Mott Post Anesthesia Care Unit Patient Flow and Assistive Personnel Support
Final Report

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EXECUTIVE SUMMARY

Introduction

The C.S. Mott Children’s Hospital (Mott), which is part of the University of Michigan Health Systems (UMHS), has recently experienced long wait times in moving patients into and out of the Phase 1 Post Anesthesia Care Unit (PACU). The staff of the PACU consists mainly of nurses who are responsible for administering primary care to the patient, and Medical Assistants (MAs), who are qualified to assist nurses with certain medical and supportive tasks.

Background

Currently, patients wait a long time to enter and exit Phase 1 of the PACU, which is attributed to two factors: a perception of inadequate staffing of MAs in Phase 1 and subjective adherence to transfer criteria that determine how much recovery time a patient spends in Phase 1. The nurse manager of the Mott OR and PACU asked an IOE 481 student team to quantify an MA’s patient care workload in Phase 1, determine the amount of variability in the criteria nurses utilized to transfer patients from Phase 1, and offer recommendations that would provide optimal patient throughput by maximizing MA utilization and determining “best nursing practices” to make patient transfer criteria standardized.

Methods and Findings

The primary participants in this project include charge nurses, registered nurses, medical assistants, clerks, and patients. To identify the general structure, processes, and tasks in the phases of the PACU, the team interviewed 14 PACU nurses and 4 MAs, and documented the following:

- Current flow of the process
- Qualitative information regarding tasks of MAs and nurses
- Workload distribution
- Staff perceptions of their tasks

Using this information, the team conducted time studies on different tasks performed by nurses and MAs, shown in Appendix E, on patient cases (N=121 patient cases) within Phase 1 of the PACU and collected patient transport data (N=122 transports), shown in Appendix C, over a two month period.

The analysis of the time studies and patient transport data accentuated a number of findings on nurse’s best practices and emphasized several issues within the Phase 1 PACU identified below:

- The average case time for patients in Phase 1 is 56.9 minutes
- Criteria for moving patients out of Phase 1 are not standard between nurses
  - Three nurses hold patients for significantly longer times than the average
  - Five nurses hold patients for significantly shorter times than the average
- MAs are not performing the 8 patient care related tasks observed in time studies (outlined in Appendix E) for which they are qualified 51.4% of the time
Key findings from the analysis performed on patient transport data consisted of the following:

- An average of 16.2 patient transports to the Nursing floor per day, each of which takes an average of 13.2 minutes
- RNs currently spend over 78 minutes per day assisting with patient transports from PACU Phase 1 when not necessary

Conclusions

Several conclusions were drawn based on the key findings, which are outlined below:

- Current MAs are loaded with too many tasks, resulting in them being unavailable to perform MA tasks consistently
- MAs are currently underutilized primarily because nurses are not aware of all the MA tasks. This lack of awareness also results in nurses being overworked as they perform MA tasks
- Criteria for moving patients out of Phase 1 is not standard between nurses
- There are no significant delays between the time parents are called and their arrival in Phase 1

Recommendations

General Recommendations
The recommendations outlined below will maximize the utilization of MAs, create standardized nursing practices, and increase patient throughput by implementation of the following:

- Educating nurses on tasks that MAs are qualified to perform
- Monitoring RNs with lowest case times; identify “best practices” to implement
- Creating more defined MA schedules; scheduling MAs to specific areas and timeframes within those areas
- Defining the role of the Unit Host, and ensuring that tasks being performed are not out outside of position’s requirements
- Exploring MA utilization in Phase 2
- Utilizing MAs for patient transfer when patients are not on a monitor

Alternative Solutions
From the analysis performed on the data, the team developed two alternative solutions to improve the Phase 1 PACU patient recovery process. The first is to hire additional MAs, and would improve the Phase 1 process by:

- Increasing MA availability to assist nurses
- Increasing focus on patient care since more MAs are available
- Reducing dependency of nurses to assist with patient transports
- Staffing schedules would be more consistent and reliable
The second alternative solution is to hire more assistive personnel to relieve MAs of some non-medical tasks. This solution improves the Phase 1 PACU patient recovery process by:

- Increasing MA availability to assist nurses
- Increasing patient focus from MAs since they will be less occupied by non-patient care tasks
- Reducing dependency of nurses to assist with patient transports
- Reducing costs (more cost effective than hiring MAs)

**Expected Impact**

The implementation of the recommendations will make nurses more aware of what MAs are qualified to do, increasing the utilization of MAs within Phase 1 PACU. The five nurses that have the lowest case time will be monitored, and used as a model for the “best nursing practices” for the other nurses in the PACU. The standardization of nursing practices will reduce the variability in the criteria nurses utilize to transfer patients from Phase 1, and provide optimal patient throughput.

The current MA utilization in patient cases and patient transports from Phase 1 is 172.6 minutes per day. The improved MA utilization in patient cases and patient transports will increase to 334.5 minutes per day. When comparing the current to the improved scenario, MA’s utilization within patient cases in Phase 1 and patient transports will increase by 93.8%, corresponding to an increase of 162 minutes per day. By implementing the recommendations to properly use MAs within Phase 1, the utilization of MAs in Phase 1 will be optimized.
INTRODUCTION

The C.S. Mott Children’s Hospital (Mott), which is part of the University of Michigan Health Systems (UMHS), has recently experienced long wait times in moving patients into and out of the Phase 1 Post Anesthesia Care Unit (PACU). The PACU consists of two phases: Phase 1 and Phase 2. These phases are differentiated by the level of care administered to the patient. The staff of the PACU consists mainly of nurses and Medical Assistants (MAs). Nurses are responsible for administering primary care to the patient, while MAs are qualified to assist nurses with certain medical and supportive tasks.

The long wait times to enter and exit Phase 1 of the PACU are attributed to two factors: a perception of inadequate staffing of MAs in Phase 1, which is thought to have led to overworked nurses who have had to perform tasks that could be performed by MAs; and subjective adherence to transfer criteria that determine how much recovery time a patient spends in Phase 1. This second factor seems to create much variance in the amount of time patients spend in PACU phases as well as how long families wait to see a patient. Mott has a guiding principle of Patient Family Centered Care (PFCC), and the current scenario in Phase 1 is not supportive of this mentality.

The nurse manager of the Mott OR and PACU asked an IOE 481 student team to quantify an MA’s patient care workload in Phase 1. She also requested a workload analysis of the Phase 1 recovery area. After accomplishing both tasks, the team sought opportunities to potentially shift some tasks from nurses to MAs.

Accordingly, the IOE 481 student project team has derived recommendations to improve throughput in Phase 1 of Mott PACU. The team has prepared a swim lane diagram for the processes in Phase 1. Based on the workload analysis results and process map, the team has quantified the need for additional MAs. The purpose of this report is to present the team’s findings and final recommendations regarding PACU Phase 1.

BACKGROUND

Phase 1 of the PACU is the primary recovery area for patients recovering from anesthesia administered in both Mott ORs and off-site locations. After Phase 1 care, patients are either transferred to nursing floors or Phase 2 PACU, or are discharged to home. The distribution of patient cases within Mott is depicted in Appendix A. Figure 1 shows a simplified visual representation of the process flow of Mott OR/PACU cases.

![Figure 1: Patient Flow in Mott](image)

Phase 1 PACU patients represent 86% of all cases from Mott operating rooms (OR) and off-sites/MRIs. Mott has recently experienced delays in patient transfers into and out of Phase 1.
These delays are due to two main factors. First, nurses’ complaining of increased workload has created a perception of inadequate MA staffing in Phase 1. Second, subjective adherence to criteria required for transfer out of Phase 1 keeps some cases in Phase 1 longer than necessary. This factor also correlates to Mott’s perception of delays in family arrival to Phase 1, which keeps in line with the PFCC principle.

**Current Scenario**

Mott currently operates two phases in the PACU, differentiated by the level of patient attention needed. Nurses and MAs use guidelines (Appendix B) provided by the American Society of Perianesthesia Nurses (ASPN) to determine the appropriate number of medical staff.

**Workflow**

Anesthesiologists and supporting surgical staff hand off patients who are still under the effects of anesthesia to Phase 1 nurses and MAs. ASPAN guidelines state that these patients in Phase 1 generally require a 1:1 nurse-patient ratio. However, in certain scenarios, patients in Phase 1 may have a 1:2 nurse-patient ratio, so long as MAs or family member(s) are present to observe the patient. Phase 1 consists of 8 patient bays, with the ability to expand to 10 during times of high patient volume.

After Phase 1 recovery, in-patients are usually transferred back to nursing floors or other units. Out-patients, though, who are further along in recovering from anesthesia (which usually requires some time in Phase 1) are brought to the next stage of PACU recovery, Phase 2. The ASPAN guidelines recommend that Phase 2 patients have a 1:2 nurse-patient ratio. In certain scenarios, patients in Phase 2 may have a 1:3 nurse-patient ratio as long as MAs or family member(s) are present to observe the patient. Phase 2 consists of 9 patient bays, 3 of which have chairs for nurses or family members to hold recovering infants.

Patients recover further while in Phase 2 and are generally given discharge instructions before being sent home.

**Staff**

The PACU staff consists mainly of nurses and MAs. Nurses administer primary care to the patient, while MAs are qualified to only assist nurses with certain medical tasks.

**Concerns**

A perception among the personnel is that an inadequate number of MAs staff the PACU. In the absence of sufficient MAs, nurses are required to perform MA tasks, increasing nurse workload. In certain situations in Phase 1, two medically qualified personnel are required to care for one patient. When not enough MAs are available, two nurses must fill this role, delaying the assisting nurse from taking on a new patient.

Another perception is that MAs are currently not utilized to their full potential. The MAs are qualified to perform medical tasks, which are detailed in the ASPAN guidelines. Due to the
perception that MAs are understaffed, MAs are currently not assigned additional medical tasks that they are qualified to perform.

If bays or nurses are unavailable when anesthesiologists and surgical staff are ready to bring patients to the PACU, patients wait in the operating rooms, which can delay subsequent surgeries.

Nurses determine when patients are transferred out of Phase 1 or are switched to a 1:2 nurse-patient ratio. Subjective adherence to transfer criteria or nurse-patient ratio switching criteria is suspected. This subjective adherence results in nurses taking varying amounts of time caring for patients in Phase 1. The nurse also determines when patients may see their families. The nurses’ subjectivity in this role leads to the suspicion of inconsistencies in how long families wait before seeing patients.

Key Issues

The following key issues are currently affecting the processes in the Mott PACU:

- A perception of inadequate number of MAs staffing Phase 1, which is increasing workloads for nurses.
- A perception of underutilization of the MAs in Phase 1, which contributes to the workload of nurses.
- The subjective adherence to criteria regarding patient care results in patients spending varying proportions of recovery time in the PACU phases, possibly impeding patient flow in Phase 1 of the PACU.
- The subjective adherence to criteria regarding patient care results in varying times before families are called to see a patient, possibly inconveniencing patients and their families.

Project Scope

This project included only the tasks performed by nurses and MAs in the PACU’s Phase 1 and Phase 2 recovery areas. The PACU recovery process begins when the patient arrives to the PACU phases. The tasks performed in both PACU phases and the patient transfers from Phase 1 were analyzed. The transporting of the patient out of the PACU phases was also analyzed. The process ended after the patient was transferred out of Phase 2.

Activities performed outside of Phases 1 and 2 were not included in this project. This specifically entails pre-op, operating, and discharge, whose procedures and activities were not examined for this project. The actual medical care given to patients was also not included in this project. However, findings and recommendations from this project could benefit projects in similar areas of medical care.
GOALS AND OBJECTIVES

To optimize the processes in the Mott PACU, the team worked to achieve the following goals:
- Determine the tasks in Phase 1 that nurses currently perform, but may be transferred to MAs
- Determine the optimal number of MAs required to perform the transferred tasks
- Establish a unanimously accepted set of criteria that facilitate the timely transfer of patients into various levels of care
- Reduce the amount of time families must wait to meet patients in the PACU recovery phases

To achieve these goals, the team has formulated the following objectives:
- Document the tasks performed by the staff (nurses and MAs) when a patient is recovering in either phases of the PACU
- Identify the tasks that MA’s are qualified to perform
- Determine the average amount of time spent and the average number of times staff performs certain tasks in Phase 1
- Redistribute workload and assign feasible tasks to MAs
- Identify criteria to transfer patients into different levels of patient care and to permit families to see patients

METHODS AND FINDINGS

The primary participants in this project include charge nurses, registered nurses, medical assistants, clerks, and patients. To identify the general structure, processes, and tasks in the phases of the PACU, the team interviewed PACU nurses and MAs. Next, the team collected and analyzed data, which was used to identify the tasks performed and to quantify the associated times. The specific methods used for data collection, and their respective findings are detailed below.

Staff Interviews

The team interviewed 14 nurses and 4 MAs for approximately 30 minutes each on October 5-6, 2010. The questions appear in Appendix C. The interviews were used to understand PACU general procedure and staff roles.

From the interviews the team documented the following:
- Current flow of the process
- Qualitative information regarding tasks of MAs and nurses
- Workload distribution
- Staff perceptions of their tasks

The team found from the nurse interviews that a majority of the nurses are open to utilizing MAs more, but are unsure how to go about giving the MAs more responsibilities. The nurses
indicated that if MAs’ abilities were clearer, delegating tasks would be easier. Nurses also voiced that one of the most time consuming tasks is transporting patients out of Phase 1. This task often requires more than one nurse or MA and the transport time varies depending on the destination.

MAs revealed in their interviews that they feel their medical training is being underutilized. They also expressed that currently, most of their workload is weighted heavily on tasks that are not patient-care focused. They indicated that they would like to perform the more patient-care oriented tasks for which they are qualified.

**Time Studies and Workload Analysis**

The team performed 60 hours of time studies and observations over 4 weeks starting October 21, 2010. The team collected the data during working hours ranging from 8am – 5pm in Phase 1 of the PACU. The following items were monitored:

- Patient arrival and exit times from the PACU
- Patient’s case information (complexity, ASA score, special needs)
- Anesthesiologist exit time
- Tasks MAs can perform and times associated with each task
- Type of staff that prepared the bay prior to patient arrival
- Number of bays in use in Phase 1 at patient arrival
- Time at family call to PACU and family arrival time into PACU
- Patient’s condition when family is called
- General observations of the Phase 1 process

The team had two objectives for these time studies and observations: 1) to identify how MAs are utilized in a Phase 1 patient’s recovery process and 2) to understand the recovery process, so that a process map could be developed.

**MA Utilization**

For tasks MAs are qualified to perform (outlined in Appendix B), the team recorded how long the task takes, whether or not an MA was available to perform the task, and if an MA was available, if he/she was utilized. This information was recorded in the Phase 1 Data Collection Sheet (Appendix E) and is summarized in Table 1 below.
Table 1: MA Tasks, Availability, and Utilization

<table>
<thead>
<tr>
<th>Task</th>
<th>Times performed</th>
<th>Performed by MA?</th>
<th>If not, why?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Taking Vitals</td>
<td>89</td>
<td>55.1%</td>
<td>44.9%</td>
</tr>
<tr>
<td>IV Help</td>
<td>24</td>
<td>41.7%</td>
<td>58.3%</td>
</tr>
<tr>
<td>Pain Help</td>
<td>6</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Care/Comfort Help</td>
<td>51</td>
<td>41.2%</td>
<td>58.8%</td>
</tr>
<tr>
<td>Nausea/Suction Help</td>
<td>17</td>
<td>35.3%</td>
<td>64.7%</td>
</tr>
<tr>
<td>Food/Fluid Help</td>
<td>21</td>
<td>47.6%</td>
<td>52.4%</td>
</tr>
<tr>
<td>Seizure Help</td>
<td>3</td>
<td>33.3%</td>
<td>66.7%</td>
</tr>
<tr>
<td>Blankets</td>
<td>44</td>
<td>54.5%</td>
<td>45.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>255</strong></td>
<td><strong>48.6%</strong></td>
<td><strong>51.4%</strong></td>
</tr>
</tbody>
</table>

Table 1 indicates that MAs did not perform tasks they are qualified to perform 25.9% of the times due to unavailability, and 25.5% of the times due to underutilization. These findings further support the initial perception that MA’s are overworked, as indicated by the amount of times they are unavailable, and underutilized, supported by the amount of times MAs are available and not utilized.

The Phase 1 data collection sheet also aided in determining the ideal amount of MA time required for patient care per case, and the actual amount of MA time utilized for patient care per case. This box plot of this data is provided in Figure 2.

![Boxplot of MA Assistance per Case](image)

**Figure 2**: Box plot of MA assistance per case

*Figure 2 indicates that the average amount of MA time required per case is approximately 4.50 minutes, with a standard deviation of 4.33 minutes. The average amount of time MAs are performed.*
utilized per case is approximately 2.17 minutes with a standard deviation of 3.33 minutes. The average case time was 56.90 minutes. Since Phase 1 takes on an average of 44.5 cases per day, MAs are currently being utilized for 96.57 minutes per day for patient-care tasks. This amount of time MAs are utilized is much lower than the time that they should be utilized for, which is 200.25 minutes per day.

While performing the time studies the team also made several observations about MAs and their role in Phase 1. These observations are listed below.

- MAs working in the PACU are not scheduled to work in a certain Phase, Phase 1 or Phase 2.
- MAs generally work in the Phase that they prefer
- MAs were often pulled to assist in random areas where there was an immediate need
- On average, there was 1 MA working on patient care tasks in Phase 1
- Several of the MAs and assistive personnel observed were temporary employees, as opposed to full time employees
- There is a discrepancy between the unit hosts’ job description and the tasks they performed
- Unit hosts often performed tasks outside of their realm of responsibilities

**Parent Call Time Study**

The Phase 1 data collection sheet also contained information regarding times of interactions with patients’ parents. These interactions included the following:

- Start time of call to parents while the patient was in Phase 1
- Time of parents’ arrival to Phase 1
- Time of patient’s exit from Phase 1

These data points helped the team identify the proportion of times in which 1) parents arrived while the patient was in Phase 1, and 2) parents arrived after the patient was moved out of Phase 1. This data is displayed in Figure 3.
The results from the time study indicate that 93% of the time, parents arrived while the patient was in Phase 1. An average of 6.20 minutes with a standard deviation of 3.15 minutes separated parent call from their arrival. This time spent waiting for parents to arrive accounts for 10.9% of an average case time.

During this time study the team learned from the nurses that they generally prefer to wait awhile before calling the parents into Phase 1. Nurses prefer to wait because they would rather be sure that the patient is in a stable condition before parents arrive, since parents tend to become a distraction to nurses’ care for parents. The time study data showed that on average the time between patient arrival into Phase 1 and parent call is 35.00 minutes with a standard deviation of 23.30 minutes.

**Observed Patient Transfer Criteria of RNs**
During observation of the Phase 1 PACU, the team determined certain criteria utilized by RNs which determined when the patient was ready to be transferred to the nursing floor. Whether the patient’s parents were called up or not, the criteria followed is listed below (there were rare cases in which the RNs implemented their own criteria):
- Patient had a stable airway
- Patient was coherent and able to converse with the RN
- Patient was awake
- Patient had received Anesthesia “sign-off” (sometimes done at Anesthesia hand-off upon patient arrival into PACU)

**Phase 1 Recovery Swim Lane Process Map**
Through observation the team identified the steps in the Phase 1 patient recovery process. This process was mapped in a swim lane diagram (Appendix F). The major components as seen from a patient or third party’s view were included. Several conclusions were drawn during composition of this diagram and from the final product.

1. *An MA never takes control of the process; he or she is only an aide.*
   This fact created difficulty in accurately determining how MAs spend their time, because they never follow a specific process but rather complete random tasks.

2. *Process flow, Nurse, MA, and other assistive personnel (i.e. Nurse Aid) availability are very random.*
   Nurses often require aid in caring for their patients, and they call upon other nurses, MAs, or other assistive personnel—whoever is available. This random selection greatly affects the process flow throughout the PACU as those three roles have very different tasks to complete normally, but they are not always focused solely on those tasks. The random task completion for all three roles also made finding quantitative information on how MAs spend their time difficult.

**PACU Phase 1 Patient Transportation Log**
Many nurses expressed that they felt transporting patients kept them away from Phase 1 for too long. Therefore, the team asked the Phase 1 Charge Nurse to record transportation data for
Phase 1 exits on the PACU Phase 1 Patient Transportation Log (Appendix D). These data assisted in determining if both the nurse and MA resources were being utilized properly for transports. Data from the log also helped in driving recommendations to improve the transportation process. The following data were included in the log:

- Transport destination
- Number of nurses and MAs involved in the transport
- Whether the patient is on a monitor
- Exit time
- Staff’s return time
- Total length of delay(s)
- Reason for delay(s)

The staff collected data for four weeks; a total of 122 cases observed. Unfortunately, not all 122 cases could be utilized because some were missing information, and therefore had to be excluded from the analysis. Table 2 displays the number of transports in which a patient was or was not on a monitor, which determines whether or not a nurse needed to be present during the transport. This information was used to determine the correct utilization of the nurses.

<table>
<thead>
<tr>
<th></th>
<th>2 RNs</th>
<th>1 RN, 1 MA</th>
<th>1 RN</th>
<th>Total Proportions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Monitor</td>
<td>1.6%</td>
<td>18.9%</td>
<td>10.7%</td>
<td>31.1%</td>
</tr>
<tr>
<td>On Monitor</td>
<td>10.6%</td>
<td>51.6%</td>
<td>6.6%</td>
<td>68.9%</td>
</tr>
<tr>
<td><strong>Total Proportion</strong></td>
<td>12.3%</td>
<td>70.5%</td>
<td>17.2%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows that 31.1% of transports did not require a nurse since the patient was not on a monitor, and 10.6% of the time, 2 RNs were used to transport a patient on a monitor due to lack of available MAs or nurses unaware that MAs could perform the transport (none of the transport cases required 2 RNs because of complexity). For these cases, other assistive personnel could have been utilized. Also, there are an average of 16.3 patient transports from Phase 1 to the Nursing Floor per day (based on April – September 2010 data).
Table 3 summarizes the average transport time stratified by day of the week and the staff members involved in the transport.

<table>
<thead>
<tr>
<th>Day of Week</th>
<th>2 RNs</th>
<th>IRN, 1MA</th>
<th>1RN</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>12</td>
<td>12.14</td>
<td>12.67</td>
<td>12.27</td>
</tr>
<tr>
<td>Tuesday</td>
<td>No data</td>
<td>12.93</td>
<td>15.67</td>
<td>13.41</td>
</tr>
<tr>
<td>Wednesday</td>
<td>11.33</td>
<td>14.25</td>
<td>11.6</td>
<td>12.90</td>
</tr>
<tr>
<td>Thursday</td>
<td>15.00</td>
<td>13.64</td>
<td>14.00</td>
<td>13.76</td>
</tr>
<tr>
<td>Friday</td>
<td>10.67</td>
<td>14.47</td>
<td>15.00</td>
<td>13.75</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>11.42</td>
<td>13.25</td>
<td>13.1</td>
<td><strong>13.22</strong></td>
</tr>
<tr>
<td>St. Deviation</td>
<td>2.81</td>
<td>4.47</td>
<td>3.37</td>
<td>4.13</td>
</tr>
</tbody>
</table>

Table 3 shows that the average transport trip takes 13.22 minutes. The longest transport times take place on Thursdays and Fridays. Also, the transport trips that involve a nurse and an MA takes the longest in comparison to having one or 2 nurses. From Tables 2 and 3 above, the team determined that nurses currently spend over 78 minutes per day assisting with patient transports from PACU Phase 1 that do not require their assistance. This additional 78 minutes of transports being performed by nurses can be transferred over to MAs to perform.

**PACU Phase 1 Patient Hold Times**

The team is not qualified to determine the medical criteria currently followed by nurses to determine how long patients are held in Phase 1. Hence, the team focused on analyzing available data to determine if the patient hold time in Phase 1 varied by nurse. The team was provided with the raw data from ‘Centricity’, the software currently used by Mott to record patient arrival and exit times, along with many other variables related to patient care. The data consisted of all the cases from January 1, 2010 to November 11, 2010.

The basic entity in the provided dataset was the patient, and the data provided attribute variables related to various stages of the patients’ stay at Mott. The team chose to concentrate on the following variables:

- Surgical procedure performed
- Time patient entered Phase 1
- Time patient exited Phase 1
- Phase 1 nurse responsible for patient’s care

The data provided some challenges prior to analysis, and the team modified the data to ensure the data analysis was reliable. A description of the modifications is provided in Appendix G. The modified data was subject to an ANOVA test to determine whether the Phase 1 nurse was a significant factor affecting the patient hold time in Phase 1. The results of the ANOVA test are
provided in Appendix G. The ANOVA test indicated that the Phase 1 nurse was a significant factor affecting the patient hold time in Phase 1.

The ANOVA test was followed up with an ANOM test to determine the number of nurses with significantly different patient hold times. The ANOM test is displayed in Figure 4.

![ANOM test for Patient Hold Time](image)

**Figure 4**: ANOM test for Patient Hold Time  
*N = 8195 patient cases, IOE 481 Team 2, January 1 - November 11, 2010*

Data points in red represent nurses that have hold times that are significantly different (longer or shorter) from the overall average. Data points in black represent nurses that have hold times that are not significantly different from the overall average.

The results of the ANOM test indicate that there are 3 nurses that are holding patients for significantly longer times than the overall average. The results also show that there are 5 nurses holding patients for significantly shorter times. These results suggest that subjective adherence to criteria in releasing patients from Phase 1 exists.

**Key Findings**

From the data collection phase, the team has identified the following key findings:

**MA Utilization**
- Nurses are not informed about the tasks that MAs are qualified to perform
- For a large proportion of their time in Phase 1, MAs are performing non-patient care related tasks that could potentially be performed by non-medically trained staff members
• MAs are not performing patient-care related tasks for which they are qualified for 51.4% of the time
  o Not available 25.9% of the time
  o Not used 25.5% of the time
• The average case time is 56.90 minutes
• MAs are currently utilized for an average of 2.16 minutes per case; this average represents 3.8% of the average total case time. Ideally, MAs can be utilized for 4.55 minutes per case (200.25 minutes per day), which represents 8% of the average total case time

MA Availability
• MAs working in the PACU are not scheduled to work in a particular area such as Pre-Op, Phase 1 or Phase 2
• The tasks for the Unit Hosts are not clearly defined, yielding a high percentage of time the Unit Hosts performs tasks that are outside of their job scope
• Nurses currently spend over 78 minutes per day assisting with patient transports from PACU Phase 1 when not necessary
  o Nurses assist in patient transport when patient is not on monitor 31.1% of the time
  o Two nurses assist in patient transport when patient is on a monitor 10.6% of the time (no transport cases required 2 nurses because of complexity)
• The average transport takes 13.2 minutes
• The average amount of transports per day from Phase 1 to the Nursing Floor is 16.3
• The team is not medically qualified to set standard criteria for patient transfers out of Phase 1

Parent Call
• 7.2% of the time parents arrive after the patient is moved out of Phase 1
• The average time between patient arrival and parent call is 35.00 minutes. This indicates that parents are waiting 61.4% of the time after the patient arrives in Phase 1
• The average time between a parent call and their arrival is 6.20 minutes, which is 10.9% of an average case time

Subjective Adherence to Patient Transfer Criteria
• The nurse responsible for the patient’s care in Phase 1 is a significant factor affecting the amount of time the patient spends in Phase 1
  o There are three nurses that are holding patients for significantly longer times than the overall average
  o There are five nurses holding patients for significantly shorter times than the overall average
CONCLUSIONS

From the key findings the team formulated four main conclusions. These conclusions are listed below in order of importance.

- Current MAs are loaded with too many tasks, resulting in them being unavailable to perform MA tasks consistently.
- MAs are currently underutilized primarily because nurses are not aware of all the MA tasks. This lack of awareness also results in nurses being overworked as they perform MA tasks.
- Criteria for moving patients out of Phase 1 are not standard between nurses.
- There are no significant delays between the time parents are called and their arrival in Phase 1.

The conclusions the team developed addresses the key issues that were identified prior to the beginning of the project. Each conclusion is discussed in detail below.

*Current MAs are loaded with too many tasks, resulting in them being unavailable to perform MA tasks consistently.*

From the interviews and observations, the team discovered that a majority of a current MA’s workload is focused on non-patient care tasks. Accordingly, little emphasis is placed on their medical training and aiding nurses with patient care. This conclusion is also supported by the workload analysis that identified 25.9% of the time MAs did not perform MA tasks due to unavailability. The team also found that since there was not a clear distinction as to which areas MAs were assigned to work in, they were often away performing a task from random areas within the PACU.

*MAs are currently underutilized primarily because nurses are not aware of all the MA tasks. This lack of awareness also results in nurses being overworked as they perform MA tasks.*

Nurses expressed in the interviews that they were uncertain of all the tasks that MAs are qualified to perform, resulting in them performing some of those tasks. The workload analysis data showed that 25.5% of the time MAs were not utilized for MA tasks even when they were available. Moreover, the transportation log findings indicated that 31.1% of all observed transports did not require a nurse to perform. Both findings further support that MAs are underutilized in Phase 1.

*Criteria for moving patients out of Phase 1 are not standard between nurses.*

The team identified from the observations that the nurses are not using the same criteria to determine when patients are ready to move out of Phase 1 (as displayed from the above Figure 4). There were three nurses that were holding patients longer than the average case time. There
were five nurses that had the fastest patient throughput. These five nurses possibly represent the those that utilize the best nurse practices within PACU Phase 1.

There are no significant delays between the time parents are called and their arrival in Phase 1. Currently, the average time from when patients’ parents are called to when the parents arrive is 6.20 minutes. This time between call and arrival is only 10.9% of an average case time. The team concluded that this percentage is too low to be identified as a delay in the process. Furthermore, parents called in Phase 1 were met outside of Phase 1 only 7% of the time. The team determined that this percentage is too low to conclude that nurses are waiting too long to call parents to Phase 1. Although the team identified the average time between patient arrival and parent call to be 35.00 minutes, the team is not medically qualified to determine if this time is a delay in the parent calling process.

RECOMMENDATIONS

From the conclusions the team formulated several general recommendations that would be a short-term solution to the key issues mentioned earlier. These recommendations are listed below.

- Educate nurses on tasks that MAs are qualified to perform
- Observe nurses with lowest case times; identify “best practices” to implement
- MA scheduling should be more defined; schedule MAs to specific areas and timeframes within those areas
- Explore MA utilization in Pre-Op and Phase 2

General Recommendations

These general recommendations will assist in promoting correct utilization of MAs in the current process. They are discussed in more detail below.

Educate nurses on tasks that MAs are qualified to perform
Informing nurses of tasks MAs are qualified for will resolve the problem of MAs being underutilized. Additionally, nurses will be more comfortable in having MAs transport patients that are not on monitors, which will alleviate some of the nurses’ workload.

Observe nurses with lowest case times; identify “best practices” to implement
The team determined that subjective adherence to criteria in releasing patients from Phase 1 does exist since nurses do have a significant effect on holding time for patients. By identifying and implementing best practices from nurses that have the fastest throughput in Phase 1, patient holding time in Phase 1 will decrease.
MA scheduling should be more defined; schedule MAs to specific areas and timeframes within those areas

MAs were often unavailable because they were away performing tasks for different areas within the PACU. As a result, when they were needed in Phase 1 they were not present to perform certain tasks. To help MAs be more available within Phase 1, they should be assigned specifically to a certain Phase.

Explore MA utilization in Pre-Operation and Phase 2

The scope of this project was limited to focusing on MA utilization for patient-care focused tasks in Phase 1 of the PACU. To determine how MAs are utilized and the adequate number of MAs needed in other areas of the PACU the team recommends that further studies be performed in those areas.

Main Recommendation Options

In addition to the general recommendations, the team developed two main recommendation options as long-term solutions to the key issues. The two options are 1) hire more MAs and 2) hire more assistive personnel (i.e. unit host) to help relieve MAs of some non-medical tasks.

Alternative 1: Hire more MAs

The team found that there is an inadequate number of MAs staffed in Phase 1. Hiring more MAs would increase MAs’ availability to perform MA tasks. Table 4 discusses the advantages and disadvantages of this option.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
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<tbody>
<tr>
<td>Decreases MA unavailability</td>
<td>More costly for Mott than using temporary employees</td>
</tr>
<tr>
<td>Higher patient care focus since there will be more MAs available</td>
<td>MAs are still responsible for a large amount of non-patient care focused tasks</td>
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<tr>
<td>Decrease in nurses transporting non-monitored patients</td>
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<tr>
<td>Reduce the amount of “Temp Hours” used</td>
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<tr>
<td>Staffing schedules would be more consistent and reliable</td>
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<tr>
<td>MAs are more versatile than temporary employees</td>
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</table>

Table 4: Advantages/Disadvantages of Alternative 1
Table 4 shows that the advantages for this alternative far outweigh the disadvantages. One of the main advantages associated with this alternative is that MA staffing schedules will be much more reliable, since an additional full-time MA position would replace some of the temporary positions.

**Alternative 2: Hire more assistive personnel to relieve MAs of some non-medical tasks**

Currently, MAs’ workload is heavily weighted on performing non-medical related tasks; the team proposes the hiring of more assistive personnel to help MAs with these types of tasks. Table 5 discusses the advantages and disadvantages of this option.

<table>
<thead>
<tr>
<th>Table 5: Advantages/Disadvantages of Alternative 2</th>
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<tr>
<td><strong>Advantages</strong></td>
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<tr>
<td>Decreases MA unavailability</td>
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<tr>
<td>Higher patient care focus since MAs will be</td>
</tr>
<tr>
<td>less occupied by non-patient care tasks</td>
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<tr>
<td>Decrease in nurses transporting non-monitored</td>
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<tr>
<td>patients</td>
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<tr>
<td>Less costly than hiring MAs</td>
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</table>

Table 4 and Table 5 show many overlaps in advantages associated with each alternative. However, for Alternative 2 Table 5 indicates that there are more disadvantages for this alternative. One of the main disadvantages being less medically trained staff available for patients. This disadvantage is highly significant since patient care is a top priority in the hospital setting.

**Expected Impact**

By implementing the team’s general recommendations and one of the main recommendation options, the team has estimated the expected impact of MA utilization within Phase 1. The details of the new expected MA utilization is discussed below.

First, the team compared how much time MAs are currently being utilized per patient case and compared that to the time that they can be utilized for. In the current state of the process, the average amount of time MAs are utilized per case is 2.17 minutes, with a standard deviation of 3.33 minutes. As indicated in Figure 2, the average amount of MA time required per case is 4.50 minutes, with a standard deviation of 4.33 minutes. There is currently an average of 44.5 cases per day in Phase 1. This results in an increased MA performance from 96.56 minutes to 200.25 minutes per day focusing on patient care.

Secondly, the team redistributed staffing personnel for patient transports. Currently, nurses unnecessarily assist with non-monitored patient transports 31.1% of the time (ASPN Guidelines indicate that nurse support for transports is only needed when patients are on a monitor or have special medical needs), and 5.3% of the time two RNs assist with patient
transport when on monitor (due to lack of MAs available). With an average transport count of 16.30 per day, the determined average of 13.22 minutes per transport, results in nurses spending over 78 minutes per day on transports when their expertise are not needed. Table 6 displays the correct utilization of MAs and nurses for transportation, which was determined by the ASPAN Guidelines.

<table>
<thead>
<tr>
<th></th>
<th>2 RNs</th>
<th>1 RN, 1 MA</th>
<th>1 RN</th>
<th>2 MAs</th>
<th>1 MA</th>
<th>Total Proportions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No Monitor</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>20.5%</td>
<td>10.7%</td>
<td>31.2%</td>
</tr>
<tr>
<td><strong>On Monitor</strong></td>
<td>N/A</td>
<td>62.2%</td>
<td>6.6%</td>
<td>N/A</td>
<td>N/A</td>
<td>68.8%</td>
</tr>
<tr>
<td><strong>Total Proportion</strong></td>
<td>0%</td>
<td>62.2%</td>
<td>6.6%</td>
<td>20.5%</td>
<td>10.7%</td>
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</tbody>
</table>

Given the above information, the correct MA utilization (comprised of MA transport and MA case time data) is shown below in Table 7, and is compared to the current MA utilization (displayed in minutes/day).

<table>
<thead>
<tr>
<th></th>
<th>Average Time/Day (mins)</th>
<th>Standard Deviation of MA Transport and Case Times/Day (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current MA Utilization</strong></td>
<td>172.6</td>
<td>7.46</td>
</tr>
<tr>
<td><strong>Improved MA Utilization</strong></td>
<td>334.5</td>
<td>8.46</td>
</tr>
</tbody>
</table>

From Table 7 above, the difference in total MA utilization from the current process to the improved process is 162 minutes per day. In order to correctly utilize MAs to their full potential, nurses should shift certain MA tasks that they have been performing because of MA unavailability back to MAs. With this new task distribution and by implementing the team’s recommendations MA utilization can be increased to its full potential.
APPENDIX A – Mott Case Distribution

IOE 481 Team 2, May 1, 2009 – April 30, 2010
Under the supervision of the perianesthesia RN, the competent perianesthesia support staff demonstrate knowledge, skills and behaviors to maintain a consistent level of practice. Recommended competencies may include but are not limited to:

1. Demonstrate appropriate communication skills.
2. Demonstrate appropriate actions and interventions in protecting patients' rights, confidentiality.
3. Demonstrate basic infection prevention and control practices.
4. Care of the patient.
   a. Basic Life Support.
   b. Basic airway support.
   c. Basic oral/nasal suctioning.
   d. Preoperative testing.
      1. Collection of a blood specimen.
      2. Collection of a urine specimen.
      3. Obtaining a twelve lead electrocardiogram.
5. Care of the patient on cardiac/pulse oximetry/pneumatic blood pressure monitors.
   a. Application of electrodes/probes/BP cuffs.
   b. Recognition of monitor alarms (ECG/pulse oximetry/BP).
   c. Notification of monitor alarms to RN.
   d. Measurement and reporting of vital signs (e.g., blood pressure, heart rate, respiratory rate, temperature, oxygen saturation).
6. Care of the patient with intravenous fluids.
   a. Recognition and notification of aberrant IV rate to RN.
   b. Recognition and notification of alarming IV pump to RN.
   c. Recognition and notification of infiltrated IV to RN.
7. Care of the patient requiring comfort measures.
   a. Identify reportable signs and symptoms related to pain and discomfort.
   b. Demonstrate use of pain scales and report scores to RN.
   c. Demonstrate measures used to provide patient comfort.
      1. Proper use of bed linens.
      2. Change patient position.
8. Care of the patient with nausea and vomiting.
   a. Positioning of patient.
   b. Basic oral suctioning.
   c. Provide mouth care.
9. Care of the patient receiving oral intake.
   a. Awareness of food and fluid restriction for the preanesthesia patient.
   b. Demonstrate correct method of providing oral fluids to the postanesthesia patient.
10. Care of the patient with drains, catheters.
APPENDIX B – ASPAN Guidelines

a. recognition and notification of hypothermia to RN.
   1. application of warm blankets.
   2. application of warming devices.
   3. monitoring of body temperature.
   4. discontinuance of warming devices.

b. recognition and notification of hyperthermia to RN.
   1. application of ice packs to “hot spots” (e.g., axilla and groin).
   2. application of cooling devices.
   3. monitoring body temperature.
   4. discontinuance of cooling devices.

12. Care of the patient with seizure disorder.
    a. positioning of patient.
    b. basic airway support.
    c. padding the sidérals

13. Care of the patient on continual antiembolism devices.

14. Care of the patient requiring assistance with ambulation.

15. Safe transport of the patient.

BIBLIOGRAPHY


This resource was reviewed and updated at the October 2007 meeting of the Standards and Guidelines Committee in Batesville, Indiana.
APPENDIX C – Interview Questions

Mott Nurse Interview Questions

Name:

Date:

1. What area do you primarily work in?

2. When a patient comes into PACU, what are the steps you take to provide care for the patient?

3. How do you currently use MAs?

4. Given the ideal world, if you had assistive personnel, how would you utilize them?

5. At what point in the process do you call the family up?
   
   a. When a call to the family is made, roughly how long does it take for them to get up?
   b. How often do you call the families up to the PACU?
   c. Do you ever have to call families up while in Phase 2?

6. What are the criteria you use to transport patients to PACU 2?
   
   a. What are the criteria you use to transport patients to the Nursing?
      
      i. When a patient is transferred to the floor, who is responsible for transporting the patient? How many people (nurses or MAs) are utilized to do this?
APPENDIX C – Interview Questions

**MA Interview Questions**

*Name:*

*Date:*

1. Please describe your understanding of your role as an MA in PACU.

2. What are the current things you are doing to help nurses in Phase 1 and Phase 2?

3. In an ideal world, what are some duties that you feel you could do to assist nurses further?

4. Do you feel you’re being utilized to your full potential?

5. How often are you asked to transport patients to the Nursing Floor?

6. Other
APPENDIX D – PACU Phase 1 Patient Transportation Log

MOTT POST-ANESTHESIA CARE UNIT – TRANSFERS FROM PHASE 1

Date: ______________

<table>
<thead>
<tr>
<th></th>
<th>Destination</th>
<th>#RNs, #MAs on transport</th>
<th>Patient on monitors?</th>
<th>Exit time</th>
<th>Return time</th>
<th>Total length of delays:</th>
<th>Reasons for delays</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
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<td>Y/N</td>
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# APPENDIX E – Phase 1 Time Study Data Collection Form

**MOTT POST-ANESTHESIA CARE UNIT – PHASE 1 DATA COLLECTION**

<table>
<thead>
<tr>
<th>Date:</th>
<th>Time in:</th>
<th>Time out:</th>
<th>Tasks performed by MA/MAA available (A)</th>
<th>did MA perform task? (F)(Time)</th>
<th>Other Observations</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Tasks completed before patient arrival</th>
<th>Case info</th>
<th>All required times</th>
<th>Patient condition at patient call</th>
<th>Arrival time:</th>
<th>Patient exit time:</th>
<th>(1-10)</th>
<th>Time @ call:</th>
<th>Time @ arrival:</th>
<th>(A)</th>
<th>did MA perform task? (F)(Time)</th>
<th>Other Observations</th>
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APPENDIX F – PACU Phase 1 Swim Lane Process Map

PACU Phase 1 Workflow

**Anesthesia**
- Transport patient from OR to predetermined bed in Phase 1
- Vital signs and other patient arrival activities

**RN s**
- Vital signs and other patient arrival activities
- General patient care
- Stable enough?
  - Yes: Controlled pain?
    - Yes: Recurring patient OR asked for parent OR waiting area?
      - Yes: Call for family
        - General patient care
        - Move patient from Phase I
        - Clean/prep bay (if no MA or UH available)
      - No: No
    - No: No
  - No: No

**MAs**
- Vital signs and other patient arrival activities (if needed and available)
- General patient care (if needed and available)
- General MA tasks (listed in "Phase I duties")
- Retrieve family if no volunteer or UH
- General patient care (if needed and available)
- General MA tasks (listed in "Phase I duties")
- Move patient from Phase I (if available, and patient does not require two RNs)
- Clean/prep bay

**Unit Host**
- Retrieve family if no volunteer
- Clean/prep bay if no MA available
APPENDIX G – Analysis and Results from Centricity Data

Data Modifications

The data provided some challenges prior to analysis, and the team modified the data to ensure the data analysis was reliable. The challenges in the data and the modifications to address them were as follows:

1. The only times available were the time of Phase 1 entry and Phase 1 exit. The difference of these times was calculated to determine the amount of time spent by the patient in Phase 1.
2. In some cases, there was more than one nurse that cared for the patient during their recovery in Phase 1. In such cases, the data only provided a single data point describing the time frame of each nurse that cared for the patient. The team was unaware of methods to convert the given data point into a numerical time difference. Also, the time of the nurse switch was random, and therefore difficult to model around. Hence the team attributed the entire duration in Phase 1 to the first nurse that cared for the patient.
3. There were a large number extreme of outliers that affected the validity of descriptive statistical measures. Hence, two iterations of outlier elimination were performed. The elimination involved purging all data points that were three standard deviations away from the mean. After the first iteration, the remaining data was subject to a second iteration of the same elimination. This resulted in elimination of all cases where patients spent greater than 217 minutes in Phase 1.
4. After the elimination, some nurses were not associated to a large enough number of cases to make conclusions about patient hold times. Hence nurses with fewer than 50 data points were also eliminated from our analysis.
5. The data contained over 3500 distinct surgical procedures, which also included data entry errors, which turned all incorrectly entered procedures into a distinct procedure. Therefore the team decided to ignore stratification based on surgical procedure.

ANOVA Test

One-way ANOVA: Hold Time versus Nurse

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\[ S = 38.36 \quad \text{R-Sq} = 3.04\% \quad \text{R-Sq(adj)} = 2.60\% \]