University of Michigan Health System
Analysis on Kellogg Eye Center Operating Rooms Instrument Sterilization Process

Final Report
12/11/03

Client:
Carol George, Clinical Supervisor, Operating Rooms
Industrial & Operations Engineering

Project Coordinator:
Mary Duck, Management Systems Coordinator

Project Members:
Ali Mehmet Kutman, IOE senior
Bilge Kiran, IOE senior
Burçak Gökçeer, IOE senior
Shana Marie Gainey, IOE senior
Table of Contents

Executive Summary 2
   Introduction 2
   Approach and Methodology 2
   Findings and Conclusions 3
   Recommendations 4

Introduction 6
   Description of the Current System 6
   Key Issues 8
   Goals and Objectives 8

Approach and Methodology 9
   Literature Search 9
   Interviews 9
   Data Collection 9
   Data Analysis Methods 9

Findings and Conclusions 9
   Turnover Times 10
   Task Analysis 11
   Instrument Processor Productivity 12
   Peri-operative Technician Productivity 13
   Increasing Direct Patient Care 14
   Other Issues 16

Recommendations 17
   Time Efficiency of Turnovers 17
   Organization of Fixed Activities 18
   Direct Patient Care 18
   Coordination Between Ancillary Staff 18
   Reducing Flashing and Additional Staff 18

Appendix A
   Literature Search References  A-1

Appendix B
   Peri-Operative Technician Beeper Study Form  B-1
   Instrument Processor Beeper Study Form  B-2
   Peri-Operative Technician Time Study Form  B-3
   Instrument Processor Beeper Study Form  B-4

Appendix C
   Peri-Operative Technician’s and Nurses’ Activity Charts  C-1
   Instrument Processor’s Activity Charts  C-2
Executive Summary

Introduction
The Kellogg Eye Center: Operating Room (OR) provides services related to outpatient eye surgery and ophthalmology. The client, Carol George, requested a study to show if the Center should hire another staff member to assist the instrument processor during busy hours, and to determine if the turnovers were time-efficient. The purpose of this project was to conduct an analysis of the tasks including instrument-reprocessing tasks completed by the instrument processor, peri-operative technician and nurses, as well as to conduct an analysis of the turnover activities. The purpose of this report is to present the findings, conclusions, and recommendations.

Description of the Current System
The nurses and the peri-operative technician turn over the operating rooms. The nurses take the instruments to the instrument room and hand wash them. Then the nurses or the instrument processor decontaminate the instruments by putting them in the wash machine. The instrument processor sterilizes them by flashing them or sending them to CSS (Central Sterile Supply).

Key Issues
The following key issues drove the need for this project:
- Considering whether the instrument processor needs assistance.
- Nurses spend time doing ancillary tasks that delay direct patient care.
- Turnovers need to be time-efficient to expedite the surgery schedule.

Goals and Objectives
The goals for the project were as follows:
- Increase the time efficiency of turnovers
- Recommend ways the instrument processor can organize tasks more efficiently
- Increase the amount of time the nurses spend on direct patient care
- Determine if there can be coordination between the ancillary staff
- Determine if there is enough workload to hire a second instrument processor

Approach and Methodology

Literature Search and Interviews
The team conducted a literature search and conducted interviews with the client, instrument processor, peri-operative technician, and several nurses. The purpose of the literature search was to provide an overview of hospital functions and to teach the use of methodologies. The purpose of the interviews was to learn the different tasks and concerns of the involved parties.

Data Collection
The team developed the time study and beeper study forms containing the tasks for the peri-operative technician and instrument processor. Both the time study and beeper study were conducted in order to have two separate sets of data that could be compared. The team collected the time study data for the instrument processor, peri-operative technician,
and nurses by observing them and recording the times it takes them to complete their tasks. For the beeper study, the peri-operative technician and the instrument processor recorded what tasks they were doing each time the beeper went off.

**Data Analysis Methods**
To analyze the data for both the instrument processor and the peri-operative technician, the team calculated the total amounts of time to complete each task, the percent of time spent on each activity, the hours per day spent on each fixed (non-case related) activity, and the minutes per case spent on each case-related activity. This was done for both the time study and beeper study data to compare the values. From the time study data for the nurses the team found the average, median, minimum, maximum, and standard deviations of the times for the nurses to turn over the rooms.

**Findings and Conclusions**

**Turnover Times**
From the literature search and benchmark analysis, the team found that OR consultants recommend 10 minutes for turnover time for ophthalmology cases. The average times for turnovers for the instrument processor, peri-operative technician, and nurses are 8 minutes, 10.1 minutes, and 12.4 minutes, respectively. Comparing these times with the average turnover time, which is 10 minutes, indicates that the turnovers are time-efficient, since the times are very close to 10 minutes. This indicates that turnover times in the Kellogg Eye Center are time-efficient.

**Task Analysis**
The team divided the staff member’s tasks into two categories: fixed activities and case activities. Fixed activities are non case-end related activities, and case activities are activities related to turnovers.

- The total working times, excluding breaks and downtimes, are 5.8 hours for the peri-operative technician, 2.7 hours being tied to turnovers and 3.1 hours for the fixed activities.
- The total working times, excluding breaks and downtimes are 5.2 hours for the instrument processor, 2.0 hours being tied to turnovers and 3.2 hours for fixed activities.
- All nurses together spend a total of 3 hours for turnover activities.
- Currently there are 10 nurses working during a one-day period, which results in 18 min/day/nurse.

Since the instrument processor can complete all of her tasks in 5.3 hours during a one-day working period of 7.5 hours excluding breaks and lunch, the team concluded that there is no need to hire an additional instrument processor as a full time employee. There is also no need for an additional peri-operative technician, since she can complete all of her tasks in 6 hours during a one-day working period.

**Instrument Processor Productivity**
The instrument processor can complete her tasks in less than 60 minutes. More fixed activities are completed than case activities. This means that she can spread her fixed activities to other times such as 3:30-4:00, which will give her more time during busy
hours to complete the case activities. Therefore, it is not necessary to hire an additional full time or part time instrument processor.

**Peri-operative Technician Productivity**
The peri-operative technician can complete her tasks in a one-hour period as well. The peri-operative technician is very busy during 9:30-10:30 AM and 12:30-2:30 PM. Most of the tasks she performs during those times slots are fixed activities. Thus, she can decrease the amount of work during these times by spreading the fixed activities to other time slots such as 2:30-5:30.

**Increasing Direct Patient Care**
In order to increase the patient care, the nurses must spend less time for turnover activities. Currently all nurses spend 12.4 minutes per case to complete turnover activities. The instrument processor spends 8 minutes per case for turnovers. Thus, the team concluded that the instrument processor could perform the hand washing activities instead of the nurses, which will decrease the amount of time nurses spend on turnovers to 10.4 minutes per case. This will give the nurses a total of 32 minutes of more time to provide direct patient care.

**Other Issues**
The team observed that the trays are flashed for 44% of the cases, with a standard deviation of 21%, of the ongoing cases / day. Flashing is not a preferable way to sterilize instruments and should only be considered when there is a shortage of inventory of the trays that would be used for the upcoming operations. However, less flashing will require the instrument processor to perform more assembling and wrapping to send the trays to CSS, increasing her turnover time. If she is performing both hand washing activities and assembling the instruments to send them to CSS for every case, her turnover time will increase even more. In this case, she would need to spend 6.7 hours working to complete her tasks with 16 cases/day. She can perform these tasks at the same time without exceeding her required work time with up to 17 cases per day. If there are 18 or more cases, she will need the nurses to assist her for the hand washing tasks. If there are 20 or more cases, then she may need an assistant for assembling in order to complete her tasks on time.

**Recommendations**

*Time Efficiency of Turnovers*
Since the turnover times are very close to 10 minutes, which is the recommended time for ophthalmology cases, the turnovers are very efficient.

*Organization of Fixed Tasks*
The team recommends that the instrument processor organize her tasks so that she is spreading some of her fixed activities to time periods such as 3:30-4:00.

The team also recommends that the peri-operative technician spread some of her fixed activities to the 2:30-5:30 time slot.
Direct Patient Care
The team recommends that the instrument processor perform the hand washing activities instead of the nurses. This will decrease the amount of time the nurses spend on turnover activities per case to 10.4 minutes, providing them with 32 minutes more time/day for patient care.

Coordination Between Ancillary Staff
The peri-operative technician’s peak hours are during the same time as those of the instrument processor. Thus, it is not possible for the peri-operative technician to assist the instrument processor during busier times.

Reducing Flashing and Additional Staff
The team recommends that the Kellogg Eye Center reduce the amount of flashing which will increase the amount of time for the instrument processor to perform her tasks to send the instruments to CSS.

The Kellogg Eye Center can find which trays are needed more frequently by adapting the OR database (OMNI) system of adding instrument trays to preference cards, a setup the same as UH and Mott OR’s. This will provide tray usage, a better management information regarding instruments. In this way, the Kellogg Eye Center will decrease the amount of flashing by rescheduling or buying more inventory.

It should be added that if the instrument processor, aside from hand washing activities, is also assembling and wrapping more due to a decrease in flashing, the maximum number of cases per day that she could handle would be 17. When there are 18 or more cases, she will need the nurses to assist her for the hand washing tasks. If there are 20 or more cases, then it may be necessary to review staffing again.
Introduction

The Kellogg Eye Center: Operating Room at the University of Michigan is a unit of the University Health System that provides services related to outpatient eye surgeries. The operating room is an outpatient suite of four rooms. The divisions of ophthalmology that are involved in the project include: Cornea & Retina Surgery, General Ophthalmology, Adult Eye Muscle Surgery and Plastic Surgery.

The client, Carol George, wondered if the Center should hire another staff member to assist the instrument processor during busy hours, and requested a study to show if this is needed. The purpose of this project was to conduct an analysis of the ancillary tasks including instrument-reprocessing tasks completed by the instrument processor, peri-operative technician and nurses. In addition, turnover activities were analyzed to find ways to make the reprocessing more time-efficient. Conclusions are drawn based on the data collected, and a recommendation is made to increase the time efficiency in the Operating Room (OR) in the Kellogg Eye Center.

The purpose of this report is to present the findings, conclusions, and recommendations.

Description of the Current System

Currently, the instrument reprocessing system is set up such that the nurses and the peri-operative technician turn over the operating rooms. The nurses and the instrument processor decontaminate the instruments, and the instrument processor sterilizes them and organizes them onto trays to prepare for upcoming cases.

Flowcharts of the Current Process

The team developed flowcharts of the instrument flow and turnover activities to show the flow of events in the processes, to see how different processes within the larger system are related, and to examine each small process for improvement possibilities. These flowcharts are in Figure 1 and Figure 2 below.
This flowchart shows that the nurses bring the instruments to the instrument room after the cases end. The nurses hand wash the instruments and either the nurses or the instrument processor put them in the wash machine for decontamination. The instruments are then assembled onto the trays by the instrument processor and flashed or sent to CSS (Central Sterile Supply). The flashed instruments are put in the clean room by the instrument processor and picked up by the nurses for the next case in which the instruments will be used. The instruments that will be sent to CSS are wrapped or marked according to the sterilization type by the instrument processor and sent to CSS.
This flowchart shows that once the cases end the operating rooms are cleaned and disinfected by the nurses and the peri-operative technician. They take out the garbage to soiled utility, pick the list charge, take the instruments to the instrument room for sterilization, open the sterile supplies for the next case and then bring in the patient for the next case.

**Key Issues**
The following key issues drove the need for this project:
- Considering whether the instrument processor needs assistance
- Nurses spend time doing ancillary tasks that delay direct patient care.
- Turnovers need to be time-efficient to expedite the surgery schedule.

**Goals and Objectives**
The goals for the project were as follows:
- Increase the time efficiency of turnovers
- Recommend ways the instrument processor can organize tasks more efficiently
- Increase the amount of time the nurses spend on direct patient care
- Determine if there can be coordination between the ancillary staff
- Determine if there is enough workload to hire a second instrument processor
Approach and Methodology

*Literature Search*
The team conducted a literature search by reading several reports for similar projects completed in previous years. The purpose of the literature search was to provide an overview of hospital functions and to teach the use of methodologies. The project coordinator provided the resources for the literature search and the references are in Appendix A.

*Interviews*
The team conducted interviews with the client, instrument processor, peri-operative technician, and several nurses. These were informal interviews, conducted between September and October, to learn the different tasks and concerns of the involved parties.

*Data Collection*
The team developed time study and beeper study forms containing the tasks for the peri-operative technician and instrument processor. These forms are in Appendix B.
The team collected the time study data between October 20 and November 6 by observing the instrument processor and peri-operative technician, and by recording the times it takes them to complete their tasks. The team also collected time study data for the tasks the nurses/scrub people perform during the room turnovers and for instrument reprocessing. A beeper study was conducted in which the peri-operative technician and the instrument processor recorded what tasks they were doing each time the beeper went off. Both the time study and beeper study were conducted in order to have two separate sets of data that could be compared.

*Data Analysis Methods*
To analyze the data the team calculated, from the time studies, the total amounts of time to complete each task for both the instrument processor and the peri-operative technician. From these times, the team calculated the percent of time spent on each activity, the hours per day spent on each fixed (non-case related) activity, and the minutes per case spent on each case-related activity.

Similarly, for the data collected from the beeper studies for the instrument processor and peri-operative technician, the team calculated the above mentioned times to compare them to the values from the time studies.

The team also found the average, median, minimum, maximum, and standard deviation of the times for the nurses to turn over the rooms after each case from the time study data that was collected.

*Findings and Conclusions*
The main purpose of this project was to analyze the tasks of the instrument processor, peri-operative technician and nurses to determine whether turnovers are time-efficient. In context, the team needed to determine whether there is enough workload to hire a second
instrument processor or whether it is more effective to have the peri-operative technician assist the instrument processor during peak times.

**Turnover Times**
The team collected and analyzed the data to find the current average of the turnover times. **Table 1** below summarizes the findings about current turnover times.

<table>
<thead>
<tr>
<th>Turnover Total time</th>
<th>Disinfect OR</th>
<th>Open Sterile Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>0:10</td>
<td>0:03</td>
</tr>
<tr>
<td>STD</td>
<td>0:05</td>
<td>0:02</td>
</tr>
<tr>
<td>Median</td>
<td>0:09</td>
<td>0:04</td>
</tr>
<tr>
<td>Maximum</td>
<td>0:30</td>
<td>0:15</td>
</tr>
<tr>
<td>Minimum</td>
<td>0:02</td>
<td>0:01</td>
</tr>
</tbody>
</table>

As shown in **Table 1**, the average time for one turnover is 10 minutes with a standard deviation of 5 minutes. This includes an average time of 3 minutes for disinfecting the OR and 7 minutes for opening sterile supplies for the next case. The maximum time for a turnover is 30 minutes; however, this occurs rarely and only when the case ended was a long process that required more cleaning.

The nurses, peri-operative technician and instrument processor perform turnovers. Each staff member has specific tasks during the process. Refer to **Appendix C** for the complete list of the turnover tasks performed by each staff member. To determine whether turnovers are time-efficient, the team compared the total turnover time with the times that the nurses, peri-operative technician and instrument processor spent for their turnover tasks.

**Table 2** below summarizes how much time each staff member needs to complete their tasks during a turnover, each working during the same time period.

<table>
<thead>
<tr>
<th>Staff</th>
<th>Total time tied to case end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument Processor</td>
<td>8 min</td>
</tr>
<tr>
<td>Peri-operative Technician</td>
<td>10.1 min</td>
</tr>
<tr>
<td>RNs</td>
<td>12.4min</td>
</tr>
</tbody>
</table>

Comparing the above times with average turnover time, which is 10 minutes, indicates that the turnovers are time-efficient, since the times are very close to 10 minutes. The nurses, peri-operative technician and instrument processor are performing their tasks in an efficient amount of time so that the operating rooms are ready before the scheduled operation begins. Refer to **Appendix C** for the list of tasks tied to the case end for each staff member.
From the literature search and benchmark analysis, the team found that OR consultants recommend 10 minutes for turnover time for ophthalmology cases. This indicates that turnover times in the Kellogg Eye Center are time-efficient.

**Task Analysis**

The second task was to determine whether there is enough workload to hire a second instrument processor or whether it is more effective to have the peri-operative technician assist the instrument processor during peak times in order to see if there is room for improvement for turnover times.

**Table 3** below shows the following:

- The amount of time the nurses, instrument processor and peri-operative technician must spend to complete the turnovers during each one hour time period.
- The amount of time the instrument processor and peri-operative technician must spend to complete the tasks that are not tied to the case ends during each one hour time period.

**Table 3: Case Activities and Fixed Activities**

<table>
<thead>
<tr>
<th>Time of the Day</th>
<th>Number Of Cases Ended</th>
<th>Peri-operative Tech</th>
<th>Instrument Processor</th>
<th>10 RNs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Case Activities</td>
<td>Fixed Activities</td>
<td>Case Activities</td>
</tr>
<tr>
<td>7:30-8:30 AM</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>8:30-9:30 AM</td>
<td>2</td>
<td>20</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>9:30-10:30 AM</td>
<td>2</td>
<td>20</td>
<td>36</td>
<td>16</td>
</tr>
<tr>
<td>10:30-11:30 AM</td>
<td>2</td>
<td>20</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>11:30AM-12:30PM</td>
<td>2</td>
<td>20</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>12:30-1:30PM</td>
<td>2</td>
<td>20</td>
<td>36</td>
<td>16</td>
</tr>
<tr>
<td>1:30-2:30 PM</td>
<td>2</td>
<td>20</td>
<td>39</td>
<td>16</td>
</tr>
<tr>
<td>2:30-3:30PM</td>
<td>2</td>
<td>20</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>3:30-4:30PM</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>4:30-5:30PM</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time of the Day</th>
<th>Total Working Time / day</th>
<th>8.5 hours – 7.5 hours</th>
<th>8.5 hours - 7.5 hours</th>
<th>8.5 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>8.5 hours – 7.5 hours</td>
<td>8.5 hours - 7.5 hours</td>
<td>8.5 hours</td>
</tr>
<tr>
<td>7:30-8:30 AM</td>
<td>0.5 hours</td>
<td>0.5 hours</td>
<td>0.5 hours</td>
<td>0.5 hours</td>
</tr>
<tr>
<td>8:30-9:30 AM</td>
<td>1.5 hours</td>
<td>1.5 hours</td>
<td>1.5 hours</td>
<td>1.5 hours</td>
</tr>
<tr>
<td>9:30-10:30 AM</td>
<td>2.5 hours</td>
<td>2.5 hours</td>
<td>2.5 hours</td>
<td>2.5 hours</td>
</tr>
<tr>
<td>10:30-11:30AM</td>
<td>3.5 hours</td>
<td>3.5 hours</td>
<td>3.5 hours</td>
<td>3.5 hours</td>
</tr>
<tr>
<td>11:30AM-12:30PM</td>
<td>4.5 hours</td>
<td>4.5 hours</td>
<td>4.5 hours</td>
<td>4.5 hours</td>
</tr>
<tr>
<td>12:30-1:30PM</td>
<td>5.5 hours</td>
<td>5.5 hours</td>
<td>5.5 hours</td>
<td>5.5 hours</td>
</tr>
<tr>
<td>1:30-2:30 PM</td>
<td>6.5 hours</td>
<td>6.5 hours</td>
<td>6.5 hours</td>
<td>6.5 hours</td>
</tr>
<tr>
<td>2:30-3:30PM</td>
<td>7.5 hours</td>
<td>7.5 hours</td>
<td>7.5 hours</td>
<td>7.5 hours</td>
</tr>
<tr>
<td>3:30-4:30PM</td>
<td>8.5 hours</td>
<td>8.5 hours</td>
<td>8.5 hours</td>
<td>8.5 hours</td>
</tr>
<tr>
<td>4:30-5:30PM</td>
<td>9.5 hours</td>
<td>9.5 hours</td>
<td>9.5 hours</td>
<td>9.5 hours</td>
</tr>
</tbody>
</table>

The information in Table 3 comes from the beeper and time studies that the team performed during the data collection in the Kellogg Eye Center. The second column, Number Of Cases Ended, shows the average number of cases that end during each one-
hour time period during a one-day period. The one-hour time periods are given in the first column, Time of the Day. Each staff member’s tasks are divided into two categories, fixed activities and case activities. Fixed activities indicate the time spent in minutes on non case-end related activities, and case activities indicate the time spent in minutes on turnovers. For further information about categorization of tasks for each staff member, please refer to Appendix C.

The total working times, excluding breaks and lunches, are 5.8 hours for the peri-operative technician, 2.7 hours being tied turnovers and 3.1 hours for the fixed activities. The total working times, excluding breaks and lunches are 5.2 hours for the instrument processor, 2.0 hours being tied to turnovers and 3.2 hours for fixed activities. All nurses together spend a total of 3 hours for turnover activities. Currently there are 10 nurses working during a one-day period, which results in 18 min/day/nurse.

From this data, the team concluded that there is no need for an additional instrument processor as a full time employee, since the instrument processor can complete all of her tasks in 5.3 hours during a one-day working period of 7.5 hours excluding breaks and lunch. There is also no need for an additional peri-operative technician, since she can complete all of her tasks in 6 hours during a one-day period.

To find whether there is a need for a part-time employee to assist the OR staff, the team calculated how much total time the instrument processor and the peri-operative technician need to complete all of their tasks during each hour.

**Table 4: Time Required To Complete Tasks in One-hour Periods**

<table>
<thead>
<tr>
<th>Time of the Day</th>
<th>Total Peri-operative Technician (min)</th>
<th>Total Instrument Processor (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30-8:30 AM</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>8:30-9:30 AM</td>
<td>41.2</td>
<td>49</td>
</tr>
<tr>
<td>9:30-10:30 AM</td>
<td>56.2</td>
<td>41.5</td>
</tr>
<tr>
<td>10:30-11:30AM</td>
<td>44.2</td>
<td>41.5</td>
</tr>
<tr>
<td>11:30AM-12:30PM</td>
<td>47.2</td>
<td>28</td>
</tr>
<tr>
<td>12:30-1:30PM</td>
<td>56.2</td>
<td>40</td>
</tr>
<tr>
<td>1:30-2:30PM</td>
<td>59.2</td>
<td>23.5</td>
</tr>
<tr>
<td>2:30-3:30PM</td>
<td>23.2</td>
<td>50.5</td>
</tr>
<tr>
<td>3:30-4:30PM</td>
<td>10.1</td>
<td>8</td>
</tr>
<tr>
<td>4:30-5:30PM</td>
<td>10.1</td>
<td>0</td>
</tr>
</tbody>
</table>

As shown in **Table 4**, the instrument processor and peri-operative technician can complete their tasks in less than 60 minutes for each hour of the day.

**Instrument Processor Productivity**

**Chart 1** below shows which hours in a day the instrument processor is most busy. The chart also demonstrates what type of activity she is performing during each hour.
As seen in Chart 1 and in Table 4, the instrument processor can complete her tasks in less than 60 minutes even during the busiest hours (8:30-11:30, 2:30-3:30). The activities performed are mostly fixed activities. This means that she can spread her fixed activities to other times such as 3:30-4:00, which leaves more free time for busy hours. Thus, the team does not recommend hiring an additional full time or part time instrument processor for the Kellogg Eye Center OR.

**Peri-operative Technician Productivity**

Chart 2 below shows which hours of the day the peri-operative technician is most busy. The chart also demonstrates what type of activity she is performing during each hour.
The peri-operative technician can complete her tasks in a one-hour period as well. The peri-operative technician is very busy during 9:30-10:30 AM and 12:30-2:30 PM. Most of the tasks she performs during those times slots are fixed activities. Thus, she can decrease the amount of work during these times by spreading the fixed activities to other time slots such as 2:30-5:30.

As the data indicates, the instrument processor does not need the assistance of the peri-operative technician due to two reasons.

- The instrument processor can complete her tasks without being pressed for time.
- The instrument processor and peri-operative technician are busy during the same hours, as seen in Chart 1. Thus, it is not possible for the peri-operative technician to assist the instrument processor during busier times.

**Increasing Direct Patient Care**

In order to increase the patient care, the nurses must spend less time for turnover activities. Currently all nurses spend 12.4 minutes per case to complete and assist in turnover activities. This amount of time can be decreased by 2 minutes per case, if other staff members can perform the hand washing activities. This will allow all the nurses to have a total of 32 minutes of more free time, while the average number of cases/day is
16. This in return will increase the amount of time that the nurses can provide direct patient care.

As shown in Table 2, the instrument processor spends the least amount of time for turnover activities, which is 8 minutes. She also is not extremely busy during an average day, which has 16 cases. Thus, the team concluded that the instrument processor could perform the hand washing activities instead of the nurses. This will increase the instrument processor’s completion time of turnover activities per case to 10 minutes. At the same time, it will decrease nurses’ completion time of turnover activities per case to 10.4 minutes, providing them with more time for direct patient care.

It can be seen from Table 5 that although there is an increase in workload for the instrument processor, she can still finish her tasks during each hour of the day, without being overloaded. Thus, the team concluded that the instrument processor could perform the hand washing tasks instead of the nurses.

<table>
<thead>
<tr>
<th>Time of the Day</th>
<th>16 Cases/Day</th>
<th>Instrument Processor</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Case Activities (min)</td>
<td>Fixed Activities (min)</td>
<td>Total Activities (min)</td>
<td></td>
</tr>
<tr>
<td>7:30-8:30 AM</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>8:30-9:30 AM</td>
<td>2</td>
<td>20</td>
<td>33</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>9:30-10:30 AM</td>
<td>2</td>
<td>20</td>
<td>25.5</td>
<td>45.5</td>
<td></td>
</tr>
<tr>
<td>10:30-11:30AM</td>
<td>2</td>
<td>20</td>
<td>25.5</td>
<td>45.5</td>
<td></td>
</tr>
<tr>
<td>11:30AM-12:30PM</td>
<td>2</td>
<td>20</td>
<td>12</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>12:30-1:30PM</td>
<td>2</td>
<td>20</td>
<td>24</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>1:30-2:30 PM</td>
<td>2</td>
<td>20</td>
<td>7.5</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>2:30-3:30 PM</td>
<td>2</td>
<td>20</td>
<td>34.5</td>
<td>54.5</td>
<td></td>
</tr>
<tr>
<td>3:30-4:30PM</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>4:30-5:30PM</td>
<td>1</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Instrument Processor (hours)

TOTAL hours  2.7  3.2  5.9

The team calculated the instrument processor’s total amount of work time for increased numbers of cases with the hand washing activities is included in her tasks. As shown in Table 6, the instrument processor can perform the hand washing tasks without exceeding her daily required work time of 7.5 hours when the number of cases per day is less than or equal to 20. However, if during one day there are 21 or more cases, she will need assistance from the nurses for the hand washing activities.

<table>
<thead>
<tr>
<th>Time of the Day</th>
<th>Instrument Processor (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL hours</td>
<td>2.7 3.2 5.9</td>
</tr>
</tbody>
</table>

Table 6: Hand Wash vs. Current Total Time for Instrument Processor
Cases/Day | Currently Total time (Hours) | Hand wash included Total time (Hours)
---|---|---
16 | 5.2 | 5.9
17 | 5.5 | 6.3
18 | 5.9 | 6.6
19 | 6.2 | 7.0
20 | 6.5 | 7.4
21 | 6.8 | 7.7
22 | 7.2 | 8.1

**Other Issues**
While collecting data, the team also observed the number of times the instruments were flashed during a one-day period. According to the team’s findings, the trays are flashed for 44% of the cases, with a standard deviation of 21%, of the ongoing cases / day. Table 7 below summarizes the findings.

**Table 7: Flashing**

<table>
<thead>
<tr>
<th>Flashed vs. # of Cases</th>
<th>Average</th>
<th>STD</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>0.44</td>
<td>0.21</td>
<td>0.92</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Flashing is not a preferable way to sterilize instruments and should only be considered when there is a shortage of inventory of the trays that would be used for the upcoming operations. Thus, flashing for 44% of the cases is a significantly large ratio, with a maximum of 92% on certain days, where the same operations are performed.

If there is enough inventory of trays to be used for the upcoming cases, it is preferable that the instrument processor not flash. However, less flashing will require the instrument processor to perform more assembling and wrapping to send the trays to CSS. This will also increase the amount of work time of the instrument processor.

**Table 8** shows that currently the amount of work time spent per case, including fixed and case activities, are 19.5 minutes. It also shows how much the workload of the instrument processor increases when she does hand washing or assembly or both.

**Table 8: Instrument Processor's Work Time/Case For Extra Tasks**

| Currently Total time spend /case | 19.5 min |
| Hand wash included Total time spend /case | 22.1 min |
| Assembly included in Total Time/case | 22.9 min |
| Assembly and Hand wash included Total time spend/case | 25.1 min |
Thus, if the instrument processor is performing both hand washing activities and assembling the instruments to send them to CSS, her total work time per case will increase to 25.1 minutes.

The team calculated the instrument processor’s total work time for an increased number of cases when only assembly for CSS and hand washing and assembly for CSS activities are included. As it is shown in Table 9 the instrument processor can perform assembly for CSS task without exceeding her daily-required work time with up to 19 cases per day. However, if during one day there are 20 or more cases and she is not flashing for any of them, then she will exceed her daily-required work time. In that case assistance should be considered for the instrument processor.

If the instrument processor is performing both hand washing and assembling the instruments to send them to CSS for every case, her total work time per day will increase more compared to other conditions. In this case, she has to spend 6.7 hours working to complete her tasks with 16 cases/day. She can perform these tasks at the same time without exceeding her required work time with up to 17 cases per day. If there are 18 or more cases, she will need the nurses to assist her for the hand washing tasks. If there are 20 or more cases, then she may need an assistant for assembling in order to complete her tasks on time.

Table 9: Current vs. Assembly vs. Hand Wash and Assembly Total Time/Case for Instrument Processor

<table>
<thead>
<tr>
<th>Cases/Day</th>
<th>Currently Total time (Hours)</th>
<th>Assembly included Total Time (Hours)</th>
<th>Assembly and Hand wash included Total time (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>5.2</td>
<td>6.1</td>
<td>6.7</td>
</tr>
<tr>
<td>17</td>
<td>5.5</td>
<td>6.5</td>
<td>7.1</td>
</tr>
<tr>
<td>18</td>
<td>5.9</td>
<td>6.9</td>
<td>7.5</td>
</tr>
<tr>
<td>19</td>
<td>6.2</td>
<td>7.2</td>
<td>8.0</td>
</tr>
<tr>
<td>20</td>
<td>6.5</td>
<td>7.6</td>
<td>8.4</td>
</tr>
<tr>
<td>21</td>
<td>6.8</td>
<td>8.0</td>
<td>8.8</td>
</tr>
<tr>
<td>22</td>
<td>7.2</td>
<td>8.4</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Recommendations

**Time Efficiency of Turnovers**
Since the turnover times are very close to 10 minutes, which is the recommended time for ophthalmology cases, the turnovers are very efficient. The nurses, peri-operative technician and instrument processor are performing their tasks efficiently, thus the team does not recommend any changes to the turnover process solely for increasing the overall time efficiency.
Organization of Fixed Tasks
The team recommends that the instrument processor organize her tasks so that she is spreading some of her fixed activities to time periods such as 3:30-4:00 in order to free up time during the busier time periods such as 8:30-11:30 and 2:30-3:30.

The team also recommends that the peri-operative technician spread some of her fixed activities to the 2:30-5:30 time slot in order to free up time during the 9:30-10:30 and 12:30-2:30 time periods.

Direct Patient Care
The instrument processor spends an average of 8 minutes per case on turnover activities, while the nurses spend an average of 12.4 minutes per case on turnover activities, and the benchmark time is 10 minutes. Thus, the team recommends that the instrument processor perform the hand washing activities instead of the nurses. This will decrease the amount of time the nurses spend on turnover activities per case to 10.4 minutes, providing them with more time for direct patient care.

Coordination Between Ancillary Staff
The peri-operative technician’s peak hours are during the same time as those of the instrument processor. Thus, it is not possible for the peri-operative technician to assist the instrument processor during busier times. However, after reorganizing her tasks as previously recommended, the instrument processor will not be pressed for time to complete her activities. Therefore the team does not recommend that the peri-operative technician assist the instrument processor during busy times.

Reducing Flashing and Arranging Assistance
The team recommends that the Kellogg Eye Center reduce the amount of flashing, which will increase the amount of time for the instrument processor to perform her tasks to send the instruments to CSS.

The Kellogg Eye Center can find which trays are needed more frequently by adapting the OR database (OMNI) system of adding instrument trays to preference cards, a setup the same as UH and Mott OR’s. This will provide tray usage, a better management information regarding instruments. In this way, the Kellogg Eye Center will decrease the amount of flashing by appropriately scheduling cases or buying more inventory.

It should be added that if the instrument processor, aside from hand washing activities, is also assembling and wrapping more due to a decrease in flashing, the maximum number of cases per day that she could handle would be 17. When there are 18 or more cases, she will need the nurses to assist her for the hand washing tasks. If there are 20 or more cases, then it may be necessary to review staffing again.