overseeing about 350 users, technical support at times can be very time consuming. This leaves them with little time to work on other IT projects, such as departmental databases. As a result, many of the databases in the Ancillary Services division have no functionality besides data entry.

Employees are responsible for backing up their own files. Most store their files locally due to shyness of sharing their work with others. This is the predominant reason that network shares aren't used. Most department heads backup files onto their own thumb drives once a week, but there is no standard protocol to do so. Documents are usually shared via email.

## Technology Planning

There is no official committee in charge of technology planning at the MOH, so most of this work falls into Everett's hands. The MOH has recently accepted a bid from an outside company to build a new system over the next twelve months that will replace the current Health Information System (HIS). This contract includes plans to migrate all of the data out of the current COBOL system to a new SQL server-based system. The IT staff is concurrently working on multiple projects of varying priority. These projects are usually the result of grant stipulations or needed functionality.

## **Internal & External Communications**

Internal communication is chiefly done in person or over the phone. Most employees check their email once a day when they get into work. The hospital also has an internal paging system for doctors. Monthly chiefs and directors meetings are held to discuss what the different departments are doing and general hospital concerns. Major allied health and warehouse employees gather weekly with the minister to discuss ongoing issues. Faxes are used to send orders from the remote dispensaries to the central pharmacy in BNH. Most external communication is done via email, although phone calls are sometimes used. Regular communication between the hospital and remote dispensaries is done over the phone.

The MOH's website, *palau-health.net*, is currently only used to access email and the Reportable Disease Surveillance System (RDSS), which is used by the laboratory to alert physicians of possible outbreaks. In the future, the MOH would like to use it for internal communication by posting reports and also as a portal to web applications.

## **Information Management**

The MOH has various databases, including the major Health Information System (HIS), which attempts to provide inventory and costing management for the warehouse and pharmacy in addition to patient tracking. The pharmacy also uses a separate database for filling prescriptions and printing labels. Various departments use unconnected databases and spreadsheets for their own needs. David is interested in compiling information from these databases for his five year strategic plan. The warehouse tracks received packages and inventory with a spreadsheet due to certain problems with HIS. The lab has begun using spreadsheets to record results since paper copies are cumbersome in volume and are getting lost. Pediatrics maintains a separate patient tracking system as does the Behavioral Health department. The cancer program tracks follow-up visits in its own database and duplicates the same information in grantor-provided software. Physical Therapy maintains a patient assessment database that currently lacks reporting features. The State Incentive Grant (SIG) Office uses a SAMSA-provided web application but has Internet connectivity problems limiting its use. The Infection Control department uses spreadsheets to keep track of surveillance data. The Wards use spreadsheets to keep track of patients and diagnosis data.

## II. Scope of Work and Outcomes

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### Task 1. Patient Encounter/Tracking Databases

#### **Problem**

Various ancillary service departments within the Ministry of Health collect data on patients and services performed. Much of this data is recorded manually in log books or improperly collected electronically making analysis difficult. Department heads are unfamiliar with generating reports and gathering statistics, so in many cases resort to manual counting. David Rykken, Chief of Ancillary Services, is in the process of creating a five-year strategic plan for the hospital and needs statistical information from the departments to better assess the current situation.

With manual log counting being the main method to extract data, secondary reports are never generated. The Ancillary Services departments would like to know which other hospital departments are sending patients and utilizing resources so that grant monies can be better distributed. Department heads believe major public health initiatives and services that use laboratory, radiology, and physical therapy resources are not sharing the burden of cost. However the needed data to show these trends cannot be easily acquired.

The three clinical inpatient wards, surgical, medical, and OB/GYN, have been entering patient encounters into EPI-Info or spreadsheets. EPI-Info is software produced by the CDC for customizing questionnaires and storing data. However, it lacks a simple interface for generating reports and users are not trained in its use. The data in spreadsheets are either incomplete or improperly collected without validation. A few supervisors have asserted that statistics about patient demographics and diagnoses would be helpful for the annual Family Health Conference in late June.

The laboratory has five different testing stations with computers used to enter results into spreadsheets. However, these spreadsheets are disjoint, leading to data duplication and difficulties with gathering department-wide statistics. There are also no policies in place requiring the electronic entry of lab results resulting in incomplete information. All lab results and encounters are hand-written into logs which are counted for statistical purposes. Currently, the lab cannot easily produce reports detailing which doctors are sending unnecessary tests or what percentages of lab resources are devoted to which medical departments. The lab has also been known to lose results occasionally. Only one staff member is usually present at night and many times is overloaded by doctor requests. For feedback purposes on scheduling, the supervisor would like statistics by what time of day a given physician sends referrals. The radiology department also suffers from unbalanced scheduling since there is only one person certified for CT scans and two for ultrasounds.

The physical therapy department is partly funded by grants that require reports on the services they are providing. Currently, technicians input all patient encounters into a Microsoft FoxPro-based system that does not have any report generating functionality. Simple queries about how many patients came in during one month require Jason Nolan, the department head, to manually count all of the records. The various grant reports require different statistics on patient counts sorted by service. Without the capability to query this information, the physical therapy department is spending extra weeks every year just manually counting their data.



The pediatrics department has an Access database used to keep track of patient follow-ups. Dr. Dever, Head of Clinical Services, is the primary user and runs the database on a laptop containing over 500 patient records. The database does a decent job of meeting his needs, but he does not have time to input patients during the day. As a result, he has a rather large stack of follow-up records that have not been entered. Other pediatricians do not have easy access to his data, which is only stored on that laptop, and keep separate copies that are not synchronized on their own laptops.

The emergency room has an Access database that is no longer being used to enter data, because the data entry process is too tedious. The database is functional and even has report generating functionality, but its lack of complete information makes the produced information less accurate.

### **Opportunity**

The opportunity identified was to work with the respective department heads of Radiology, Physical Therapy, Laboratory, the Wards, Pediatrics, and the Emergency Room to create or update patient encounter/tracking databases. These databases would use Microsoft Access, because the department heads already were familiar with it from a weeklong training session held by PALARIS, the Office of the Palau Automated Land and Resource Information System, in January. The department heads were enthusiastic to work on the databases, because they had become frustrated with manually counting data for statistics.

### **Approach**

- Used the patient assessment and encounter forms to identify tables and fields that should be part of the database with the individual department heads, including:
  - Francis Termeteet and March Kloulubak in lab
  - Jason Nolan in physical therapy
  - Jesse Rechelluul in radiology
  - Dr. Selaima Lalabalavu in the inpatient wards
- Identified new fields and unused ones to be changed from existing databases with:
  - Dr. Robert Maddison in the emergency room
  - Dr. Greg Dever, Dr. Yuriko Becheserrak, and Dr. Catherine Decherong in pediatrics
- Designed and drew out the Entity-Relational diagram that represents the database with the department heads
- Customized a basic patient tracking database built by the consultants to meet the individual department needs using Microsoft Access
  - Worked with the department heads on:
    - Editing tables and relationships
    - Editing forms
    - Importing data from any old systems into the new database
- Created queries with the department heads and staff members to export the Access data to Microsoft Excel for analysis
- Worked with the department heads to create charts and do further analysis of data in Microsoft Excel to determine various things from the patient information, such as how many particular services were received in a particular month
  - The main Excel features taught were Pivot Tables, Charts, and Lists
- Taught all other departmental staff members how to use the database for future data entry

- in the future until they were comfortable enough to enter it independently
- Created a backup of the database with the department heads

## **Outcome**

Three new departmental patient encounter/tracking databases were developed, in partnership with the student consultants, by the heads of radiology, physical therapy, and the wards. The databases reduce the number of times that the departments have to enter redundant data such as a patient's name, hospital identification number, and service code. They also decreased the amount of time in compiling necessary quarterly or yearly reports for grants and hospital requirements. The department heads have demonstrated that they can create and edit tables, forms, queries, and reports. Planning and training was completed for the laboratory's database. The existing pediatric database was edited and sharing functionality was added.

The radiology, physical therapy, and inpatient wards databases are similar because they were customized from the radiology database. Therefore, only sections of each database will be described as an overview.

The E-R diagram of the radiology database showing its tables, fields, and relationships can be found in appendix A. The main tables are Patients, Encounters, and EncounterProcedures. The Patient table holds information related to patients, such as hospital number and name. The Encounter table holds information related to encounters, such as the referring department, provider, and date. Refer to Appendix B for a datasheet view of the Encounter table. The EncounterProcedures table holds information related to the procedures that were given to the patient during an encounter, such as the name, technician, films used, and films wasted.

The start screen for the medical ward database can be found in Appendix C. Most data will be entered from the encounter form (see Appendix D for an example from physical therapy). This form contains distinguished subforms from the Patients, Visits, and EncountersSupplies tables. An Encounter List form was created so that past encounters could be searched by various fields and edited (refer to Appendix E).

The reports can show diverse slices of information, such as most popular treatments, the most frequent provider requests, and the employees who have given the most procedures. Analysis on any of the fields can be performed with Microsoft Excel. The reports of the radiology department database show the referring departments and providers requesting radiology's procedures. Refer to Appendix F to see these reports.

The emergency room and pediatric databases were updated to better reflect their departmental needs. Many unnecessary fields were removed from the emergency room's database and the ability to search through the ICD 9 diagnosis codes was added to reduce the amount of time required to enter patient encounter information from the logbook. The pediatric database's diagnosis categories were reorganized to make data entry easier. A field storing the provider name was added, so that the pediatricians can determine who performed which checkup.

The current state of the departmental databases provides evidence of this outcome:

- The department heads were involved throughout the development process, they
  - Spent at least 10 hours working with the consultants improving their skills with Microsoft Access
  - Created at least 2 tables and forms under minimal supervision from the

- consultants
    - Edited the tables and forms on their own time
- Information on patient encounters is now available.
  - The Radiology department has entered over 500 encounters
  - The Physical Therapy department has entered over 50 new encounters and 100 visits, and over 5,000 past encounters were imported from the previous system
  - The Inpatient wards have entered over 20 encounters
  - The supervisors each made a departmental report based on encounter information.

The current state is an improvement over the past state without the patient encounter databases. The past state included:

- Typing up repetitive data into an Microsoft Excel spreadsheet and manually counting the records for information
- Data filled with typos from Microsoft Excel not verifying data types and data fields with existing ones
- Data disorganized in paper form in departmental log books

While the databases for physical therapy, radiology, inpatient wards, and pediatrics were completed, the laboratory's was not. Currently, they have created their E-R diagram and have finished Microsoft Access training. However, laboratory's needs were larger in scope than the other departments and the consultants and laboratory personnel did not have the time to complete the database. This suggests capacity "yet to be reached" because there are other departments within the MOH, such as laboratory, which could benefit from Patient Encounter Tracking databases. Sharing capabilities could also be added to the Pediatric database by moving it on to a network share. Since three pediatricians share the same patient information, it would be beneficial for their data to be located on one database.

The departmental heads' capacity has been increased as database developers, as they now are more familiar and comfortable with creating one and understand the necessary building steps. Their increased capacity as database developers may lead to the creation of other databases which help MOH accomplish its mission of attaining a healthful environment by providing insight into what services can be improved.

The most important sustainability risk is if the departmental employees stop entering the patient encounter data; the databases would lose utility and departmental heads again would resort to counting data from log books. There is also a risk that this outcome is not sustainable if the department heads decide to quit MOH and their replacement is unfamiliar with Microsoft Access. However, it has been suggested that any new department head hire be trained to work with Microsoft Access. This way the reports and statistics can continue to be gathered from the databases.

The department heads have demonstrated that the databases are sustainable in that they know how to create new tables, forms, and reports. They have also documented the steps necessary to do so. It is difficult to predict all of the reports that they will need to generate in the future, but with a working knowledge of Microsoft Access and Excel they should be able to create them. All of the department heads have been given electronic copies of two Microsoft Access reference textbooks. Since all of the department heads are using a similar database, they can also use each other as resources when they run into difficulties. Microsoft Access was chosen to build the

databases because more local people and groups, such as PALARIS, have experience working with it. The department heads have a copy of the database on a removable flash drive to be used for weekly backups. The department heads have each made at least one backup so far. David and the IT staff have each been given copies of the database, so if it becomes corrupted, they can replace it. David has been instructed on creating reports from the data in the databases, so that he can do it himself without the assistance of the department heads.

This outcome has supported MOH's new vision in improving their services so that they can better meet their overall vision of a healthy Palau in a healthful environment. The first part of the MOH's mission is to "attain healthful environment". The information gathered through the departmental databases will be used to achieve the goal of a more healthy Palau by analyzing trends over time. Diagnosis data and encounter data will be used to support research and provide statistics to show where Palau is healthy and which areas need improvement. Instead of guessing, the MOH now has the expanded capacity to statistically gather the most common or most frequent diagnosis and health issues. The information from the departmental reports will be used by David when he creates MOH's five year strategic plan starting this upcoming fall. The main outcome the consultants attained was empowering the Ministry of Health to generate proper reports and useful statistics to get a better assessment of their services.

### ***Recommendation for Patient Tracking databases***

#### ***Rationale***

In order to prevent the new databases from falling into the same traps as the former ones, the consultants recommend that the use of technology be incorporated into MOH employee's job duties. More specifically, data entry should become part of a department employee's job duties and monthly reporting should become part of a department supervisor's role.

The past Emergency Room and Pediatric databases were ineffective mostly because employees stopped entering data. The employees claimed that entering the data was too time consuming. Once gaps start to develop in the database, its information becomes less valuable. All employees have been instructed and have personally entered data for at least two patient encounters without the consultants' assistance. Therefore, the employees have the knowledge necessary to use the systems but must still make an effort to stay current with data entry.

Physical Therapy's old database of over 40,000 records (including encounters, visits, and procedures performed) contained the most data out of any of the previous systems. Their strategy of entering each day's encounters at the end of the day seems to work for them. Employees alternate data entry duties to keep the workload fair.

While this strategy works for Physical Therapy, it may not work for all departments. Radiology finds it easier to enter the encounters as they receive them and distribute the workload throughout the day. This strategy limits the time spent doing data entry to quick 1 minute intervals throughout the day. The consultants feel that this is the best strategy for reducing data entry boredom, because it means that someone only has to stare at the computer for brief periods of time. This reduces having stressed out eyes or tired hands.

No matter which data entry strategy is used, it is important that proper data entry is performed. Without complete data, the databases will not provide insight into services that can be improved and would not help MOH meet their mission.

Another strategy to motivate employees to enter data is to show them the rewards and reason behind their work. The supervisors should continue making monthly reports to show trends to employees and perhaps involve them in discussions about how to improve the department services to handle their encounters.

The consultants also recommend that generating monthly departmental reports become part of the departmental supervisor's job duties. In the past departments have gone for long stretches without generating reports or departmental statistics. Many waited until grant stipulations required statistics, resulting in many hours of manually counting. If this happens with the new databases, the supervisors may forget how to properly generate the reports. Therefore, generating quick monthly reports that follow general guidelines should be mandatory. David could specify due dates for reports such as the last day of each month and to whom they should be sent. The consultants recommend that monthly reports be sent out to at least David, Dr. Dever, and Dr. Yano.

*Steps:*

1. Change the job roles of existing departmental employees to include data entry. Ensure that employees have ample time during their shift.
2. Employees that are slower at performing data entry can have their keyboarding skills improved. See the recommendation for keyboarding training under the Microsoft Excel/Access training scope of work.
3. Change the job roles of existing departmental supervisors to include generating monthly reports. Make sure that the supervisors know the due dates, content format, and recipients of these reports.
4. Start creating the monthly reports immediately for August.

*Resources:*

- The Microsoft Access forum for technical support at <http://www.access-programmers.co.uk/forums/>. Department heads may search it for answers to questions they cannot find in their electronic Access tutorial books. They can also post their personal questions to it for answers.
- An online Microsoft Access 2000 tutorial can be found at <http://www.fgc.edu/support/office2000/access/>. This site has screen shots of how to create forms, queries, reports, etc. if the department heads can't find the instructions in their Access tutorial books.
- Microsoft's official page for help with Microsoft Access is <http://office.microsoft.com/Access>. This page can be used as another resource to search error messages or for information on how to implement new functionality.

## **Task 2. Human Resources Database**

### ***Problem***

The MOH has over 350 employees, of which 26 are physicians and 100 are nurses. The human resources department of MOH and the continuing education department under Ancillary Services were lacking organized employee information. There was incomplete information on education and training levels for employees, making it difficult to identify those in need of more training. Jullie Tellei is interested in scheduling new training sessions for MOH, but was missing information about what type of training was needed. In addition, there was no system to track employee skills (e.g. grant writing, public speaking), making it difficult for HR to match their staff with the needs of a certain skill set. Physicians and nurses are required to complete a certain number of training hours per year for licensing requirements. However, manually counting these hours was too consuming for HR so they relied on an honor code with the physicians and nurses to complete the hours.

### ***Opportunity***

The opportunity identified was to develop a Microsoft Access database that tracks hospital employees, their education levels and training, continuing medical education events, and licensing requirements.

### ***Steps***

1. Met with Julie Tellei, Darren Skilang, and Elizabeth Kyota to gather requirements
  - a. Determined previous record keeping methods
  - b. Collected previous existing data
2. Created database in Microsoft Access
3. Imported existing employee data into database
4. Taught Julie how to use it to:
  - a. Input new hospital employees
  - b. Edit existing employees' education levels and training,
  - c. Input new continuing medical education events and attendance
  - d. Determine those short of licensing requirements
  - e. Generate reports such as skills within MOH and counts of each

### ***Outcome***

The human resources database was installed on Julie's computer. Julie created a backup of the database and a copy of it was given to David Rykken and the IT staff. All current hospital employees' information was entered into the database.

Julie created a survey to update employee information with regards to education and skill levels. This survey was sent for review on August 7, 2006 and she will soon be inputting the results into the database. For a screenshot of the employee form she will use to enter the data, refer to Appendix G.

Julie also learned to enter training events, such as Continuing Medical Education (CME) workshops. For a screenshot of the form used to enter an event, refer to Appendix H. The main screen of the database also shows employees whose licenses are soon to expire. This information is useful to Elizabeth so she can notify physicians and nurses.

The human resources database will lead to increased capacity within MOH. MOH has wanted to provide more training opportunities for those staff members who need them, so now they can better identify those in need. One of the MOH's program objectives is to build the skills and capacity of health providers, which this database helps accomplish. Through these increased skills, MOH can better meet their mission of attaining a healthful environment.

The human resources database can be configured to reside on a network server and work simultaneously from Julie, Darren, and Elizabeth's computers. This capacity is yet to be reached, but will enable Darren to enter CME events and Elizabeth to check on expiring licenses without Julie. The IT staff has been notified of this future requirement.

This database relies heavily on complete data. Missing data would provide little utility over the previous spreadsheet-based lists. There is a sustainability risk if the surveys are not entered, especially since Julie is the only one using it. We recommend that the network sharing be quickly enabled so there are more people able to enter data into the database and its usage becomes more widespread.

### **Task 3. Asset Tracking Database**

#### ***Problem***

MOH has millions of dollars worth of assets, but much is not tracked. Some assets are in need of maintenance, others have been misplaced, and others have been disposed. However, the MOH has grant stipulations and requirements from the Ministry of Finance to keep track of their hospital assets, even after they are out of service. The Minister of Health, Dr. Yano, identified the need for an asset tracking database.

#### ***Opportunity***

The opportunity identified was to develop a Microsoft Access database that tracks information on hospital assets, such as their department, their tag number, their value, and their location.

#### ***Approach***

1. Met with Nick Ngwal, the hospital administrator, to identify requirements for the annual inventory check.
  - a. Determined previous record keeping methods
  - b. Collected any previous electronic data
2. Built database with Microsoft Access
3. Imported assets list from the Department of Property and Supply
4. Held focus group attended by seven departmental heads, plus David and the Minister to gather additional requirements
5. Installed replicated databases on computers for:
  - a. Dental
  - b. Bio-Med
  - c. Facility/Maintenance
  - d. Primary Care
  - e. Behavioral Health
  - f. Cancer Program

- g. Department of Environmental Health
  - h. Physical Therapy
6. Performed personal training with departmental supervisors and additional staff member from each department. Those trained include:
- a. Lalai Ikluk, Dental
  - b. Jesse West, Bio-Med
  - c. Severio Joseph, Facility/Maintenance
  - d. Ann Klass, Primary Care
  - e. Sylvia Wally, Behavioral Health
  - f. Melinda Lawrence, Cancer Program
  - g. Eden R. Uchel and Hilda, Department of Environmental Health
  - h. Jason Nolan, Physical Therapy

### ***Outcome***

The Asset Tracking database was rolled out to eight MOH departments for them to better identify their asset value and location. Nick can identify current locations of MOH assets, which could reduce waste. Nick has made a backup of the database on a thumb drive. A copy was also given to David and the IT staff. Refer to Appendix I for a screenshot of the list of assets, which provides quick reference to their location and value. To see how transactions will be monitored refer to Appendix J for a screenshot of an individual asset with movements.

The asset tracking database has led to increased capacity within MOH. MOH can better identify those assets in need of maintenance and their current locations. This will lead to savings of a week or more spent on yearly inventory for the Ministry of Finance. The MOH can also better match unused assets with departments that need them, which leads to more efficient utilization of resources, one of the MOH's program objectives. Better management of assets will help MOH accomplish their mission of attaining a healthful environment by lessening waste through the identification of existing equipment that can be reused.

## **Task 4. Pharmacy Database**

### ***Problem***

The pharmacy department suffers from a lack of inventory control. Their dispensary often runs out of stock. They also have poor reporting functionality about drug usage, making ordering difficult. The pharmacy currently predicts future order quantities without analysis of current drug usage trends.

The pharmacy's dispensary database was written in Microsoft Access 97 using older methodologies. This makes it difficult to edit for the staff, which is more accustomed to Microsoft Access 2000 or 2003, the predominate version in use across the hospital.

### ***Opportunity***

The opportunity identified was to update the dispensary database to Access 2003 format while adding inventory control and reporting functionality.



## **Approach**

1. Created E-R diagram for the inventory side of the database
2. Trained Morgan, Ashley, and Biribo in how to create and edit tables, relationships, and forms in Microsoft Access
3. Consultant upgraded existing database from Access 97 to 2003 and added new functionality
4. Trained all pharmacy employees in data entry
5. Trained Biribo in report generation

## **Outcome**

Due to time constraints, this task did not accomplish all its goals. Requirements were gathered and the staff was trained, but a new database was not fully completed. Since the pharmacy dispenses many prescriptions per day, they are very reliant on the existing database's capabilities, some of which still needed to be properly updated. However, an iterative design process involving feedback from all the staff resulted in a good stepping stone to a new and functional database.

Morgan, Ashley, and Biribo all attended Access training sessions where we developed a data model to accommodate their needs. We worked on building tables and data entry forms. Refer to Appendix K for a screenshot of the prescription form as developed in conjunction with the pharmacy staff. Their capacity to modify and create new databases has been greatly increased. However, guidance is still needed to undertake a major functional database, like the dispensary's, which requires some programming to achieve all of its requirements.

Pharmacy's updated database will lead to more efficient utilization of resources, one of MOH's program objectives. By submitting more accurate orders, pharmacy can improve their inventory levels. This will prevent drug shortages, helping the MOH meet their mission of attaining a healthful environment.

## **Task 5. Microsoft Excel/Access training**

### **Problem**

There has been a lack of training in basic usage of office-suite applications like spreadsheets and simple databases. Many of the employees at the Ministry of Health only use what they have personally managed to figure out. As a result, spreadsheets and databases are not being used to their full potential. Employees are still counting data from spreadsheets and performing calculations on a calculator. Data in database tables are printed and then manually counted to generate reports. Data in spreadsheets is inconsistent and disjoint, making statistical analysis more difficult. Counted data is rarely used to generate graphs for further analysis, reporting, or presentations. David is interested in statistics and information from the ancillary services department, such as trends over time, so that he can develop a five-year strategic plan.

Belinda Eungel, the Infection Control Nurse, is responsible for keeping data on the hospital environment and preparedness, which is more extensive than the information most staff members gather. Belinda's role requires her to have more than a basic understanding of the office-suite, so that she can generate many different types of reports.

## **Opportunity**

The opportunity identified was to use the hospital's library for Microsoft Excel and Access training sessions for MOH employees, especially the departmental supervisors, so that they could spread the knowledge throughout the Ministry. In addition to the weekly group sessions, one-on-one training sessions with Belinda covered more customized lessons to her specific role.

## **Approach**

- Reserved the library for Friday mornings at 10:30 – 11:30.
- Prepared an agenda. Agenda topics included:
  - “The importance of data consistency and organization in Excel”
  - “How to export data from EpiInfo into Excel”
  - “How to analyze data and gather statistics in Excel using formulas”
  - “How to use lists to filter data and gather statistics in Excel”
  - “How to make charts and graphs in Excel”
  - “How to use pivot tables to generate charts and graphs in Excel”
  - “How to create and edit tables in Access”
  - “How to create and edit forms in Access”
  - “How to export data for analysis from Access to Excel”
- Used a laptop and projector to go over material.
- Asked attendants to repeat tasks on computers or laptops.
- Allowed 10 minutes at the beginning of each session for open questions.
- Asked for suggestions at end of sessions for future lesson plans.
- Met with Belinda in her office from 10:30 – 11:30 on Tuesday, Wednesday, and Thursday mornings for customized sessions.

## **Outcomes**

Belinda's technical capacity has expanded to include many new skills. The professionalism and content of her monthly reports have improved; the Infection Control department's June Newsletter was created in partnership with a student consultant and the July Newsletter was created independently, refer to Appendix L for two screenshots. Belinda revised two existing spreadsheets in partnership with a student consultant and created charts and statistics from another spreadsheet and a word document independently. She also revised her inventory spreadsheet independently to better organize the data fields.

The bi-weekly sessions were attended by Dr. Selaima Lalabalavu, Dr. Robert Maddison, Dr. Angie Marcel, Dr. Catherine Decherong, and Dr. Yuri Becheserrak. Their capacity has by being able to use their new spreadsheet skills to analyze current departmental data. Dr. Maddison was able to export his blood donor database from Epi-Info to Excel and then gather statistics on it independently. Dr. Decherong was able to apply principles from the workshop to gather statistics from the Family Health School survey. Consultant assistance was required in this endeavor, but she is confident to do it next year. Dr. Becheserrak was able to analyze the OB/GYN Ward's Excel spreadsheet to look into factors related to birth data.

The current state of the trainees' Excel/Access skill levels provides concrete evidence of this outcome:

- Belinda's reports are more professional
  - Use a letterhead

- Use grammar check
  - Use columns
  - Include properly sized pictures
- Belinda's spreadsheets are better organized
  - Folders are used to store similar files
  - Use different columns for different data fields
  - Uses formulas to calculate summations and counts
  - Lists and pivot tables have been used to generate various types of graphs and charts
- Redundant surveillance spreadsheets have been converted to an Access database
  - 50 handwashing checks were entered by Belinda independently
  - 20 hospital environment checks were entered by Belinda independently
  - Two reports, one on handwashing trends and one on the hospital environment, were generated independently by Belinda
- The other doctor's and nurses learned that:
  - Data must be consistent

The current state shows improvement over the previous state, which included:

- Less professional reports
  - Using word-art graphics with poor readability
  - No overall continuity
  - No pictures or charts
- Disorganized spreadsheets
  - All spreadsheets were in one folder
  - Data fields were split over two columns making analysis difficult
  - Summations and counts were performed manually

The doctors and nurses now have the increased capacity to analyze their data from Epi-Info, Excel, or Access themselves. This will help them meet their vision of a healthy Palau in healthful environment because they can identify trends over time and create promotional campaigns to educate the local population or better understand how to utilize staff members to meet Palau's health needs. For example, the Infection Control department can calculate which germ is most occurring and where it is, then work to improve that area. The medical ward can analyze information about patients' BMI and weight factors, useful in Palau where a large portion of the population is considered overweight. They can identify trends in health issues correlated with being overweight or tobacco use and then use information to educate the public. This expanded capacity increases the MOH's ability to "promote health and social welfare" and "protect family and health safety", which are the second and third parts of their mission.

The biggest risk to this outcome is if the doctors and nurses decide to wait until next year to analyze their data again. David is interested in this data for his five-year strategic plan that he'll be writing in the fall, so he'll be pressuring them for the information. It is important the nurses and doctors do not wait months to analyze the data, because without practice they will forget the techniques. The consultants estimate that if the MOH staff goes three months without using their newly acquired knowledge they will forget almost all of it.

David's new vision of implementing quality control and quality assurance throughout the MOH is enforced by this training, because this new data analysis will provide the concrete evidence supporting his plan.

### ***Recommendation: Keyboarding training and future technology workshops***

#### *Rationale:*

After observing many MOH employees enter data into the departmental databases during training sessions, it became evident to the consultants that some lacked basic keyboarding skills. Julie expressed an interest in increasing the keyboarding skills of slow typists. She is in charge of the Pacific Open Learning Health Network computer lab in the library, the same one used for the weekly training sessions. Keyboarding tutorials would save time doing entry and reduce the number of errors. The consultants believe that increasing words per minute speed by up to five times could be done within about 10 hours of practice.

In January, the Ministry of Health scheduled a Microsoft Access tutorial through PALARIS, a government development group. A number of supervisors and employees attended the week-long conference, which they thought was helpful. It gave them initial exposure to what databases could do and how they could use them. The consultants recommend a yearly technology conference be held that give departments exposure to new technologies that they could use.

#### *Steps:*

- The consultants downloaded Typershark and suggested its installation on all POHLN computers in the library. The game features lessons showing proper finger placement techniques. After the lessons are completed, an adventure game can be played. The game features a SCUBA diver, hammer head sharks, jellyfish, piranhas, and others. The consultants sampled a variety of typing tutorials and found this one to be the most fun and rewarding.
- MOH employees can be encouraged to use the computers in the lab to practice their typing with Typershark. This could count towards their continuing education requirements.
- After each version of Typershark has been played for an hour, full-versions can be purchased for \$20. If there is no budget for the full-versions, the game can be played online at <http://www.popcap.com/gamepopup.php?theGame=typershark>, although it is not recommended to have more than a few people play it online at a time due to bandwidth restrictions. As a lower bandwidth alternative, <http://www.typing-lessons.org>, also was rewarding and easy for the consultants to practice with.
- Typershark includes high-scores, which can be incorporated into a friendly "typing competition" between departments with bragging rights or even prizes, such as a dedicated parking spot, for the winner.
- An hour a day for a week should be enough time to learn basic finger positioning. An hour a day for the second week should be spent practicing with the TyperShark adventure mode as this will improve overall typing speed drastically.
- Contact PALARIS or another local education to come in for a yearly technology conference.

#### *Resources:*

- Typershark can be played online or downloaded from *<http://www.popcap.com/gamepopup.php?theGame=typershark>*
- Online typing lessons can be found at *<http://www.typing-lessons.org>*
- PALARIS can be reached by phone at 488-6654 or by email at [PALARIS\\_palau@hotmail.com](mailto:PALARIS_palau@hotmail.com)

### III. Other Recommendations

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#### ***Recommendation 1. Expand MOH's website***

##### *Rational:*

It has been recommended that the MOH further develop their website to serve as another means of both internal and external communication. During the partnership, the consultants noted that there was very little information shared between departments, although many departments are related to one another. For example, the Medical Ward requests x-rays from Radiology which can lead to a referral to Physical Therapy. David is going to try to analyze the big picture of MOH in his five-year strategic plan, but department heads may be able to pick up on trends that he did not notice. It is also beneficial for department heads to understand general hospital trends so they can better adjust their departments.

For internal communication, the website can post departmental reports and host web applications, since information from departments should to be shared. The MOH already has the hardware, the fiber optic backbone and extensive wireless network, in place to support hosted web applications. The site could include an online directory of staff email addresses for quick reference.

For external communication, the website can post jobs, needs, and goals, since the MOH recruits employees internationally and gathers a large amount of funding from international grants. Other statistics and information can be provided for grant readers, such as HIV/AIDS rates, TB, number of beds, and patients per year. David's five-year strategic plan could be posted for other organizations to see and provide feedback. MOH presentations and newsletters can be uploaded to show those funding what the MOH has accomplished. If outside funding led to a particular training session or piece of equipment, pictures and articles could be posted that give credit to the funding organization.

Once Internet usage becomes more widespread in Palau, the website's functionality can be expanded to include health advice and a calendar for classes and other events. Educational information on topics such as stress management, alcohol use, depression, and drug addiction can also be posted. The Internet provides an anonymous gateway to this information.

##### *Steps:*

1. Identify someone to build the website. The consultants recommend Carnegie Mellon University's Information Systems program which would provide MOH with a 6 person team to build the site. Besides being a world-class institution, Carnegie Mellon University does not charge for their Information Systems projects.
2. Identify content producers within MOH and content approvers. Producers would be departments or individuals that generate reports to be shared within the organization or externally. Department heads would then approve the visibility of any content.
3. Identify website requirements. The consultants recommend having the following:
  - Foreign language support for Taiwanese, Japanese, and Tagalog/Filipino
  - Listing MOH contact information at the bottom of every page
4. Create a template for website sections and functionality that match content and requirements

5. Build the site using a content management system that allows managers and IT staff to continue its development without relying on the builders.
6. Review the site with others in MOH and acquire feedback
7. Incorporate feedback into the site
8. Include site URL on all MOH business cards
9. Send site URL to all partnering or sponsoring organizations

*Resources:*

- Carnegie Mellon University's Information Systems department contact information can be found at <http://is.hss.cmu.edu/contactus.html>. Contact them during the upcoming spring to acquire a 6 person team to build website.
- A website for comparing open source Content Management Systems can be found at <http://www.cmsmatrix.org>
- New Zealand's MOH website can be found at <http://www.moh.govt.nz>, particularly good sections as identified by the consultants were:
  - Job vacancies at <http://www.moh.govt.nz/vacancies>
- Singapore's MOH website can be found at <http://www.moh.gov.sg/>, particularly good sections as identified by the consultants were:
  - "Press Release on recent Flu Pandemic Drill" at <http://www.moh.gov.sg/corp/about/newsroom/pressreleases/details.do?id=38928388>
  - "8 priorities with champions" at <http://www.moh.gov.sg/corp/about/priorities.do>
  - Publications and statistics at <http://www.moh.gov.sg/corp/publications/index.do>
- Guam's Memorial Hospital Authority website can be found at <http://www.gmha.org/>, their site uses Inter-Tran foreign language support. Inter-Tran's website is <http://www.tranexp.com/>

***Recommendation 2. Create an MOH technology committee and technology plan***

*Rational*

It was also recommended that the MOH create a technology committee to help them expand the role that technology can play within their organization, since they are currently lacking formal communication between the departmental heads and the IT staff. It is difficult for any two staff members to gather requirements from over 300 employees for the new HIS system. It will be even more difficult for the outside consultants hired if the MOH is not organized about what they want; they may end up with another system that doesn't fully meet their needs like the existing HIS. Therefore, it is important that careful consideration and thought be put into the technology needs of each department. A round-table discussion between departments could facilitate brainstorming about what has worked in the past and what ideas they have for the future. This discussion can occur with or without the IT staff. These requirements can then be passed onto the new contractors.

MOH's technology committee could expand the role that technology plays within their organization. Technology can help address many of MOH's current problems, such as being understaffed and not having enough funding. Many have agreed that technology can help address these problems by increasing worker efficiency through time savings and making it easier, in both time saved and money saved, to raise funds and publicity. In order to have the most efficient use and greatest return on investment from their new HIS, MOH should write

down their future goals and requirements into a technology plan. Without a written plan, certain needs and requirements may be forgotten or overlooked by the outside consultants. This would prevent MOH from using technology as a tool to achieve their mission. This plan could also include technology education for the staff, a budget for technology, and the members of the technology committee.

### *Steps*

- Invite each department head to join the technology committee for the new HIS, if department heads don't want to be a part of it maybe they can recommend another member, it is recommended that David, Dr. Yano, and Everett be a part of this committee
- Schedule weekly meetings to discuss current technology problems and goals for the future
  - Have someone take minutes of the meeting
  - The goal of MOH's technology should be to better accomplish their vision of a healthy Palau in a healthful environment
- Department heads can discuss within department and then bring information to the meeting
- Perform research on what other organizations are doing and identify needs
  - The outside consultants can be asked on this topic
- Decide on how other forms of technology could be used and taught within MOH.
- Develop an action plan with a time line
  - Keep this plan under two years, as technology quickly changes
- Evaluate the technology plan
  - Does it make sense?
  - Will it achieve the goals and objectives?
- Identify costs and budgets
  - Estimate how much it will cost in terms of both employee time and monetary amounts
- Use the plan and keep it current

### *Resources*

- For reference on technology plans, please see the following article on how technology saved Arts/Boston <http://www.techsoup.org/howto/yourstories/techplan/page1458.cfm> Arts/Boston had a similar technical environment to what MOH has now. A technology plan was able to save them from disaster, by providing a budget and a timeline for new technology to be implemented. This article describes how a technology plan is more about planning than technology. Their final technology plan serves as a model for MOH's technology plan and can be read at [http://spiderschool.org/workshops/kit\\_buffalo\\_01/artsboston/index.html](http://spiderschool.org/workshops/kit_buffalo_01/artsboston/index.html).
- Refer to the Minnesota Department of Education John See's "Developing Effective Technology Plans" for more guidelines at <http://www.nctp.com/john.see.html>. The main points: keep it short term (1 year at a time), make the plan outcome-based not input-based, and include as technology more than just computers.
- After the technology plan has been created, it should be evaluated using the questions at <http://www.nsba.org/sbot/toolkit/atp.html>.



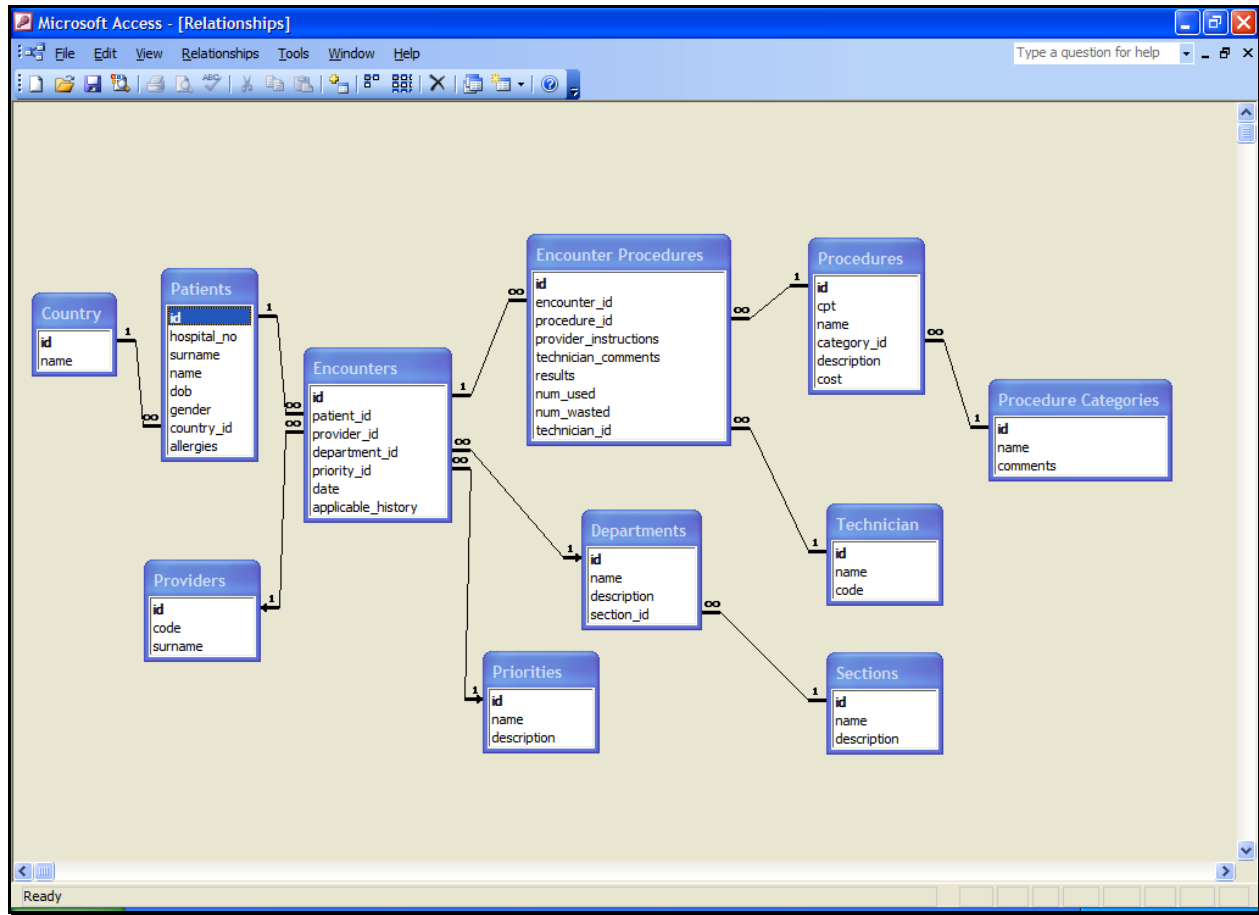
## **About the Consultants**

Steven Maher is a senior in Information Systems with a minor in Business Administration at Carnegie Mellon University. He plans to continue his international travels by pursuing a consulting career.

Gopal Patel is a senior in Computer Science and Electrical and Computer Engineering at Carnegie Mellon University. He plans to pursue a master's degree in Electrical Engineering.

## Appendix A.

This is the Entity – Relationship diagram for Radiology's Patient Encounter database. It shows all of the fields used in the database along with their respective tables and relationships. This diagram is similar to the ones in the other patient encounter databases, like Physical Therapy's and the Inpatient Ward's.



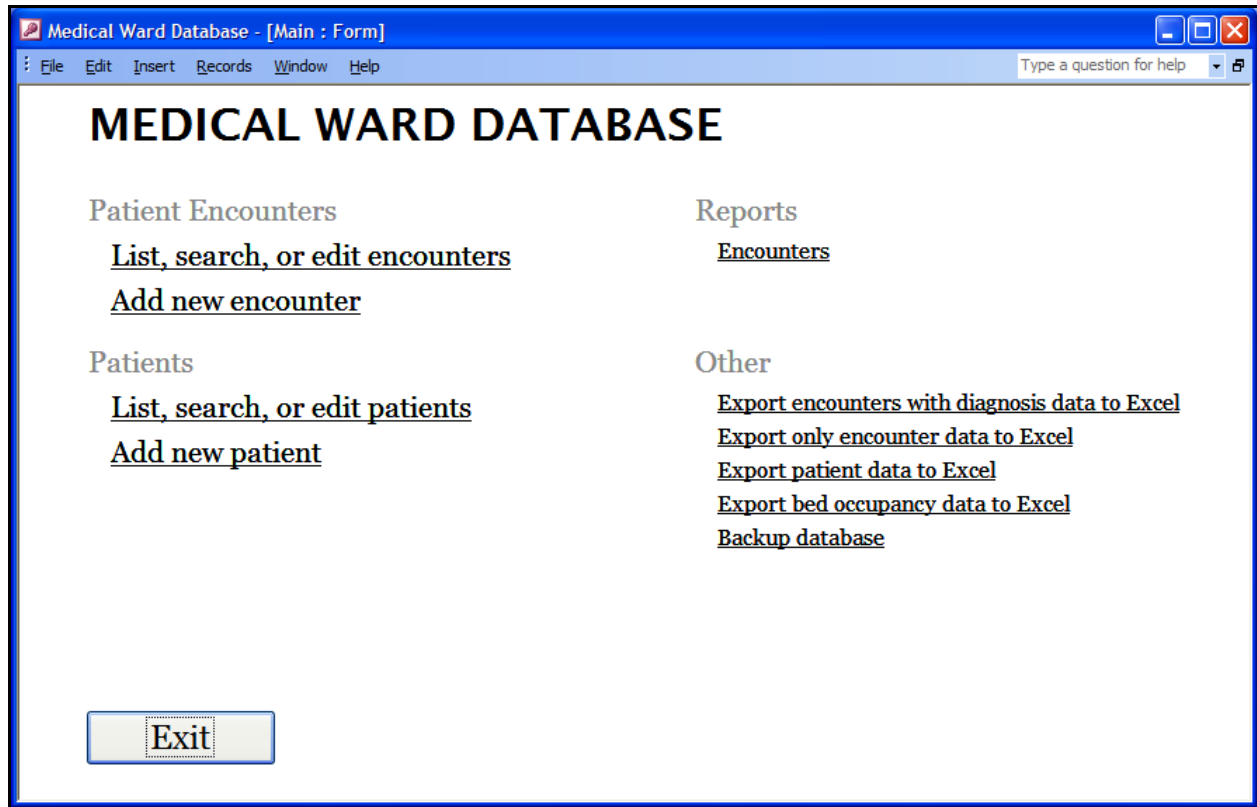
## Appendix B.

This is the encounters table from the Radiology database. It holds the information about the referring provider, the referring department, the date/time, the priority, and applicable history of the encounter.

ID	Patient	Provider	Department	Priority	Date/Time	Applicable History
46	A-77500	Malsol	Emergency Room (ER)	STAT	7/18/2006 10:00:00 AM	
47	A-14192	Lalabalavu	Emergency Room (ER)	STAT	7/17/2006 3:18:11 PM	
48	A-31778	Ngemaes	Emergency Room (ER)	STAT	7/16/2006 5:10:00 PM	
49	A-1341	Ngiraswei	Private	Routine	7/17/2006 3:32:36 PM	
50	A-79802	Dever	Emergency Room (ER)	STAT	7/15/2006 4:00:00 PM	
51	A-31868	Malsol	Emergency Room (ER)	STAT	7/16/2006 9:30:00 PM	
52	A-8072	Roberts	Emergency Room (ER)	Routine	7/17/2006 3:52:05 PM	
53	A-6202	Roberts	Private	Routine	7/17/2006 3:58:31 PM	Lower Back pain
55	A-8597	Soaladaob	Outpatient (OPD)	Routine	7/17/2006 1:30:00 PM	
56	A-70509	Lalabalavu	Outpatient (OPD)	Today	7/17/2006 4:56:21 PM	
57	A-24183	Maddisson	Outpatient (OPD)	Today	7/17/2006 5:50:11 PM	
58	A-80519	Maddisson	Outpatient (OPD)	Today	7/17/2006 6:39:31 PM	
59	A-59100	Setik	Outpatient (OPD)	Today	7/17/2006 6:41:24 PM	
60	A-1303	Soaladaob	Cancer	Routine	7/18/2006 9:07:00 AM	
61	A-2342	Soaladaob	Cancer	Routine	7/18/2006 9:35:51 AM	
62	A-79836	Marcil	CDC	Routine	7/18/2006 9:39:20 AM	
64	A-12035	Marcil	CDC	Routine	7/18/2006 9:43:58 AM	
66	A-11755	Marcil	CDC	Routine	7/18/2006 9:55:34 AM	
67	A-47516	Soaladaob	Surgical Ward (SW)	Today	7/18/2006 10:03:30 AM	RLQ pain
68	A-24175	Malsol	Outpatient (OPD)	Today	7/18/2006 10:12:58 AM	
69	A-119	Ngemaes	Gynecology	Today	7/18/2006 10:16:23 AM	Prolong PV bleeding
70	A-5006	Soaladaob	Cancer	Routine	7/18/2006 10:29:15 AM	
71	A-10493	Soaladaob	Cancer	Routine	7/18/2006 10:31:46 AM	
72	A-1789	Soaladaob	Cancer	Routine	7/18/2006 10:51:22 AM	
73	A-13554	Malsol	Outpatient (OPD)	Routine	7/18/2006 11:07:47 AM	
74	A-6079	Marcil	CDC	Routine	7/18/2006 12:43:05 PM	
75	A-12006	Htoo	Outpatient (OPD)	Routine	7/18/2006 1:18:17 PM	
76	A-19384	Marcil	Outpatient (OPD)	Routine	7/18/2006 1:24:06 PM	
77	A-3670	Lalabalavu	Medical Ward (MW)	Routine	7/18/2006 1:26:49 PM	
78	A-74957	Htoo	Outpatient (OPD)	Routine	7/18/2006 1:30:08 PM	
79	A-8975	Htoo	Outpatient (OPD)	Routine	7/18/2006 1:36:35 PM	
81	A-2181	Soaladaob	Emergency Room (ER)	Routine	7/18/2006 1:52:26 PM	
83	A-10634	Lalabalavu	Outpatient (OPD)	Routine	7/18/2006 1:49:00 PM	F/U on 1cm LLL opa
84	A-24183	Maddisson	Outpatient (OPD)	Routine	7/18/2006 2:24:22 PM	

## Appendix C.

This is the start screen for the Medical Ward database. From this screen, users can choose what action they would like to perform. This start screen is similar to the ones in the other databases.



## Appendix D.

This is the encounter form for the physical therapy database. It uses drop downs to ensure that data is consistent. It uses subforms to show information related to the patient, visits, and supplies, which are all stored in tables related to the encounter table.

Encounter : Form

### EDIT ENCOUNTER

Data Entry:  \*

Hospital No:  \*

**PATIENT INFORMATION**

Last Name:  First Name:  Gender:

Residence:  Date of Birth:

Referral Date:  Discharge Date:  Diagnosis:

Physician:   Department:

Referral Reason:

**VISITS**

Date	Visit Type	Site	Procedures		
02-Aug-06	Initial Assessment	PT Clinic	3	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
03-Aug-06	Follow Up Visit	PT Clinic	3	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
04-Aug-06	Follow Up Visit	PT Clinic	1	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>

**SUPPLIES**

Supply	Comments		
Exercise Handou	<input type="text"/>	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>

Required fields are indicated with a \*  
Use the [TAB] key to navigate fields.

## Appendix E.

This is the encounter list form for Physical Therapy. The list can be searched or filtered by the fields at the top. In this screenshot, the list is filtered by all the encounters with a “shoulder pain” diagnosis. The number at the bottom of the screen shows that there are 359 total encounters with a “shoulder pain” diagnosis.

**ENCOUNTER LIST**

**SEARCH/FILTER**

Hosp. #:  Last Name:  First Name:  Diagnosis:    
Physician:  Department:  Start Date:  End Date:

Referral Date	Hospital No.	Last Name	First Name	Physician	Department	Diagnosis	Last Visit	No of Visits	Edit	Delete
02-Aug-06	00000			Yano	Private/Dispensary	Shoulder pain	04-Aug-06	3	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
30-May-06	10384					Shoulder pain	09-Jun-06	5	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
29-May-06	00121					Shoulder pain	09-Jun-06	9	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
29-May-06	03614					Shoulder pain	31-May-06	2	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
02-May-06	22091					Shoulder pain	18-May-06	10	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
06-Apr-06	77628					Shoulder pain	07-Apr-06	1	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
30-Mar-06	01882					Shoulder pain	07-Apr-06	5	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
21-Mar-06	01942					Shoulder pain	08-Jun-06	44	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
08-Mar-06	12638					Shoulder pain	08-Mar-06	1	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
02-Mar-06	05878					Shoulder pain		0	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
02-Mar-06	07587					Shoulder pain	08-Mar-06	2	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
28-Feb-06	08895					Shoulder pain	01-Mar-06	2	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
24-Feb-06	01942					Shoulder pain	24-Feb-06	1	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
07-Dec-05	03723					Shoulder pain	15-Dec-05	5	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>

**Total Encounters: 359**

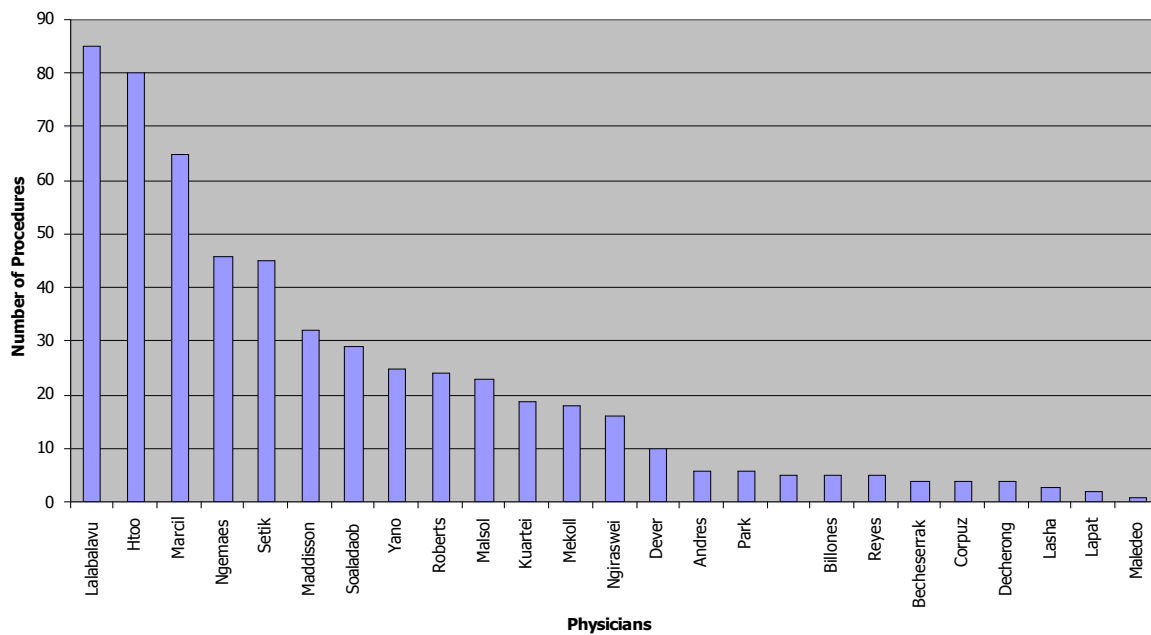
Record:   6   of 359 (Filtered)

Form View FLTR

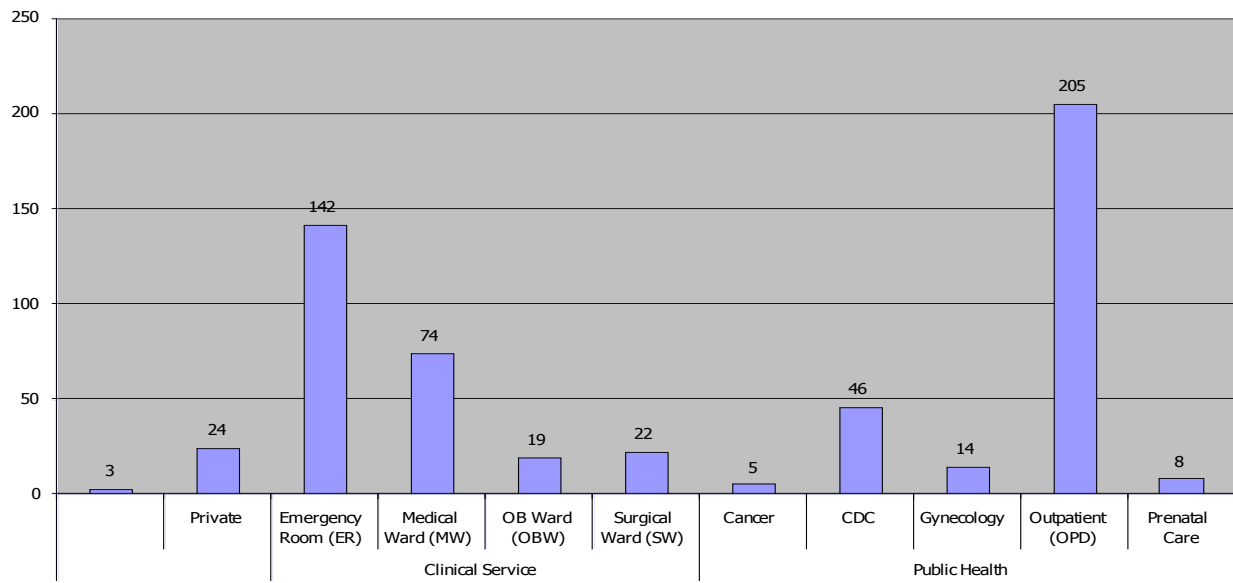
## Appendix F.

Below are charts created from the Radiology database. These charts were created by exporting the data to Microsoft Excel and then using a pivot chart. The first chart involved a pivot on the physicians and the second on the department.

**Radiology Procedures by Physician**  
**7/16/2006 - 8/6/2006**



# **Radiology Procedures by Department** **7/16/2006 - 8/6/2006**





## Appendix G.

This is the edit employee form from the human resources database. From this form, users can add education/degrees, training, skills, licenses and evaluations. Other personal data can also be edited.

Employee : Form

EDIT EMPLOYEE

Last Name: Tellei

First Name: Julita

Date of Birth: 6/16/1951

Gender: Female

SSN:

Title: Human Resource Development Officer

Type:

Recruitment Date:

Projected Retirement Date:

New Title...

New Type...

Education/Degrees

Training

Skills

Licenses

Evaluations

Degree Name	Level	Institution	Dates Attended		
Bachelor of Arts	16	University of Guam	9/1/1980	5/15/1985	Edit Delete

Add Degree or Educational Level...

Highest Grade Level: 16

OK

Cancel

Use the [TAB] key to navigate fields.

Print

## Appendix H.

This is the new training event form from the human resources database. From this form, users can add information about the event and its attendance.

Training Event : Form

### NEW TRAINING EVENT

Event Title:

Start Date:  End Date:  Credit Hours:

Event Type:  Instructor:

Organization:

Location:

Description:

Comments:

EMPLOYEES WHO ATTENDED THIS TRAINING/EVENT/CERTIFICATION

Employee	Credit Hrs.	Comments	
Marcil, Angela	<input type="text" value="0"/>	<input type="text"/>	Delete
Lalabalavu, Selaima	<input type="text" value="0"/>	<input type="text"/>	Delete
Becheserrak, Yuriko	<input type="text" value="0"/>	<input type="text"/>	Delete
<input type="text"/>	<input type="text" value="0"/>	<input type="text"/>	Delete

OK Cancel *Use the [TAB] key to navigate fields.*

## Appendix I.

This is the asset list form from the asset tracking database. From this form, users can search and filter all of the assets and choose to edit ones. The form also shows the total number of assets, at this time 452, and their value, at this time \$1,164,596.39.

Microsoft Access - [Asset List : Form]

File Edit View Insert Format Records Tools Window Help

Tahoma 7 B I U

Type a question for help

### MOH ASSET LIST

**SEARCH/FILTER**

Department:  Manufacturer:  Location:  Go

Tag No:  Category:  Vendor:  Reset

Tag	Name	Status	Category	Dept.	Mfg.	Vendor	Model	Serial	P.O.	Tag Date	Cost	Location	
MP-11637	1314 TILT TRUCK, STANDARD DUTY			HP	Rubber Maid		N/A	N/A	L43060	8/31/2004	\$1,138.00		Edit
MP-11638	1314 TILT TRUCK, STANDARD DUTY			HP	Rubber Maid		N/A	N/A	L43060	8/31/2004	\$1,138.00		Edit
MP-98964	AIR COMPRESSOR, PORTABLE *			OHD	N/A		NONE	T11390-110-0	NONE	5/31/1997	\$1,002.00		Edit
MP-10580	AIR CONDITIION, SAMSUNG, SPLIT900			PH	Samsung		US09A6MA	00015	L31938	1/31/2003	\$1,043.00		Edit
MP-98806	AIR CONDITION *			Clinical	N/A		MCW509C101	2J045-20007	NONE	5/31/1997	\$1,295.00		Edit
MP-98748	AIR CONDITION 14,000 BTU			DPHS	Mitsubishi		6505	SCK3522K5	L72676	4/30/1997	\$1,670.00		Edit
MP-98747	AIR CONDITION 18,000 BTU			DPHS	Mitsubishi		3A020F	SRCL825K25	L72676	4/30/1997	\$2,139.00		Edit
MP-98652	AIR CONDITION 29,000 BTU			DPHS	Whirlpool		ACQ29XAO	QD3903629	L71194	2/27/1997	\$1,189.00		Edit
MP-98619	AIR CONDITION 9000 BTU SANYO SPL			DPHS	Sanyo		C95G6	0012561	L70784	12/31/1996	\$1,392.00		Edit
MP-99965	AIR CONDITION, CARRIER 48,000 BTU			DPHS	Carrier inc.		38CKC48-301	3098E25993	L91334	1/31/1999	\$3,900.00		Edit
MP-99964	AIR CONDITION, CARRIER, 48,000 BTU			DPHS	Carrier inc.		38CKC48-301	3098E25987	L91334	1/31/1999	\$3,900.00		Edit
MP-2896	AIR CONDITION, GENERAL FUJITSU90			PHLTH	General Fujitsu Co		IABSF	4001193	L15436	8/31/2001	\$1,180.00		Edit
MP-3237	AIR CONDITION, SAMSUNG 7000BTUS			Clinical	Samsung		7000	800112	L25183	8/31/2002	\$1,150.00		Edit
MP-10760	AIR CONDITION, SAMSUNG SPLIT TY			PH	Samsung		US24AZRC	PIAR200117	L33009	3/31/2003	\$1,545.00		Edit
MP-10793	AIR CONDITION, SANYO 22000 BTUSP			PH	Sanyo		SAP-C241J	0024401	L33360	3/31/2003	\$2,399.00		Edit
MP-2921	AIR CONDITION, SANYO, SPLIT UNIT			ADMH	Sanyo		SAPKC185G5	0046591	L04875	8/30/2001	\$1,845.00		Edit
MP-10378	AIR CONDITION, SANYO, SPLIT, 18000			PH	Sanyo		C181JA	0021511	L30690	11/30/2002	\$1,892.00		Edit
MP-98896	AIR CONDITION, SPLIT *			NONM	Trane		S12	9	NONE	5/31/1997	\$1,080.00		Edit
MP-98897	AIR CONDITION, SPLIT *			NONM	N/A		S12	13	NONE	5/31/1997	\$1,280.00		Edit
MP-98898	AIR CONDITION, SPLIT *			NONM	N/A		S12	7	NONE	5/31/1997	\$1,280.00		Edit
MP-98899	AIR CONDITION, SPLIT *			NONM	N/A		S12	6	NONE	5/31/1997	\$1,280.00		Edit
MP-10863	AIR CONDITION, SPLIT 17K FUJITS			ADMH	Fujitsu		S817	T003936	L34785	7/31/2003	\$1,239.00		Edit
MP-99801	AIR CONDITION, SPLIT TYPE			MSVC	Mitsubishi		AIRCON	65050003	L84314	9/30/1998	\$1,670.00		Edit
MP-99802	AIR CONDITION, SPLIT TYPE			MSVC	Mitsubishi		SRK3533K25	65050004	L84314	9/30/1998	\$1,670.00		Edit
MP-99727	AIR CONDITION/29,000 BTU WINSO			PHLTH	Whirlpool		ACQ254X40	Q63806428	L83028	5/31/1998	\$1,038.00		Edit
MP-98651	AIR CONDITIONER, 29000 BTU WHIR			PHLTH	Whirlpool		ACQ29XAO	QD3903623	L71194	2/27/1997	\$1,189.00		Edit
RP-96674	ANESTHESIA MACHINE, DIALYSIS CO			MSVC	Cobe Corp.		018773001	2C5084	P40320	9/30/1991	\$11,550.00		Edit

**Total Assets: 452** **Total Value: \$1,164,596.39**

Close Print List Add New Asset

Record: 1 of 452

Form View

## Appendix J.

This is the edit asset form from the asset tracking database. From this form, users can add transactions. Other asset data can also be edited.

Asset : Form

EDIT ASSET

Name: SCANNER, HEWLETT PACKARD 61 00C SCANNER

Status: 

New Status

Tag No: MP-99971

Tag Date: 2/27/1999

Serial No: SG88D13OCC

P.O. No: L84111

Manufacturer: Hewlett Packard 

New Manufacturer

Model No: C6260A

Purchase Cost: \$1,100.00

Vendor: 

New Vendor

Warranty:

Category: 

New Category

Department: MSVC 

New Department

Description:

Comments:

History (sorted by Date):

Type	Date	Location	Employee	Description of Transaction	
Maintenance	8/2/2006	IT Office	West, Jesse	Broken already, needs new power supply	<div>Edit</div> <div>Delete</div>
Movement	8/1/2006	Administration Offices	Ngwal, Nick	On Nick's desk	<div>Edit</div> <div>Delete</div>

Add Transaction

OK

Cancel

Use the [TAB] key to navigate fields.

## Appendix K.

This is the prescription form from the pharmacy dispensary database. From this form, users can add all prescription information. They can also print the information on a label.

Script : Form

# EDIT PRESCRIPTION

**KEYBOARD SHORTCUTS:**  
[TAB] - move between fields  
[Ctrl-D] - pull up common info from last prescription

ah

Date: 6/19/2006

Hospital No:  New Patient...

Script No. 749684

**PATIENT INFORMATION**

Name:  Gender:  DOB:

Allergies:

**DRUG**

By Abbreviation:  OR By Name:  New Drug...

**QUANTITIES**

Quantity:  units go here Refills:

**DIRECTIONS**

By Abbreviation:  New Directions Text...

Edit:

**PHYSICIAN**

By Abbreviation:  OR By Name:  New Physician...

**WARD**

By Abbreviation:  OR By Name:  New Ward...

Save & New [F2] Save & Close [F3] Print & Close [F4] or [Ctrl-P] Child Dosages... [F5] Cancel & Close [ESC]

## Appendix L.

This is the Infection Control department's July newsletter written by Belinda. It shows the new letterhead, the professional looking fonts, the readable columns, the pictures, and charts that were incorporated into the newsletter.

