Analysis and Recommendations of the Billing Process for Pediatric Cardiology

Final Report

December 16, 1996
Industrial and Operations Engineering, Hospital Practicum
University of Michigan, Ann Arbor

by:
Melissa Petrucci
Gary Schwartzbard
C. Elena Szymanski
Another case is from the following
act the military force for
President Carter's

*Image from page 314 of "Adventures in the Unknown World" by James A.…and the Future..."
# Table of Contents

- Executive Summary: Page 2
- Introduction: Page 3
- Background: Page 3
- Purpose: Page 3
- Method: Page 3
- Current System: Page 5
- Alternatives: Page 5
- Findings: Page 6
- Conclusions: Page 8
- Recommendations: Page 9
- Action Plan: Page 11
- Appendix: Page 13
Executive Summary

This report will focus on the billing process for Pediatric Cardiology at the University of Michigan Medical Center. The motivation of the project is to achieve 100% billing of non-invasive procedures, minor procedures, and catheterization laboratory hospital charges. With this goal in mind, we will look to improve the accuracy of the charge ticket information and increase the efficiency of the billing process. Obtaining 100% billing is not only important because of the loss of charges but also from a budget standpoint. The division’s hospital budget is based on the number of procedures that are billed. Therefore missed billing also reduces the division’s hospital budget. This report will illustrate the current system and define the problems through the analysis of data for the month of July.

In the current system, for each patient that enters the clinic the clerk creates a charge ticket. On this ticket an office visit charge as well as any necessary procedural activities should be identified by placing a check in the appropriate box. All of charge tickets are located at the nurses station. At the end of each day the charge tickets are collected and entered into the University’s billing system the following morning.

The first step in our approach to improving the billing process was to identify how many procedures were not being billed. More specifically we wanted to find out which laboratories were affected and the financial impact of the missed procedures. The time period from 1, 1996 through July 30, 1996 was audited.

The first aspect of billing that was looked at was the general office visit. However, the Medical Service Plan (MSP) component will not be addressed either in the process nor in the lost charges because the necessary patient specific data was not available. The MSP portion of the billing should be reviewed in the future.

Next, the laboratory procedures were analyzed for lost billing. The echocardiogram report and the log books were then compared against the Falcon billing sheets for each patient. The days surrounding the date of service were also checked to ensure the patient’s billing had actually been missed and not posted on a later date. Patients that had procedures that were not billed were identified.

This analysis revealed that the division does not bill for all procedures performed but the reason why still remained in question. The problem had to be further identified. For each patient that had not been billed, their charge ticket for the date of service in question was reviewed. Three possible situations were found. First there was no check mark in the box. This clearly shows the patient was not billed because the person who performed the procedure did not mark it. Secondly, there were many cases in which the procedure had been checked but had not been billed. This was attributed to a data inputting error. Lastly, the charge ticket was missing. The cause of this is almost impossible to identify. Since for the echocardiogram laboratory a list of reports that were generated was used in place of the log books, an additional check was performed to ensure the validity of the data.

Using the data we analyzed for the targeted procedures we have found that Pediatric Cardiology is only billing 89% of their procedures. The total amount of monetary facility charges that has been found to have been lost based on the audit of July’s activity comes to a total of $28,085. Assuming that July is fairly representative of an average amount of activity the total charges lost over the span of a year would equal $337,020. The actual loss to the clinic is more than shown due to the fact that the expense budget provided to the division from the University of Michigan Hospital is based on the activity that is billed.

After close scrutiny and meticulous collection of all of the data it has been determined that an electronic billing system directly tied to the billing system of the University of Michigan should be implemented. This type of system is currently used for 80% of the billing at the Hospital. There are some problems that are inherent to an electronic system. These problems are not a common occurrence and can be remedied if the proper backups are instituted.

The log books should be electronic and be the point of entry for a charge to be electronically sent to the University’s billing system. This is the only possibility that would eliminated the three sources of missed billing. It would also reduce the workload as well as offer additional capacities.

The action plan for the system would begin with the benchmarking of a current system. From here all of the necessary fields and functionality needed for the Pediatric Clinic would have to be identified. The interaction with other software both within the clinic and with the Hospital will also need to be recognized. Once this preliminary design has been completed the system must then be designed, tested, implemented, and maintained. All users should also be trained.
Introduction

This report will focus on the billing process for Pediatric Cardiology at the University of Michigan Medical Center. It will illustrate the current system and define the problems through the analysis of data for the month of July. The method for this study and the conclusions reached will also be included. Finally, in consideration of all the data, a recommendation will be made and an implementation plan will be provided.

Background

Over the past few years, Pediatric Cardiology has been attempting to identify an efficient billing process. The current system uses a charge ticket that has information about a patient as well as the procedures that were performed. When a patient has a procedure performed the appropriate box is to be checked off.

The billing process is composed of two components. The University of Michigan Hospital side (facility) and the Medical Service Plan (MSP) side. At the request of our client, an audit of missed billing for the office visits will be done. However, the MSP component will not be addressed either in the process nor in the lost charges because the necessary patient specific confirmatory data was not available from the MSP billing office. The scope of the project was limited to the Hospital billing aspect and the true loss may actually be more because of the omission of the MSP component.

Achieving 100% billing is not only important because of the loss of charges but also because of budget considerations. The division's hospital budget is based on the number of procedures that are billed. Therefore missed billing also reduces the division's hospital budget.

Purpose

The motivation of the project is to achieve 100% billing of non-invasive procedures, minor procedures, and catheterization laboratory hospital charges. With this goal in mind, we will look to improve the accuracy of the charge ticket information and increase the efficiency of the billing process. The systems involved are the billing process and possibly the procedure log books. Along with the modification of these processes, the responsibilities of the employees may shift under a new system. Our final outcome will be a recommendation for a more efficient billing process for Pediatric Cardiology. The major implication of this process will be the elimination of lost charges. Additionally, the hospital budget will be reflective of the true workload of the unit.

Method

The first step in our approach to improving the billing process was to identify how many procedures were not being billed. More specifically we wanted to find out which laboratories were affected and the financial impact of the missed procedures. Our client suggested that we audit the month of July and provided us with the necessary information for July 1, 1996 through July 30, 1996. The hospital billing data for July 31, 1996 was not available. Although July is a change over month it should not have influenced our data since the technicians, faculty, and data entry positions did not change.

The first aspect of billing we looked at was the general office visit. Each patient that came into the clinic should have an office visit charge. Since the specific patient billing data needed from the billing office was not available, the patient's charge ticket was used. The clinic scheduling sheets for July were also used because they contained every patient that arrived for an appointment. The patients that were marked as cancelled or as "no-shows" were disregarded. For each patient that arrived their charge ticket was reviewed to see if a consultation or return visit box
was checked for the given date of service. All office visits that were not billed were identified to be either as missing the entire charge ticket or missing the check on the charge ticket in the related box. For each missing ticket or missing charge on the ticket the name of the patient, the resource, the date, the time, and the day of the week were noted. Our client will follow up with the billing office to verify these charges are not in the MSP system.

Next, the laboratory procedures were analyzed for lost billing. The most accurate account of the activity in these laboratories was identified to be the log books, with the exception of the echocardiogram lab. With the help of Dr. Vermillion, it was decided that the most complete data was that of the reports generated for the echocardiogram procedure. The log books from the other labs and list of patients from the echocardiogram lab that had a report generated for the month of July were used. A copy of the Falcon billing compiled by the University of Michigan’s billing system was also used. It contained names and procedure descriptions for every patient that had a laboratory procedure billed during the month of July. The echocardiogram report and the log books were then compared against the Falcon billing sheets for each patient. The days surrounding the date of service were also checked to ensure the patient’s billing had actually been missed and not posted later due to a technician delay, a data entry error or an inefficiency in the University’s billing system. Patients that had procedures that were not billed were identified. Since our data only went until July 31, 1996, our client is currently checking to see if any of the patients that are identified as having procedures that were not billed may have been billed at a later date.

This analysis revealed that the division does not bill for all procedures performed but the reason why still remained in question. The problem had to be further identified. For each patient that had not been billed, their charge ticket for the date of service in question was reviewed. Three possible situations were found. First there was no check mark in the box. This clearly shows the patient was not billed because the person who performed the procedure did not mark it. Very infrequently there was a check mark that was hard to identify. It was either very faint or it was not in the box and was difficult to tell which procedure was checked. This error was also attributed to the person performing the procedure. Secondly, there were many cases in which the procedure had been checked but had not been billed. This was attributed to a data inputting error. Lastly, the charge ticket was missing. It is almost impossible to identify the cause of this.

Since for the echocardiogram laboratory a list of reports that were generated was used in place of the log books, an additional check to ensure the validity of the data was necessary. Dr. Vermillion looked over the list of missed billing and compared it to the log books to make sure that the procedures were supposed to be billed. An additional factor that was checked was that each patient identified had a valid name and a valid report.

There is a safeguard in place in the current system in which the person is to indicate in the log book that a procedure was checked on the charge ticket. To evaluate the effectiveness of this, for those patients that were not billed for the procedure and the corresponding box was not checked on the charge ticket, the log book was again looked at. Those that were marked as having been checked on the charge ticket but in reality had not been checked were identified. In the case of the echocardiogram laboratory, the actual log books were looked at to see if the technician had placed an “M” or an initial in it, indicating that it had been billed.

Using the gathered information we were able to identify the procedures that needed to be targeted. Several procedures were eliminated from our project. The catheterization laboratory and minor procedures were not looked at further because all of their procedures were checked and they appeared on Falcon. The ProTime procedure was also ignored because the procedure did not generate a facility charge. The ECG-UH procedure was also not addressed because it did not appear on the Falcon billing sheets. Lastly the Holter analysis procedure was not included because of the variable and possibly extensive time period from the beginning of a test to the end of it. Although these procedures are not specifically addressed in this report the recommendations provided are for the entire clinic and would apply to these procedures as well.

Interviews with the employees of Pediatric Cardiology were also conducted. The interviews were done with different positions throughout the division so as to receive information from different perspectives and because the
new system will most likely affect staff in many areas. Members of the faculty, such as Dr. Rosenthal and Dr. Vermillion, provided much guidance as to how the division’s billing process works now and how it should ideally work. We also met with Mike Pearlstein, a senior laboratory technician. He helped to document the technician’s role in the current billing process. We frequently met with Dorothy Nalepa, our client. She helped us to attain and compile the information as well as provided us with direction.

The results of the data from the remaining laboratories was then tallied and entered into a spreadsheet using Excel and charts were made to graphically represent the findings.

The information regarding the process flow that was collected through interviews was then documented. The flow of the charge ticket for each of the procedures was flow charted using Visio software. The flow charts may be found in Appendix C.

A rough layout of the clinic was drawn in Visio. This was done so that the interaction between the charge ticket located at the nurse’s station and the various laboratories could be shown. This drawing may be found in Appendix D.

**Current System**

For each patient that enters the clinic the clerk creates a charge ticket. On this ticket an office visit charge as well as any necessary procedural activities should be identified by placing a check in the appropriate box. The person that performs a procedure is responsible for marking the charge ticket accordingly. All of charge tickets are located at the nurses station. After the charge ticket is marked for the procedure performed the log books should be marked with an M or an initial to indicate that the procedure was billed. For the echocardiogram lab throughout the day, as time permits, the log books are compared to the charge tickets and the log books are marked indicating that the procedures were billed. The flow of the billing process and the interaction with the charge ticket that is presently in place has been documented for each of the targeted laboratories. The charts are included in Appendix A.

The most accurate account of the patients activity are the log books. Each procedure and in some cases, i.e. the echocardiogram lab, each machine has it’s own paper log book that is located in the appropriate room. The technicians manually log in each patient.

At the end of each day the charge tickets are collected and entered into the University’s billing system the following morning. The day after they have been entered the division will receive two reports. One of which is an error report specifying any inconsistencies that were detected. These errors are then at this point to be corrected. The second report is the accepted procedures that have been posted to a patients account. Recently the clinic has instituted a procedure to check the charge tickets that were entered the day before to the report of charges posted. Any of the procedures that were missed are to be put in. This causes some problems because the system may simply not have processed a patient and the patient may be billed twice if another charge is entered.

**Alternatives**

Their were two paths that we felt that we could follow in our recommendations for Pediatric Cardiology. The first we considered was to carefully examine the process that we had charted. We brainstormed many alternatives for this type of direction. Possibly come up with standard procedures that must be followed for each laboratory. Place reminders or checklists in each of the laboratories. Examine the flow of the process and find the trouble spots in the process and fix them. Implement some type of a double checking throughout the process. Possibly even scratch the entire process and come up with a new one or revert back to a variation of their previous system in which the charge ticket followed the patient’s chart. This alternative could significantly reduce the technician error but could not
absolutely eliminate it, nor could it eliminate the problems of data entry error or missing charge tickets. It would also create more work that would need to be distributed.

The second path we saw was one that would take considerably more effort to develop and implement but would be dramatically more efficient than any other. It would also reduce the workload of the clerk, technician and data entry personnel. This path was to automate the process electronically by having the log books be on-line and having them be the point of entry for a charge to be electronically sent to the University’s billing system. This would eliminate the technician error since it would no longer be necessary to go find the charge ticket to check off. The data inputting error would also be eliminated because this part of the process would be removed. This alternative was not without hesitations. The development of such a system would be time consuming to develop and then to maintain. It would also be something that would be very unfamiliar to the entire clinic.

**Findings**

After the data had been compiled it became clear that something strange had occurred on July 22, 1996. Almost all of the procedures that had occurred on that day had not been billed. This significantly altered the data and did not contribute to helping us identify the standard causes of missed billing. Statistically the date in question was an outlier and was eliminated to show a more accurate representation. The findings that include this date can be found in Appendix B. Except for this Appendix, the recommendations and findings in the report do not include this date. This does bring about the possibility that the data used may have slightly more missed billing than actually shown because what was meant to have been billed on that day is not known.

The data in Table 1.1 shows a breakdown of the procedures that were not billed by the specific laboratories. The actual number may be found in Appendix A. The echocardiogram laboratory is losing the greatest number of charges, but all of the laboratories must be considered. The final recommendation will apply to them all.

**Table 1.1 Laboratory Procedures Percentages That Were Not Billed**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total # Performed</th>
<th>Checked on Charge Ticket</th>
<th>Total Not Checked</th>
<th>Missing Ticket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Checked in Log Book</td>
<td>Not Checked in Log Book</td>
<td></td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>118</td>
<td>9.9%</td>
<td>5.1%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Transtelphoneic</td>
<td>28</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Echocardiogram</td>
<td>389</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>EKG</td>
<td>502</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Pacemaker Analysis</td>
<td>21</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Exercise Lab</td>
<td>18</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Catheterization</td>
<td>42</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Minor Procedure</td>
<td>22</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1140</td>
<td>14.4%</td>
<td>8.0%</td>
<td>2.6%</td>
</tr>
</tbody>
</table>
The Graph 1.1 shows the percentage of the not billed charges in the month of July versus those that were billed.

**Graph 1.1 Percentage of Not Billed Charges**

**Graph 1.2** graphically displays a further breakdown of the reasons behind the not billed charges.

**Graph 1.2 Breakdown of the Not Billed Charges**

<table>
<thead>
<tr>
<th>July Charges</th>
<th>Total Not Billed</th>
<th>11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billed</td>
<td></td>
<td>89%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Not Billed</th>
<th>Missing Ticket</th>
<th>11%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Checked on Charge</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Ticket</td>
<td></td>
</tr>
</tbody>
</table>

| Not Checked on Charge Ticket | 7 |
Graph 1.3 displays the reasons behind the charges not billed by procedure.

**Table 1.2 Office Visits Not Billed**

<table>
<thead>
<tr>
<th>Missing Charge Tickets</th>
<th>Not Checked</th>
<th>Total Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>27</td>
<td>6</td>
</tr>
<tr>
<td>Percent</td>
<td>5.1%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

**Conclusions**

Using the data we analyzed for the targeted procedures we have found that Pediatric Cardiology is only billing 89% of their procedures. We have attributed the remaining 11% to one of three reasons. First is the technician error. This is the case when a charge is missed because the procedure was not checked off on the charge ticket. Secondly charges could be missed due to a data inputting error. The procedures were marked on the charge ticket but not entered into the University’s billing system. The University’s billing system could also be responsible. Lastly, the charge ticket was missing and if the procedure was checked or not is unknown.
The data also suggest that the mark made when the charge ticket is reconciled against the log books is not effective. Many of those that were indicated in the log books as having been marked in fact were not. This safety check has not proved to resolve the problem.

These numbers and percentages may also be translated into actual monetary loss of facility charges. Table 1.3 converts the missed billing numbers into actual lost hospital charges.

Table 1.3 Charges Lost in July

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Facility Charges</th>
<th>Total # Performed</th>
<th>Total Not Billed</th>
<th>Charges Lost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echocardiogram</td>
<td>$445</td>
<td>389</td>
<td>13.62%</td>
<td>$23,585</td>
</tr>
<tr>
<td>Electrocardiogram</td>
<td>$37</td>
<td>502</td>
<td>10.16%</td>
<td>$1,887</td>
</tr>
<tr>
<td>Catheterization</td>
<td>$1621</td>
<td>42</td>
<td>2.4%</td>
<td>$1621</td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>$34</td>
<td>118</td>
<td>14.41%</td>
<td>$378</td>
</tr>
<tr>
<td>Exercise Lab</td>
<td>$180</td>
<td>18</td>
<td>5.56%</td>
<td>$180</td>
</tr>
<tr>
<td>Transtelephonic</td>
<td>$37</td>
<td>28</td>
<td>14.29%</td>
<td>$148</td>
</tr>
<tr>
<td>Pace Maker Analysis</td>
<td>$43</td>
<td>21</td>
<td>9.52%</td>
<td>$86</td>
</tr>
<tr>
<td>Minor Procedures</td>
<td>$1,621</td>
<td>22</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,140</strong></td>
<td></td>
<td><strong>11.3%</strong></td>
<td><strong>$28,085</strong></td>
</tr>
</tbody>
</table>

The total amount of charges that has been found to have been lost based on the audit of July’s activity comes to a total of $28,085. See Table 1.3 for a breakdown by procedure. Assuming that July is fairly representative of an average amount of activity the total charges lost over the span of a year would equal $337,020.

The loss to the division from these findings is greater than simply the lost charges. The expense budget provided to the division from the University of Michigan Hospital is based on the activity that they bill. Since they are missing 11% of their billing their budget is much lower than it should be to cover the procedures that actually are performed in the division.

The data from the office visit audit show that there is potentially a problem in this area. From our data collected we found no correlation between missing charges and day of the week, time, or resource. Lack of patient specific data from the MSP billing office prohibited us from proceeding further.

**Recommendations**

After close scrutiny and meticulous collection of all of the data it has been determined that an electronic billing system directly tied to the billing system of the University of Michigan should be implemented. This is the only way that both the technician billing errors, lost charge tickets, and the data entry errors may be corrected and the ultimate goal of 100% billing be achieved. Simply improving the process would still not ensure that the charge tickets would indeed be checked nor would it ensure that a mistake in the entry of the data into the University’s billing system would not occur.

The physical requirements for this system would not be extensive. Their are currently IBM computers in each of the laboratories. The program would be loaded onto a server and be accessible from all of them.

In April of 1997 the University of Michigan’s facility billing system will be switching from FALCON billing to HQ3.0 (Healthquest 3.0). This is an on-line system that will allow for charges to be posted directly to a patients
account. This system differs significantly from the current system and all interfaces between the recommended
electronic system and the University’s billing system should be done with respect to HQ3.0 and not FALCON.

The point of entry for the system will be the log books since every patient that has a test must be logged in. In the
current process, the patient is logged in so an extra step would not need to be added. A major change with the new
system is that instead of manually writing in the patient’s information they would enter it into a computer. This
would eliminate the technician having to remember to check the charge ticket, walk over to the charge ticket, and
then mark it clearly in the appropriate box. This eliminates the possibility of the charge ticket not being checked as
well as the possibility of missed billing due to a lost charge ticket.

The electronic log book would be standard procedure for each laboratory. The main screen for each laboratory
would look the same except for the fact that the field would be individually tailored to meet their specific needs.
Each employee would be given a name and password to gain access into the system. Depending on their access
privileges, they would be allowed into different parts of the system.

The change to an electronic system is significant but many aspects would remain similar. The electronic log book
would look and function similarly to the log books currently in place. All of the fields that are in the current log
books would be designed into the electronic system. The relevant information concerning type of procedure
would also be available. Their would still be a list of the patients with the option to add the most recent patient at the
bottom of the list. Once a patient is entered their information will be stored in a database.

The time spent to log in a patient would be decreased because all of the information would not need to be added.
Simply entering one field would bring up the necessary information from the database relating to the patient. This
would not only decrease the time but the accuracy as well. Safety checks in the program would catch any mistakes
made about a patient. For example if a registration number was not valid an error message would appear indicating
this. The patient name would also be automatically entered and any confusion caused by misspelling would be
eliminated.

The entire step of having to reconcile the log books with the charge tickets would also be eliminated. Each patient
in the log books would no longer have to be initialed as having been billed. This step was shown in the data to be
ineffective.

Additional capacities could also be added that are not possible in the current system. The option to count the
number of a procedure performed in specified months could be available. In addition, reports could be generated
that show any specified compilation of data that would be useful to the employees in the division. For example a
report could be made to display all of the procedures a patient had for a given date of service. Queries concerning
any aspect of the database could also be made. Another possibility is to included additional fields that do not occur
in the log books but would be useful, such as the diagnostic code. The above are only possibilities to demonstrate
the capacity of the suggested system. The actual capacities should be decided upon by the division.

After the essential information had been entered it is then to be sent directly to the University of Michigan’s billing
system. This bypasses the necessity for a clerk to manually input all of the days activities into the system. By
sending them directly it will not only eliminate the time spent but will eliminate the chance of a data entry error.

This type of direct electronic system is currently used in 80% of the clinics at the University of Michigan Hospital
including the Adult Cardiology Clinic. The transfer process is already known, so the clinic needs only to follow the
format of the other clinics. In general terms, after the patients data has been logged in and stored in a database it
will need to be formatted in a standard way specified by the Hospital. For example the registration number would
need to be eight characters in length, the visit number 4 characters, etc. From here the formatted information would
be saved as a file and sent by a file transfer program to the mainframes of the Hospital. This formatting and sending
of files would be done after each working day. To ensure that the billing had been accurate a report of the activity
of the given day could be generated from the new system and reconciled against the printout from the Hospital’s billing system.

There are some problems that are inherent to an electronic system. These problems are not a common occurrence and can be remedied if the proper back ups are instituted. The server that Pediatric Cardiology uses at the present time backs up all of its information once a day. This process should be continued. A hard copy of the logbooks should also be printed out at the end of the week so if something were to happen to the system a copy of all of the patients for each laboratory would still be available. Additionally a paper log book having the same fields as the electronic system should be kept in each of the laboratories. This is in case the system is ever down and it is necessary to log in a patient. However once the system is up again, the information should be transferred from the log book into the system.

The automated system would make many jobs in the division a lot easier. Those employees that would experience this reduction in work load could then focus their time in other areas. The extra time would not go to waste, but shift the focus into areas that my have been previously neglected.

It is additionally recommended that the Medical Service Plan portion of the billing be reviewed. This includes the MSP portion of the laboratory procedures as well as the office visit charge in it’s entirety. The loss of billing due to data entry error was not able to be quantified but should be in the future. The automatic billing should be a standard procedure that applies to all aspect of the billing process including eventually the MSP side. We would assume that if a charge ticket was not checked then the MSP side would also not get the charge contributing to a greater loss.

All of the above recommendations will assist in the attainment of the goal of 100% billing as well as improve accuracy, data and report generation and budgetary planning. Assuming July is a typical month, they will assist in capturing at the least, the $28,085 of lost charges for a month and the $337,020 lost annually.

**Action Plan**

The Pediatric Cardiology Clinic should immediately begin planning for the electronic system. There are several areas that need exploring in the development and implementation of the new system.

A project team will be necessary. The project manager should be named that will plan a feasible time schedule, oversee the progress, and help to have a timely completion. There will also have to be members that have technical knowledge in the following fields; database management systems, programming languages, server knowledge, and general networking knowledge. These technical members will have a number of responsibilities. They will set up the database, design, program, debug, test, and implement the system. There should be several technical members due to the amount of work that will be required in this area. The input of the entire clinic will be needed, especially those that will be significantly effected.

As a beginning point, Adult Cardiology’s electronic system should be benchmarked. The construction of their system should be closely examined. The interaction between their interface and the Hospital’s mainframes should be documented. Contact should be kept with the clinic throughout the project when complications arise since the Adult clinic already has a proven system. It may even be possible to replicate some of the system for pediatrics.

The next information source that should be contacted is one that could define the requirements for the file transfer method and formatting that are required by the University of Michigan Hospital’s billing. There are several related departments that may need to be contacted. The system should be created to interact with the new HQ3.0 billing system. The possibility of verifying that files have been received should also be investigated. Once this is completed the focus can then shift to the construction of the electronic billing system.
The specific needs of Pediatric Cardiology will need to be identified. This includes the state of the current log books as well as any additional features that would be desired. Each of the laboratories needs to submit exactly what fields they think would be useful in the new system. This would include the columns that are currently in place. They would also include any additional information that would be helpful. They would also submit any type of report that would be helpful to them if generated by the system.

The physicians should also contribute their suggestions. Additional fields should be added, such as diagnostic codes. They would also request that the system have the capacity to generate certain types of reports that would be helpful to them.

The other positions in the clinic should also be consulted as to any capabilities they may need.

Once all of the suggestions had been collected and compiled, the design of the system should be outlined. This documentation should be flowcharted and all of the relationships in the program defined. The design should then be shown to the faculty and senior laboratory technicians to receive any additional input.

The database management system should then be decided upon. The type of software that is desired should be installed. The database relationships among the desired fields should then be made. From these relationships the most optimal database should be constructed.

With the database constructed and the system design complete, the development phase of the project may begin. This will be one of the most difficult and time consuming aspect to the project. The programming in the chosen language should begin. This coding should be broken down into different phases and a timeline set for the completion of each. This breakdown will make the programming more manageable. As the program is developed debugging should be occurring simultaneously. After the program is able to run, error handling should be invoked.

After a version of the program is ready a fairly extensive amount of testing should be performed. A testing software may be purchased or manual testing may be done. Every possible combination of information and every avenue possible should be explored. This is critical step in the quality of a system once it has been implemented.

Once all of the above steps have been executed the system is ready to “go live”, or in other words ready to be used. The fully developed program should be placed onto the server at Pediatric Cardiology so that all of the computers throughout the facility will have access. Training sessions should be held so that all employees are aware of the change and understand how to use the system. A manual should also be written so that it may be referenced should problems occur.

During the first few weeks of implementation the hand written log book and checking of the charge tickets as well as the electronic system should be run simultaneously. This is to test the system in a real situation and this is also so that if a problem occurs no data will be lost.

After the system is running without problems the hand written log books should be filed away. A single log book should be placed in each lab in case the system goes down. A binder for the weekly printouts should also be placed in each laboratory.

The final documentation and code should also be filed and a copy of the program stored. This is so that if adjustments or additions need to be made in the future they may be done.

The last hurdle that the new system will encounter is the maintenance of the system. This is not a small job and an employee should be responsible for it. The division will hold the responsibility for the system and will be primarily responsible for handling all maintenance concerns internally.
Appendix A
Actual Numbers

Appendix B
Data with July 22, 1996

Appendix C
Flow Charts

Appendix D
Diagram of the Pediatric Cardiology Clinic

Appendix E
Pediatric Cardiology Charge Ticket

Appendix F
Source Code for Demonstration Program
Appendix A

Actual Numbers

Actual Numbers for the percentages found in Table 1.1

<table>
<thead>
<tr>
<th>Test</th>
<th>Checked on Charge Ticket</th>
<th>Not checked on Charge Ticket</th>
<th>Missing Ticket</th>
<th>Total Not Billed</th>
<th>Total # Performed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Checked in Log Book</td>
<td>Not Checked in Log Book</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Echo</td>
<td>23</td>
<td>12</td>
<td>8</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Pace Maker Analysis</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>TTX</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>O2</td>
<td>1</td>
<td>6</td>
<td>7</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Minor Procedure</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Exercise Lab</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Catheterization</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>EKG</td>
<td>10</td>
<td>40</td>
<td>0</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>TOTALS</td>
<td>40</td>
<td>58</td>
<td>16</td>
<td>75</td>
<td>14</td>
</tr>
</tbody>
</table>
Appendix F: MD Data Collection Form for Establishing and Monitoring Scheduling Templates

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Patient ID</th>
<th>Diagnosis</th>
<th>Treatment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**MD Data Collection Form for Establishing & Monitoring Scheduling Template**

Doctor: 

Patient type: 

<table>
<thead>
<tr>
<th>Date</th>
<th>Indirect Begin</th>
<th>Indirect End</th>
<th>Total Indirect Service</th>
<th>Direct Time-In</th>
<th>Direct Time-Out</th>
<th>Total Direct Service</th>
<th>Total Service Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix B

**Data with July 22, 1996**

#### Actual Count

<table>
<thead>
<tr>
<th>Test</th>
<th>Total # Performed</th>
<th>Checked on Charge Ticket</th>
<th>Not checked on Charge Ticket</th>
<th>Missing Ticket</th>
<th>Total Not Billed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Checked in Log Book</td>
<td>Not Checked in Log Book</td>
<td>Total Not Checked</td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>128</td>
<td>10</td>
<td>6</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Echo</td>
<td>408</td>
<td>41</td>
<td>12</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Transtelephonic</td>
<td>29</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pace Maker Analysis</td>
<td>22</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>EKG</td>
<td>531</td>
<td>10</td>
<td>40</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Minor Procedure</td>
<td>24</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>2</td>
</tr>
<tr>
<td>Exercise Lab</td>
<td>18</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Catheterization</td>
<td>44</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>1204</strong></td>
<td><strong>70</strong></td>
<td><strong>58</strong></td>
<td><strong>17</strong></td>
<td><strong>78</strong></td>
</tr>
</tbody>
</table>

#### Percentage

<table>
<thead>
<tr>
<th>Test</th>
<th>Total # Performed</th>
<th>Checked on Charge Ticket</th>
<th>Not checked on Charge Ticket</th>
<th>Missing Ticket</th>
<th>Total Not Billed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Checked in Log Book</td>
<td>Not Checked in Log Book</td>
<td>Total Not Checked</td>
</tr>
<tr>
<td>Oxygen Saturation</td>
<td>128</td>
<td>7.8%</td>
<td>4.7%</td>
<td>5.5%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Echo</td>
<td>408</td>
<td>10.0%</td>
<td>2.9%</td>
<td>2.2%</td>
<td>5.1%</td>
</tr>
<tr>
<td>Transtelephonic</td>
<td>29</td>
<td>17.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Pace Maker Analysis</td>
<td>22</td>
<td>9.1%</td>
<td>0.0%</td>
<td>4.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>EKG</td>
<td>531</td>
<td>1.9%</td>
<td>7.5%</td>
<td>0.0%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Minor Procedure</td>
<td>24</td>
<td>0.0%</td>
<td>N/A</td>
<td>N/A</td>
<td>8.3%</td>
</tr>
<tr>
<td>Exercise Lab</td>
<td>18</td>
<td>0.0%</td>
<td>N/A</td>
<td>N/A</td>
<td>5.6%</td>
</tr>
<tr>
<td>Catheterization</td>
<td>44</td>
<td>4.6%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>1204</strong></td>
<td><strong>5.8%</strong></td>
<td><strong>4.8%</strong></td>
<td><strong>1.4%</strong></td>
<td><strong>6.5%</strong></td>
</tr>
</tbody>
</table>
Appendix C

Flow Charts
Echocardiogram

Patient requires Echocardiogram

Is the patient from clinic?

Yes

Log patient in appropriate log book

Perform test

Report generated

Place a copy for review

Is the patient from clinic?

No

Create a new charge ticket

Yes

Exit lab and find charge ticket while finding chart to place report

Make a new charge ticket

Is charge ticket found at nursing station?

No

Yes

Check off log book that patient was billed (Does not occur immediately)

Place report with chart and place charge ticket in outbox
Electrocardiogram

Patient requires Electrocardiogram

Perform test

Tracing generated

Log patient in log book

Place copy in files

Is the patient from clinic? No

Make a new charge ticket and place tracing in chart

Yes

Take tracing to chart and find charge ticket

Is the charge ticket found at nursing station? No

Make a new charge ticket

Yes

Mark appropriate box
Exercise Test

Patient requires Exercise test

Log patient in log book

Perform test

Handwritten report generated

Report place in box for reviewing and to be typed

Find charge ticket while placing report in chart

Place final report in chart

Is the charge ticket found at nursing station?

Yes

Mark appropriate box on charge ticket

No

Make a new charge ticket
Patient scheduled to arrive

Charts are brought from medical records to a box near the clerks

Patient arrives

Charge ticket is created and the appropriate office visit charge marked

Charge ticket placed in box at the nursing station

Charts travel with patient to the exam room

During testing the chart either stays in the exam room or is placed in the nurses' station or in the physicians' consultation room

The following morning the charge tickets are collected and entered into Falcon billing system by clerk.
Appendix D

Diagram of the Pediatric Cardiology Clinic
Diagram of Pediatric Cardiology Clinic

- Library
- Physicians' Consultation Room
- Echo
- Nurse Clinicians
- EKG
- Exercise Lab
- Charge Tickets
- Nursing Station
- Clerks Check-In
- Waiting Room

* Not to scale
Appendix E

Pediatric Cardiology Charge Ticket
### Analysis of anti-tachycardia PM system

- ECG
- Programming
- Induction
- Management of tachycardia
- Interpretation of recordings

### Electrocardiogram

- 360 04

### Intubation

- Endotracheal

### Pulse Oximetry

- Continuous monitoring

### Inpatient

- Treatment
- Room
- Time ≤ 1 hour
- Room
- Time > 1 hour

---

### PROVIER OF SERVICES AND BILLING AREA

- SITE: 003
- Select Physician and Sub-Site on grid below:

---

### HIPAA Privacy Notice

- Staff Physician Signature Required for any of the above

---

### 01073
<table>
<thead>
<tr>
<th>ULTATIONS</th>
<th>DR. IDX</th>
<th>CODE</th>
<th>QTY</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Cons - Level 1</td>
<td>99201</td>
<td>145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2</td>
<td>99202</td>
<td>155</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 3 (Fetal Imaging)</td>
<td>99243</td>
<td>185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 4</td>
<td>99244</td>
<td>220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 5</td>
<td>99245</td>
<td>250</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Referring MDs

<table>
<thead>
<tr>
<th>PROCEDURES-NON INVASIVE</th>
<th>DR-IDX</th>
<th>CPT</th>
<th>QTY</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echocardiography, complete (all 3 codes)</td>
<td>99332</td>
<td>630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doppler</td>
<td>99331</td>
<td>850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doppler Color Flex ($150)</td>
<td>99333</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| OFFICE VISITS | | | | |
|-----------------|-----------------|-----------------|-----------------|
| New Patient Office Visit - Level 1 | 99555 | 50 | | |
| Level 2 | 99512 | 60 | | |
| Level 3 (PDC services during 3 yrs) | 99203 | 80 | | |
| Level 4 | 99204 | 115 | | |
| Level 5 | 99205 | 150 | | |

ReVisits - Level 1 (MD not reg) | 99211 | 35 | | |
| Level 2 | 99511 | 40 | | |
| Level 3 | 99212 | 65 | | |
| Level 4 | 99213 | 125 | | |
| Level 5 | 99214 | 125 | | |

PREVENTION CLINIC

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CPT</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrocardiogram - Standard, 12 lead</td>
<td>99201</td>
<td>630</td>
</tr>
<tr>
<td>Holter, up to 48 hours</td>
<td>99202</td>
<td>500</td>
</tr>
<tr>
<td>Late Potential ECG</td>
<td>99203</td>
<td>500</td>
</tr>
</tbody>
</table>

PROLONGED PHYSICIAN SERVICES

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CPT</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treadmill Test and ECG</td>
<td>99204</td>
<td>160</td>
</tr>
<tr>
<td>Oxygen uptake or cardiac output</td>
<td>99205</td>
<td>100</td>
</tr>
<tr>
<td>Underlying cardiac dysfunction</td>
<td>99206</td>
<td>135</td>
</tr>
</tbody>
</table>

CONFERENCES

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CPT</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-tachy PM analysis, w/programming</td>
<td>99207</td>
<td>110</td>
</tr>
<tr>
<td>Pacemaker, electronic analysis, single</td>
<td>99208</td>
<td>100</td>
</tr>
<tr>
<td>Pacemaker, electronic analysis, dual</td>
<td>99209</td>
<td>90</td>
</tr>
<tr>
<td>Team Conference (1/2)</td>
<td>99210</td>
<td>110</td>
</tr>
</tbody>
</table>

NURSING/OHER CARE

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CPT</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transtelephonic pacemaker, single</td>
<td>99211</td>
<td>45</td>
</tr>
<tr>
<td>Transtelephonic pacemaker, dual</td>
<td>99212</td>
<td>40</td>
</tr>
<tr>
<td>Pro-time</td>
<td>99213</td>
<td>35</td>
</tr>
<tr>
<td>Pulses or ECG Oximetry, single</td>
<td>99214</td>
<td>20</td>
</tr>
<tr>
<td>Pro-time</td>
<td>99215</td>
<td>15</td>
</tr>
</tbody>
</table>

CMS HOSPITAL BILLING

<table>
<thead>
<tr>
<th>Procedure</th>
<th>FEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Room Time, less than one hour</td>
<td>XXX</td>
</tr>
<tr>
<td>Treatment Room Time, greater than one hour</td>
<td>XXX</td>
</tr>
<tr>
<td>Discount the charge by % as Professional Courtesy</td>
<td></td>
</tr>
</tbody>
</table>

Bill insurance only - Do not send a bill to the patient unless accompanied by a research protocol.
Appendix F

Source Code for Demonstration Program
Form: EditPatient

_objects

Section: Detail
Rectangle: Box5
Command Button: cmdCancel
Command Button: cmdUpdate
TextBox: DOB
TextBox: First
Label: Label0
Label: Label1
Label: Label2
Label: Label3
Label: Label4
TextBox: Last
TextBox: Middle
TextBox: RegNumber

_code
1  Attribute VB_Name = "Form_EditPatient"
2  Attribute VB_Creatable = True
3  Attribute VB_Exposed = False
4  Option Compare Database
5  Option Explicit
6
7  Sub cmdUpdate_Click()
8      On Error GoTo Err_cmdUpdate_Click
9
10      DoCmd.DoMenuItem acFormBar, acRecordsMenu, acSaveRecord, ,
11         MsgBox "Record successfully updated!", 64, "Saved"
12      DoCmd.Close
13
14       Exit_cmdUpdate_Click:
15           Exit Sub
16
17      Err_cmdUpdate_Click:
18         MsgBox Err.Description 20         Resume Exit_cmdUpdate_Click
19
20      End Sub
21  On Error GoTo Err_cmdCancel_Click
22  Dim Answer As Integer
23
24      Answer = MsgBox("Cancel any changes?", 36, "Cancel")
25      If Answer = 6 Then
26         DoCmd.Close
End If

Exit cmdCancel_Click:
Exit Sub

Err_cmdCancel_Click:
MsgBox Err.Description
Resume Exit_cmdCancel_Click.

End Sub

---

Form: EKG

Objects

Section: Detail

Rectangle: Box32

Command Button: cmdClose

Command Button: cmdReport

Command Button: cmdReview

Option Group: frmOptions

Label: Label1

Label: Label11

Label: Label13

Label: Label25

Label: Label27

Label: lblTotal

Line: Line10

Line: Line36

Line: Line37

Line: Line38

Line: Line4

Line: Line6

Line: Line9

Label: Month: _Label

Option Button: optAll

Option Button: optSome

Subform/Subreport: subAll

Subform/Subreport: subSelect

ComboBox: txtMonth

ComboBox: txtYear
Private Sub cmdClose_Click()
  DoCmd.Close
End Sub

Private Sub cmdReport_Click()
  DoCmd.OpenForm "Lab Reporting"
  Forms![Lab Reporting]!ReportRequested.Caption = Me.Caption
End Sub

Private Sub Form_Load()
  ' Initialize variables
  txtMonth = Val(Format(Now, "mm"))
  txtYear = Val(Format(Now, "yyyy"))
  lblTotal.Width = 2500
  lblTotal.Caption = "Total # of Records for " & txtMonth & "/" & txtYear
  lblTotal.Width = 2500
End Sub

Private Sub frmOptions_Click()
  If frmOptions.Value = 1 Then ' All records
    subAll.Visible = True
    subSelect.Visible = False
    txtMonth.Enabled = False
    txtYear.Enabled = False
    lblTotal.Caption = "Total # of Records"
    lblTotal.Width = 1500
  End If

  If frmOptions.Value = 2 Then ' Selected month
    subAll.Visible = False
    subSelect.Visible = True
    txtMonth.Enabled = True
    txtYear.Enabled = True
    lblTotal.Caption = "Total # of Records for " & txtMonth & "/" & txtYear
    lblTotal.Width = 2500
  End If
End Sub

Private Sub txtMonth_Change()
  lblTotal.Caption = "Total # of Records for " & txtMonth & "/" &
End Sub

Private Sub txtYear_Change()
  lblTotal.Caption = "Total # of Records for " & txtMonth & "/" &
End Sub
Sub cmdReview_Click()
On Error GoTo Err_cmdReview_Click
Dim stDocName As String
Dim stLinkCriteria As String
stDocName = "Patient Info"
DoCmd.OpenForm stDocName, , stLinkCriteria
Exit cmdReview_Click:
 Exit Sub
Err_cmdReview_Click:
MsgBox Err.Description
Resume Exit_cmdReview_Click
End Sub
Form: Lab Reporting

Objects

Section: Detail
Rectangle: Box7
Check Box: Check30
Check Box: Check32
Command Button: cmdClose
Command Button: cmdPreview
Option Group: frmPrint
Option Group: frmsort
Label: Label0
Label: Label12
Label: Label17
Label: Label19
Label: Label21
Label: Label25
Label: Label28
Label: Label3
Label: Label31
Label: Label33
Label: Label6
Option Button: Option16
Option Button: Option18
Option Button: Option20
Label: ReportRequested
TextBox: txtFromDate
TextBox: txtSQL
TextBox: txtToDate

Form: Lab Reporting
1 Attribute VB_Name = "Form_Lab Reporting"
2 Attribute VB_Creatable = True
3 Attribute VB_Exposed = False
4 Option Compare Database
5 Option Explicit
6
7 Private Sub cmdClose_Click()
Private Sub cmdPreview_Click()
Dim OrderBy As String
Dim SQLWhere As String
Dim optPreview As Boolean

' Determine sort request
Select Case frmSort.Value
Case 1
    OrderBy = "Date, RegNumber"
Case 2
    OrderBy = "RegNumber, Date"
Case 3
    OrderBy = "Name, Date"
End Select

' Print or Preview
If frmPrint.Value = 1 Then optPreview = True Else optPreview = False

' Generate SQL for specific dates
SQLWhere = "Date > #" & Format(txtFromDate, "mm/dd/yy") & " and Date <= #" & Format(txtToDate, "mm/dd/yy") & ":

' Open appropriate report
Select Case ReportRequested.Caption
Case "PaceMaker"
    ReportSQL = "Select * from qryPacemaker Order by " & OrderBy
    If optPreview Then
        DoCmd.OpenReport "Pacemaker LogBook", acNormal, SQLWhere
    Else
        DoCmd.OpenReport "Pacemaker LogBook", acPreview, SQLWhere
    End If
Case "EKG"
    ReportSQL = "Select * from qryEKG Order by " & OrderBy
    If optPreview Then
        DoCmd.OpenReport "EKG LogBook", acPreview, SQLWhere
    Else
        DoCmd.OpenReport "EKG LogBook", acNormal, SQLWhere
    End If
End Select

Private Sub Form_Load()
' Init. variables
Dim TempDate As String
TempDate = Format(Date, "mm") & "/01/" & Format(Date, "yy")
txtFromDate = CDate(TempDate)
End Sub
Form: MainMenu

Objects
Section: Detail
Rectangle: Box1
Rectangle: Box3
Command Button: cmdCath
Command Button: cmdEkg
Command Button: cmdExercise
Command Button: cmdPaceMaker
Command Button: cmdPatients
Command Button: cmdQuit
Command Button: Command8
Label: Label0
Label: Label2
Label: Label4
Image: OLEUnbound12

Code
1  Attribute VB_Name = "Form_MainMenu"
2  Attribute VB_Creatable = True
3  Attribute VB_Exposed = False
4  Option Compare Database
5  Option Explicit
6
7  Private Sub cmdCath_Click()
8    MsgBox "Lab book not yet implemented", 16, "Under construction"
9  End Sub
10
11  Sub cmdEkg_Click()
12    On Error GoTo Err_cmdEkg_Click
13      Dim stDocName As String
14      Dim stLinkCriteria As String
15    stDocName = "EKG"
16    DoCmd.OpenForm stDocName, , , stLinkCriteria
17
18
19    Exit_cmdEkg_Click:
20    Exit Sub
21
22    Err_cmdEkg_Click:
23    MsgBox Err.Description
24    Resume Exit_cmdEkg_Click
25    Resume Exit_cmdEkg_Click
Private Sub cmdExercise_Click()
    MsgBox "Lab Book not yet implemented", 16, "Under construction"
End Sub

Private Sub cmdFaceMaker_Click()
    DoCmd.OpenForm "Pacemaker"
End Sub

Private Sub cmdPatients_Click()
    DoCmd.OpenForm "Patient Info"
End Sub

Sub cmdquit_Click()
    On Error GoTo Err_cmdquit_Click
    DoCmd.Quit
    Exit_cmdquit_Click:
    Exit Sub
Err_cmdquit_Click:
    MsgBox Err.Description
    Resume Exit_cmdquit_Click
End Sub

Private Sub Command8_Click()
    DoCmd.OpenForm "Patient Reporting"
End Sub
Form: Pacemaker

Objects
Section: Detail
Rectangle: Box32
Command Button: cmdClose
Command Button: cmdReport
Command Button: cmdReview
Option Group: frmOptions
Label: Label1
Label: Label11
Label: Label13
Label: Label25
Label: Label27
Label: IbitTotal
Line: Line10
Line: Line36
Line: Line37
Line: Line38
Line: Line4
Line: Line5
Line: Line9
Label: Month:_Label
Option Button: optAll
Option Button: optSome
Subform/Subreport: subAll
Subform/Subreport: subSelect
ComboBox: txtMonth
ComboBox: txtYear
Label: Year_Label
Private Sub cmdClose_Click()
    DoCmd.Close
End Sub

Private Sub cmdReport_Click()
    DoCmd.OpenForm "Lab Reporting"
    Forms![Lab Reporting]![ReportRequested].Caption = Me.Caption
End Sub

Private Sub Form_Load()
    ' Init. variables
    txtMonth = Val(Format(Now, "mm"))
    txtYear = Val(Format(Now, "yyyy"))
    lblTotal.Width = 2500
    lblTotal.Caption = "Total # of Records for " & txtMonth & "/" & txtYear
End Sub

Private Sub frmOptions_Click()
    If frmOptions.Value = 1 Then ' All Records
        subAll.Visible = True
        subSelect.Visible = False
        txtMonth.Enabled = False
        txtYear.Enabled = False
        lblTotal.Caption = "Total # of Records"
        lblTotal.Width = 1500
    End If

    If frmOptions.Value = 2 Then ' Selected records
        subAll.Visible = False
        subSelect.Visible = True
        txtMonth.Enabled = True
        txtYear.Enabled = True
        lblTotal.Caption = "Total # of Records for " & txtMonth & "/" & txtYear
        lblTotal.Width = 2500
    End If
End Sub

Private Sub txtMonth_Change()
    lblTotal.Caption = "Total # of Records for " & txtMonth & "/" &
End Sub
Private Sub txtYear_Change()
    lblTotal.Caption = "Total # of Records for " & txtMonth & "/" &
End Sub

Sub cmdReview_Click()
    On Error GoTo Err_cmdReview_Click
    Dim stDocName As String
    Dim stLinkCriteria As String
    stDocName = "Patient Info"
    DoCmd.OpenForm stDocName, , , stLinkCriteria
    Exit_cmdReview_Click:
    Exit Sub

Err_cmdReview_Click:
    MsgBox Err.Description
    Resume Exit_cmdReview_Click
End Sub
Objects

Section: Detail

Command Button: cmdClose

Label: Label11
Label: Label13
Label: Label2
Label: Label8
Line: Line10
Line: Line6
Line: Line7
Line: Line9

Subform/Subreport: Patient Data

Code

1  Attribute VB_Name = "Form_Patient Info"
2  Attribute VB_Creatable = True
3  Attribute VB_Exposed = False
4  Option Compare Database
5  Option Explicit
6
7
8  Sub cmdClose_Click()
9    On Error GoTo Err_cmdClose_Click
10
11
12    DoCmd.Close
13
14  Exit_cmdClose_Click:
15    Exit Sub
16
17  Err_cmdClose_Click:
18    MsgBox Err.Description
19    Resume Exit_cmdClose_Click
20
21  End Sub
Form: Patient Reporting

Objects
Section: Detail
Rectangle: Box46
Rectangle: Box7
Check Box: Check30
Check Box: Check32
Check Box: chkAll
ComboBox: cmbPatients
Command Button: cmdClose
Command Button: cmdPreview
Option Group: frmPrint
Label: Label0
Label: Label28
Label: Label3
Label: Label31
Label: Label33
Label: Label47
Label: Label48
Label: Label50
Label: Label6
TextBox: txtFromDate
TextBox: txtToDate

Code
1  Attribute VB_Name = "Form_Patient Reporting"
2  Attribute VB_Creatable = True
3  Attribute VB_Exposed = False
4  Option Compare Database
5  Option Explicit
6
7  Private Sub chkAll_AfterUpdate()
8          If chkAll.Value = True Then  ' Disable date boxes
9                  txtFromDate.Enabled = False
10                 txtToDate.Enabled = False
11  Else  ' Enable date boxes
12                 txtFromDate.Enabled = True
13                 txtToDate.Enabled = True
14  End If
15  End Sub
End If
End Sub

Private Sub cmbPatients_Change()
cmdPreview.Enabled = True
End Sub

Private Sub cmdClose_Click()
DoCmd.Close
End Sub

Private Sub cmdPreview_Click()
Dim SQLWhere As String

' Generate SQL to select patient on form
SQLWhere = "RegNumber = " & Format(cmbPatients.Value) & ", "
PatientWhere = "Date >= " & Format(txtFromDate, "mm/dd/yy") & ", " & Format(txtToDate, "mm/dd/yy") & " and Date <= " & Format(txtToDate, "mm/dd/yy")

If frmPrint.Value = 1 Then
Else
End If
End Sub

Private Sub Command51_Click()
PatientWhere = "Date >= " & Format(txtFromDate, "mm/dd/yy") & " and Date <= " & Format(txtToDate, "mm/dd/yy")
End Sub

Private Sub Form_Load()
' Init. variables
Dim TempDate As String
TempDate = Format(Date, "mm") & "/01/" & Format(Date, "yy")
txtFromDate = CDate(TempDate)
End Sub
Form: subEKG

_objects

Section: Detail
TextBox: Comments
TextBox: Date
Label: Label0
Label: Label10
Label: Label11
Label: Label12
Label: Label14
TextBox: month
ComboBox: RegNumber
Label: RegNumber:_Label
TextBox: Technician
TextBox: Year

_code

1 Attribute VB_Name = "Form_subEKG"
2 Attribute VB_Creatable = True
3 Attribute VB_Exposed = False
4 Option Compare Database
5 Option Explicit
6
7 Private Sub Form_Error(DataErr As Integer, Response As Integer)
8 ' Display error if patient does not exist in patient table
9 If DataErr = 3201 Then
10 MsgBox "Invalid registration number. Patient does not exist!" & Chr(13) & 
11 "(Hit ESC to abort record)", 48, "Error"
12 Response = acDataErrContinue
13 End If
14 End Sub
15
16 Private Sub RegNumber_DblClick(Cancel As Integer)
17 ' Open patient edit screen
18 On Error GoTo 1
19 Dim SQLWhere As String
20 CurRegnum = RegNumber
21 SQLWhere = "Regnumber = " & CurRegnum & ""
22 DoCmd.OpenForm "EditPatient", , SQLWhere, , acDialog
29 1 Exit Sub
30 End Sub
31
32
33
Form: subPacemaker
Section: Detail
TextBox: Comments
TextBox: Date
ComboBox: Dual
Label: Label0
Label: Label10
Label: Label11
Label: Label2
Label: Label3
Label: Label4
TextBox: month
ComboBox: RegNumber
Label: RegNumber:_Label
ComboBox: Single
TextBox: Year

_Code
1 Attribute VB_Name = "Form_subPacemaker"
2 Attribute VB_Creatable = True
3 Attribute VB_Exposed = False
4 Option Compare Database
5 Option Explicit
6 Dim SingleValue As Boolean
7 Dim DualValue As Boolean
8
9 Private Sub Dual_BeforeUpdate(Cancel As Integer)
10     If Me.Dual.Text = "Yes" Then
11         DualValue = True
12     Else
13         DualValue = False
14     End If
15 End Sub
16
17
18 Private Sub Form_Error(DataErr As Integer, Response As Integer)
19     ' Display error if patient does not exist in patient table
20     If DataErr = 3201 Then
21         MsgBox "Invalid registration number. Patient does not exist!" & Chr(13) & "(Hit ESC to abort record)", 48, "Error"
22     Response = acDataErrContinue
23 End If
24
25
26 End Sub
Private Sub RegNumber_DblClick(Cancel As Integer)
' Display patient edit form
On Error GoTo 1
Dim SQLWhere As String
CurRegnum = RegNumber
SQLWhere = "RegNumber = " & CurRegnum & ""
DoCmd.OpenForm "EditPatient", , SQLWhere, , acDialog
Exit Sub
End Sub

Private Sub Single_LostFocus()
If Me.Single.Text = "Yes" Then
SingleValue = True
Else
SingleValue = False
End If
End Sub

End Sub
Form: subPatient

Objects
Section: Detail
TextBox: DOB
TextBox: First
Label: Label0
Label: Label1
Label: Label2
Label: Label3
TextBox: Last
TextBox: Middle
TextBox: RegNumber

Code
1  Attribute VB_Name = "Form_subPatient"
2  Attribute VB_Createable = True
3  Attribute VB_Exposed = True
4  Option Compare Database
5  Option Explicit
6
7  Private Sub Yorm_BeforeDelConfirm(Cancel As Integer, Response As Integer)
8       Response = acDataErrContinue
9  End Sub
10
11  Private Sub Form_Delete(Cancel As Integer)
12    ' Confirm deletion
13    Dim Answer As Integer
14    Answer = MsgBox("Are you sure you want to delete patient? " & Chr(13) & " (All records relating to patient will be deleted!)", 36, "Delete"
15    If Answer = vbNo Then
16       Cancel = True
17    End If
18  End Sub
19
20
21
22
23
24  Private Sub RegNumber_DblClick(Cancel As Integer)
25  DoCmd.OpenForm "Patient Reporting"
26  Forms! [Patient Reporting]! [cmbPatients]. SetFocus
27  Forms! [Patient Reporting]! [cmbPatients]. Text = RegNumber & " - " & Trim(Last) & " & Trim(First) & " & Middle
28  Forms! [Patient Reporting]! [cmdPreview]. SetFocus
29  End Sub
30
31
Form: TitleScreen

**Objects**

Section: Detail

Rectangle: Box7
Rectangle: Box8
Label: Label2
Label: Label3
Label: Label4
Label: Label5
Label: Label6
Image: OLEUnbound1

**Code**

```vba
Option Explicit

Private Sub Form_Click()
    DoCmd.Close
    DoCmd.OpenForm "MainMenu"
End Sub

Private Sub Form_Timer()
    'After timer is over close title screen and open main menu
    DoCmd.Close
    DoCmd.OpenForm "MainMenu"
End Sub
```