Mott Respiratory Care Procedure Time Assessment

Final Report

Client: Ron Dechert, Manager, Respiratory Care
        Ken Bandy, Administrative Director-Healthcare
        Coordinator: Sam Clark, Senior Management Engineer

December 19, 2006

Satomi Abe: Project Team Member
Jessica Kron: Project Team Member
Samara Mejia: Project Team Member
Table of Contents

Executive Summary 2
Introduction 4
Background
  Goals and Objectives 4
  Key Issues 4
  Project Scope 4
Data Collection 6
Data Categorization 7
Non-ICU Time Assessment
  Data Approach 8
  Findings 8
ICU Time Assessment
  Approach 12
  Findings 12
Internal Transport Time Assessment
  Approach 18
  Findings 18
FTE Calculations 20
Recommendations 21
Appendices 23
Executive Summary

The Respiratory Care department in the Mott Hospital at the University of Michigan-Ann Arbor is a critical part to the entire health care team. In recent years, there have been changes in procedural requirements for regular workday tasks associated with respiratory care. The project team was asked to conduct time studies to incorporate these new procedures in the overall time assessment of daily tasks. The collected times would be used to better calculate staff scheduling and determine the cost benefit of adjusting the number of FTEs (Full Time Equivalents) needed per year.

Three intensive care units (the Neonatal ICU, the Pediatric Cardiothoracic Unit, and the Pediatric ICU) and the non-intensive care general floor area were analyzed. The data collected by our project team focused on Nebulized Medication Treatments (NMTs), ventilator care, and internal hospital transports. All data collected, which included tasks outside of the focus area, were categorized as Direct Value-Added, Direct Non-Value Added, Non-Direct Value Added, Non-Direct Non Value-Added, and Inactivity. NMTs in the Non-ICU areas were also stratified by pre-treatment, treatment, and post-treatment times.

**Non-ICU**. The findings of the Non-ICU area data collected resulted in a NMT time of 23.5 minutes. It was found that throughout the total observation time of 5 hours, the time spent is categorized in Table 1. The mean times for the pre-treatment, treatment, and post-treatment were observed to be 5.58 minutes, 12.59 minutes, and 4.35 minutes respectively. The sample size was 25.

<table>
<thead>
<tr>
<th>Table 1. NMT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Value-Added</td>
<td>32%</td>
</tr>
<tr>
<td>Non-Direct Value Added</td>
<td>31%</td>
</tr>
<tr>
<td>Non-Direct Non Value-Added</td>
<td>37%</td>
</tr>
<tr>
<td>Inactivity</td>
<td>24%</td>
</tr>
</tbody>
</table>

**ICU**. Throughout a 5 hour period, the time spent that was categorized in Table 2. It was found that the largest percentage of the work shift is ventilator care at 36% of a 5 hour period, followed by the next largest category being miscellaneous tasks. Within ventilator care, ventilator check is 58%, suction is 26%, blood gas is 10%, and the rest of the time was extubation, intubation, and bi-pap. The average times for ventilator check, suction, and blood gas are 7.73 minutes, 6.04 minutes, and 4.43 minutes respectively. Within the 32% direct value-added time, assessing patient is 20%, suction is 20%, and miscellaneous tasks are 27%. Within the 43% non-direct value-added time, supplies and equipment is 22%, communication and documentation are both 21%. Overall, 21% of the time was direct and 64% was value-added time.

<table>
<thead>
<tr>
<th>Table 2. ICU</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Value-Added</td>
<td>21%</td>
</tr>
<tr>
<td>Non-Direct Value Added</td>
<td>43%</td>
</tr>
<tr>
<td>Non-Direct Non Value-Added</td>
<td>21%</td>
</tr>
<tr>
<td>Inactivity</td>
<td>15%</td>
</tr>
</tbody>
</table>
The Respiratory Care Department Log times were separated into categorization of either MRI or Non-MRI. The mean time for all Non-MRI transports was found to be 82.8 minutes. The mean time for all MRI transports was found to be 112.2 minutes. This demonstrates that due to differing procedures and protocol, MRI transports take 29.4 minutes longer on average.

The project team noted that the times to adjust patients and equipment before and after the transport were not included in the logs. The project team distributed surveys as a means to capture this data. On average, 16.88 minutes is needed to prepare for a Non-MRI transport and 18.93 minutes to prepare for an MRI transport. Approximately 14.88 and 15 minutes are needed for Non-MRI and MRI respectively, to adjust the patient and equipment after a transport. An MRI transport takes more time in preparation and adjustment. Combining the time spent within the unit preparing and adjusting and the time spent outside the unit transporting and staying with the patient, the mean MRI transport time is 146 minutes and Non-MRI is 114 minutes.

**FTEs.** Based on our time requirements combined with the activity levels and the worked hours per FTE, the project team determined the FTE requirements as follows:

- Treatments: 11 FTEs
- Vent Care: 77.6 FTEs
- Internal Transports: 0.3 FTEs

**Recommendations.** The project team recommends the determined FTEs for use in updating staffing and budgeting equations. Based on these determined FTEs, Respiratory Care can calculate the appropriate levels of staffing and update the weights for the Relative Value Units (RVUs) with the determined time standards to calculate productivity. In conclusion, the project team recommends that further time studies be conducted to determine accurate time requirements for other portions of vent care the project team was not able to gather adequate data on including intubations and extubations as well as internal transports.
Introduction

In the department of Respiratory Care in Mott Hospital, regulatory changes over the past years have increased the required patient care time for respiratory therapists and respiratory technicians. Additional time is needed to complete procedures, especially during Respiratory Syncitial Virus (RSV) season when patients must be kept in isolation, yet time standards for the procedures have not been re-evaluated to reflect the changes made. The manager of Mott Respiratory Care was concerned that past time studies for respiratory therapists and respiratory technicians do not currently reflect the time requirements for procedures. Therefore, the purpose of this project was to re-evaluate the time standards for procedures done by respiratory therapists and technicians due to a gap between old standards and the new practices involved in procedures.

Background

The Respiratory Care Department performs various procedures which have been changed and need to be re-evaluated to effectively schedule staff. The three primary procedures that this project focused on were ventilator care, treatments and internal hospital transports. Changes in procedures that have been implemented include new guidelines for the documentation and infection control activities of patients. In addition, new elements for the education of families in treatment require added time to complete procedures. Previous time studies involved strictly procedural tasks and did not include the time necessary to talk to families, which the University Hospitals are now emphasizing. Therefore, the Manager of Respiratory Care had relayed the importance of re-evaluating the procedures and reported that the staff feels overworked.

Staff was shown to be scheduled to work at 100% productivity, which requires them to work 10.5 hrs out of a 12-hour workday. During Respiratory Syncitial Virus (RSV) season, staff is scheduled to work up to 160% productivity. This is calculated at the beginning of each shift and uses RVUs (Relative Value Units). The RVUs are a part of the existing staffing model, which is a measurement of productivity needed from staff and a certain RVU is assigned to each procedure. The RVUs are summed and divided by the total number of staff multiplied by 100% productivity or 10.5 divided by 12 hours. The 160% productivity is accomplished by overlapping staff within areas and includes supervisors filling in when the workload is excessive. When the supervisors fill in for the respiratory therapists, the amount of administrative work that can be accomplished decreases. The RVU weights need updating to determine how the changes have impacted staffing and ability to best meet the patients’ needs. The staffing model also needs to reflect the more current time standards found by the project team.

Goals and Objectives. The goal of this project was to document current procedural times and evaluate requirements for respiratory procedures with emphasis on ventilator care, Nebulized Medication Treatments (NMTs) and internal hospital transports. These procedural times were a measure of work based upon the amount of therapist time involved in completing an activity.

Objectives included generating more accurate procedural time requirements to perform daily tasks. The project team determined maximum and minimum times and variations for the three
procedures. The sample size was set at a goal of 30 data points from both Non-ICU and ICU areas, so that there would be sufficient data to obtain average times. Direct and non-direct times were divided to document the value-added time and account for the non-value added steps in each procedure. This data also provided a more accurate measure of time spent throughout a Respiratory Therapist’s shift.

The original expected impact was for the Respiratory Care Manager to use the suggested time requirements to update RVU standards, which can lead to more efficient staff scheduling.

**Expected Impact.** The project team expects this project to accomplish the following:

- New procedural and time study data to set time standards, including the non-direct as well as direct time involved
- Time standards system to be used for staffing schedule decisions to update the RVU system and to be used for future budget plans
- Improved employee and patient satisfaction through adequate staffing levels enabling more direct time with patient

**Support from Operating Entities.** The primary parties involved included:

- Manager of Respiratory Care, who relayed the needs of the project
- The Administrative Director of Healthcare, who provided departmental data.
- The Health Systems Senior Management Engineer, who guided and mentored the project team
- Respiratory Care department therapists and technicians, who perform the procedures that were documented
- The Project Team Members, who collected and analyzed the data

Our client, Manager of Respiratory Care, provided ongoing details of the problem addressed. He also helped in scheduling interviews with the staff. He alerted the staff of our presence in the area and explained the purpose of our research to ensure cooperation of staff in data collection activities.

The Administrative Director of Healthcare provided us with existing departmental data.

**Sam Clark,** our project coordinator ensured our results were quantitative. He helped us to ensure our chosen methodologies addressed the entity of the problem. Mr. Clark served as a mentor to our group and helped us improve both our technical and communication skills.

**Key Issues.** The following key issues were considered:

- Clinical procedures have changed and do not include issues such as infection control activities for many isolation procedures such as RSV outbreaks. Other issues not included are obtaining drugs and documentations.
- Staff has a calculated work productivity output of up to 160%.
• Direct time such as taking time to educate a patient, looking at medical records, and tracking down doctors was not included in the previous scheduling methodology.

**Project Scope.** The primary focus of this project was to conduct time studies for the procedures of ventilator care, treatments, and internal hospital transports in respiratory care for pediatric and neonatal patients. For treatments, Nebulized Medication Treatments (NMTs) were the main focus. Direct as well as non-direct time was included in the data and was stratified to include value added and non-value added time. The project team excluded activities conducted simultaneously while administering NMTs.

The project team did not include external transports and focused solely on internal hospital transports. If more than one destination was visited and grouped together in the department log, that transport was not analyzed.

Our team did not evaluate tasks that are outside of clinical respiratory therapy tasks or outside of these three primary activities. However, we hope that the methodologies developed and implemented for this project can be applied to all of the respiratory care procedures.

**Data Collection**

To assess time requirements the team examined three main procedures in the Mott Respiratory Care Department of ventilator care, treatments and internal hospital transports. Our team collected data to determine the clinical procedures based on the following approach:

- Interviewed respiratory therapists and technicians
- Reviewed uniform reporting standards
- Reviewed relevant literature
- Shadowed staff
- Developed flowchart of procedures
- Conducted time studies of daily RT tasks
- Examined internal transport logs
- Distributed and collected surveys to respiratory therapists

The team interviewed Mott Respiratory Care Department therapists and technicians to gain perspective over the problems they currently experience. We each completed one 60-minute interview, summing to three hours of interview time during which we learned about the procedures of focus and gained insight on staff workload.

The team reviewed existing time standards, specifically the Uniform Reporting Manual Acute Care Hospitals, Fourth Edition to learn the scope of each procedural task. We conducted a literature search to learn time study data collection methods and means of categorizing tasks into direct and non-direct as well as value added and non-value added categories.

The team shadowed therapists and technicians for 15 hours prior to data collection in both the Intensive Care Units (ICU) and Non-intensive care units (non-ICU) totaling 30 hours of
observation to understand the procedures of focus and determine start and end points of data collection.

The project team collected data for randomly assigned respiratory therapists in the non-intensive care units and the intensive care units. Observations were also conducted throughout the workday shifts, three days a week and on both weekend days. Each observation period lasted for five hours and included all aspects of the respiratory therapists' regular work day. The project team members followed the respiratory therapists everywhere, excluding the rest room, to document how time was spent throughout the work shift.

The project team created a flowchart of the Nebulized Medication Treatment (NMT) as shown in Appendix B to categorize the elements for process time analyses. The flowchart is based on observed tasks when following respiratory therapists and from procedural documents obtained by the client. Digital stopwatches were used to record start and stop time of each task within treatments. Time has been rounded to the minute, unless the task took less than one minute then it was recorded in seconds. Actions taken place outside of the structured tasks, have been commented, but recorded as part of the function.

The project team examined departmental internal transport logs from January to October of 2006 and a sample size of 169 transports. In addition the team distributed surveys to all respiratory therapists to better capture times not contained in the log and received eight on which the data is based. Based on the logs and the survey results, the project team analyzed internal transports.

Data Categorization

The data was categorized using the following methods:

- Determined time requirement of procedure
- Compared determined requirements with existing requirements
- Compared observer data using statistical evaluation
- Categorized observation time
  - Direct, Non-Direct
  - Value Added, Non-Value Added
- Separated statistical evaluations based on category

The data has been categorized into Non-Value Added (NVA), Value-Added (VA) and Non-Direct (ND) and Direct (D) tasks. Using the Uniform Reporting Manual for Acute Care Hospitals, Fourth Edition, we identified the scope of the activity covered. Based on discussion and consensus, the team determined the tasks that fall into each categorized data set. We deemed any time spent face-to-face with the patient as direct time. Below is a division of the categories:

- Tasks Performed Before Seeing the Patient are ND and VA including:
  - Verifying physician’s order for correctness
  - Following infection control activities (hand washing, glove, gown, mask)
  - Preparing equipment and supplies
- Tasks Completed Prior to Activity are D and VA including:
  - Introducing and educating patient and family
  - Explaining intended activities
• Activity, Monitoring, including rounds, and coaching as required are D and VA.
• Post-Treatment Tasks that are ND and VA include:
  o Documenting observations
  o Ensuring appropriate communication with other staff members
• Post-Treatment Tasks that are ND and NVA include:
  o Cleaning, Storing and Discarding Equipment
• Other ND and NVA added activities include:
  o Billing patients
  o Walking
  o Completing non-direct administrative tasks

For each of the three procedures of focus, we divided the times to determine the requirements of
each procedure according to the above categories. Time requirements for NMTs, ventilator care
and internal hospital transports were determined and categorized by direct and non-direct time
and then stratified to value-added and non-value added time.

**Non-ICU Time Assessment—Approach and NMT Time Standard Findings.**

For three weeks, the project team conducted a time study in the non-ICU areas. The focus of this
study was to analyze all NMTs performed and to gain a time standard for each treatment.

**Approach.** The total treatment was categorized into pre-treatment, treatment, and post-treatment.
Pre-treatment included tasks such as documenting, obtaining medication, setting up equipment,
and checking work orders. The treatment times were the actual times used to conduct an NMT
and to assess the patient. Post treatments included tasks completed after the treatment such as
documenting, washing hands, and signing Medical Administration Records (MARs). Times
were based on a 5-hour time period per a 12-hour RT work shift.

**Findings.** Each observer compiled the average NMT time observed and the results (Table 3)
show that an average NMT took about 23.5 minutes with a total variation of about 7.75 minutes.
Table 3. Non-ICU Time Study Results

<table>
<thead>
<tr>
<th>Observer</th>
<th>Mean (Min)</th>
<th>Stdev</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22.5</td>
<td>9.4</td>
<td>10</td>
<td>36</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>23.8</td>
<td>7.4</td>
<td>13.7</td>
<td>35</td>
<td>21.5</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>25.2</td>
<td>5.8</td>
<td>17.5</td>
<td>32</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Overall</td>
<td>23.5</td>
<td>7.8</td>
<td>10</td>
<td>36</td>
<td>21.9</td>
<td>25</td>
</tr>
</tbody>
</table>

The mean times of each observation were compared to indicate any significant differences. A box plot of the average mean times is shown in Figure 1.

As the box plot shows, the average NMT times of each observer are relatively similar. Therefore, there are no data discrepancies amongst the results and can be used to create time standards for NMTs.
A scatter plot was also developed and analyzed to determine any outliers within the data. This helped to determine the distribution of the data and to make any adjustments if the data was indeed skewed.

Figure 2. Scatter Plot of NMT Times

Figure 2 shows that all the data points fall within the 23.5 minute +/- 7 data range, in which the range was based on 2σ. The NMT times were also categorized by pre-treatment, treatment, and post-treatment. As seen in Figure 3, the actual treatment administered accounts for 55% of the total NMT time. This treatment time on average was 13 minutes. The pre-treatment time was about 6 minutes, which included any setting up of equipment, checking work orders, or obtaining medication. This accounted for about 20% of the total NMT time. The post-treatment, about 25% of the total NMT time, included tasks such as washing hands, documenting, signing MARs and on average too about 4.6 minutes.
Although the emphasis was on calculating NMT time standards, the project team also documented times spent on other tasks throughout the day. As discussed previously, tasks were categorized by non-direct, direct, value-added, non-value added. All tasks were documented as such and the results are indicated in Figure 4.
Figure 4. Results of Non-ICU Data Categorization

Based on the results, there is an observed Direct Value-Added that accounted for 32% of the time, which includes activities such as treatments and assessing the patient. Non-Direct Value-Added tasks accounted for about 38% of the RT’s daily tasks, included documenting, washing hands, and signing MARs. Inactivity results were considered Non-Direct Non-Value added, but were separated from the category since they encompassed such a large portion of this Non-Direct Non-Value added time. Inactivity included any breaks and idle time spent doing tasks outside of the regular RT duties and accounted for 24%. The rest Non-Direct, Non-Value Added, which was 6%, accounted for tasks such as billing.

**ICU Time Assessment**

**Approach.** As with non-ICU, our project team conducted time studies for respiratory therapists in the ICU of Mott Children’s Hospital in the following areas:

- Pod A or PCTU (Pediatric Cardio-Thoracic Unit)
- Pod B/C or PICU (Pediatric Intensive Care Unit)
- Holden or NICU (Neonatal Intensive Care Unit)

The total time observed was 2,522.64 minutes or 42.044 hours during Monday, Tuesday, and Friday for 3 weeks. To analyze the time a respiratory therapist spends, the times were categorized using a more general direct versus non-direct and value-added versus non-value-
added categorization scheme. The collected times were also categorized based on specific categories, which are described below.

The time observed was categorized into the following categories for direct versus non-direct and value-added versus non-value-added:

- Direct and value-added
- Non-direct and value-added
- Non-direct and non-value-added

Within direct and value-added, the times were categorized into the following components:

- Treatment
- Assess Patient
- Suction
- Blood gas
- Observing
- Education
- Transport
- Bipap
- Extubation
- Other

The treatment component is the administration of medication. Assess Patient includes stethoscoping and physically checking the status of the patient. The suction component is where the respiratory therapist was giving the patient oxygen through a hand pump while a nurse suctioned. The blood gas component includes times were the respiratory therapist did the actual lab testing for the blood gas results and the times where the respiratory therapist received a blood gas report. Observing includes times where the respiratory therapist needed to stand by the patient in order to assist them if needed. Transport is internal where the patient is moved from one area to another. Extubation is a task that requires a respiratory therapist. Most patients in the ICU require ventilator care, which requires the patient to be intubated or have a tube inserted through the mouth and throat so that oxygen can be administered by the ventilator. Extubation is where the inserted tube is taken out of the patient’s mouth. The other category covers all miscellaneous tasks.

Within non-direct and value-added, the times were categorized into the following components:

- Communication
- Documentation
- Supplies & Equipment
- Glove/Wash hands
- Ventilator Adjustment and Check
- Shift Change
- Other

All tasks that involve communicating to other staff members such as doctors, nurses, and other respiratory therapists by phone, e-mail, pager, or verbally are included in the communication component. Documentation includes writing on the patient’s chart, MAR, or history. Supplies and equipment include tasks that require setting up, retrieving, moving, and putting back supplies or equipment. Glove/Wash elements include sanitization, washing hands, gloving, gowning, and putting on masks. Ventilator Adjustment and Check include all tasks involving direct contact with the ventilator. Shift change is time where the day shift and night shift switch and a meeting...
between both shift RTs is needed to transfer patient information. The other category is all other times.

The total time was also categorized into the following areas:

- Communication
- Billing
- Inactivity
- Transport
- Ventilator Care
- Pre-shift
- Break
- Other

Communication is the same as described above. Billing is strictly time spent on the computer billing patients. Inactivity is all time spent not involving respiratory therapy tasks. Transport is the same as described above. Ventilator Care is described below. Pre-shift time is time spent receiving reports from the previous shift. Break is time where the respiratory therapist takes an official break that is covered by a supervisor. Other encompasses all other times.

Ventilator Care was broken down into the following components:

- Ventilator check
- Suction
- Blood gas
- Intubation
- Extubation
- Bi-pap

Ventilator check includes time that the respiratory therapist directly checks the ventilator. Suction, blood gas, and extubation are the same as described above. Intubation is where the respiratory therapist is involved in inserting the tube into the patient’s mouth.

Findings. The following charts and tables categorize our project team findings for the ICU.

Categorization by tasks. In order to analyze the data, the 42 hours of observed time was categorized by specific tasks in Figure 5 below.
Figure 5. Categorization of Total Time Into Eight Categories

Figure 5 shows that the majority of time is ventilator care, followed by other, and inactivity.

Since the ventilator care was the largest part of a respiratory therapist’s day, the ventilator care was stratified below in Figure 6.

Figure 6. Categorization of Ventilator Care into Six Components
Figure 6 further breaks down ventilator care. Note that the percentages shown are of the 36% from Figure 5. The majority of this time is specifically ventilator check, followed by suctioning.

Table 4. Total Times, Sample Size, and Averages for Ventilator Care Components

<table>
<thead>
<tr>
<th>Categories</th>
<th>Total Time (min.)</th>
<th>Sample Size (N)</th>
<th>Average (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent Check</td>
<td>464.04</td>
<td>60</td>
<td>7.73</td>
</tr>
<tr>
<td>Suction</td>
<td>211.25</td>
<td>35</td>
<td>6.04</td>
</tr>
<tr>
<td>Blood gas</td>
<td>84.2</td>
<td>19</td>
<td>4.43</td>
</tr>
<tr>
<td>Intubation</td>
<td>8.5</td>
<td>1</td>
<td>8.50</td>
</tr>
<tr>
<td>Extubation</td>
<td>29</td>
<td>1</td>
<td>29.00</td>
</tr>
<tr>
<td>Bi-pap</td>
<td>9</td>
<td>2</td>
<td>4.50</td>
</tr>
</tbody>
</table>

Table 4 shows the total times for each category along with the sample size and average times. There were sufficient sample sizes for ventilator check and suction. However, intubation, extubation, and bi-pap sample sizes were too low to use the data for the average times.

**Categorization by Direct/Non-Direct and Value Added/Non-Value Added.** The 42 hours of observation time was categorized into Direct/Non-direct and Value Added/Non-Value Added below.

![Figure 7. Categorization of Time Into Direct-Value-Added, Non-Direct-Non-Value-Added, Non-Direct Value-Added, and Inactivity](image)

As depicted in Figure 7, the majority of time that is spent is non-direct value added time. The time spent by the respiratory therapist that is value-added is 64%. Inactivity is 15%, but it is necessary, so that in case of unexpected emergencies, there will be a buffer. Also, it is a buffer for unexpected external transportations where a respiratory therapist must leave the premises.

Direct patient care tasks are categorized below.
Figure 8. Direct Value Added Components

Figure 8 further breaks down direct value-added time. Note that the percentages shown are of the 21% direct value-added time of the total observed time. As shown in Figure 8 and Table 5 below, the majority of time is assessing the patient, suctioning, and other times.

Table 5. Total Times for Direct Value-Added Components

<table>
<thead>
<tr>
<th>Category</th>
<th>Total (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>18</td>
</tr>
<tr>
<td>Assess Patient</td>
<td>88.5</td>
</tr>
<tr>
<td>Suction</td>
<td>86.5</td>
</tr>
<tr>
<td>Bloodgas</td>
<td>39.5</td>
</tr>
<tr>
<td>Observing</td>
<td>16</td>
</tr>
<tr>
<td>Education</td>
<td>31</td>
</tr>
<tr>
<td>Other</td>
<td>124</td>
</tr>
<tr>
<td>Transport</td>
<td>7</td>
</tr>
<tr>
<td>Bi-pap</td>
<td>17</td>
</tr>
<tr>
<td>Extubation</td>
<td>11</td>
</tr>
</tbody>
</table>

Non-Direct Value Added components are also categorized below.
Figure 9. Non-Direct Value Added Components

Figure 9 further breaks down non-direct value-added times. Note that the percentages are of the 43% non-direct value-added times of the total observed times. The majority of time is spent on communicating, documenting, supplies and equipment. The breakdown of non-direct value-added times is shown in Table 6. For the computation of ventilator care time, only Vent Adjustment and Check, Glove/Wash, Supplies & Equipment, and Documentation are used.

Table 6. Total Times for Non-Direct Value-Added Components

<table>
<thead>
<tr>
<th>Category</th>
<th>Total (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>236.5</td>
</tr>
<tr>
<td>Documentation</td>
<td>236.45</td>
</tr>
<tr>
<td>Supplies &amp; Equipment</td>
<td>237.25</td>
</tr>
<tr>
<td>Glove/Wash</td>
<td>66.84</td>
</tr>
<tr>
<td>Other</td>
<td>118.95</td>
</tr>
<tr>
<td>Ventilator Adjustment and Check</td>
<td>99.5</td>
</tr>
<tr>
<td>Shift Change</td>
<td>107</td>
</tr>
</tbody>
</table>

Our project team was given the 2004 AARC (American Association for Respiratory Care) Uniform Reporting Manual For Acute Care Hospitals, which contains information on national averages for specific tasks. The comparison of our project team findings and the national average are shown in Table 7.
Table 7. Comparison Between National Averages And Observation Averages

<table>
<thead>
<tr>
<th>Task</th>
<th>National Average (min.)</th>
<th>Observed Average (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient/Ventilator Assessment</td>
<td>13.97</td>
<td>2.94</td>
</tr>
<tr>
<td>Setting Adjustment</td>
<td>9.11</td>
<td>7.73</td>
</tr>
<tr>
<td>Suctioning of Artificial Airway with In-line</td>
<td>6.47</td>
<td>6.04</td>
</tr>
<tr>
<td>Suction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The difference between the observed average for “Patient/Ventilator Assessment” and the national average is due to the difference in tasks that are included in the times. The observed data does not include non-direct value added elements that are included in the national average. The observed average for “Setting Adjustment” is lower than the national average by 1.38 minutes. A major factor affecting “Setting Adjustment” average time may be due to differences in ventilator equipment used and some differences in tasks that are included in the national average but not in the observed. The observed data for “Suctioning of Artificial Airway with In-line Suction” is approximately .43 minutes off from the national average.

Ventilator Care Time Calculation. The computation of ventilator care time is as follows:

- Ventilator Care is comprised of
  - Suctioning
  - Blood gases
  - Ventilator checks

To calculate ventilator care time, total non-direct value added time and direct value added time is needed.

To find total non-direct value added time:

- \( (\% \text{ total non-direct value added time}) \times (\% \text{ included in vent. care time}) \)
- Vent. care times included are Vent. Adjustment and Check, Glove/Wash, Supplies & Equipment, and Documentation as shown in Figure 9.
- So, the total non-direct value added time is calculated by:
  - \( 43\% \times (0.09 + 0.06 + 0.22 + 0.21 + 0.21 + 0.10) = 38.27\% \)
  - \( (24 \text{ hours} \times 0.3827) \times 60 \text{ min./hour} = 551 \text{ minutes of ND/VA time} \)

To find total direct value added time:

- The number of times suctioning, blood gases, and ventilator checks that occur in a 12 hour shift must be considered.
- It is approximated that suctioning occurs 4 times, blood gases occur 4 times, and ventilator checks occur 6 times.
- The average times for each are multiplied by the respect number of times that they occur.
- Direct value added time = (4 x 6.04) + (4 x 4.43) + (6 x 7.73) = 88 min.

The total ventilator care time is:
Internal Transport Time Assessment

In-hospital transportation of mechanically ventilated patients for diagnostic or therapeutic procedures is conducted by respiratory therapists. Assuring constant monitoring, ventilation, oxygenation, and patient care during movement is needed. The monitoring provided during transport should be similar to that during stationary care. Patient transport includes preparation, movement to and from, and time spent at destination. It is important to note the therapist cannot simply pick up and leave when there is a transport. There is equipment that is necessary as outlined below:

**Equipment**
- Emergency airway management supplies
- Portable oxygen source of adequate volume
- A self-inflating bag and mask of appropriate size
- Transport ventilator if available
- Portable power supply for the duration of transport
- An FIO$_2$ of 1.0
- A pulse oximeter is desirable
- Appropriate pharmacologic agents should be readily available
- Stethoscope
- Hand-held spirometer for tidal volume measurement

**Approach.** Our project team split the patient transport into two sections due to data constraints:
- Movement time and time spent at destination
- Time spent preparing prior to transport as well as adjustments after transport

Movement time as well as time spent at destination is recorded in the Respiratory Care Department Log. These times begin once the therapist has left the assigned unit and begins moving to the specific patient destination. All mechanically ventilated patients need to be accompanied during the entire transport, so while the patient is undergoing a procedure, the therapist must be present to maintain equipment and patient safety should a problem arise. Some common destinations at the University Hospital include Magnetic Resonance Imaging (MRI) as well as Computerized Tomography Scan (CT). The times include all time spent moving to patient destination and end when the therapist is back in their assigned unit.

Our project team noted that time spent preparing for a transport and making necessary adjustments following transport were not included in the Respiratory Care Department Log based on staff interviews. During the project team time study period, only one partial transport was observed due to sporadic occurrence of transports. Therefore, the project team gathered data on preparation and adjustment times from therapist surveys.

Due to difference in MRI procedures and protocol, the project team also split the transports into two categories:
- MRI transports
- Transports to other locations

The projected team excluded transports where more than one location was visited.

**Findings-Department Logs**
Based on the Respiratory Care Department Log the mean times for internal transports were calculated based on the records from January 1, 2006 to October 8, 2006. The results are shown in Table 8.

**Table 8: Mean Times for Routine Non-MRI Transports**

<table>
<thead>
<tr>
<th>Location</th>
<th>Sample Size (N)</th>
<th>Mean Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>68</td>
<td>54.6</td>
</tr>
<tr>
<td>XRAY</td>
<td>17</td>
<td>61.8</td>
</tr>
<tr>
<td>OTHER</td>
<td>17</td>
<td>111</td>
</tr>
<tr>
<td>ER</td>
<td>18</td>
<td>169.2</td>
</tr>
<tr>
<td>CATH LAB</td>
<td>13</td>
<td>101.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>133</td>
<td>82.8</td>
</tr>
</tbody>
</table>

The locations include Computed Tomography Scan (CT), XRAY, Catheterization Lab (CATH LAB), Emergency Room (ER), and other locations where the sample size, N, was less than 10. Other Locations include Angiography (ANGIO), Upper Gastrointestinal (UGI), and the Operating Rooms (OR). The mean time for all Non-MRI transports was found to be 82.8 minutes.

The MRI Transports were also summarized as seen in Table 9. The mean time for all MRI transports was found to be 112.2 minutes.

**Table 9: Mean Time for MRI Transports**

<table>
<thead>
<tr>
<th>MRI</th>
<th>Min (min)</th>
<th>Max (min)</th>
<th>Median (min)</th>
<th>Mean (min)</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>60</td>
<td>180</td>
<td>120</td>
<td>112.2</td>
<td>36</td>
</tr>
<tr>
<td>Non-MRI</td>
<td>12</td>
<td>450</td>
<td>60</td>
<td>82.8</td>
<td>133</td>
</tr>
</tbody>
</table>

We can note from Table 9 that MRI transports take 29.4 minutes longer on average than Non-MRI transports.

**Table 10: Statistical Data based on Transport Log**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Transport Time (min)</th>
<th>Yearly Time (Hrs)</th>
<th>FTEs Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-MRI</td>
<td>177</td>
<td>336</td>
<td>.2</td>
</tr>
<tr>
<td>MRI</td>
<td>48</td>
<td>117</td>
<td>.1</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>453</td>
<td>.3</td>
</tr>
</tbody>
</table>
Table 10 summarizes the statistical data based on all transports, to both MRI and non-MRI locations. The minimum transport was recorded to be 12 minutes, the max was 450 minutes and the median and mode were both 60 minutes in time. In comparing the median time to our mean times from Table 9, our median is lower than both of our mean times. This is the result of a few extremely high transport times specifically two that were over 420 minutes, which skew the distribution to the right.

These times however do not include the time preparing for and adjusting patient and equipment both before and after transport and now the survey data will be discussed.

Findings -Survey Data

Based on surveys distributed to staff, the project team was able to account for the time spent arranging the patient and equipment for a transport and adjusting the patient and equipment subsequent to the transport.

Table 11: Survey Estimates of Mean Times

<table>
<thead>
<tr>
<th>Location</th>
<th>Pre-Transport</th>
<th>Post-Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>18.9</td>
<td>15</td>
</tr>
<tr>
<td>Non-MRI</td>
<td>16.9</td>
<td>14.4</td>
</tr>
<tr>
<td>N = 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It can be concluded from Table 11 that MRI pre-transport as well as post-transport times are higher than Non-MRI transport times. In addition staff estimated they spend more time on pre-transport activity than post-transport activity.

Based on the times for the survey data as well as the transport logs, the project team determined that 0.2 FTEs were needed for Non-MRI transports and 0.1 FTEs were needed for MRI transports in the Fiscal YTD 2006. For total internal transports for the current year through October, 0.3 FTEs were needed. In the future, internal transport activity can be projected and included in the budget based on our time assessments.

FTE Calculations

To determine the appropriate number of Full Time Equivalents (FTEs), the project team looked at the department activity and used this activity along with the determined time standard.

Approach. The project team examined the Fiscal Year 2006 activity and determined the activity for treatments as well as patients on ventilators. In addition budgeted activity for 2007 was examined and the project team based all calculations on this activity level.

To determine the FTEs required, our determined time standard was used. For treatments, 23.5 minutes and vent care, 223.5 minutes respectively. The volume was found using the time requirement multiplied by the activity. The volume in hours was divided by worked hours in a
year per person, which took into account paid time off as well as vacation time. The volume divided by the worked hours in a year, or 1768, yielded the needed FTEs. The determined FTEs were then compared to the budgeted FTEs.

Findings
The numbers in the following section are determined FTE’s and encompass approximately 80% of the departmental activity as stated by the project client. Each FTE corresponds to one respiratory therapist. The determined FTEs use our determined time standard, while the budgeted FTEs use the RVU/TSI allotment of 20 minutes and 225 minutes respectively for treatments and vent care. The treatment time is 20 minutes per procedure and the vent care is 225 minutes for a 24 hour period per patient.

- Determined FTEs
  - Treatments: 11 FTEs
  - Vent Care: 77.6 FTEs
  - Internal Transports: .3 FTEs

- FTEs Budgeted
  - Treatments: 9.4 FTEs
  - Vent Care: 31.3 FTEs
  - Transports: Not budgeted for

Conclusions
The FTEs needed for treatments will increase based on our result, which makes sense due to the additional infection control activities and documentation in the MAR. The FTEs needed for vent care will increase by 284% which is a very significant amount. It must be noted that our calculation included non-direct time involved and that our studies were conducted solely on pediatric patients. The internal transports can now be included in the budget once projected activity is determined.

Recommendations
Based on the results of the project we recommend further time studies to be completed to increase the sample size on activities that we observed few of during our time study period including but not limited to:

- Intubation
- Extubation
- Internal Transport Activity

The project team also recommends time studies be conducted throughout the different seasons to see the impact that RSV season makes on the time requirements and staffing model.

The project team recommends the determined FTEs for use in updating staffing and budgeting equations. Based on these determined FTEs, Respiratory Care can determine the appropriate levels of staffing.
In addition, Respiratory Care can update the weights for the Relative Value Units (RVUs) with the determined time standards to more accurately determine productivity. The project team recommends the department infuse the model with the additional resources put in to the productive direct time provided by support.

Lastly, the project team recommends to work towards reducing the elements in the Non-Direct, Non-Value Added category. Specifically, the elements that can be reduced are time spent billing, time spent walking, as well as time spent stamping patient flow sheets with their information.
Appendices:

Appendix A
Survey for Respiratory Therapists

Our project team is attempting to collect the following information in order to determine average time spent on pre-transport and post-transport for internal hospital transports. Please do not include any time that you would document in the internal transport log record.

1. Estimate the average time (in minutes) you spend preparing for an internal hospital transport (planning, setting up transport vent, etc.) excluding MRI transports.

2. Estimate the average time (in minutes) you spend preparing for an MRI transport (planning, setting up transport vent, etc.)

3. Estimate the average time (in minutes) you spend after a transport (tucking patient in, storing equipment, etc.) excluding MRI transports

4. Estimate the average time (in minutes) you spend after an MRI transport (tucking patient in, storing equipment, etc.)

5. Is there any other information you would like to note?
Appendix B

Nebulized Medication Treatment Flow Chart

1. Obtain work order
2. Verify Pharmacy Review
3. Obtain Equipment
4. Is patient to receive an antibiotic med?
   - Yes: Use special NMT set to prevent sensitizing
   - No: Expand Equipment
5. Is patient to receive 2 or more compatible med during treatment?
   - Yes: Use special NMT set to prevent sensitizing
   - No: Expand Equipment
6. Identify self and inform patient about med and treatment; answer questions
7. Identify Patient
8. Wash hands
9. Finish Obtaining Equipment
10. Assess Patient
11. Set up equipment and deliver med
12. Perform procedural actions
   - Yes: Expand
   - No: Expand
13. Does patient experience adverse reaction?
   - Yes: Assess Patient
   - No: Expand
14. RT monitor for adverse reactions
15. Finish treatment and wash hands
16. Document treatment on Respiratory Care Flow Sheet
17. Document treatment on MAR
18. Charge for treatment and med in OES
19. Record treatment on Respiratory Care Flow Sheet
20. Document treatment on MAR
21. Charge for treatment and med in OES
Findings

we see that there was (watch wordy phrases) an event split in the Direct Value-Added, and Non-Direct Value-Added fractions of the total time observed.

ICU Time Assessment

Approach.

The approach is basically the same as

ur project team conducted time studies for respiratory therapists in the ICU of Mott Children’s Hospital in the following areas:
- Pod A or PCTU (Pediatric Cardio-Thoracic Unit)
- POD BC or PICU (Pediatric Intensive Care Unit)
- Holden or NICU (Neonatal Intensive Care Unit)

The total time observed was 2,522.64 minutes or 42.044 hours during Monday, Tuesday, and Friday for 3 weeks. To analyze the time a respiratory therapist spends, the times were categorized using a more general direct versus non-direct and value-added versus non-value-added categorization scheme. The collected times were also categorized based on specific categories, which are described below.

The time observed was categorized into the following categories for direct versus non-direct and value-added versus non-value-added:

- Direct and value-added
- Non-direct and value-added
- Non-direct and non-value-added

Within direct and value-added, the times were categorized into the following components:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Section Break (Continuous)</th>
<th>Blood gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess Patient</td>
<td>Observing</td>
<td>Education</td>
</tr>
</tbody>
</table>
The treatment component is the administration of medication. Assess Patient includes stethoscoping and physically checking the status of the patient. The suction component is where the respiratory therapist was giving the patient oxygen through a hand pump while a nurse suctioned. The blood gas component includes times were the respiratory therapist did the actual lab testing for the blood gas results and the times where the respiratory therapist received a blood gas report. Observing includes times where the respiratory therapist needed to stand by the patient in order to assist them if needed. Transport is internal where the patient is moved from one area to another.

CPAP (Continuous Positive Airway Pressure) are tasks that involve this machine.

Extubation is a task that requires a respiratory therapist. Most patients in the ICU require ventilator care, which requires the patient to be intubated or have a tube inserted through the mouth and throat so that oxygen can be administered by the ventilator. Extubation is where the inserted tube is taken out of the patient’s mouth. The other category covers all miscellaneous tasks.

Within non-direct and value-added, the times were categorized into the following components:

- Communication
- Documentation
- Supplies & Equipment
- Glove/Wash hands
- Ventilator Adjustment and Check
- Shift Change
- Other

All tasks that involve communicating to other staff members such as doctors, nurses, and other respiratory therapists by phone, e-mail, pager, or verbally are included in the communication component. Documentation includes writing on the patient’s chart, MAR, or history. Supplies and equipment include tasks that require setting up, retrieving, moving, and putting back supplies or equipment. Glove/Wash elements include sanitization, washing hands, gloving, gowns, and putting on masks. Ventilator Adjustment and Check include all tasks involving direct contact with the ventilator. Shift change is time where the day shift and night shift switch. The other category is all other times.

The total time was also categorized into the following areas:

- Communication
- Billing
- Inactivity
- Transport
- Ventilator Care
- Pre-shift

- Section Break (Continuous)
Communication is the same as described above. Billing is strictly time spent on the computer billing patients. Inactivity is all time spent not involving respiratory therapy tasks. Transport is the same as described above. Ventilator Care is described below. Pre-shift time is time spent receiving reports from the previous shift. Break is time where the respiratory therapist takes an official break that is covered by a supervisor. Other encompasses all other times.

Ventilator Care was broken down into the following components:

Ventilator check  
- Suction  
- Blood gas  
- Intubation  
- Extubation  
- Bi-pap

Ventilator check includes time that the respiratory therapist directly checks the ventilator. Suction, blood gas, and extubation are the same as described above. Intubation is where the respiratory therapist is involved in inserting the tube into the patient’s mouth. Direct patient care tasks are categorized below.

Avoid starting a sentence with a numeral such as this one since it has to be spelled out, when it appears at the beginning of a sentence.

Watch wordy phrases. In this case, the respiratory therapists that are left must take over any work that the respiratory therapist that went on an external transport was in charge of.
Findings. The following charts and tables categorize

Non-Direct Value Added Components

Figure 9. Non-Direct Value Added Components

Figure 9 further breaks down non-direct value-added times. Note that the percentages are of the 43% non-direct value-added times of the total observed times. The majority of time is spent on communicating, documenting, and supplies and equipment. Watch parallel structure in the list. The breakdown of non-direct value-added times is shown in Table 4. For the computation of ventilator care time, only Vent Adjustment and Check, Glove/Wash, Supplies & Equipment, and Documentation are

Categorization by tasks. In order to analyze the data, the 42 hours of observed time was categorized by specific tasks in Figure 5 below.

our project team findings for the ICU.
Figure 5. Categorization of Total Time Into Eight Categories

Figure 5 shows the time split up into 8 categories. The majority of time is ventilator care, followed by other, and inactivity.
Since the ventilator care was the largest part of a respiratory therapist’s day, the ventilator care was stratified below in Figure 6.

![Ventilator Care Components](image)

**Figure 6. Categorization of Ventilator Care Into Six Components**

Figure 6 further breaks down ventilator care. Note that the percentages shown are of the 36% from Figure 5. The majority of this time is specifically ventilator check, followed by suctioning.

**Table 2. Total Times, Sample Size, and Averages for Ventilator Care Components**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Total Time (min.)</th>
<th>Sample Size (N)</th>
<th>Average (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent Check</td>
<td>464.04</td>
<td>60</td>
<td>7.73</td>
</tr>
<tr>
<td>Suction</td>
<td>211.25</td>
<td>35</td>
<td>6.04</td>
</tr>
<tr>
<td>Blood gas</td>
<td>84.2</td>
<td>19</td>
<td>4.43</td>
</tr>
<tr>
<td>Intubation</td>
<td>8.5</td>
<td>1</td>
<td>8.50</td>
</tr>
<tr>
<td>Extubation</td>
<td>29</td>
<td>1</td>
<td>29.00</td>
</tr>
<tr>
<td>Bi-pap</td>
<td>9</td>
<td>2</td>
<td>4.50</td>
</tr>
</tbody>
</table>
Table 2 shows the total times for each category along with the sample size and average times. There were sufficient sample sizes for ventilator check and suction. However, intubation, extubation, and bi-pap sample sizes were too low to

As depicted in Figure 7, the majority of time that is spent is non-direct value added time.

Categorization by Direct/Non-Direct and Value Added/Non-Value Added. The 42 hours of observation time was categorized into Direct/Non-direct and Value Added/Non-Value Added below.
The time spent by the respiratory therapist that is value-added is 64%. Inactivity is 15%, but it is necessary, so that in case of unexpected emergencies, there will be a buffer. Also, it is a buffer for unexpected external transportations where a respiratory therapist must leave the premises.

Figure 8. Direct Value Added Components

Figure 8 further breaks down direct value-added time. Note that the percentages shown are of the 21% direct value-added time of the total observed time. As shown in Figure 8 and Table 3 below, the majority of time is assessing the patient, suctioning, and other times.

Table 3. Total Times for Direct Value-Added Components

<table>
<thead>
<tr>
<th>Category</th>
<th>Total (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>18</td>
</tr>
<tr>
<td>Assess Patient</td>
<td>88.5</td>
</tr>
<tr>
<td>Suction</td>
<td>86.5</td>
</tr>
<tr>
<td>Bloodgas</td>
<td>39.5</td>
</tr>
<tr>
<td>Observing</td>
<td>16</td>
</tr>
<tr>
<td>Education</td>
<td>31</td>
</tr>
<tr>
<td>Other</td>
<td>124</td>
</tr>
<tr>
<td>Transport</td>
<td>7</td>
</tr>
<tr>
<td>Bi-papCPAP</td>
<td>17</td>
</tr>
<tr>
<td>Extubation</td>
<td>11</td>
</tr>
</tbody>
</table>

Non-Direct Value Added components are also categorized below.

Table 4. Total Times for Non-Direct Value-Added Components

used.
<table>
<thead>
<tr>
<th>Category</th>
<th>Total (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>236.5</td>
</tr>
<tr>
<td>Documentation</td>
<td>236.45</td>
</tr>
<tr>
<td>Supplies &amp; Equipment</td>
<td>237.25</td>
</tr>
<tr>
<td>Glove/Wash</td>
<td>66.84</td>
</tr>
<tr>
<td>Other</td>
<td>118.95</td>
</tr>
<tr>
<td>Ventilator Adjustment and Check</td>
<td>99.5</td>
</tr>
<tr>
<td>Shift Change</td>
<td>107</td>
</tr>
</tbody>
</table>

**Conclusion**

Are these conclusions for only ICU Time Assessment? Should other sections also include “Conclusions” or should “Conclusions” be at a higher heading level?

Our project team was given the 2004 AARC (American Association for Respiratory Care) *Uniform Reporting Manual For Acute Care Hospitals*, which contains information on national averages for specific tasks.

What did you do with this information? Refer to Table 5 in text.

The comparison of our project team findings and the national average are shown in Table 5.

**Table 5. Comparison Between National Averages And Observation Averages**

<table>
<thead>
<tr>
<th>Task</th>
<th>National Average (min.)</th>
<th>Observed Average (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient/Ventilator Assessment</td>
<td>13.97</td>
<td>2.94</td>
</tr>
<tr>
<td>Setting Adjustment</td>
<td>9.11</td>
<td>7.73</td>
</tr>
<tr>
<td>Suctioning of Artificial Airway with In-line Suction</td>
<td>6.47</td>
<td>6.04</td>
</tr>
</tbody>
</table>

The difference between the observed average for “Patient/Ventilator Assessment” and the national average is due to the difference in tasks that are included in the times. The observed data does not include non-direct value added elements that are included in the national average. The observed average for “Setting Adjustment” is lower than the national average by 1.38 minutes. A major factor affecting “Setting Adjustment” average time may be due to differences in ventilator equipment used and some differences in tasks that are included in the national average, but not in the observed. The observed data for “Suctioning of Artificial Airway with In-line Suction” is approximately .43 minutes off from the national average.
Ventilator Care Time Calculation. The computation of ventilator care time is as follows:

Ventilator Care is comprised of
- Suctioning
- Blood gases
- Ventilator checks

In order to

Internal Transport Time Assessment

In-hospital transportation of mechanically ventilated patients for diagnostic or therapeutic procedures is conducted by respiratory therapists. Assuring constant monitoring, ventilation, oxygenation, and patient care during movement is needed. The monitoring provided during transport should be similar to that during stationary care. Patient transport includes preparation, movement to and from, and time spent at destination. It is important to note the therapist cannot simply pick up and leave when there is a transport. There is equipment that is necessary as outlined below:

Equipment
- Emergency airway management supplies
- Portable oxygen source of adequate volume
- A self-inflating bag and mask of appropriate size
- Transport ventilator if available
- Portable power supply for the duration of transport
- An FIO$_2$ of 1.0
- A pulse oximeter is desirable
- Appropriate pharmacologic agents should be readily available
- Stethoscope
- Hand-held spirometer for tidal volume measurement

Approach.

Our project team split the patient transport into two sections due to data constraints:
- Movement time and time spent at destination
- Time spent preparing prior to transport as well as adjustments after transport
Movement time as well as time spent at destination is recorded in the Respiratory Care Department Log. These times begin once the therapist has left the assigned unit and begins moving to the specific patient destination. All mechanically ventilated patients need to be accompanied during the entire transport, so while the patient is undergoing a procedure, the therapist must be present to maintain equipment and patient safety should a problem arise. Some common destinations at the University Hospital include Magnetic Resonance Imaging (MRI) as well as Computerized Tomography Scan (CT). The times include all time spent moving to patient destination and end when the therapist is back in their assigned unit.

Our project team noted that time spent preparing for a transport and making necessary adjustments following transport were not included in the Respiratory Care Department Log based on staff interviews. During the project team time study period only one partial transport was observed due to sporadic occurrence of transports. Therefore, the project team gathered data on preparation and adjustment times from therapist surveys.

Due to difference in MRI procedures and protocol, the project team also split the transports into two categories:
- MRI transports
- Transports to other locations

The projected team excluded transports where more than one location was visited.

Findings

Still need to add text?

Department Logs

Does the info that follows present Approach? Findings? If a reader is trying to follow pattern established with earlier sections, this different approach might be confusing.

Based on the Respiratory Care Department Log the mean times for internal transports were calculated based on the records from January 1, 2006 to October 8, 2006. The results are shown in Table 6.

Table 6: Mean Times for Routine Non-MRI Transports

<table>
<thead>
<tr>
<th>Location</th>
<th>Sample Size (N)</th>
<th>Mean Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>68</td>
<td>54.6</td>
</tr>
<tr>
<td>XRAY</td>
<td>17</td>
<td>61.8</td>
</tr>
<tr>
<td>OTHER</td>
<td>17</td>
<td>111</td>
</tr>
<tr>
<td>ER</td>
<td>13</td>
<td>169.2</td>
</tr>
<tr>
<td>CATH LAB</td>
<td>10</td>
<td>101.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>133</td>
<td>82.8</td>
</tr>
</tbody>
</table>
The locations include Computed Tomography Scan (CT), XRAY, Catheterization Lab (CATH LAB), Emergency Room (ER), and other locations where the sample size, N, was less than 10. Other Locations include Angiography (ANGIO), Upper Gastrointestinal (UGI), and the Operating Rooms (OR). The mean time for all Non-MRI transports was found to be 82.8 minutes.

The MRI Transports were also summarized as seen in Table 6. The mean time for all MRI transports was found to be 112.2 minutes.

Table 7: Mean Time for MRI Transports

<table>
<thead>
<tr>
<th>Activity</th>
<th>Min (min)</th>
<th>Max (min)</th>
<th>Median (min)</th>
<th>Mean (min)</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>60</td>
<td>180</td>
<td>120</td>
<td>112.2</td>
<td>36</td>
</tr>
<tr>
<td>Non-MRI</td>
<td>12</td>
<td>450</td>
<td>60</td>
<td>82.8</td>
<td>133</td>
</tr>
</tbody>
</table>

We can note from Table 7 that MRI transports take 29.4 minutes longer on average than Non-MRI transports.

Table 7: Statistical Data based on Transport Log

<table>
<thead>
<tr>
<th>Activity</th>
<th>Activity Transport Time (min)</th>
<th>Yearly Time (Hrs)</th>
<th>FTEs Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-MRI</td>
<td>177</td>
<td>114.1</td>
<td>1.9</td>
</tr>
<tr>
<td>MRI</td>
<td>48</td>
<td>156.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>270.2</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Table 7 summarizes the statistical data based on all transports, to both MRI and non-MRI locations. The minimum transport was recorded to be 12 minutes, the max was 450 minutes and the median and mode were both 60 minutes in time. In comparing the median time to our mean times from Table 6, our median is lower than both of our mean times. This is the result of a few extremely high transport times specifically two that were over 420 minutes, which skew the distribution to the right.

These times however do not include the time preparing for and adjusting patient and equipment both before and after transport and now the survey data will be discussed.

Survey Data

Findings.
Based on surveys distributed to staff, the project team was able to account for the time spent arranging the patient and equipment for a transport and adjusting the patient and equipment subsequent to the transport.

Table 8: Survey Estimates of Mean Times

<table>
<thead>
<tr>
<th>Location</th>
<th>Pre-Transport</th>
<th>Post-Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI</td>
<td>18.9</td>
<td>15</td>
</tr>
<tr>
<td>Non-MRI</td>
<td>16.9</td>
<td>14.4</td>
</tr>
</tbody>
</table>

It can be concluded from Table 8 that MRI pre-transport as well as post-transport times are higher than Non-MRI transport times. In addition staff estimated they spend more time on pre-transport activity than post-transport activity.

Conclusions. Based on the times for the survey data as well as the transport logs, the project team determined that .2 FTEs were needed for Non-MRI transports and .1 FTEs were needed for MRI transports in the Fiscal YTD 2006. For total internal transports for the current year through October, .3 FTEs were needed. In the future, internal transport activity can be projected and included in the budget based on our time assessments.

FTE Calculations

Consider including a brief intro text in situations such as this one, where one subheading follows directly after the first level heading.

Approach.

The project team examined the 2006 Year to Date activity and determined the activity for treatments as well as patients on ventilators. In addition the Fiscal Year 2007 activity through October was examined and compared to the Budgeted activity for 2007.

To determine the FTEs required, our determined time standard was used. For treatments, 23.5 minutes and vent care, 223.5 minutes respectively. The volume was found using the time requirement multiplied by the activity. The volume in hours was divided by worked hours in a year per person, which took into account paid time off as well as vacation time. The volume divided by the worked hours in a year yielded the needed FTEs. Treatments were found to require 11 FTEs and vent care was found to require 30 FTEs.

The Determined FTEs were then compare to the Budgeted FTEs.
Need Findings before Conclusions?

Conclusions

Determine FTEs
Treatments: 11 FTEs
Vent Care: 30 FTEs
Internal Transports: .3 FTEs

FTEs Budgeted
Treatments: 9.4 FTEs
Vent Care: 31.3 FTEs
Transports: Not budgeted for

The FTEs needed for Treatments will increase based on our result, which makes sense due to the additional infection control activities and documentation in the MAR. The FTEs needed for Vent Care will decrease minimally. The internal transports can now be included in the budget once projections are determined.

Recommendations

Based on the results of the project we recommend further time studies to be completed the increase the sample size on activities that we observed few of during our time study period including but not limited to:

Intubation
Extubation
Internal Transport Activity

The project team recommends the determined FTEs for use in updating staffing and budgeting equations. Based on these determined FTEs, Respiratory Care can determine the appropriate levels of staffing. In addition, Respiratory Care can update the weights for the Relative Value Units (RVUs) with the determined time standards to more accurately determine productivity.
Approximate 5 weekly hours of observation per person

Appendix A

Nebulized Medication Treatment Flow Chart

1. Obtain work order
2. Verify Pharmacy Review
3. Obtain Equipment
4. Is patient to receive an antibiotic med?
   - Yes: Use special NMT set to prevent sensitizing
   - No:

12/18/2006 12:41:00 PM