University of Michigan Health System
Cardiovascular Center

Analysis of Transportation Needs for the Cardiovascular Center
Final Report
Program & Operations Analysis

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Executive Summary

Introduction and Background

The new Cardiovascular Center at the University of Michigan is scheduled to open in the summer of 2007. The Cardiovascular Center (CVC) will increase workload on the current patient transportation staff of the hospital. This report will address the increased patient transportation, by evaluating daily volumes of inpatient transportation to and from the CVC and various parts of the hospital. We will also determine the staffing requirements to transport each patient, and determine the shortest and safest travel routes. This project also addresses whether patient safety will be in jeopardy when the CVC opens.

Approach and Methodology

There were three phases in this project: data collection, data analysis, and recommendations. During data collection, we interviewed management and gathered data in the form of transportation logs. We performed time studies to determine walking standards and elevator wait times. We collected transfer data between departments to determine patient transportation volumes; and determined route lengths. During data analysis, we used our estimated route lengths, patient volumes, and time standards to determine the number of hours of transportation between relevant departments in order to determine the full time equivalent (FTE’s) required to fulfill the transportation needs. In the final phase, we formulated and presented recommendations for the appropriate staffing levels and optimal routes for the transportation of patients.

Findings and Conclusions

We identified and sequenced travel times, as well as determined major concerns facing affected departments. From our discussions with Transportation Department we found the following information:

- 61 FTE’s currently employed, which includes approximately 9 dispatchers
- Average transport time is 17.35 minutes
- Target number of transports is 20 transports per transporter per day
- Hours of productive time for each transporter are 6.5 hours of work per day

From the 4B and Thoracic Intensive Care Unit (TICU), we found the following:
- Currently the two departments are located next to each other, making transporting patients between the two much shorter than when TICU is moved to the CVC
- The nurses will be responsible for transporting patients rather than tech staff leading to many concerns with transporting critical patients

The Emergency Department (ED) informed us that:
- The ED had limited resources for transport.
- Currently the ED staff transports admitted patients to other departments

From Cardiology we found that:
- ECHO and EKG manage their own transport
- They have 1 dedicated transporter
• The ECHO machine weighs 450 lbs so it is necessary for someone to accompany the transporter.

We performed time studies, with sample sizes of 40 trials, to accurately capture walking speed during transportations. From these results we determined that the mean time for pushing a stretcher was 2.23 miles per hour and for a wheelchair the mean time was 2.19 miles per hour. We also conducted a time study to estimate elevator wait time. We found the average total trip time to be 2 minutes 11 seconds.

We also consulted a literature source on motion and time study for walking standards (Barnes, Ralph M., “Motion and Time Study: Design and Measurement of Work” John Wiley & Sons, INC. New York, 1980). According to Ralph Barnes, the standard walking time for an individual is three miles an hour. A general heuristic from our research concluded that pushing a stretcher or wheelchair would result in the transporters operating at a 70 percent capacity. This amounts to standardized walking speed of 2.1 miles per hour for our transportation. This is extremely close to the value that we calculated as a result of our own time studies.

Data Analysis

To determine the additional workload for the Patient Transportation Department, we used the following equation:

Projected Workload = Projected Volume x (Travel Time + Load and Unload Time)

Net increase of workload due to Travel Time = (2.90 FTE – 0.57 FTE) = 2.30 FTE

Net increase of workload due to Load and Unload Time = 0.77 FTE

Total Net Increase = 2.30 FTE + 0.77 FTE = 3.1 FTE

Recommendations

• Increase their staffing levels by 3.1 FTE.
• An examination of the utilization of SWAT nursing be completed after they have completed the training process for their current trainees.
• Delivery of the travel times, contained within this report, to the clinical departments directly associated with the CVC. These departments would then be able to determine the increase of their workload on a case by case basis.

Expected Outcomes

• Increase in staffing levels for the Patient Transportation Staff
• Smooth transition as the CVC opens in June 2007.
• Safe and efficient patient transportation to and from the CVC.
Introduction

The University of Michigan Health System is currently improving patient cardiovascular care by building a new Cardiovascular Center, which is scheduled to open in the summer of 2007. It is estimated that the Cardiovascular Center (CVC) will increase workload on the current patient transportation staff of the hospital. To address this need for increased patient transportation, our team determined the future patient transportation needs for the CVC in order to recommend staffing levels for the patient transportation department and other possible transporting entities. This project also considered whether patient safety will be in jeopardy when the CVC opens. This final report presents our findings and recommendations for the future transportation needs of the CVC.

Goals and Objectives

To achieve our primary goal of determining the patient transportation needs of the new CVC, we determined the current daily volumes of inpatient transportation to and from the CVC and various parts of the hospital, determined the staffing requirements to transport each patient, and determined the shortest and safest travel routes.

Background

The new CVC will hold 48 new inpatient beds, 8 operating rooms, and 12 minimally invasive procedure rooms. Patients will be arriving to and departing from these areas from the Emergency Department, the Survival Flight Helicopter pad and inpatient floors in University Hospital. Three concourses to and from University Hospital will be located on levels B1, 2 and 4.

The opening of the CVC will alter the current state of the Health System complex dramatically. For example, the distance between the Emergency Department and the CVC’s patient treatment areas will be many times larger than the current distances traversed in University Hospital. There is a general concern amongst those involved that the larger distances will lead to an increase in demand for transportation services as trip times increase. For this reason, our team studied the current and future states of the patient transportation department, which included studying the daily volumes of patient transport, the time of day these volumes occur, the type of transport, elevator wait times, who transports the patients, and the length of time of various routes. Management expects that our project will aid in the transition to the CVC by providing a clear picture of future patient transportation needs.

Key Issues

The following key aspects of the current situation affected this project:

- The distances CVC patients travel. The departments moved to the CVC will be farther from the departments in the University Hospital (UH).
- The volume of patients that will need to be transported.
Staffing requirements (i.e. nursing, transportation staff, or departmental technical staff)
- Transportation method used (i.e. wheelchairs or stretchers)
- Special considerations for critical patients. Critical patients often need immediate attention or extra equipment to be carried alongside them.
- The possible implementation of alternate routes for patients, such as using an ambulance to transport patients from the UH to the CVC.

Project Scope

The project scope included:
- Patient transportation needs within the CVC and to or from the CVC to outside departments such as the Emergency Department, UH Radiology, and Intensive Care Units.
- Inpatient and admitted patients’ requirements and did not observe outpatient needs
- Activity for the opening year of the CVC and does not include activity beyond Fiscal Year 2008.

The project scope excluded:
- Any transportation route that does not enter or leave the CVC building.
- Patient transportation through levels 2 and 4 connectors. Three concourses to and from University Hospital will be located on levels B1, 2 and 4. The concourse on level 2 will be public and not be used for patient transportation. The level 4 connector will not be completed for six months after the opening of the CVC. Therefore, this project only concerned patient transportation through the B1 level connector and did not consider levels 2 and 4 for transporting patients.
- The wait times for staff to arrive to transport the patient.
- Any emergency or safety plans.

Approach and Methodology

To determine the patient transportation needs of the new CVC, we observed the travel needs of the Cardiovascular Center (CVC). The primary operating entities include nursing, transportation staff, and departmental technical staff. The various departments that will be affected include the departments that will be relocated to the new CVC building from the University Hospital (UH), as well as the departments that interact with the newly moved CVC departments. Some of these departments include the Emergency Department (ED), Radiology, and CVC Operating Rooms. We performed this project in three phases: data collection, data analysis, and recommendations.

Data Collection

During the first phase, data collection, we interviewed management of the transportation and cardiovascular departments to further understand the scope of the project and gather data in the
form of transportation logs; performed time studies to determine walking standards and elevator wait times; collected transfer data between departments to determine patient transportation volumes; and determined route lengths.

**Interviews**

We performed 10 interviews as described below in Table 1.

<table>
<thead>
<tr>
<th>Interviewed</th>
<th>Regarding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Krupansky (MSA, RCST, Director of Patient Transportation)</td>
<td>The Transportation Department’s current interaction with cardiovascular related departments and what data they could provide.</td>
</tr>
<tr>
<td>Debra Cobb (Manager of Transportation)</td>
<td></td>
</tr>
<tr>
<td>Jolé Mowry (RN, Clinical Nurse Specialist)</td>
<td>The increased distance needed to transport patients from the TICU to the step down clinic in 4B.</td>
</tr>
<tr>
<td>Laurie Hartman (NP, Administrative Coordinator of Thoracic Intensive Care Unit (TICU) and 4B Thoracic)</td>
<td></td>
</tr>
<tr>
<td>Joan McNeice (Head Nurse of 4B Thoracic)</td>
<td></td>
</tr>
<tr>
<td>Nancy Mamolen (RN, MSN, Emergency Department Nurse Manager)</td>
<td>Increased pressures patient transportation will put on the Emergency Department’s nursing and technical staff.</td>
</tr>
<tr>
<td>Mary Sue LeMire (BS, RDCS, Senior Allied Health Technical Specialist)</td>
<td></td>
</tr>
<tr>
<td>Kevin McHugh (Allied Health Technical Coordinator)</td>
<td>Their concerns regarding the increased distance needed to transport patients between cardiology and other departments.</td>
</tr>
<tr>
<td>Judy Burke (Supervisor of Patient Transportation)</td>
<td>General transportation problems that occur and the reasons for such problem</td>
</tr>
<tr>
<td>Matthew Green (Clinical Nurse III, UMH Nursing – SWAT)</td>
<td>Staffing level concerns</td>
</tr>
</tbody>
</table>
Time Studies

We also performed time studies to collect data on the travel process and compare to the transportation standards provided by the Transportation Department. The results from these time studies were used to illustrate the length of the transfer process, the distribution of times associated with each task, and the general process flow.

We performed three time studies. One involved a group member pushing another group member a specified distance of 256 feet in a wheelchair. Another was performed the same, but used a stretcher. The sample size for each time study was 40 trials. We also consulted a literature source about motion and time study for an additional walk speed standard.

The third time study was performed to model elevator trip times during the peak hours of the day. Through our interviews with Patient Transportation staff, the peak hours were Monday – Friday, 10 am through 2 pm. Our procedure to collect time data was to measure the time elapsed from when the elevator was called to when the passenger exited on the destination floor. Time was differentiated between waiting time off the elevator and time spent on the elevator. Elevators that were too full to accommodate a patient stretcher were not counted. Only rides between level B1 to the 4th and 7th levels were recorded. These were selected to simulate a patient riding to and from 4BC and 7BC in order to pass to the CVC by way of the B1 connector. The sample size was 48 elevator rides.

Transfer Data

We used two sources for collecting transfer data between departments. The project coordinator, Sam Clark (Senior Management Engineer of Program Operations Analysis) provided a sample period of eight months worth of transfer data between departments that did not contact the Transportation Department. Most of our data was drawn from the Patient Transportation System (PTS) database. This database contains detailed transportation information pertinent to this project such as location to location, transport completion time, equipment type, date of transport, and time of transport. We collected a sample period of one year from March 2005 to March 2006.

Transportation Routes

To determine the length of transportation routes, we used floor plans of the CVC and UH. The Transportation Department provided paid time off (PTO) and non-productive time standards to aid with determining full time equivalents (FTE’s).

Data Analysis

During the second phase, data analysis, we used our estimated route lengths, patient volumes, and time standards to determine the number of hours of transportation between relevant departments. Taking into account, the PTO and non-productive time standards, we then
determined the FTE's required to fulfill the transportation needs. Also in conducting this study, our team used statistical quality assurance methods to analyze the results.

**Current Situation**

Currently there are 61 transportation staff members in terms of Full Time Equivalent (FTE). This staff on average performs 57 patient transportation trips a day involving units that are moving to the CVC. Right now all of the cardiac related departments are located in the University Hospital, but the Thoracic Intensive Care Unit (TICU), Cardiac Operating Room (OR), Cath Lab, and Cardiac Procedure Unit (CPU) will be moving to the CVC. Currently, there are 4 beds in the OR designated for cardiac surgeries and 14 beds in the TICU, but when these departments move to the CVC the total number of beds between the two will increase to 24. Below in Table 2 are the current distances and transportation times from one place in the hospital to another place that is currently in the University Hospital but will be moving the CVC.

### Table 2: Current and Projected Distance and Travel Times

<table>
<thead>
<tr>
<th>From Location</th>
<th>To Location</th>
<th>Distance (Feet)</th>
<th>Elevator Trips</th>
<th>Time Net Increase (Min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>ED</td>
<td>UH Cath Lab</td>
<td>150</td>
<td>0</td>
</tr>
<tr>
<td>Projected</td>
<td>ED</td>
<td>CVC Cath Lab</td>
<td>1209</td>
<td>1</td>
</tr>
<tr>
<td>Current</td>
<td>4BC</td>
<td>TICU</td>
<td>160</td>
<td>0</td>
</tr>
<tr>
<td>Projected</td>
<td>4BC</td>
<td>CVC Level 4</td>
<td>1404</td>
<td>2</td>
</tr>
<tr>
<td>Current</td>
<td>TICU</td>
<td>UH Radiology</td>
<td>192</td>
<td>1</td>
</tr>
<tr>
<td>Projected</td>
<td>CVC Level 4</td>
<td>UH Radiology</td>
<td>1324</td>
<td>2</td>
</tr>
</tbody>
</table>

**Findings and Conclusions**

**Interviews:** Concern regarding increased pressures on staffing levels due to increased distances.

Based on the information gathered in the interviews, detailed below in Table 3, we identified and sequenced travel times, as well as, determined major concerns facing affected departments.
Table 3: Interview Findings

<table>
<thead>
<tr>
<th>Interviewed</th>
<th>Department</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Krupansky</td>
<td>Transportation</td>
<td>- Access to the UMHS patient transportation database to help us collect patient travel times of places in the scope of our project.</td>
</tr>
<tr>
<td>Debra Cobb</td>
<td></td>
<td>- Currently there are 61 FTE’s, which includes approximately 9 dispatchers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Average transport time = 17.35 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Target number of transports = 20 transports per transporter per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Hours of productive time = 6.5 hours of work per day</td>
</tr>
<tr>
<td>Jolé Mowry</td>
<td>TICU and 4B</td>
<td>- Currently transporting patients from the TICU to the step down clinic 4B is relatively easy because the two units are located right next to each other</td>
</tr>
<tr>
<td>Laurie Hartman</td>
<td></td>
<td>- TICU will be moving to the CVC when it opens, making nurses, as well as possible other staff that handle equipment, have to transport patients across the hospital to move them from TICU to 4B, instead of currently having a tech person transport these patients.</td>
</tr>
<tr>
<td>Joan McNeice</td>
<td></td>
<td>- The increased distance leads to many concerns with transporting critical patients.</td>
</tr>
<tr>
<td>Nancy Mamolen</td>
<td>Emergency</td>
<td>- ED has limited resources for transport</td>
</tr>
<tr>
<td></td>
<td>Department</td>
<td>- Currently, ED staff transports admitted patients to other departments</td>
</tr>
<tr>
<td>Mary Sue LeMire</td>
<td>Cardiology</td>
<td>- ECHO and EKG departments manage their own transport.</td>
</tr>
<tr>
<td>Kevin McHugh</td>
<td></td>
<td>- Have 1 dedicated transporter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ECHO machine is portable, but weighs 450 lbs so it is necessary for someone to accompany the transporter.</td>
</tr>
<tr>
<td>Matthew Green</td>
<td>SWAT</td>
<td>- Currently there are 9 FTE’s (includes 3 recently added)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- They transport patients for surgery and assist operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- They complete on average 4500 total transports a year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- In 2005, they completed 474 CVC related transports, while there were 605 requests</td>
</tr>
</tbody>
</table>

Time Studies: Stretcher = 2.23 mi/hr, Wheelchair = 2.19 mi/hr, Elevator = 2 min 11 sec

We conducted time studies to accurately capture walking speed during transportations. As mentioned earlier, we conducted time studies with sample sizes of 40 trials. From these results we determined that the mean time for pushing a stretcher was 2.23 miles per hour and for
pushing a wheelchair was 2.19 miles per hour. This amount was calculated by using the mean
time of the time studies, and dividing it by the total distance traveled.

For the elevator time study, the average total trip time was 2 minutes 11 seconds. The
maximum total trip time was 8 minutes 35 seconds. There was a difference of 23 seconds in
total trip time on average, when riding from the 4th and 7th levels to level B1. There was a
difference in 1 minute and 12 seconds between the West and East Elevators. However, the
overall total trip time average of 2 minutes and 11 seconds will be used to model both the current
elevators and also the patient transportation in the CVC. This assumption was found to be
acceptable by our client. The above mentioned elevator trip times can be seen below in Figure 1.

![Figure 1: Total Elevator Trip Time (Weekday)](image)

**Literature Search:** Standard walking speed = 2.1 MPH

We also consulted a literature source on motion and time study for walking standards (Barnes,
Ralph M., “Motion and Time Study: Design and Measurement of Work” John Wiley & Sons,
INC. New York, 1980). According to Ralph Barnes, the standard walking time for an individual
is three miles an hour. This decreases with the amount an individual is asked to carry or push
along the way. A general heuristic from our research concluded that pushing a stretcher or
wheelchair of about would result in a decrease of about 30-35 percent of the individuals walking
capacity. This results in the transporters operating at a 70 percent capacity. This amounts to
standardized walking speed of 2.1 miles per hour for our transportation. This is extremely close
to the value that we calculated as a result of our own time studies. This only further validated
that the travel speed, when a stretcher or wheelchair is not waiting for an elevator, is very close
to 2.1 miles per hour.
Transfer Data

The patient volumes are estimated from the collected data. The CPU, OR, and IR patient volumes include projected increases. The projected increase for the CPU is 10%. The OR and IR patient volumes are derived from the estimated budgeted volumes for those departments provided by our client. The projected patient transportation volumes for various departments are shown in Table 4 in Appendix A.

Transportation Routes

Using floor plans, the transportation routes between the departments within the scope of the project were measured. The routes followed approved patient transportation hallways and were determined by the optimal distance. Shown in Table 5 of Appendix A, are the transportation route distances.

Transportation Travel Times

The transportation travel times are shown in Table 6 in Appendix A. Appendix B details how these times were derived.

Data Analysis

Patient Transportation Department Analysis: Net Increase = 3.1 FTE

To determine the additional workload for the Patient Transportation Department, we used the following equation:

\[
\text{Projected Workload} = \text{Projected Volume} \times (\text{Travel Time} + \text{Load and Unload Time})
\]

The group then compared the projected workload for CVC related transportation to the current CVC related transportation. The net increase in capacity needed was found by subtracting the projected demand by the current demand.

\[
\text{Net Increase of Workload} = \text{Projected Workload} - \text{Current Workload}
\]

The increased workload in travel time can be attributed to the increase of distances that will be necessary to travel when moving patients to and from the CVC. The increased workload from load and unload time can be attributed to the projected growth in the number of total trips to and from the CVC. The details of the calculation completed:

\[
\begin{align*}
\text{Net increase of workload due to Travel Time} &= (2.90 \text{ FTE} - 0.57 \text{ FTE}) = 2.30 \text{ FTE} \\
\text{Net increase of workload due to Load and Unload Time} &= 0.77 \text{ FTE} \\
\text{Total Net Increase} &= 2.30 \text{ FTE} + 0.77 \text{ FTE} = 3.1 \text{ FTE}
\end{align*}
\]
Nursing Workload Analysis: Increased Annual Nursing Workload for UH 4BC = 95 Hrs; for CVC ICU = 235 Hrs

The increased distance and volumes would also place extra burden on inpatient nursing staff in the CVC Level 4 ICU and UH 4BC inpatient floor. In the current situation, patients going to the Thoracic ICU were often transported by a floor technician from 4BC. It is felt the increased distances would force nursing staff to escort the patient to and from the ICU in the CVC. The following analysis was performed to quantify that extra workload.

Annual Transfers from Floor 4BC to TICU currently = 144 trips

Considering that the CVC ICU would increase in capacity by 10 beds it is assumed transfers would also rise to:

Projected Transfers from Floor 4BC to CVC ICU = 204 trips

Increased Annual Nursing Workload for UH floor 4BC = 95 Hours

The increased pressure put on the ICU nursing staff in the CVC was quantified in the following manner:

Annual Transfers from TICU to UH Inpatient Floors = 840 trips

Projected Transfers from CVC ICU to UH Inpatient Floors = 1192 trips

Increased Annual Nursing Workload for CVC ICU = 235 Hours

Recommendations

• In order to compensate for the increase in patient transportation department, we recommend that the Patient Transportation Department increase their staffing levels by 3.1 FTE. If no action is taken, it is estimated that transportation demand would outpace capacity and patient care would suffer.

• We also recommend that an investigation of the utilization of SWAT nursing be completed after they have completed the training process for their current trainees. The SWAT team, at full capacity of 9.0 FTE, could play a crucial role in alleviating the pressure that will be placed on Clinical Nursing staff in transporting critical patients.

• We suggest the delivery of the travel times, contained within this report, to the clinical departments directly associated with the CVC. These departments would then be able to determine the increase of their workload on a case by case basis. These departments include, Main Emergency Department, CVC Operating Rooms, CVC Cardiac Procedure Unit, CVC Non-Invasive Diagnostics, CVC Interventional Radiology, CVC Inpatient Floors, and UH 4BC.
**Expected Outcomes**

- Our recommendations will lead to an increase in staffing levels for the Patient Transportation Staff. This will lead to an adequate amount of employees for efficient operations.
- We expect that the implementation of our recommendations will lead to a smooth transition as the CVC opens in June 2007. The patient transportation staff will have sufficient capacity to compensate for increased volumes and distances to and from the CVC.
- It is expected that the overall and key outcome of our recommendations is safe and efficient patient transportation to and from the CVC.
Appendix

Appendix A
  Table 4. Projected Patient Transportation Volumes (Annual).
  Table 5. Patient Transportation Distances.
  Table 6. Patient Transportation Travel Times.

Appendix B
### Appendix A

<table>
<thead>
<tr>
<th>From Location</th>
<th>ED</th>
<th>CPU</th>
<th>CPU Pre-Op &amp; Recovery</th>
<th>NID</th>
<th>UH Radiology</th>
<th>CVC IR</th>
<th>CVC OR</th>
<th>CVC PACU</th>
<th>UH ICUs</th>
<th>4BC</th>
<th>7BC</th>
<th>CVICU</th>
<th>Other UH IP Units</th>
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<td>ED</td>
<td></td>
<td>167</td>
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B1 Connector Length (Feet) 200
Stretcher Rate (Feet per second) 2.75
Elevator Time (Minutes per ride) 4

*Times Measured in Minutes*
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*Distances Measured in Feet

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B1 Connector Length (Feet)  300
Stretcher Rate (Feet per second)  2.75
Elevator Time (Minutes per ride)  2.166667

*Times Measured in Minutes
Appendix B

For this project a simple algorithm was created to project the point to point distances and times to the CVC. We used University Hospital and CVC floor plans to determine the travel distances for specified trips related to the CVC. The results of the Stretcher and Elevator time studies were then used to convert the raw point to point distances to projected travel times. The results used were:

Stretcher Speed $= 2.75$ feet per second, Elevator Time $= 2$ minutes, 11 seconds

And the algorithm used to project total travel time was:

$$\text{Total Trip Time} = \left(\frac{\text{Total Distance}}{2.75 \text{ ft/s}}\right) + \left(\text{Number of Elevator Rides} \times 2.17 \text{ minutes}\right)$$

An excel spreadsheet was used to organize and streamline the calculation.
Analysis of Transportation Needs for the Cardiovascular Center

Project Presentation
April 24, 2006

Project Team

• Client: Barbara Radloff, RN: Sr. Management Consultant
• Coordinator: Sam Clark: Senior Management Engineer
• Student Team
  – Nick Hamm
  – Brian Nichols
  – Suzanne Poprawa
  – Ryan Sheils

Introduction

• Cardiovascular Center (CVC) is scheduled to open Summer 2007
• CVC is predicted to put increased pressures on current Transportation staff, Nurses and SWAT (Specialized Workforce for Acute Transportation)

Background

• Patients will be moving daily to and from CVC, Emergency Department, University Hospital inpatient floors, and other locations
• Distances traveled by patients will increase by several times
Comparison of Current / Future Routes

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Goals & Objectives

- Determine the future transportation needs for the CVC
- Identify CVC transportation attributes:
  - Estimated Daily Volumes
  - Staffing Requirements
  - Length of Route
  - Transportation Travel Times

Source: University Hospital and Cardiovascular Center Floor Plans
Primary Operating Entities
• Clinical Nursing Staff
• Transportation Staff
• Departmental Technical Staff

Affected Departments
• UH & CVC Inpatient Floors
• Emergency Department
• CVC Cath & EP Labs
• CVC Interventional Radiology
• CVC Operating Rooms
• CVC Echo and EKG
• SWAT Transportation
• University Hospital Radiology
• Survival Flight

Key Issues
• Traveling Times
• Patient Volumes
• Staffing Requirements
• Transportation Method
• Implementation of Alternate Routes

Project Scope
• Included in Project
  – CVC Related Transportation
  – Inpatient and Admitted Patients
• Excluded from Project
  – Outpatient Transportation
  – Activity After First Fiscal Year of Operation
  – Waiting Time for Transportation
Approach

- Interviewed 10 Managers and Staff
  - Frank Knapsky, Director, Patient Transportation
  - Debra Cobb, Manager, Patient Transportation
  - Nancy Mamolen, Nurse Manager, ED
  - Matthew Green, S.W.A.T. Nurse
  - Jodi Mowry, Nurse Specialist, 4BC and TICU
  - Laurie Hartmann, Nurse Manager, TICU
  - Joan McNeilce, Nurse Manager, 4BC
  - Mary S. LeMire, Technical Coordinator, Echo
  - Kevin McHugh, Technical Coordinator, EKG & Stress Test
  - Judy Burke, Supervisor, Patient Transportation

Approach

- Projected Trip Times To & From CVC
  - Measured Future Distances Using UH and CVC Floor Plans
  - Elevator Time Study
  - Stretcher Time Study
  - Wheelchair Time Study

Approach

- Projected Transportation Volumes
  - TICU and CICU Transfers & Admissions
  - Cath Lab and EP Lab Volumes
  - OR and IR Volumes
  - ECHO & EKG Volumes
  - ED Admissions

Current Situation

- 61 FTE Transport Staff
- 57 CVC Related Patient Transports a Day
- 4 Operating Room Beds on Level 1
- 14 TICU Beds on Level 4
- TICU Next to Step Down Unit at 4BC
- Takes Less Than 1 Minute to Transport Between TICU and 4BC
Findings

• Interviews
  - Transportation Department Managers
    • Currently 61 FTE’s (including approximately 9 dispatchers)
    • Transportation Department Standards
      – Average transport time = 17.35 minutes
      – Target number of transports = 20 transports per transporter per day
      – Hours of productive time = 6.5 hours of work per day
  - 4BC and TICU Managers
    • Currently TICU and step down clinic 4B are located right next to each other
    • When TICU moves to CVC, nurses rather than a tech person, may have to transport patients across hospital
  - Cardiology Diagnostics Managers
    • SCHO and 2KG manage own transport and have 1 dedicated transporter
    • ECHO is portable, but weighs 450 lbs
    • Have STAT Call Response Time Goal of 10 Minutes

• Interviews
  - S.W.A.T. Transport Staff
    • Currently have 9 FTEs (3 just added)
    • Transport patients for surgery and assist operations
    • Complete on average 4500 total transports a year
    • Completed 474 CVC related transports in 2005, while there were 605 requests

Findings

• Time Studies
  - Performed time studies with stretcher and wheelchair on actual transportation routes
    • Mean speed for pushing a:
      – Stretcher = 2.23 miles per hour
      – Wheelchair = 2.19 miles per hour
    • Sample sizes of 40 trials
      – Each member conducted 10 trials runs
  - NIOSH Standard
    – Standard speed for pushing a stretcher is about 2.1 MPH
Findings

- Elevator Time Study
  - Studied waiting and trip times of East and West Elevators
  - Average total trip time was 2 minutes 11 seconds

Source: Collected Data, Week Feb 12-19, 2006
Sample Size = 48 Elevator Runs

Findings

- Route Lengths
  - Route distances were calculated from floor plans of UMHS and CVC
  - Routes followed approved patient transportation hallways
  - Routes were determined by the optimal distance

Source: UH & CVC Floor Plans

Findings

- Transfer Volume Data
  - Projected increase of 10% for NID, CPU and CVICU

Source: Historical Data, Calendar Year 2005

Zone to Zone Distances

Source: UH & CVC Floor Plans
Findings

• Transportation Travel Times
  - Two main components determine travel times
    • Time it takes to move patient (Zone to Zone standards)
    • Time it takes to load/unload patient
  - Calculating time to move patient
    • (Stretcher Speed * Distance) + (# of Elevators * 2.18 minutes)
  - Calculating time to load/unload patient
    • Average total travel time – zone to zone standards
    • Average load/unload time is 16 minutes

Total Transport Time Breakdown

Source: Patient Transportation Historical Data, 3/05 – 3/06
Sample Size = 20,430 transports

Analysis

• Data Analysis
  - 1.0 FTE of Transportation Staff = 1495 Hours
    Annual Work Time
  - Calculations
    » (2080 – 240)*6.5 / 6 = 1495
    » 2080 = Total hours available to work in a year
    » 240 = PTO a year: Includes vacation and sick days
    » 6.5 = Hours of work done in a shift
    » 8 = Hours in a shift

Source: Route Lengths and Time Studies
Conclusions

- Nursing Staff Workload
  - CVC 4 Transfers to LH Floors
    - Projected 1192 annual transfers from ICU to other floors*
    - Projected 235 Hours annually in increased ICU Nursing Workload
    - Average increase of travel time is 12 minutes

  *Based on 840 Annual ICU Transfers and 10 Bed Increase

- Patient Transportation Projected CVC-Related Workload =
  - Travel Time Increase = 2.33 FTE
  - Unload/Load Increase = 0.77 FTE
  - Net Increase = 3.10 FTE

Analysis

- Calculating Projected Additional Workload
  - Workload = Projected Volume\(^*\) \times (Travel Time + Load/Unload Time)
  - FTE Increase = Workload Increase (Hours)
  - 1495 (Hours per FTE)
Recommendations

- Increase Patient Transportation Staff by 3.1 FTE
- Re-examine utilization of SWAT once new members are trained
- Deliver projected travel times to Clinical Departments to determine workload increase

Expected Outcomes

- Smooth Transition for Patient Transportation as CVC opens
- Increase of Patient Transportation Staff
- Efficient and Safe Transportation

Questions?

Thank you for your time. Are there any questions or comments?