University of Michigan Health System
Program and Operations Analysis

**Analysis of Nasogastric Tube Insertion, Placement Verification, and Feedings**
**Final Report**

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EXECUTIVE SUMMARY

C.S. Mott Children’s Hospital (Mott), part of the University of Michigan Health System (UMHS), is widely regarded as one of the leading pediatric health care centers in the United States. An important function in Mott is nasogastric (NG) tube feedings, which involve inserting an NG tube through a patient’s nose and directly into the stomach to provide medication, infant formula, or breast milk to infants and children who cannot ingest enough food by mouth. In the last 15-20 years, UMHS has operated under job descriptions that allow Registered Nurses (RNs) as well as Patient Care Tech Associates (Techs) to perform the entire four-step NG tube procedure: inserting tube, removing tube, verifying tube placement, and administering feedings.

Nursing executives have recently revised the Tech job description and responsibilities in an effort to standardize operations, create flexibility for Techs, and enhance patient safety. The revised job description permits only Registered Nurses (RNs) to insert tubes, remove tubes, and verify tube placement, which may cause unnecessary lag in the NG feeding process.

The scope of this project involved observing and analyzing two care units that utilize their Techs in varying ways; the revised Tech job description may impact the NG feeding process of each unit differently as a result of their contrasting Tech utilization strategies. The Brandon Newborn Intensive Care Unit, known as 8 West (8W), is designed with a cluster-care approach, encouraging an individual hospital staff member to perform all necessary procedures and tasks for a patient at a given time. Typically, RNs in 8W work on their patients exclusively and Techs perform supportive tasks rather than hands-on technical tasks. The new Mott building contains a “Milk Room” where separate Milk Room Techs fortify and prepare both breast and formula milk for patients before a feeding. The Clinical Nurse Specialist in 8W reported that the Milk Room has reduced the work performed by Techs in 8W by 42%, and fears that removing more responsibility may leave Techs underutilized.

The Eleven West General and Moderate Care Pediatric Unit (11W) operates under a dynamic atmosphere in which RNs frequently delegate technical tasks to Techs, especially NG feedings. The removal of Tech responsibility for NG tube placement verification will require either exclusively RNs to complete the entire NG feeding process, or will require Techs to complete part of the process and retrieve an RN to complete the tube placement verification. The purpose of this project was to evaluate and analyze the NG feeding process to provide UMHS nursing leadership with critical information to help reduce the change in staff responsibility. The primary deliverable of this project was a quantitative analysis of the NG feeding process and time needed to complete each step of an NG feeding.

Methodology and Findings
Various strategies were used to collect and analyze data, due to the significant differences in the operations of both units and limitations given to the project team. Surveys were distributed and time studies were performed to quantify the observable, measurable current state under the original Tech job description. Interviews with nursing leadership members were conducted to project obstacles and challenges the units may face under the revised Tech job description.
Surveys
The project team distributed surveys to 156 staff members in 8W and 71 staff members in 11W; 58 surveys were returned, all of which were completed by RNs. The surveys pertained to the effectiveness of the NG feeding process and general workflow of RNs and Techs.

The project team analyzed all survey responses using Minitab statistical software. Analysis of variance tests proved a significant difference in the mean idle time of an RN based on the RN’s unit. The idle time of RNs in 8W is double the idle time of RNs in 11W, 66 minutes and 33 minutes, respectively. No other significant findings were discovered.

Time Studies
The project team performed time studies on a total of 29 NG feedings, 12 from unit 8W and 17 from unit 11W. The time studies involved measuring the time taken to insert an NG tube, remove an NG tube, verify correct tube placement, and administer a feeding. The studies yielded a total of 280 minutes of NG feeding tasks. The data were analyzed using Microsoft Excel, including pivot tables, to evaluate the effectiveness of each role in the NG feeding process and the amount of time needed to complete it. The team documented the total number of patients in each unit, as well as the number of patients on NG feedings, for each collection day. The number of patients on NG feedings were extrapolated to quantify the total number of feedings administered daily in each unit, since all patients on NG feedings are administered a feeding every 3 hours.

The team used nursing leadership interview feedback and time study results to project the three most probable scenarios for administering NG feedings once Tech responsibilities are changed:
- Scenario 1: An RN completes all tasks related to administering an NG feeding
- Scenario 2: Tech retrieves an RN to verify correct placement of the NG tube while the patient’s food warms
- Scenario 3: Tech retrieves an RN to verify correct placement of the NG tube after the patient’s food warms

Scenarios 2 and 3 involve best and worst case projections based on the time needed to retrieve an RN. The best case scenario projections required 20 seconds for a Tech to retrieve an RN; the worst case scenario projections required 10 minutes to retrieve an RN. The projected time for each scenario in each unit can be found in Figures E-1 and E-2 on the following page.

Interviews
The project team conducted two primarily unscripted, conversational interviews with a total of six nursing leadership members to anticipate potential obstacles and challenges of the NG feeding process once the revised Tech responsibilities are put into effect.

The interviews revealed that Techs perform primarily supportive tasks in 8W while RNs complete most NG feeding tasks. The team also found that the addition of the Milk Room in the new Mott building reduced Tech work in 8W by 42%, which may leave them underutilized. Conversely, the interviews illustrated a high dependency of Tech delegation for NG feedings in 11W. Nursing leadership is concerned that RNs may have insufficient time to complete all NG feeding in 11W without the help of Techs, and the fragmented care approach may be disruptive.
Conclusions and Impact

Project findings led the team to conclude the following:

- NG feeding process in 8W **will not be significantly impacted**
- Techs in 8W **may be underutilized** without full NG feeding responsibilities under the revised job description
- NG feeding process in 11W **will be significantly impacted**
- RNs in 11W **may have insufficient time** to complete all NG feeding steps in without the help of Techs

The project findings are expected to provide critical, short-term information to UMHS as well as provide the foundation for future projects to recommend potential process improvements.
C.S. Mott Children's Hospital, part of the University of Michigan Health System (UMHS), is nationally recognized for its excellence in clinical services, research, and education. As one of the leading pediatric health care centers in the United States, this newly opened, state-of-the-art facility aims to fulfill the Hospital’s continued commitment to providing newborns, children, and pregnant women with the best healthcare possible. UMHS executives recently revised the job description and responsibilities of Patient Care Tech Associates (Techs) in an effort to standardize operations, create flexibility for Techs, and enhance patient safety.

Original Job Description
The Brandon Newborn Intensive Care Unit, referred to as “8W” for 8th floor West, at UMHS is designed with a cluster-care approach, encouraging an individual hospital staff member to perform all necessary procedures and tasks for a patient at a given time. 8W is geographically split into 2 sections, “Maize” and “Blue,” providing the same care to patients in both sections. The general and moderate pediatric care unit, referred to as “11W” for 11th floor West, operates under a dynamic atmosphere, typically involving multiple staff members working with a patient at a given time. One of the most important functions in both units is nasogastric (NG) tube feedings. An NG tube is inserted through the nose and directly into the stomach to provide medication, infant formula, or breast milk to infants and children who cannot ingest enough food by mouth. An illustration of the NG tube can be seen in Figure 1.

Figure 1. Illustration of NG Tube Insertion
The original Tech job description permitted Techs to perform the entire four-step NG feeding process: inserting tube, removing tube, checking tube placement, and administering feeding. According to the Clinical Nurse Specialist, this set of work allowed for a quick, seamless process flow ensuring accuracy and patient safety.

**Revised Job Description**
The recent Tech job description revisions have removed the ability of Techs to perform NG tube insertions, removals, and placement verification. These revisions now permit only RNs to insert tubes, remove tubes, and verify tube placement, which may cause unnecessary lags in the NG feeding process. Nursing leadership has expressed concern that the revised job description may increase Tech idle time and RN responsibility, and potentially diminish patient safety due to the transition of responsibilities. Patient comfort may also be affected due the increased staff necessary to complete NG feedings.

**Project Approach**
Mott Children’s Hospital requested a University of Michigan IOE 481 student team to conduct a quantitative analysis of the NG feeding process in 8W and 11W under the original Tech job description as well as investigate potential NG feeding processes under the revised job description. The primary goal of this project was to evaluate and analyze the NG feeding process under the original Tech job description to provide UMHS nursing leadership with critical information to help reduce the change in staff responsibility. The deliverables of this project include an analysis of the NG feeding process under the original Tech job description and a projection of potential obstacles that may arise after the job description revision is put into effect. **A recommendation is not a deliverable of this project.** The purpose of this final report is to present the detailed analysis of the current NG feeding process, forecast potential problems that may arise from the job description revision, and provide all collected data to nursing leadership for future decisions.

**BACKGROUND**
According to a UMHS Administrative Manager and popular media reports, C.S. Mott Children’s Hospital is one of the leading pediatric treatment centers in the world. Many units throughout UMHS, including 8W and 11W, perform therapeutic administration techniques such as NG feedings to treat infants unable to receive sufficient nutrition orally.

**Operations Under Original Job Description**
In the last 15-20 years, UMHS has operated under job descriptions and responsibilities that allow RNs as well as Techs and family members of patients to perform NG feedings. Both Techs and family members are trained by an experienced RN to ensure safety. Due to proper training coupled with the simplicity of performing NG feedings with a small child (much lower risk than with adults), UMHS has never encountered a serious problem attributed to lack of education or experience.

**Effects and Implementation of Revised Job Description**
UMHS has recently confirmed a revision in the job description for Techs to standardize
operations; create flexibility across UMHS in its entirety; and reduce risk associated with NG tube insertions, removals, and placement verifications. The revision has not yet taken full effect, but enforcement will begin in the near future. Nursing executives are implementing these changes to accomplish the following goals:

- Standardize Tech roles across UMHS in its entirety in an effort to increase Tech flexibility and reduce scheduling costs
- Enhance patient safety by permitting only more highly qualified staff to perform certain NG feeding tasks

The original job description emphasized specialized work for Techs such as feeding preparation, NG tube insertion/removal, and feeding administration. The revised job description defines Tech duties and responsibilities in the units as the following:

- Monitoring patients and their vital signs
- Obtaining patient measurements (height, weight, etc.)
- Collecting specimens such as urine, stool, and saliva
- Changing diapers and maintaining personal hygiene
- Performing feedings after tube is placed and checked
- Stocking supplies and equipment, cleaning, changing bed linens, transporting materials
- Assisting RNs with their duties

The effects of this job description revision are severe limitations on Tech involvement in NG feeding process. This process can be broken down into four distinct steps:

- Insertion of NG tube
- Removal of NG tube
- Placement verification of tube inside patient’s body
- Administration of feeding

The original job description permitted Techs to perform all four steps, but the new job description removes Tech responsibility for inserting tubes, removing tubes, and verifying tube placement, allowing for only RNs to perform those tasks.

**Frequency and Completion of Feedings**

Prior client knowledge and initial project findings from the team have verified wide variability in the frequency of inserting and removing NG tubes. Typically, an NG tube is replaced every 30 days, but sometimes sooner if the patient pulls the tube out early or if problems arise with feedings. The larger problem lies within the much more frequent process of verifying the placement of a tube before a feeding, which occurs every 3 hours. The number of daily feedings and the time to warm a feeding for each unit were determined from the team’s time studies and can be found in Table 1.
Table 1. Mean Feedings and Warming Time by Unit

<table>
<thead>
<tr>
<th>Unit</th>
<th>8W</th>
<th>11W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedings per day</td>
<td>178</td>
<td>72</td>
</tr>
<tr>
<td>Warming time (min)</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>Standard deviation (min)</td>
<td>0</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*Note: Sample size of 29 (17 from 11W and 12 from 8W)

Table 1 illustrates that there is a mean of 106 more daily NG feedings administered in 8W than in 11W. The results also show that it takes a mean of 3.7 minutes longer to warm an NG feeding in 8W than in 11W.

Time studies revealed different warming techniques used by each unit. All patient rooms in 8W include an automated “Penguin Nutritional Warmer,” which takes exactly 10 minutes to warm a feeding. No variation of warming times were found in 8W because all feedings are warmed using this automated method. Conversely, 11W uses an unstandardized method by warming feedings in a cup of hot water. This method requires an arbitrary amount of time based on RN or Tech discretion, which illustrates the variation of warming times found in 11W.

The team found no literature of who should be responsible for administering NG feedings, just the documented process of how it is done. Parents and other family members without any prior training or education have been, and can still be, trained to perform all steps of NG feedings. When UMHS was faced with a shortage of RNs in the past, Techs with previous training and education were trained to perform NG feedings and have done so successfully according to UMHS staff. Leadership in 8W recently benchmarked the composition of its medical personnel against NICUs of other hospitals; the results have shown that UMHS is rare in that it uses Techs to administer NG feedings, while many other NICUs use exclusively RNs.

Key Issues
The following key issues provided the need to perform this project:

- Revision of Tech job description removing responsibility of checking NG tube placement
- Increase of responsibility for already scarce RN resources may require overtime or additional staff, which will significantly increase labor costs
- Prioritization of patient safety
- Interest in standardization of Tech roles across UMHS

Goals and Objectives
The primary goal of this project was to evaluate and analyze the NG feeding process to provide UMHS nursing leadership with critical information to help reduce the change in staff responsibility. The secondary goal of this project was to forecast potential problems that may arise from the job description revision.

To accomplish these goals, the team achieved the following tasks:

- Performed time studies to determine the time needed to complete each step of an NG feeding
• Estimated the number of daily NG feedings performed based on number of patients with NG tubes and feedings every 3 hours
• Measured the effectiveness of RNs versus Techs in both units
• Distributed and analyzed survey results on staff workload
• Integrated feedback and recommendations from nursing leadership interviews
• Estimated alert response time for staff members
• Projected and analyzed probable future scenarios and their impacts

With this information, the team delivered the following results:
• Quantitative analysis of the NG feeding process and time needed to complete each step of an NG feeding
• Forecasted obstacles that may arise in the NG feeding process (eg. who will complete them, under/overutilization of staff, problems of Tech locating an available RN)
• Comparative analysis of three scenarios using different strategies to successfully complete all steps of an NG feeding

Project Scope
This project included the measurement and analysis of:
• Data collected in only 8W and 11W between March 4 and March 30, 2012
• NG feeding tasks performed by RNs, Techs, and family members of patients. Process began as staff gathered supplies before feeding and concluded after post-feeding tasks were performed
• Total number of patients in each unit and number of patients on NG feedings. Measurements changed on a daily basis, so the numbers for each collection day were documented
• Feedback from RNs, Techs, and nursing leadership

This project excluded:
• Any task that did not involve the NG feeding process
• Activities performed in non-participating units although NG feedings take place in other units throughout UMHS
• Recommendations for the optimal Tech job description and distribution of responsibilities
• Any financial effect or implication on UMHS

DATA COLLECTION, ANALYSIS, AND FINDINGS

Due to the limitations presented within the units, two separate data collection and analysis strategies were performed: one to define the current state and the other to project the future state reflecting changes in Tech responsibilities. All participating units in UMHS are currently using the original Tech job description. The present state is observable and can be accurately quantified through surveys and time studies. To define the current state, surveys were distributed to all staff within the participating units. Additionally, time studies were performed to document the NG feeding tasks performed by both RNs and Techs.
No precedent has been set in UMHS to analyze the future process flow, so the future state was simulated based on nursing leadership speculation and projection as well as other probable scenarios. In addition, members of nursing leadership were interviewed regarding the Tech job description revision to accurately project the future state.

**Surveys – Defining the Current State**

The project team distributed surveys to 156 staff members in 8W and 71 staff members in 11W. The surveys pertained to the effectiveness of the NG feeding process and general workflow of RNs and Techs. Communication with the Clinical Nurse Specialist in unit 8W helped the team formulate the survey questions which were based on staff workload and NG feeding tasks. These surveys were collected between March 4 and March 30, 2012 to allow for at least 30 complete responses.

**Data Collection**

Staff surveys were created by the project team and approved by the client before becoming available to staff members. The survey can be found in Appendix I. An email, which included a hyperlink to the Qualtrics online survey, was sent to all staff in participating units. Physical copies were also left in the staff break rooms of each unit for completion. A total of 58 surveys were obtained, 52 fully completed and 6 partially completed. All 58 responses were completed by RNs. This amounts to 26% of the RN staff on the 2 units studied.

The survey asked a series of questions pertaining to the effectiveness of the NG feeding process. Sample questions included:

- In a typical 8-hour shift, how much time do you spend on NG tasks for all patients you care for?
- How many minutes are typically needed to fully complete the following processes (including preparation time, clean-up, etc)?
  - NG tube insertion?
  - NG tube removal?
  - NG tube placement verification?
  - Initiate NG feeding?
  - Post-feeding tasks?
- What unit do you work in?
- How many years have you been an RN/Tech?

**Data Analysis**

The team uploaded the survey results into Minitab and compared responses between the 2 unit types and among different years of experience. Response values based on role could not be compared because no Techs completed a survey. The project team performed analysis of variance tests on the survey results.

**Findings**

The team analyzed the survey responses using Minitab statistical software to determine whether factors such as years of experience or type of unit affected any of the responses. Results of the analysis of variance tests showed no significant difference in the responses based
on years of experience. The following survey responses exhibited no statistical differences in means or standard deviations:

- Mean time spent on NG tasks in an 8-hour shift
- Mean time needed for NG tube insertion
- Mean time needed for NG tube removal
- Mean time needed for NG tube placement verification within a patient’s body
- Mean time needed to administer feeding
- Mean time needed to complete post-feeding tasks

Results of the analysis of variance tests proved a significant difference in the mean idle time of an RN based on the RN’s unit. The idle time of RNs in 8W is nearly double the idle time of RNs in 11W. The results can be seen in Table 2 and Figure 2.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Mean Idle Time (min)</th>
<th>Standard Deviation (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11W</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>8W</td>
<td>66</td>
<td>34</td>
</tr>
</tbody>
</table>

*Note: General Care corresponds to 11W, ICU corresponds to 8W

Figure 2. Boxplot of Idle Time (in minutes) Based on Unit
The analysis of variance tests proved no significant difference in the time spent completing NG procedures in an 8-hour shift, nor was a significant difference found in the time spent completing each step of an NG feeding. The mean time spent on NG tasks, by unit, can be found in Table 3.

**Table 3. Mean Time to Complete NG Tasks**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Insertion (min)</th>
<th>Removal (min)</th>
<th>Placement Verification (min)</th>
<th>Feeding (min)</th>
<th>Post-Feeding Tasks (min)</th>
<th>Total NG Procedures (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11W</td>
<td>4.5</td>
<td>1.1</td>
<td>1.0</td>
<td>3.3</td>
<td>2.4</td>
<td>45.9</td>
</tr>
<tr>
<td>8W</td>
<td>3.8</td>
<td>1.4</td>
<td>1.1</td>
<td>3.1</td>
<td>2.6</td>
<td>49.8</td>
</tr>
</tbody>
</table>

Table 3 illustrates that the mean time to complete NG feeding tasks were similar between unit 8W and 11W. On average, staff in unit 8W reported that they insert an NG tube 0.7 minutes faster than staff in 11W and administer a feeding 0.2 minutes faster than staff in 11W. On average, staff in unit 11W reported that they remove, verify placement and complete post-feeding NG tasks 0.3 minutes, 0.1 minutes and 0.2 minutes faster than staff in 8W, respectively.

**Time Studies – Defining the Current State**

The team performed time studies on both RNs and Techs to determine the amount of time spent performing each step of the NG feeding process. Additionally, the total number of patients in each unit as well as the number of patients on NG feedings were documented on each collection day. The number of patients on NG feedings in each unit were extrapolated to quantify the total number of feedings administered daily in each unit, since all patients on NG feedings are administered a feeding every 3 hours. All time studies were performed between March 4 and March 30, 2012.

**Data Collection**

A feeding schedule was obtained upon team arrival with all NG feedings performed during that visit to maximize the number of time studies performed. Custom data collection sheets were created based on initial NG feeding observations in 8W and 11W as well as assistance from the Clinical Nurse Specialist in 8W. Detailed notes were taken on the custom data collection sheets describing the task being performed; time needed to perform it; and whether an RN, Tech, or family member performed the task. All collected data were documented on the data collection sheet in Appendix II.

A total of 29 observations were performed by individual project team members. The project team followed 10 different RNs and Techs in both units 11W and 8W combined. Figure 3 displays the number of RNs and Techs observed within each unit.
Figure 3 illustrates that more Techs were observed in 11W than 8W and more RNs were observed in 11W than 8W. These results emphasize how RNs and Techs are utilized within each unit. The results concur with the team’s observations that RNs perform more NG feeding tasks in unit 8W while Techs perform more NG feeding tasks in unit 11W.

Data Analysis
Time studies were performed on a total of 29 NG feedings, 12 from unit 8W and 17 from unit 11W. These studies yielded a total of 280 minutes of NG feeding tasks. The data obtained from time studies were used to compare the NG feeding tasks performed by both RNs and Techs. The data were analyzed using Microsoft Excel to evaluate the effectiveness of each role in the NG feeding process. Pivot tables were constructed to identify the mean time taken to complete each step of the NG feeding process based on roles and units. Additionally, these means were used to project the most probable future scenarios and their impacts on each unit.

Findings
Figure 4 compares the mean time taken by an RN and Tech in 8W to verify placement of an NG tube and administer a feeding.
Figure 4 illustrates that, on average, RNs verify placement of an NG tube within a patient’s body 0.3 minutes faster than Techs with a mean time of 0.3 and 0.6, respectively. Techs administer an NG feeding 0.4 minutes faster than RNs; however, an outlier exists for an RN who administered a feeding in 4.1 minutes. If this outlier is neglected, the mean time to administer a feeding by an RN and Tech is 1.3 and 1.2 minutes, respectively.

Figure 5 compares the mean time taken by an RN and Tech in 11W to verify placement of an NG tube and administer a feeding.
Figure 5 illustrates that there is no significant difference in the time taken by RNs and Techs to verify placement of an NG tube within a patient’s body; however, Techs administer feedings 0.2 minutes faster than RNs with a mean time of 1.5 and 1.3, respectively.

Table 4 explains the three most probable NG feeding process scenarios under the revised job description. The scenarios were determined based on team observations and nursing leadership interviews. Scenario 1 involves an RN completing all steps of an NG feeding. Scenarios 2 and 3 involve a combination of a Tech and RN to complete a feeding, with best and worst cases for the time a Tech needs to retrieve an RN to verify tube placement before feeding administration.

Table 4. NG feeding process scenarios under revised job description

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Best Case</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RN completes all tasks related to administering an NG feeding: warming a feeding, checking the patient’s vitals, verifying correct tube placement within the patient’s body, and administering the feeding</td>
<td>Tech retrieves an RN to verify correct tube placement in <strong>20 seconds</strong> <em>while</em> patient food warms</td>
<td>Tech retrieves an RN to verify correct tube placement in <strong>20 seconds</strong> <em>after</em> patient food warms</td>
<td>Tech retrieves an RN to verify correct tube placement in <strong>10 minutes</strong> <em>while</em> patient food warms</td>
</tr>
</tbody>
</table>

Figures 6 through 14 contain flowcharts illustrating all scenarios for both units.
Figure 6. Scenario 1: RN performs all NG feeding tasks – 8W

Figure 7. Scenario 2 (both cases): Tech retrieves RN to verify placement while food warms – 8W

Figure 7 illustrates both cases for scenario 2. The best and worst case times will be identical because the times to warm a feeding and to retrieve an RN are both 10 minutes.
Warm feeding → Check vitals/chart/comfort patient → Find RN → RN verifies placement → Administer feeding

**Figure 8. Scenario 3 (best case): Tech retrieves RN to verify placement – 8W**

10 min + 2.4 min + 0.3 min + 0.3 min + 1.2 min = 14.2 min

**TOTAL TIME**

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Warm feeding → Check vitals/chart/comfort patient → Find RN → RN verifies placement → Administer feeding

**Figure 9. Scenario 3 (worst case): Tech retrieves RN to verify placement – 8W**

10 min + 2.4 min + 10 min + 0.3 min + 1.2 min = 23.9 min

**TOTAL TIME**
Figure 10. Scenario 1: RN performs all NG feeding tasks – 11W

Figure 11. Scenario 2 (best case): Tech retrieves RN to verify placement while food warms – 11W
Figure 12. Scenario 2 (worst case): Tech retrieves RN to verify placement while food warms – 11W

Figure 13. Scenario 3 (best case): Tech retrieves RN to verify placement – 11W
Figure 14. Scenario 3 (worst case): Tech retrieves RN to verify placement – 11W
Figures 15 and 16 show the mean time needed to complete an NG feeding for each scenario in 8W and 11W, respectively.

Figure 15. Mean time to complete a feeding in unit 8W

Figure 15 shows that both scenario 2 cases take the least amount of time to complete an NG tube feeding in unit 8W with a mean of 13.9 minutes. Scenarios 1 and 3 (best case) were similar in time to complete a feeding with a mean of 14.3 minutes and 14.2 minutes, respectively; however, scenario 3 (worst case) illustrates the potential for scenario 3 to take as long as 23.9 minutes.
Figure 16 shows that scenario 2 (best case) takes the least amount of time to complete an NG tube feeding in unit 11W with a mean of 10.4 minutes; however, scenario 2 (worst case) shows that scenario 2 may take as long 14.1 minutes due to the less time needed to warm a feeding. Similar to 8W, scenario 1 and 3 (best case) times for 11W were comparable in time with a mean of 10.6 minutes and 10.7 minutes, respectively. Scenario 3 (worst case) takes significantly longer than the other processes with a mean time of 20.4 minutes.

**Interviews – Projecting the Future State**
Nursing leadership members were interviewed in person to project obstacles and challenges in the NG feeding process with changes in Tech responsibilities. These interviews were conducted with all willing nursing leadership who are actively involved in the job description transition.

**Data Collection**
Two interviews were conducted with nursing leadership members: one on March 20 at 9:15AM (4 participants) and the other on March 26 at 3:30PM (2 participants). The interviews followed a primarily unscripted, conversational structure as opposed to a scripted question-and-answer session. This structure allowed nursing leadership to elaborate on issues that surfaced during the interview.

Sample interview questions included:
- When do you plan to inform your staff of the revisions to Tech job description?
- When do you plan to implement these changes?
- What are the steps you will be taking to implement these changes?
- What are the biggest challenges you expect to face during the transition?
Data Analysis
The team documented the opinions collected from the nursing leadership interviews to project obstacles and challenges the units would face as a result of the Tech job description revision. These opinions were inspected for consistency to establish any unanimous obstacles the leadership members foresee.

Findings
The nursing leadership interviews helped the team quantify the staff breakdown for each unit and emphasize a difference in the way Techs were utilized in their respective units. In 8W, all RNs and Techs can work with patients throughout the entire unit. The same number of RNs and Techs are scheduled regardless of the shift time or day:
- Approximately 17 RNs per shift with 1-3 patients each
- 2 Techs per shift, 1 in “Maize” and 1 in “Blue” section, who help patients and aid RNs in their respective sections

The nursing leadership interviews also revealed that 8W and other NICUs follow a cluster-care approach in which RNs typically work exclusively with their newborn patients who require around-the-clock observation. Nursing leadership members believe the cluster-care approach helps enhance patient safety and comfort because one experienced individual is fully focused on his/her patient and can perform all tasks successively without interruption. The Techs in 8W perform more supportive tasks to aid the RNs and less hands-on technical tasks.

The new Mott building contains a “Milk Room” where breast and formula milk is fortified and prepared for patients before the feeding. In the old Mott building, Techs in 8W and 11W were responsible for fortifying breast milk, which accounted for 42% of their time. Upon transitioning to the new building, Milk Room Techs were hired to perform these specific tasks. Nursing leadership is concerned that Techs will no longer be fully utilized in 8W once their responsibilities are changed; work has already been reduced by 42% due to the Milk Room addition and no other responsibilities have been added.

In 11W, the number of Techs scheduled changes based on time of day. The unit is also comprised of both a general care and moderate care section, which differ in staffing. The staff breakdown in 11W is as follows:
- 3 RNs in the moderate care unit and no use of Techs
- 6-7 RNs in the general care unit and use of Techs
  - 2 Techs during the day shift
  - 1 Tech during the evening and night shifts

Nursing leadership believes the change in Tech responsibilities will significantly impact 11W. RNs in 11W delegate technical tasks to Techs frequently, especially NG feedings tasks. A significant number of NG feedings will require fragmented care if Techs continue to complete their permissible NG tasks. Nursing leadership believes that RNs cannot safely and successfully complete all steps of NG feedings in 11W without the help of Techs and the fragmented care approach will be highly disruptive.
CONCLUSIONS

Extensive NG feeding observation and project data analysis helped provide the project team with a concrete understanding of the NG feeding process under the original Tech job description in 8W and 11W. Survey findings provided the team with feedback from RNs in both units to determine the distribution of RN workload and opinions on the amount of work and responsibility for RNs. Time study results quantified the number of daily feedings performed in each unit as well as the times needed to perform each step of an NG feeding. Nursing leadership interview findings provided expert opinions on the future NG feeding process under the revised Tech job description and forecast obstacles that may arise in the future NG feeding process.

Surveys – Defining the Current State
The project team concluded a significant difference between the idle times (not actively performing patient-related tasks) of RNs in 8W and RNs in 11W. Survey findings proved the mean idle time of RNs in 8W is double the idle time of RNs in 11W, which nursing leadership believes is extremely important because 8W is a newborn intensive care unit. Intensive care unit patients typically have life-threatening conditions, which require close monitoring and constant care. A greater amount of RN idle time in 8W allows for more effective response to emergencies, which is very valuable and necessary in an intensive care unit.

The team concluded that the current workload is appropriate for RNs. Survey findings showed that RNs believe their current workloads are appropriate and that they are not overwhelmed with their current responsibilities.

Time Studies – Defining the Current State
The project team concluded that there is no standard procedure for warming milk before an NG feeding in 11W. Time study findings illustrate high variation (2.6 minutes) in the time needed to warm milk before an NG feeding; however, there is no variation in time taken to warm milk before an NG feeding in 8W.

The team concludes that medical personnel who perform more NG tube feedings in their respective unit are faster than personnel of a different role in the same unit. In 11W, time study findings illustrated the following:
- Techs performed more NG feedings than RNs
- Techs verified NG tube placement 3.6 seconds faster than RNs
- Techs administered a feeding 9 seconds faster than RNs

Conversely, RNs in 8W perform more NG feedings than Techs in 8W; these RNs verify NG tube placement 15.6 seconds faster than Techs.

The team concludes that scenario 2, Tech retrieves an RN to verify correct placement of the NG tube while the patient’s food warms, will consistently take the least amount of time in 8W. Time study findings showed that the cumulative time it will take to administer a feeding using the scenario 2 process is 13.9 minutes for both the best and worst case times to retrieve an RN.
The team concludes that **no strategy will consistently take the least amount of time in 11W**. The time study findings showed that scenario 2 (best case) will take the least amount of time to complete an NG feeding in 11W (10.4 minutes); however, scenario 2 (worst case) will take significantly longer (14.1 minutes). The actual time needed to complete an NG feeding using scenario 2 will sometimes be minimal, but may also be significantly longer than alternatives. Scenario 1, RN completes all tasks related to administering an NG tube feeding, will consistently take 10.6 minutes.

**Interviews – Projecting the Future State**
The team concluded that the **revised Tech job description will impact 8W and 11W in different ways and of varying severities**. The nursing leadership interviews revealed a significant difference in the utilization strategies of Techs between 8W and 11W. Techs in 8W have already lost 42% of their work to the Milk Room, and the **removal of more responsibilities may leave Techs underutilized in 8W**. Also, Techs in 8W perform mostly supportive tasks, but not many NG feedings; so the **NG feeding process in 8W will not be significantly impacted**.

Nursing leadership findings revealed concerns that **RNs may have insufficient time to complete all NG feeding steps in 11W without the help of Techs**. Time study findings show that as many as 72 daily NG feedings will require disruptive fragmented care, which will **significantly impact the NG feeding process in 11W**.

**EXPECTED IMPACT AND OUTCOMES**
The deliverables of this project were the following:

- Quantitative analysis of the NG feeding process and time needed to complete each step of an NG feeding
- Forecasted obstacles that may arise in the NG process (eg. who will complete them, under/overutilization of staff, problems of Tech locating an available RN)
- Comparative analysis of three scenarios using different strategies to successfully complete all steps of NG feeding

The deliverables are expected to provide both a short and long-term impact for UMHS. In the short term, the team expects its findings to help reduce the change in staff responsibility by providing the following knowledge:

- Time needed to complete each step of the NG feeding process
- Number of patients that require NG feedings
- Cumulative labor needed to complete all feedings
- Problems that may arise after the job description revision is put into effect
- Potential time wasted once Tech responsibilities are changed
In the long term, the team expects its findings to enhance the knowledge of labor requirements for NG feedings and provide a foundation for future projects to recommend potential improvements. Potential future projects include the following:

- Determine the most effective responsibilities for Techs
- Standardize each step of the NG feeding process
- Recommend the optimal staffing schedule
APPENDICES

Appendix I: Data Collection Sheet

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<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Shadowing</th>
<th>Experience</th>
<th>Total # of patients</th>
<th># patients caring for</th>
<th># patients on NG tubes</th>
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<th>7 day</th>
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Appendix II: General Staff Survey

Q1. What is your current position within the UM Hospital System?
- Registered Nurse (RN)
- Patient Care Tech Associate (PCTA)
- Nursing Leadership
- Other ________________

Q2. What type of unit do you work in?
- Intensive Care Unit (ICU)
- General Care
- Other ________________

Q3. How long have you been working in your unit?
- Less than a year
- 1-2 Years
- 2-5 Years
- 5-10 Years
- 10+ Years

Q4. How do you feel about the work you have in a given shift?

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<th>Definitely Agree</th>
<th>Mostly Agree</th>
<th>Neutral</th>
<th>Mostly Disagree</th>
<th>Definitely Disagree</th>
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<tr>
<td>On average, my workload is appropriate for my role.</td>
<td>⬜</td>
<td>⬜</td>
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<td>I often feel overwhelmed by the amount of work I do.</td>
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Q5. In a typical 8-hour shift, how much time do you spend on the following for all patients you care for (IN MINUTES):

______ Any part of the NG feeding process (tube insertion, removal, placement check, feeding)
______ Idle time (not actively performing tasks)

Q6. How many MINUTES are typically needed to fully complete the following processes (including preparation time, clean-up, etc)?

______ Inserting NG tube
______ Removing NG tube
______ Verify correct tube placement
______ Initiate feeding
______ Post feeding tasks

Q7. Please list and explain the most common problems you encounter involving the NG feeding process.

Q8. What percentage of your time in a typical workday is spent focused on the following? (Please assign a percentage for each that sums to 100)

______ Patient safety
______ Patient comfort
______ Employee satisfaction
______ Time/efficiency