Analysis of the Computerized Nurse Documentation System

Prepared For: Trauma Burn Center, University of Michigan Hospital

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Programs and Operations Analysis
December 10, 1999
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Executive Summary

On September 22, 1999, the Trauma Burn Center commissioned a project team in order to estimate the impact to date of the Computerized Nursing Documentation System (CND) in relation to efficiency, cost, and benefits. Also, the group was to determine any inefficiencies within the system and suggest improvements to gain a more efficient use of nursing hours.

The goal was to fully assess the value and determine the efficiency of the CND system.

The team accomplished this goal through the following methods:

   Method One- Nurse documentation time studies and observations
   Method Two- Trauma Burn Center nurse interviews
   Method Three- Trauma Burn Center nurse survey
   Method Four- OPTS interview
   Method Five- Doctor Survey

Through analysis of the results the following was found:

   • The CND system's benefits far outweigh its cost.
   • Though slower, the CND system is more efficient than the paper method of documentation in terms of quality and accessibility of data.
   • Some major benefits of CND over paper
     ➢ Data legibility ➢ Data accessibility
     ➢ Data extensiveness ➢ Data consistency
   • The CND system and computer systems in general, are not being used to their full potential in the Trauma Burn and hospital as a whole.
   • The CND system had several inefficiencies related to it
     ➢ Non-standardized training of nurses on how to use system
     ➢ Poor communication of system upgrades to nurses
     ➢ Poor doctor competency on CND system
     ➢ Back of flow sheet has user friendliness problems
     ➢ Occasional computer downtimes and slow processing times

The project team has the following recommendations for improvement:

   • Expand the use of the CND system, and computers in general, in the Trauma Burn and hospital
   • Better training for nurses and doctors on how to use the CND system in the form of a training course or tutorial disk
   • Better communication of system upgrades through a single efficient method
   • Availability of a suggestion box for nurses to suggest system improvements
   • Implement monitor enhancement
   • Improve method of nurse documentation for road trips
   • Investigate reasons for computer downtimes if they persist after the New Year
I. Current Situation

In 1996, CND eliminated some forms of paper documentation used by nurses in the Trauma Burn Center (TBC) to record patient information. Today, nurses record patient information via computer at the patient’s bedside, however some paper charting still exists. The CND was implemented because it allows nurses to store more information and more detailed information than the paper method did. It also allows the nurses and doctors access to the information faster and from several different locations. The TBC would like to know the impact that the CND has had on the unit to date. They also want to know what could be done to gain a more efficient use of the computers in relation to nursing hours. Therefore, the goal of the project is to fully assess the value and determine the efficiency of the CND by answering the following questions:

- How cost effective is the CND compared to the paper method of collecting patient information?
- How has it effected the nurses’ charting efficiency and quality?
- How has CND effected the way nurses spend their time?
- How efficiently is CND being used today?
- What improvements should be made in the future to reduce cost and increase efficiency?

II. Approach and Methodology

Time Study

Time studies were conducted to analyze the amount of time nurses spent documenting patients' vitals. The data collection period began on October 15, 1999 and ended on November 19, 1999. Each member of the research group collected data for the time study in two-hour blocks. Data were collected in the TBC on the computerized documentation system and compared with the SICU paper documentation system. The following section shall highlight the methods used to collect the data on nurse documentation, the results of the data collected, and analysis of the data.

The same time study methodology was used in the TBC and the SICU. Nurses were timed while entering patient vitals into the computer in the TBC or onto paper in the SICU. Two forms of information were collected within these departments. One form was the front flow (FF) which contains the patient data that are collected hourly. The FF vitals consist of the blood pressure, medication level, urine level, and other information. The second form was the back flow (BF) which is the head-to-toe assessment and is collected every 2-4 hours depending upon the patient’s condition. For example, this could describe the patient’s wounds in a certain location and the condition of that wound over the patient’s recovery. The FF data were collected in both departments for comparison and only data for the BF data were collected in the TBC.

Stopwatches were used to accurately time how long it took nurses to perform documentation. The nurses were only timed while actually entering the patient’s data into the computer. The time it took for a nurse to walk or work with the patient was not
included in the study. For example, if it took a nurse 5 minutes to complete the FF, 2 minutes were spent on the computer and 3 minutes away from the computer, the time recorded would be 2 minutes.

The data were recorded onto the Data Collection Form (DCF), which can be found in the appendix. The nurse's name, total computer time, medicus level of patient, and total paper time if necessary were recorded during the time study.

Time of Study
  ➢ The majority of the time studies took place between the hours of 8 AM to 8 PM.

Nurse Name
  ➢ The nurses' names were recorded to measure whether there was a correlation between years of experience and documentation time.

Medicus Level
  ➢ The medicus level was recorded to measure whether there was a correlation between the severity of the patient's condition and how long it took to document vitals.

Observations

The observations were taken in two different locations; the Trauma Burn Center and the Surgical Intensive Care Unit. The observations consisted of nurses' actions, nurse's comments, and the way the computer or paper system worked. The following is a detailed methodology and description of the results.

The same methodology was used in both places. All three members of the research group performed observations at both locations. The observations were taken between October 15, 1999 and November 19, 1999. All were made within the hours of 9:00 am to 2:00 am. However, the majority were taken between the hours of 8:00 am and 8:00 pm. Primarily, observations were taken and recorded during the time study. Observations were made when performing the time study and between timing sessions. The Data Collection Form provided a column entitled "Comments" where observations could be written. A column for counting the number of times a nurse logged into the CND system was used while observing at the Trauma Burn Center. There were a total of 26 observations taken at TBC and 3 observations at SICU that were documented on the Data Collection Form, which is provided in Appendix A. Additional observations were taken by simply watching the nursing staff working in their units and these observations were recorded on regular paper.

Interviews

Trauma Burn Center Nurse Staff
Six different Trauma Burn Center nurses were interviewed. These nurses were strategically chosen based on their experience in the Trauma Burn Center, experience
with the computer documentation system, and amount of time they spend working in the Trauma Burn Center. The goal was to interview a nurse who has extensive experience and understanding of the CND system, a nurse who is new and still learning the system, and a nurse who uses the system but not on a daily basis. This goal was achieved.

The interviews were very structured and lasted on average about twenty to thirty minutes. The six nurses were separately interviewed during the week of November twelfth to the eighteenth. Two group members were present at each interview to insure that all the information given by each nurse was collected to the fullest extent. All the nurses were asked the same five questions and allowed to express any other opinions or comments they had at the end of the interview that the questions did not touch on. The aim of the questions asked was to discover the nurses’ like and dislikes about the CND system, bring to the forefront any problems they are having with the application of the CND system, and discuss whether they would like the CND system further implemented. A copy of the interview questions can be found in Appendix C.

OPTS Computer Support Group
Two members of the OPTS staff were interviewed simultaneously, the interview took place on November twenty-third. These members were strategically chosen based on their experience with the CND system in the Trauma Burn Center and knowledge of the system. The goal was to interview one staff person who has extensive experience and understanding of the CND system (Vikas Kheterpal, M.D.), and one who works with the system everyday and is aware of the daily issues (Celina M. Corridore).

The interview was very structured and lasted about an hour. Two group members were present at the interview to insure that all the information given by the OPTS staff members was collected to the fullest extent. During the interview, they were asked seven questions and allowed to express any other opinions or comments they had at the end of the interview that the questions did not touch on. The aim of the questions asked was to discover why the system was implemented and its importance, their views on problems with the CND system, and in what direction they would like to see the CND system go in the future. A copy of the interview questions can be found in Appendix E.

Surveys

Trauma Burn Center Nurse Survey
The purpose of this survey was to get feedback from a broader base of the Trauma Burn Center nursing staff since only six nurses were interviewed. A large envelope with the blank surveys, along with a large envelope for completed surveys, were pinned on the bulletin board in the Trauma Burn nurses’ break room and left there for a week. An email was sent out by the Trauma Burn Center Nurse Manager Nancy Mamolen to all the nurses informing them of the purpose of the survey and its importance and stressing that they complete it. A sign was also posted in the break room requesting the nurses to fill out the survey. The completed surveys were then picked up and analyzed by the group.
The survey contained seven questions aimed to get a better understanding of how the nurses felt about how they were trained to use the CND system, frustrations or difficulties they have with the system, improvements they would like to see, and communication of upgrades. A copy of the survey questions can be found in Appendix D.

**Doctor Survey**

The purpose of the doctor survey was to get feedback from doctors who have worked or are working in the Trauma Burn Center about how they feel about the CND system. An email with a short description of the project and a list of four focused questions was sent to a select group of doctors. The message was sent to eight doctors. Three of the doctors were currently working in the Trauma Burn Center and five doctors who had just left the Trauma Burn Center. The reason for this was to get opinions from doctors just learning the system and doctors who already used the system. The aim of the questions was to learn the doctors' likes and dislikes about the CND system, how comfortable they felt accessing and using the system, and improvements they would like to see in the system. A copy of the doctor survey questions can be found in Appendix F.

**III. Results and Analysis**

**Time Study Results**

**Computer Documentation Front Flow Results**

Twenty-seven data points were collected in the TBC for the computerized documentation system and fifteen points were collected in the SICU for the paper documentation system. The data were recorded in mins/flow-sheet. The units mins/flow-sheet tells how long it takes to enter the data onto a flow sheet on per minute basis. The data points from the computerized documentation system were organized into three groups. In the first group, the average and standard deviation were calculated for the entire population of twenty-seven points. In the second group, the data were separated into smaller groups based on the nurses' experience. The average and standard deviation were calculated for nurses with less than two years of experience and 3 or more years of experience. The data were separated into these two groups because it was almost an even spread of the data. In the final group, the data were divided and calculations performed based on the severity of the patient. The data were separated into the 5th and 6th medicus levels, because all the data points, with the exception of one, were 5th or 6th medicus level and needed to be divided. The results are given in table 1.
Table 1. Computerized Front Flow Results

<table>
<thead>
<tr>
<th>Group Samples</th>
<th>Number of Data Points</th>
<th>Mean (mins/flow-sheet)</th>
<th>Variance (mins^2/flow-sheet^2)</th>
<th>Standard Deviation (mins/flow-sheet^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>28</td>
<td>2.088</td>
<td>1.694</td>
<td>1.301</td>
</tr>
<tr>
<td>Nurses with 0-2 yrs experience</td>
<td>16</td>
<td>2.091</td>
<td>6.407</td>
<td>2.531</td>
</tr>
<tr>
<td>Nurses with &gt;=3 yrs experience</td>
<td>12</td>
<td>2.085</td>
<td>1.787</td>
<td>1.334</td>
</tr>
<tr>
<td>5th Medicus Level</td>
<td>12</td>
<td>1.795</td>
<td>1.024</td>
<td>1.012</td>
</tr>
<tr>
<td>6th Medicus Level</td>
<td>15</td>
<td>2.443</td>
<td>2.024</td>
<td>1.422</td>
</tr>
</tbody>
</table>

*One data point was a 2nd Medicus Level patient and was not included in the Medicus Level breakdown.

Computer Documentation Back Flow Results
Nine data points were collected during the time study of the back flow. The average, variance, and standard deviation were calculated for this group sample. The results are listed below in Table 2,

Table 2. Back Flow Data Results

<table>
<thead>
<tr>
<th>Group Sample</th>
<th>Number of Data Points</th>
<th>Mean (mins/flow-sheet)</th>
<th>Variance (mins^2/flow-sheet^2)</th>
<th>Standard Deviation (mins/flow-sheet^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>9</td>
<td>5.23</td>
<td>12.03</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Paper Documentation Front Flow Results
The average and standard deviation were calculated for the fifteen points from the paper documentation system. The data were not divided into groups because all the nurses were well experienced with the paper documentation system. Plus, there were not enough similar medicus levels to divide the data by medicus level as in the groupings and results for the computer system. The results are located in table 3 below.
Table 3. Paper Front Flow Results

<table>
<thead>
<tr>
<th>Group Sample</th>
<th>Number of Data Points</th>
<th>Mean (mins/flow-sheet)</th>
<th>Variance (mins^2/flow-sheet^2)</th>
<th>Standard Deviation (mins/flow-sheet^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>10</td>
<td>0.609</td>
<td>0.151</td>
<td>0.388</td>
</tr>
</tbody>
</table>

Time Study Analysis

*Computer Documentation Front Flow*

The average time it took nurses to enter data using the computerized documentation system was 2.08 min/record with a standard deviation of 1.30 min/record. This information suggests that the TBC department require about 1.18-3.38 minutes/record to enter patient vitals. The standard deviation of 1.30 min/record indicates that some variance exist in the computerized documentation system. However, it was hard to predict the reason for the large source of the variance in the population. Thus, the medicus group and nurse group results were analyzed.

Nurses with less than or equal to 2 years of experience and nurses with greater than or equal 3 years of experience took about the same time on average to enter patient data into the computer as the total group population analyzed. However, the standard deviation of nurses with less than or equal to 2 years of experience was 2 times greater than the standard deviation of the group sample total population and the nurses with over 3 years of experience. Therefore, it is believed that nurses with less than or equal to 2 years of experience effected the standard deviation of the total population. This indicates that nurses with less experience are costing the department more time to do the same work. After 2-3 years of experience, it is believed that nurses could be acclimated with the system from using it everyday, given they have received sufficient training.

Neglecting nurse experience, the medicus level was analyzed to see if it had an impact on the average time that it took for nurses to enter patient data. The higher the patient’s medicus level the longer it took to enter the patient vitals. Thus, the standard deviation of the group population average could be a result of the medicus level. If this is true, patients with a medicus level of 6 will increase the nurse documentation processing time.

The data show that nurses with less than two years experience do not all perform on the same level, because the standard deviation places the average in a wide range. This illustrates two potential situations. Either the nurses have different computer skill levels or they are receiving different degrees of training.
**Computer Documentation Back Flow**
The nine data points that were collected are not sufficient for analysis of the computer documentation back flow. Thus, the area of the study needs to be investigated in further detail. It is important to investigate the time it takes to complete the back flow because it is believed the amount of information on the back flow screen increases the computer processing time (The University of Michigan Business School 12). The University of Michigan Business School conducted a study prior to April 1999, and made the recommendation to conduct a diagnosis of OPTS. This recommendation was made because the nurses complained it took too long to enter data because the computers were slow.

**Paper Documentation Front Flow**
The analysis of the data collected from the paper documentation system and the computer documentation system show that it takes more time to enter data using the computer system than it takes to enter data using the paper system. It takes an extra minute to use the computers instead of paper to enter the patient vitals. However, two things must be taken into consideration before one can determine if the CND system is more beneficial than the paper system. One, the nurses have years of experience using the paper system. Two, only fifteen data points were used to draw the conclusion.

A large standard deviation indicates that nurses are at many different levels of capability. This illustrates that training does not bring them up to a standard knowledge.

**Observations Results**
The Time Study and Observation Log provided in Appendix B shows the observations that were taken during the time study. The following is a summary of those observations.

Nurses at the SICU were observed walking around as they filled in their flow sheets. This was possible because their flow sheets were documented on paper making it easy for them to move around as they complete their work. Much of the documentation for the front of the flow sheets was found to be on the patients’ vitals monitors. The SICU nurses would walk up to these monitors and write the data into their flow sheets. In the Trauma Burn Center, the nurses could not move with their flow sheets because documentation was being done on stationary PC’s. When getting information from the patients’ monitors, they would walk over to the monitors to read them and then return to the PC to enter the information. Typically, they would do this several times because they needed to report multiple pieces of data.

The experience levels of the nurses were determined. The observations were then separated into those pertaining to very experienced nurses (3 or more years of experience with the CND), moderately experienced nurses (1 to 3 years of experience), new nurses (less than 1 year of experience). Much of the results are based on the experience levels that were matched with the observations.
While taking observations, many of the TBC nurses commented that they liked the system. However, they also expressed that it took a long time to become familiar with it. Orientation and new (two or less years of experience in TBC) nurses were observed to have many more difficulties using the system. They were often seen searching through the system to find the part of the program they needed. Initially, orientation nurses are assigned a nurse preceptor. This is an experienced nurse at the Trauma Burn Center who is in charge of training the orientation nurse. Most often, the preceptor nurse provides all of the training on the computer system. The preceptor’s primary job is to work with the student and typically this nurse does not have any patients of her own. The preceptor nurses were observed reviewing the information entered by the orientation nurses and often entering additional information and making corrections. After working with a preceptor nurse, new nurses are on their own. New nurses stated that although they were done working with the preceptor nurse, they were still in the process of learning the system. One orientation nurse was observed working on her own and having a lot of problems. For example, data were input improperly by the orientation nurse. The preceptor nurse looked it over and had to redo it. This orientation nurse appeared frustrated by the program.

Many nurses complained that they had to log into the system multiple times while doing their documentation. However, this was never observed. It was necessary for nurses to login one time because the system reverted to the login screen when sufficient time elapsed between uses. Several times, no logins were recorded because the time between documentation sessions was not long enough to cause the computer to revert to the login screen. This time could vary between computers in different rooms.

On three occasions the nurses were observed to calculate information on a sheet of paper before entering it into the computer. This was found to occur with CRRT (Continuous Renal Replacement Therapy). The nurses were observed calculating information on paper and then walking to the computer to document the information, and walking back to calculate more data necessary for documentation. During these calculations it was observed that the nurse walked back and forth between the computer and calculator at least four times. No other instances were found of nurses initially writing documentation on paper and then transferring it to the computer system.

The computer system was observed to hold much more data than the paper system. This data were also much more in depth than that of the paper system. It was possible for nurses to enter comments of any length that they desired when using the CND system. The paper system restricted the amount of space they had to write in their comments by having a limited amount of room on the paper flow sheets.

Several other characteristics of the data entered in the computer were observed. Data entered into the computer were found to be more legible. While the legibility of the data in the paper system were dependent on the handwriting of the nurse doing the documentation. The computer system provides dropdown lists that contain the possible responses for some sections of the program. This keeps the responses consistent. There is no way to control the data being entered into the paper system. Nurses have freedom
to respond as they wish in all parts of paper documentation. Entering data into a computer, rather than on paper, saves space because all the paper documentation would have to be stored. Computer documentation provides a large, easily accessible database of patient information. This is useful for research institutions such as the University of Michigan Hospital. When doing research and writing papers, it is beneficial to have a database, which can easily be queried for patient data. It is also possible to track data over a period of time with a computer system. This is a very time consuming and difficult task to accomplish on a paper system because the documents must be searched through manually.

Observations Analysis

When nurses walk to the patient monitors and then back to the computer to get the information that they need to input data into the flow sheets, wasted motion is occurring. This movement does not add any value to the work that the nurses at the Trauma Burn Center are doing. The SICU nurses have an advantage because they can move around as they work on their flow sheets. The data that are being entered in the front side of the flow sheets is on the monitors located by the patients' beds. This data are already in a computer system that controls the monitors. Currently, these monitors are not linked to the CND system. Entering this data into the CND is also wasted motion because the data are already in a computer system and the nurses are simply taking the time to transfer it.

The training that is provided for the orientation nurses does not make them capable to use the CND system efficiently and without errors. A preceptor nurse trains the orientation nurses. There are many preceptor nurses, so the level of training the orientation nurse gets depends on how effectively that preceptor is able to train someone. In addition, the training practices are designed to last a specific amount of time rather that meeting a specific CND efficiency level. After the orientation period is over, the new nurses are still less efficient than the experienced nurses because they are continuing to learn and make mistakes. This is a risk for the patients and hospital. Many problems can arise from having a nurse incorrectly document patient information. For example, any procedure that is done on a patient must be documented to prove that it was completed. This is a liability issue. If a nurse does not document something, then there is no proof of it being done. There is a greater chance of this happening to a new nurse because they are still familiarizing themselves with the system. Of course, if a new nurse still does not understand how to do something on the CND, she can ask another nurse to show her. However, this is another form of wasted nurse time. Properly trained nurses would not take this extra time to ask for help. Therefore, this helping time should be kept to a minimum. Better training would help decrease the amount of errors that recently oriented nurses are making. The fewer errors they make, the less time they spend correcting mistakes, reducing time it takes to complete documentation.

Additionally, multiple login times were not found to be a concern. This is not a problem that affects the nurses' use of the CND system.
Interviews

Trauma Burn Nurse Staff Results

There were a few common themes expressed by each of the nurses interviewed, most of these related to their likes and dislikes about the system.

All the nurses interviewed stated that they liked the CND system and would like to see it further implemented to include other facets of the nursing and overall hospital tasks. Each liked the clarity, neatness, and amount of information entered into the system. Another common comment throughout all the interviews was that they liked the CND system better than the paper method because of the more detailed information they are able to document and the technological advantages the CND system has that can allow it to improve patient care. For example, being able to examine the data from several different locations.

There were also several similar dislikes that the nurses voiced during the interviews. The most common was the doctors’ working knowledge of the CND system. The nurses stated that doctors frequently have difficulty getting into the system and finding the needed information, and therefore, continually go to them seeking assistance. This takes away from the nurses’ time to tend to their patients and complete their daily tasks.

The nurses also expressed a strong dislike for some of the charting used on the back of the CND flow sheet in relation to its user friendliness, in particular wound charting. Every nurse interviewed stated that they do wound charting on paper because of how difficult it is to do it in the CND system. The explanation given in one of the interviews was “it never seems to work right.”

The two final dislikes all the nurses interviewed referred to were the CND system speed and the ability to write notes. The nurses complained that at times the computers are very slow, “sometimes it takes an entire hour to input hourly vitals.” The frequency of this problem is debatable, each of the nurses gave different estimates; some complained that this occurred often and others said only occasionally. Finally, each of the nurses made it a point to say that the system needs a better note writing feature. They sometimes have difficulty putting in personal notes about the patients. One of the nurses said that some parts of the CND system only allow you to scribble in notes (only capable to do this in handheld computers, this feature was never changed when they switched to bedside terminals), an action that the computer does not allow them to do.

There were also some items that were not consistent in the interviews. The first item has to do with they way system upgrades are communicated to the Trauma Burn nurses. About half of the nurses said they are informed about upgrades through email, and that this method of communicating upgrades was sufficient. The concern lies with the other half of the nurses. They stated that they are never informed of upgrades and that they just happen to come across them while they are documenting in the system. Two of the nurses that said this have been in the Trauma Burn Center since the CND system was implemented and are quite comfortable with CND system. These nurses who have not
been receiving information about upgrades all said hearing about them would help them very much.

The other item where answers were not in agreement concerned the quality of training the nurses received. Nurses who worked in the Trauma Burn Center when the CND system was implemented received a four-hour training course to allow them to learn and familiarize themselves with the system. Nurses who came to the Trauma Burn Center to work more recently are informally trained during their orientation a by one of the other nurses acting as a nurse preceptor. All the nurses interviewed agreed that the class was sufficient training and allowed them to pick up the system relatively quickly. These nurses agreed that the new nurses would benefit from this training class. There was inconsistency in the answers given between the nurses who did not receive this class. Some said they did not need a class to learn the system, that the training they received was enough. The repeated phase was “I learn better hands on.” Others said that they felt inadequately trained and that some sort of class would have help. One comment was consistent between them though was that it took or is taking them awhile to totally learn the system after their orientation was completed and they were left to work on their own.

A response that only one nurse gave as a problem and needed improvement that deserves attention has to do with road-trips. The nurses can not take a computer with them so they must write all the documentation data on paper and transfer it to the CND system afterwards. She said that this is very frustrating.

**Trauma Burn Nurse Staff Analysis**

After reviewing the results of the Trauma Burn Center nursing staff interviews, one thing is clear: the nurses interviewed like the CND system better than the paper system. There are several advantages to using the CND system that can not be achieved though paper documentation. For instance, the CND system allows to be input clearer, neater, and more detailed than the paper system. For this reason, these nurses would like to see the system expanded.

Although they would like to see the CND system expanded, several things must be improved first. Doctors are not learning the system fast enough, or good enough, and they are having trouble with simple things like getting into the system and finding the necessary data. Instead of learning how to use the CND system, they approach a nurse to get the information for them. This takes away from the nurses’ time to do their assigned tasks, either increasing cost because they must now work longer to finish their duties or decreasing efficiency because they must now work faster to finish their duties on time.

Some of the tools on the back of the flow sheet, especially wound charting and note writing, are not user friendly so the nurses simply do not use them. This takes away from the efficiency of the system because it is not being used to its full potential. The nurses instead use paper charting, which causes there to be inconsistency in documentation practices in the Trauma Burn. You must now look in two different places to find data, the computer and paper.
Computer speed is also an item that must be addressed. Although slowness at times will always be a setback present with computers, the frequency of these slow processing periods can and must be reduced. These downtimes and slow periods cause the nurses to become frustrated with work and damage the morale of the staff. This is unacceptable.

How system upgrades are communicated to the Trauma Burn nursing staff also appears to be a problem. Some of the nurses are hearing about the upgrades; so the question is why are all of the nurses not hearing about them? After hearing the nurses’ responses, the reason seems to be that no standard way of telling them about upgrades exists. This makes it easier for nurses to miss information because they are not expecting it. It also increases the chances that information is not reaching all nurses.

Training appears to be a major problem when it comes to the nurses that entered the Trauma Burn after the CND system was implemented. These nurses are not formally trained to use the system, so the type of training they do receive varies from nurse to nurse. These nurses do not know the system when they start working and take longer to learn the system than nurses who received the four-hour training course. Some the nurses who did not receive the training course stated that they learn better hands on, so they would rather not go through a training course. The question that needs to be asked is whether the hospital wants to run the risk of allowing these nurses to learn hands-on and make a mistake on a real patient, or have them formally trained and make those mistakes a situation where it will not jeopardize someone’s health?

OPTS Computer Support Group Results
The major points brought out in the interview were that the CND system carries huge advantages and that its full capabilities have only been slightly tapped. They said that when the CND system was implemented to improve the quality of nurse documentation. One area of concern was the American College of Surgeons (ACS). The CND system provided support to keep the Level 1 verification from the ACS. The CND has allowed the Trauma Burn Center to strengthen their documentation and became even more competitive with other hospitals. They feel the CND system provides a form of documentation that is more consistent, legible, and assessable. But they also feel that it can do a lot more for the Trauma Burn Center and the hospital as a whole. As a research driven institution, the more information and data put on-line, the better. This data is more accessible and costly paper audits are avoided. OPTS says that there are also other computer systems in the hospital that could be linked to the CND system to cut back on workload. For instance, if in one unit of the hospital a patient’s data already exists in their computer database, another unit should be able to download that patient’s data if he is transferred to that unit. This could eliminate re-documenting data that already exists in a computer system. Another major advantage of the CND system that OPTS brought to attention is that insurance companies like clients to use computer systems over paper systems because of legal issues. With a computer system there is less room for error due to the legibility and consistency of data.

When it comes to problems with the CND system, there is the potential for conflict between OPTS and the Trauma Burn nursing staff. As OPTS put it, “nurses don’t have
experience to know the process of computers”. They don’t have the knowledge to know what can be done easily and can not be done easily with computers. There are two types of changes that can be made to a computer system: a change that can be done without a change to software, and a change that requires a change in software, can not be done easily. A change not requiring a change in software can be done easily. A change that requires a change in software can not be done easily. OPTS stated that any change that will help the nurses and can be done easily is implemented. The only conflict that could arise in this case is that all requested changes can not be made to fit one person’s needs because there is a team of nurses who must use the system not just one. This type of change would not be made.

To address the problem of communication of upgrades to the Trauma Burn Nursing staff, OPTS says that they do several things to inform the nurses ranging from flyers to emails to the Trauma Burn Nurse Manager. Examples stated by OPTS are that they make announcements at shift changes and walk around informing the nursing staff about changes.

Downtime and computer slowness was another topic that was addresses in the interview. OPTS said that the majority of the longer downtimes were due to changes being made to address Y2K preparation and that those should end soon. They also said that some slowness and downtimes are just part of computers, and although they can be minimized, they can not be totally eliminated.

In response to the question of what changes they would like to see made and where they would like to see the CND system go, OPTS made a few suggestions. First, simpler changes that should be made are forcing doctors to become more proficient with the CND system so they do not need to ask the nurses for help, and improving the quality of printed data output. A bigger change OPTS would like to see is the implementation of better technology like monitor enhancement, where data are transported straight from the patient monitors to the CND system.

OPTS Computer Support Group Analysis
From the interview with OPTS, it seems that they are willing to improvements to the CND system when feasible. An upgrade that will require software changes would have to be looked at very closely and determine whether it would be beneficial to the Trauma Burn Center and by how much.

The way OPTS communicates system upgrades to the Trauma Burn Center nurses is a problem because it is inconsistent. They use a variety of different ways to inform the nurses of these upgrades. The best approach to communicating the upgrades would be to use only one method. This method could consist of many forms of communication, but each of the forms must be used every time. This way things do not get complicated, the message is not transformed in any way, and if for some reason one of the nurses does not get inform of the upgrade it is easy to go back and find out why. You would only have to trace back through one method instead of multiple methods.
OPTS stated that the long downtimes are due to Y2K preparation, so after the New Year if the problem remains then some sort of action must be taken. Computer downtimes affect the morale of a team and the quality of work that is put out; it is a problem that carries huge costs.

From the results of the OPTS interview one thing is clear: the full capabilities of the CND system and computers in general have only been scratched by the Trauma Burn Center and the University of Michigan Hospital. The CND system was brought in to strengthen documentation in the Trauma Burn Center and it appears to have done that. The positives far outweigh those of paper documentation. There is no reason why the CND system should not be expanded. With CND system, doctors are now capable to access a clearer set of patient data from a computer at any location. This gives them the ability to examine the status of more patients, making the hospital more efficient. Through the utilization of computers to store data, it becomes cheaper to access and analyze patient data. As a research driven hospital this is important because time consuming and costly paper audits can be avoided. The CND system provides a cleaner collection of data that are easier to research and run tests on. The potential is endless.

Surveys

Trauma Burn Center Nurse Survey Results
Twenty-five surveys were received and their responses were very similar to the results of the interviews performed on the six Trauma Burn Nurses.

Once again, there was no agreement between the nurses in the issues of training and communication of upgrades to the CND system. Of the nurses who completed surveys, seventeen said they were adequately trained and eight said they were not.

Sixteen of the nurses responded that they do not write on paper before entering data into the CND. Nine nurses stated that they often or occasionally write on paper first.

Twenty-two nurses said they experience problems and frustrations to some extent while using the CND system, a point that should not be left out is that all the nurses who were unhappy with their training also said they experience these frustrations. The frustrations of the nurses who were happy with their training are more focused on computer speed than actual use of the system. Eight nurses stated that they have problems with the system when upgrades occur. However, twenty-four nurses stated that being aware of upgrades would help to limit their frustrations with the system.

Twenty-three of the surveyed nurses stated that they liked the CND system and would like to see it expanded to implement other nursing tasks. Despite their happiness with the system, they also voiced some common improvements they would like to see. The most common were better wound charting, computer system speed, doctor competence of system, and ability to make personal notes. Twenty-three nurses stated that if there was a standardized way to voice their opinions and suggestions about improvements they would use it.
Trauma Burn Center Nurse Survey Analysis
The results of the Trauma Burn Center nursing survey mirrored that of the results of the
six Trauma Burn Center nurses that were interviewed. Therefore, the analysis is
basically the same. The only significant thing to add is that since nearly all the nurses
said that if there was a standardized way to voice their opinions and suggestions about
improvements to the CND system that they would. This should be utilized to improve
the quality and efficiency of the CND system. Initially this will provide a standard line
of communication between the nurses and OPTS. The problems and frustrations the
nurses are having will no longer go unnoticed. OPTS stated in their interview that “nurses
don’t have experience to know the process of computers.” At the same time no one
knows the needs of a nurse better than a nurse does. Although a nurse may not have the
knowledge needed to know how computers work, they can definitely help OPTS shape a
system that will make them more efficient by supplying OPTS with the knowledge of
what nurses need.

Doctor Survey Results and Analysis
Despite numerous emails, only one doctor responded to the survey. The number of
responses to the survey was disappointing. The single doctor response is in Appendix G.
Because only one response was received, no further analysis was done.

IV. Paper Vs. Computer Documentation Analysis

The two systems had benefits and costs associated with them. Many benefits were found
with the computer system. The information entered into the computer system was of a
higher quality due to greater legibility, consistency, and accessibility. Researchers can
benefit by using the more extensive data that are collected in the computer
documentation. In the past, this data were even sold by the hospital to another research
institution. By doing so, the computer data were used to bring in a profit. This could be
used as a source of income for the hospital in the future.

The CND system provides support for the Level 1 re-verification process. Verification as
a Level 1 trauma system indicates that the outcome quality has been achieved to treat
critically injured trauma patients. This can influence the number of patients that are
referred for trauma care. The number of patients treated is directly related to increased
revenue. The CND system provides effective care for these patients.

Because liability is directly related to documentation, it is important that it be done
correctly and be legible. This is more easily accomplished with a computer system. By
maintaining legible documentation, the hospital’s liability will decrease. By using the
computer documentation, it is possible to check whether the required procedures are
being done on the patients and then documented. This is easily done with a query on a
computer system. On a paper system, this would have to be done manually and it would
take much more time.
Another benefit is the ease of accessing the computer system from many places. This could save the doctors from having to go to TBC to find out about their patients when it would be sufficient to read their vitals on the computer. This could free up some of their time and enable them to see more patients. Because the patient information is easily accessible through the computer, doctors might take the time to check it at times that they might not have because of the inconvenience of getting it on the paper system. They could monitor their patients easier and better.

There are, however, a few costs associated with the computer system that are not incurred when using a paper system. The nurses must be trained to use the computer system. Currently, a preceptor nurse provides this training, but this takes up nursing resources and therefore costs money. It takes time for the nurses to learn how to use the CND system. In particular, nurses who are older and might not have had much exposure to computers could experience more difficulty learning the system. Younger nurses would have been required to use computers in their schooling and would therefore tend to learn the system faster. Because it takes longer to enter data into the computer, the nursing cost for doing computerized documentation will be higher than nursing cost for doing paper documentation.

The other cost is that of implementing the system. Computers and software must be purchased and kept up to date. A computer support staff must be maintained. These costs will vary depending on the system that is selected.

V. Recommendations

1) Overall, the analysis has shown that it would be beneficial to use more computers throughout the hospital. The programs should be consistent between departments as much as possible. For example, the registration form used in the TBC should be the same as that used in ER. There are many advantages to extending computer usage. It would make patient documentation more consistent throughout the hospital. This in turn would eliminate the repetitive work of re-entering patient information into different types of systems such as back and forth from paper to computer. Storage space would be saved by keeping patient information on computer rather than on paper. All doctors and nurses would be familiar with the computers and they would not have difficulties when moving between departments. They would be able to easily access data spanning any time frame for any of their patients. Currently, it is difficult to get this data. Problems accessing patient data can arise when a patient’s records are being used in a different department. This would not happen if all the information were in a computer. Multiple people could access it at the same time. Having extensive data in a computer system provides a large database that can be used for research. Selling this data can also make revenue. By having computerized documentation, support is provided for the ACS re-verification process. This will directly affect revenue because more patients could possibly be sent to the TBC. Of course, there are costs associated with doing this. The main costs will be those of purchasing the computers and training people. The most effective way to phase in the computer system has not yet been analyzed. This should be done to determine the best method for implementing further computer documentation.
2a) Both nurses and doctors should go through a more formal training to learn the CND system. The doctors should spend a minimum of one hour in a training course. If the one-hour course does not significantly increase the doctor's knowledge of the CND system, a longer and more extensive course should be instituted. The training class should consist of a teacher first demonstrating how the program works. Time should also be provided for the doctors to get hands-on experience using the program during the training session. This hands-on portion is crucial to the training session because this is how most of the nurses stated they best learned the system. Several benefits of better training should be evident. By providing proper training the number of questions the doctors ask the nurses about the CND system will decrease. Nurses will have more time to work with patients because they will not be taking time out to assist the doctors with the CND. With greater system knowledge, doctors should be more likely to access the CND information from outside the TBC. This will free up the time that doctors would spend getting paper documentation or going down to the TBC to check on a patient when it might not be necessary to do so. The doctors can use this time to see more patients. Therefore, even though there will be a cost to run a training session, these benefits should outweigh it.

2b) Like the doctors, the nurses should also be given a more formal training. It is recommended that a four-hour training class, similar to the one provided for the nurses when the system was first implemented, be conducted for the new nurses. A significant portion of this class should consist of the nurses having hands-on practice. Because they feel that learning in a real life situation helps them to understand the system, a simulation should be run to give them this experience. For instance, they should be given information regarding a patient and then be asked to input it into the system. This will allow them to practice entering data without putting a patient at risk. They will be less likely to make errors once they are out on the floor documenting for real patients because they will have had this time to practice. This will also make them faster at entering data into the computer. These two features should free up time that orientation and preceptor nurses are spending on documentation and this in turn will benefit the hospital by having more available nursing hours. There should also be fewer errors in nurse documentation. By being more thoroughly trained, the nurses will be capable of using more aspects of the documentation system. This is beneficial to the University of Michigan Hospital because they are learning institution and can use the extensive information in the CND database for research.

2c) Although the training class is seen as the most beneficial teaching method, a more cost-effective method could be to create a training disk. This type of training is primarily recommended for the nurses because they need more extensive training than the doctors do and they tend to come into the unit one at a time. It would not be cost effective to run a four-hour training course each time a nurse was being oriented. However, a one-hour training course would be the most efficient and cost effective method for training the groups of new doctors. The training disk for the nurses should be created by OPTS. It should consist of general teaching procedures and then allow for the nurses to practice entering data as they would for a real patient. This disk will ensure that the training will be standard for all nurses. It can be provided on the Internet so that it will be accessible.
from many locations. This would make it possible for some nurses to go through training from their homes or other locations outside TBC. The maintenance for this disk would be minimal. It would only need to be updated periodically when OPTS makes upgrades to the system. For instance, if a major upgrade has been made, the disk will need to be updated at that point. However, if only a minor upgrade is made, OPTS could wait until a few of these have been made before updating the disk. Overall, this is a low cost training alternative that will keep training standard and through. One disadvantage of using the training disk would be that nurses would no longer be able to interact with an instructor and ask questions during their training. For this reason, the preceptor nurse may need to be available to answer questions while the orientation nurse is working with the training disk.

3) There should be a standard way to inform the nurses of computer upgrades. This process should be used every time and it should communicate the upgrades to all of the nurses at once. This will get the nurses accustomed to being informed in of changes in one particular way and decrease the chances that nurses would be unaware of an upgrade in the system. It is recommended that they use the email group set up for all the nurses who work in the TBC. When an upgrade is made, OPTS will send email to this group to inform them. Additionally, the charge nurse informs the nurses of the system change. For two days following the upgrade, the charge nurses will announce that there has been a change in the system and remind the nursing staff to read their email. This will be done during the shift change meetings and is aimed to decrease the chance that nurses are unaware of system upgrades.

4) There should be a more clearly defined standard procedure for the nurses to make recommendations for system improvement. Currently, a suggestion box is being used and it is recommended that this method remain in place. However, it is suggested that the box be placed in the break room, so that the nurses can easily access it. The box should be put in an area where it can be seen easily, but not be in the way so that it does not get moved elsewhere due to any inconveniences it causes. It should be well labeled so that its function is evident. The forms that are currently being used to make recommendations can still be used, and they should be placed next to the suggestion box. Nancy Mamolen will be in charge of collecting suggestion from the box once a week. After she has reviewed them, she will deliver them to OPTS. There should be a set day of the week on which she will collect the suggestions. Not every suggestion will be implemented, but each will be considered. Recommendations that are justifiable and beneficial to the overall nursing staff will be made.

5) Monitor enhancement should be implemented. The monitors in the patients’ rooms should be linked to the CND system. The front flow vitals should be downloaded to the CND system from the monitors every hour. The nurses will be able to change this information in the event that something was being done to the patient at the moment that the vitals downloaded and it caused their vitals to briefly be skewed. For example, if the patient was being turned, his/her heart rate might be elevated. Because the patient’s heart rate was raised for only a few seconds, this value would not be a good representation of heart rate for that hour. Therefore, the nurse would be able to go into the CND system
and edit this value. Although the nurses will still have to edit the data that are downloaded from the monitors, it will decrease the time that they spend entering front vitals and frees them to work with the patients. This will also ensure that the vitals are being input at a standard time for every patient. Doctors who want to check up on their patients from outside the TBC will know when to check to get the most recent vitals information. This will allow for doctors to more effectively monitor their patients from outside the TBC.

6) Two upgrades should be made to the back of the flow sheet. The first change should be to improve the wound charting. OPTS should get specific feedback from the nurses as to the improvements needed in this area. This could be done by talking to nurses during their shifts and asking them what problems they experience and what they would like improved with the wound care. OPTS should check whether the problems nurses are experiencing are related to poor training. In other words, they should find out if nurses are not using the wound care charting because they do not understand how it works or whether it is a flaw in the design of the program. Once they target the problem, it should be addressed. If the difficulties are due to redesign, an upgrade should be made. If the problems stem from lack of training, OPTS should send out an email explaining how to use this section of the CND system. They should go out on the floor at the TBC and check to see that each nurse knows how to use this portion of the program. This should be done on each shift for two days. By having the nurses convert to using the computer for wound care, the documentation will be more consistent because all of it will be on the computer rather than having a portion on paper. This way all patient documentation will be accessible through the computer system. This is relevant when doctors access patient information from outside the TBC. The second correction should be made to the parts of the program that allow for comments to be inserted. There are still comment sections that require scribble mode to enter information. These should be changed to allow entry via the keyboard. This will allow for better communication of the patients’ conditions.

7) It is also recommended that the TBC further look into providing a portable computer for nurse to use when going on the road trip. This analysis was outside the scope of the project and has therefore not been done. However, it should be considered because a portable computer could eliminate redundant work and save nursing time.

8) The last recommendation is to monitor the computer crashes and slow down. If these do not decrease after Y2K, as OPTS states they should, the causes of these problems should be determined. Steps ought to be taken to remove these sources. This will decrease the time nurses spend writing documentation on paper and then entering it into the computer when crashes occur. It will decrease the periods when entering information into the computer takes extra time due to system problems causing slow downs.
VI. Action Plan

1.) Inform upper level management about the importance and benefits of implementing the CND throughout the entire hospital. Determine the best strategy to implement the change over from paper to computer documentation throughout the hospital.

2.) Decide the best training method to increase skill level of doctors and nurses with the CND. If formal training selected determine the most cost-effective strategy to train doctors and nurses. If electronic training used work with OPTS to create a software training package

3.) Use the email a group to communicate changes in the CND system, and make it mandatory that OPTS send an email to the charge nurse and other nurses when updates occur.

4.) Place the suggestion box in the break room, and Nancy Mamolen should be responsible for retrieving suggestions on a weekly basis and then delivering them to OPTS.

5.) Discuss with OPTS the ability to transfer data from the monitors to the computer nurse documentation system.

6.) Arrange time for OPTS or computer software firm and nurses to meet so that they can improve back flow sheet. Contract out OPTS or another software company to do updates to the system.

7.) Research cost and benefits of portable computer for nurses that go on road trips.

8.) Monitor computer nurse documentation crashes after January 31, 1999.
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<td>6</td>
<td>Front and Back 6</td>
<td>1.08</td>
<td>8.18</td>
<td>12.22</td>
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<td>Location</td>
<td>Event Description</td>
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<tr>
<td>28-Oct</td>
<td>TBC</td>
<td>Front</td>
<td>Didn't like lab results when they entered.</td>
<td></td>
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<tr>
<td>28-Oct</td>
<td>ICU</td>
<td>Front</td>
<td>They were too slow or they crashed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29-Oct</td>
<td>TBC</td>
<td>Front</td>
<td>New monitors, preferred the slow ones.</td>
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<tr>
<td>5-Nov</td>
<td>TBC</td>
<td>Front</td>
<td>New nurse did not get orientation.</td>
<td></td>
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<tr>
<td>6-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They had much data to input.</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>6-Nov</td>
<td>Front</td>
<td>Front</td>
<td>HPs seldom the computer was already on and didn't have much data to input. The new monitors, preferred the slow ones.</td>
<td></td>
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<tr>
<td>7-Nov</td>
<td>Front</td>
<td>Front</td>
<td>She had to check on patient lot.</td>
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<tr>
<td>7-Nov</td>
<td>Front</td>
<td>Front</td>
<td>The answer choice they need was not consistent.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7-Nov</td>
<td>Front</td>
<td>Front</td>
<td>According to lab results when they entered.</td>
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<tr>
<td>7-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow or they crashed.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10-Nov</td>
<td>TBC</td>
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<td>They were too slow.</td>
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<tr>
<td>12-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow or they crashed.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow or they crashed.</td>
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<tr>
<td>14-Nov</td>
<td>TBC</td>
<td>TBC</td>
<td>They were too slow.</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>15-Nov</td>
<td>TBC</td>
<td>TBC</td>
<td>They were too slow.</td>
<td></td>
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<td></td>
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<tr>
<td>16-Nov</td>
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<td>Front</td>
<td>They were too slow.</td>
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<td></td>
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<tr>
<td>19-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow.</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>19-Nov</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>28-Oct</td>
<td>Front</td>
<td>Front</td>
<td>They were too slow.</td>
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### Appendix B: Time Study and Observation Log

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<th>Activity</th>
<th>Notes</th>
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<td>11:29</td>
<td>ICU</td>
<td>Back</td>
<td>N</td>
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<td>2:22</td>
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<td>ICU</td>
<td>Back</td>
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<td>ICU</td>
<td>Back</td>
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</tr>
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<td>Back</td>
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<td>Back</td>
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<td>ICU</td>
<td>Front</td>
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</tr>
<tr>
<td>5-Oct</td>
<td>1:05</td>
<td>ICU</td>
<td>Front</td>
<td>3</td>
</tr>
<tr>
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<td>ICU</td>
<td>Front</td>
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<td>1</td>
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<td>16-Oct</td>
<td>3:02</td>
<td>ICU</td>
<td>Front</td>
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</table>

1. nurses seemed confused
2. Back is faster than paper.
3. Monitor screen was difficult to see.
5. Doctor already logged in.
6. Front
7. Done

Doctors don't like the system because they don't know how to use it and they must get a nurse to help. It takes a while to learn. They don't really like the computer system but it takes a while to learn. It feels faster than paper, but slower than more experienced nurses.
Appendix C: Nurse Interview Questions

1. What do you like and dislike about the system?
2. How were you trained to use the system?
3. How did you feel about your training?
4. How long did it take you to become familiar with the system?
5. What improvements would you like to see made to the system?
6. Are you informed of computer updates?
7. If you are informed of updates, how is this done and is it sufficient?
8. Either now or when you first started to use the system, do you feel frustrated?
9. What causes the frustration you might feel?
10. What improvements would you like to see in the system?
Appendix D: Trauma Burn Center Nurse Survey

This survey is in correspondence with the research project being conducted on the Trauma Burn Center’s Computerized Nurse Documentation System (CND). Your accurate answers are essential to the successful completion of the project. Your participation in this survey is at the request of Nurse Manager Nancy Mamolen and Dr. Tajeri.

Survey Questions:

1) Do you feel like you were adequately trained to use the CND system?

2) How often do you first calculate or write information on paper before entering it to the CND system?

3) Would you like to see more CND system implementation (i.e. expand it to included other nursing tasks)?

4) Do you have suggestions for improving the CND system?

5) Do you have difficulties using the CND system when upgrades are made to it?

6) Do you ever feel frustrated when using the CND system?
   i. if so, would better training have helped?
   ii. would knowing about upgrades to the CND system when they occur help?

7) If there was a way for you to voice your opinions, concerns, or suggestions about the CND system to the computer staff or Trauma Burn nurse management would you do so?
Appendix E: Survey Results

<table>
<thead>
<tr>
<th>Questions</th>
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<td>Do you feel like you were adequately trained to use the CND system?</td>
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<td>8</td>
</tr>
<tr>
<td>Do you first calculate or write information on paper before entering it to the CND system?</td>
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<td>12</td>
</tr>
<tr>
<td>Would you like to see more CND system implementation?</td>
<td>23</td>
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<tr>
<td>Do you have suggestions for improving the CND system?</td>
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<tr>
<td>Do you have difficulties using the CND system when upgrades are made to it?</td>
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<td>17</td>
</tr>
<tr>
<td>Do you ever feel frustrated when using the CND system?</td>
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<td>4</td>
</tr>
<tr>
<td>If there was a way for you to voice your opinions, concerns, or suggestions about the CND system to the computer staff or Trauma Burn nurse management would you do so?</td>
<td>23</td>
<td>2</td>
</tr>
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</table>
Appendix F: OPTS Interview Questions

1. Briefly explain how the system was originally designed.
2. How do you decide what upgrades to do?
3. How do you communicate these upgrades to the nurses?
4. Do you see any particular problems that the nurses experience with the system?
5. Do you have any suggestions how the nurse difficulties can be resolved?
6. Where do you see this program going in the future?
7. Would it be possible to set up a portable system for nurses to use on road trips?
8. What other suggestions do you have regarding the use of the system or its design?
Appendix G: Doctor Survey Questions

1. What do you like and dislike about the computerized nurse documentation system used in the Trauma Burn Center?
2. How long did it take you to feel comfortable using the system?
3. How often do you access the system from outside Trauma Burn?
4. What improvements would you like to see implemented into the system?
Appendix G: Doctor Response

1. I am still partial to the paper system in the SICU. It's nice to see the "big picture," 24 hours worth of data, at a glance. I like the fact that the computerized system will probably be more accurate and better for record keeping.

2. Did not use it that much but not too difficult

3. Never

4. I'd like a one screen glance at 24 hours worth of data.