Study of RN Staffing for Additional Chronic Care Initiatives
Project Final Report

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Executive Summary

The University of Michigan Health System (UMHS) currently offers chronic care services through clinic nurses in only some of its primary care sites, but is looking to implement these services across all of primary care. To perform this implementation successfully, The Director of Nursing, Candia Laughlin, has asked a team of Industrial and Operations Engineering students to study the incremental registered nurse (RN) work of providing the new care initiatives. Based on observations and analysis, the team has modeled the chronic care service process and made recommendations on required staffing needs.

Background

UMHS is specifically concerned with two types of chronic care initiatives: Transition of Care and Patient Center Medical Home (PCMH). Transition of Care is a one-time checkup after a patient is discharged from General Medicine or Family Medicine inpatient services to schedule further appointments, ensure proper medication intake, etc. PCMH is a series of multiple checkups for patients with diabetes, asthma, hypertension, and/or hyperlipidemia. Three UMHS sites have been successful in integrating these initiatives, and their nurses are considered exemplars in these care functions: Briarwood Family Medicine (PCMH), Domino’s Farms (Transition of Care and PCMH), and Canton Health Center (Transition of Care). In order to successfully implement these services in approximately 11 additional sites, UMHS needs to understand and model the RN staffing needs of these chronic care initiatives.

Goals and Objectives

The primary goal of the project was to measure the incremental RN work needed to provide Transition of Care and PCMH services. The secondary goal was to recommend RN staffing requirements for the new initiatives. The team accomplished these goals by completing the following tasks:

- Created a current state process map of RN administration of Transition of Care and PCMH care
- Conducted a series of measurement studies to identify the incremental RN work of providing Transition of Care and PCMH
- Analyzed data using statistical approaches
- Developed recommendations on staffing requirements of the initiatives

Methods

The following methods were used in this project to collect and analyze data.

Observations
Observations included shadowing nurses and recording the time spent on three different tasks within the chronic care process: prep work, phone call/visit, and post work. The
team observed at the three “best practice” sites and used this data to validate the data collected from self-reporting.

**Self-Reporting**
Self-reporting was conducted by nurses for three to four weeks using a Microsoft Excel spreadsheet tool that the team developed to record task time lengths and descriptions.

**Data Analysis**
The student team analyzed the self-reported time data from the nurses using Minitab statistics package and Microsoft Excel. Using the results of the analysis, the team developed recommendations on the staffing requirements of providing chronic care.

**Findings**
The following findings were identified from the initial client meeting, observations, self-reporting tool, and data analysis.

**Initial Client Meeting**
The team understood the following points from the initial project meeting:
- The current method of recording Transition of Care and PCMH process times is not precise.
- There is a discrepancy in the time performance of chronic care between “best practice” methods and other methods.
- Management would like to understand the time requirements of the “best practice” methods.

**Observations**
The student team members conducted observations to understand the process, and mapped out a process map for the general chronic care service.

![Figure E1. Process Map for Chronic Care](image)

**Figure 1** shows the process by which RNs handle chronic care patients. The key
difference between the Transition of Care and PCMH process is that the RNs label patients as Asthma, Diabetes, Hyperlipidemia, or Hypertension so as to determine the course of treatment for the PCMH patients. The data collected from the observation phase was also used to validate the self-reporting data collection method and confirm that prep work, phone call/visit, and post work times were being recorded accurately and precisely.

**Self-reporting**

It was determined that for Transition of Care on average nurses spend:
- 17 minutes on prep work
- 24 minutes on a phone call or visit
- 21 minutes on post work
- 64 minutes on the total process time with a standard deviation of 16 minutes

It was determined that for PCMH on average nurses:
- 9 minutes on prep work
- 36 minutes on a phone call or visit
- 31 minutes on post work
- 1 hour 10 minutes on the total process with a standard deviation of 31 minutes

**Data Analysis**

The data in this study was analyzed per site and for all three sites. The main findings are stated below.

**Percentage of Time Spent Per Task**

The percentage of time that an RN spends per task in the chronic care process determined that the order of tasks from most time-consuming to least time-consuming (phone call/visit, post work, prep work) is the same for both Transition of Care and PCMH; however, the percentages of time spent per task shows that these are two distinct processes and require separate analysis (cannot be averaged together).

**Average Task Time Per Patient**

For Transition of Care, the average time per task per patient is longer at Domino’s than at Canton except for prep work. This point may be attributed to the complexity of or the RN’s familiarity with the patient. For PCMH, the average time per task per patient is longer at Domino’s then at Briarwood. This may be attributed to the experience of the RN performing the care.

**Histograms of Average Process and Task Times**

For the distribution of total process times for Transition of Care with a sample size of 30, plus and minus one standard deviation from the mean lie at 80 minutes and at 47 minutes, respectively. By inspection, it was determined that the distribution resembles a bimodal distribution; this may be due to small sample sizes, differences in patient type, and/or differences in the experience of the RN performing the care. For the distribution of total process times for the PCMH process with a sample size of 48, plus and minus one standard deviation from the mean lie at 102 minutes and at 38 minutes, respectively. By inspection, it was determined that this distribution is also closer to a bimodal distribution,
and can potentially be explained by the same reasons as those for Transition of Care.

**FTE calculations**

The team conducted a full-time equivalent (FTE) analysis. Assuming a full-time employee works 32 hours per week, the team made the following calculations in Table 1.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Transition of Care Patients per Week per FTE</th>
<th>PCMH Patients per Week per FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briarwood</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Canton</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Domino’s</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td>All Sites</td>
<td>30</td>
<td>27</td>
</tr>
</tbody>
</table>

**Conclusions**

The student team determined the following conclusions from this study.

- Consider Transition of Care and PCMH processes separately when staffing.
- A greater amount of data points would decrease standard deviation and allow the removal of more outliers.
- A bimodal distribution may be more appropriate than a normal distribution due to small sample sizes, differences between new/complex versus recurring/simple patient types, and/or differences in experience level of the RN administering care.

**Recommendations**

Based on the findings and data analysis, recommendations were developed for continuing the data collection process, studying different types of patient times, and staffing based on the team’s FTE calculations.

**Continuing the Data Collection Process**

- Verify that nurses have a thorough understanding of the data collection process.
- Consider potential seasonal changes in patient demand or nurse performance.
- Study the influence of PCMH illness classification on task and process times.

**Studying New/Complex vs. Recurring/Simple Patient Times**

- Study the process times of recurring/simple versus new/complex patient cases separately.

**Staffing Based on FTE Calculations (patients per week per FTE)**

- Staff 30 FTEs across all Transition of Care sites
- Staff 40 FTEs at Briarwood Family Medicine and 24 at Domino’s Farms
- Transition of Care can be staffed at one level across all sites, whereas PCMH may need to be determined per site.
**Introduction**

Chronic care is the continued care of patients after being discharged from hospital services. Recently, chronic care for patients after hospital discharge and in a Patient Centered Medical Home has become an institutional and national priority. The University of Michigan Health System (UMHS) currently offers chronic care services through clinic nurses in only some of its primary care sites, but is looking to implement these services across all of primary care. In order to understand the requirements for an effective full-scale implementation, nurse management is interested in assessing the registered nurse (RN) workload for the new chronic care initiatives and identifying the necessary staffing needs. The Director of Nursing, Candia Laughlin, has asked a team of Industrial and Operations Engineering students to study the incremental RN work of providing the new care initiatives. To achieve this, the student team has observed and interviewed nurses and instituted a self-reporting tool. Based on observations and analysis, the team has modeled the chronic care service process in detail and made recommendations on required staffing needs. This report presents the methodology, findings, conclusions, and recommendations of this study.

**Background**

The role of an Ambulatory Care Nurse (ACN) in the University of Michigan Health System (UMHS) is changing as UMHS introduces chronic care services. UMHS is specifically concerned with two types of chronic care initiatives: Transition of Care and Patient Center Medical Home (PCMH). Transition of Care is a one-time checkup after a patient is discharged from General Medicine or Family Medicine inpatient services to schedule further appointments, ensure proper medication intake, etc. PCMH is a series of multiple checkups and interventions administered to patients with diabetes, asthma, hypertension, and/or hyperlipidemia (see Appendix A for a high level process map of both types of care).

These services involve medium to high-risk complexity patients who are assessed by Ambulatory Care Nurses. The assessment determines patient’s needs and gaps in care, and are performed in addition to primary care. Three UMHS sites have successfully integrated these initiatives into their daily work, and the nurses at these sites are considered exemplars in these care functions: Briarwood Family Medicine (Transition of Care and PCMH), Domino’s Farms (Transition of Care and PCMH), and Canton Health Center (Transition of Care). To successfully implement these services in approximately 11 additional sites, UMHS needs to understand and model the RN staffing needs of these chronic care initiatives. As the importance of chronic care grows, it is increasingly important to achieve a better understanding of this work to increase employee and patient satisfaction.

**Goals and Objectives**

The primary goal of the project was to measure the incremental RN work needed to provide Transition of Care and PCMH services. The analysis of the chronic care process
is incremental (each part of the process was studied separately) in order to assess RN workload for each task (prep work, phone call/visit, post work). The secondary goal was to recommend RN staffing requirements for the new initiatives. The team accomplished these goals by completing the following tasks:

- Created a current state process map of RN administration of Transition of Care and PCMH care
- Conducted a series of measurement studies to identify the incremental RN work of providing Transition of Care and PCMH
- Analyzed data using statistical approaches
- Developed recommendations on staffing requirements of the initiatives

Key Issues

The following key issues were drivers for this project:

- The role of the Ambulatory Care Nurse (ACN) is becoming more comprehensive as new initiatives are launched.
- It is important for UMHS to integrate chronic care services into all of its sites.
- To perform this integration, nurse management needs to know what staffing levels are necessary to perform the chronic care tasks.

Project Scope

This project included the chronic care processes only at the three UMHS sites: Briarwood Family Medicine, Canton Health Center, and Domino’s Farms. Only two care processes were studied: Transition of Care and PCMH. Transition of Care was studied at Canton and Domino’s, while PCMH was studied at Briarwood and Domino’s. The care process began when the RN first contacted the patient for follow up care and ended when the patient was cleared of further care. The chronic care initiatives were segmented and studied in three phases: prep work, phone call/visit, and post work.

A study of any task performed by the RN’s unrelated to Transition of Care or PCMH was not included in this project. This includes RN tasks performed in between chronic care tasks. Any chronic care for patients outside of the three specified UMHS sites was also not studied under this project. However, the hope is that the findings can be extended to these sites in the future.

Methods

The parties involved in this study were the Director of Nursing for the University of Michigan Health System and four RNs: two from the Canton Health Center and one each from Domino’s Farms and Briarwood Family Medicine.

The data collection methods for this project included observing nurses and instating a self-reporting tool. After data collection was complete, the student team conducted a statistical analysis of the information.
**Observations**

Observations included shadowing nurses and recording the time spent on three different tasks within the chronic care process: prep work, visit/call, and post work. Prep work is the preparation work performed before each patient visit/call, the visit/call is when the actual care is administered, and post work is any paperwork or follow-up work to the visit/call. The student team observed nurses at Domino’s Farms, Canton Health Center and Briarwood Family Medicine, and had a sample size of 30 patients for Transition of Care and 48 patients for PCMH. The team used this data to validate the data collected from self-reporting.

**Self-Reporting**

Self-reporting was conducted by nurses using a Microsoft Excel spreadsheet tool that the team developed to record task time lengths and descriptions for Transition of Care and PCMH. An electronic version of the tool was emailed to the nurses at each site, along with detailed instructions on how to populate the tool. The student team followed up these instructions with a phone call to each site to answer any questions or further explain the tool’s use. See Appendix E for samples of the self-reporting tools. Table 1 shows the dates for which the nurses at each site self-reported data.

<table>
<thead>
<tr>
<th>Site</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briarwood</td>
<td>October 25</td>
<td>December 2</td>
</tr>
<tr>
<td>Canton</td>
<td>October 19</td>
<td>November 4</td>
</tr>
<tr>
<td>Domino’s</td>
<td>October 10</td>
<td>November 14</td>
</tr>
</tbody>
</table>

**Data Analysis**

The student team analyzed the self-reported time data from the nurses using Minitab statistics package and Microsoft Excel. The following metrics were determined:

- Percentage of Time Spent Per Task Per Patient
- Average Task Time Per Patient
- Histograms of Average Process and Task Times
- Full-Time Equivalent (FTE) calculations

Using the results of the analysis, the team developed recommendations on the staffing requirements of providing chronic care.

**Findings**

The following findings were identified from the initial client meeting, observations, self-reporting tool, and data analysis.

**Initial Client Meeting**

At the initial project meeting on September 23, the following key points were understood by the student team from the client:
The current method of recording Transition of Care and PCMH process times is not precise, as the times are rounded to 15-minute intervals.

There is a discrepancy in the time performance of chronic care between “best practice” methods and other methods.

Management would like to understand the time requirements of the “best practice” methods.

**Observations**

The student team conducted multiple observations over the course of the project to understand the chronic care process and collect data. The following key points were gathered from the student team’s observations:

- PCMH care is offered to patients with Asthma, Diabetes, Hyperlipidemia, and/or Hypertension.
- The chronic care process is segmented into three parts: prep work, phone call/visit, and post work.

After understanding the chronic care process, the student team members mapped out a current state process map for Transition of Care and PCMH after observing the processes at Canton Health Center and Domino’s Farms, respectively.

![Process Map for Transition of Care](image)

**Figure 1. Process Map for Transition of Care**

Team 6: ACU RN Staffing
Figure 1 shows the process by which RNs handle Transition of Care patients. The RN begins the process by starting prep work documentation for a selected patient. After the prep work is started, the RN attempts to contact the patient or the patient comes in for a scheduled visit. If the RN is unable to connect with the patient after three attempts, the RN schedules a later date to contact the patient and the patient returns to the beginning of the process. If the RN is able to connect with the patient, the RN completes the phone call/visit and then begins the post work. The RN is finally able to discharge the patient once the prep work and the post work are complete.

Figure 2 shows a very similar process to the process mapped in Figure 1. The key difference in Figure 2 is that the RNs label patients as Asthma, Diabetes, Hyperlipidemia, or Hypertension so as to determine the course of treatment for the patients.

The data collected from the observation phase was used to validate the self-reporting data collection method and confirm that prep work, phone call/visit, and post work times were being recorded accurately and precisely. Table 2 shows the student team member’s observation of Canton Health Center.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Prep Work</th>
<th>Phone Call/Visit</th>
<th>Post Work</th>
<th>Total Process Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0:15</td>
<td>0:09</td>
<td>0:35</td>
<td>0:59</td>
</tr>
<tr>
<td>2</td>
<td>0:30</td>
<td>0:01</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>0:09</td>
<td>0:02</td>
<td>0:03</td>
<td>0:14</td>
</tr>
</tbody>
</table>

The times recorded by the student team are very similar to those self-reported by the nurses; therefore, the student team was about to validate the self-reporting process at Canton Health Center. The student team also conducted qualitative observations at Domino’s Farms and used that information to validate the self-reporting process at that site.
**Self-reporting**

The following observations were made from the self-reporting tools. Tables 3 and 4 below show the average time and standard deviation in minutes that RN’s spend administering each part of the Transition of Care and PCMH processes, respectively. These averages take into account the total process average times with regards to Canton Health Center, Domino’s Farms, and Briarwood Family Medicine.

Table 3: Average Time Per Patient in Minutes for Transition of Care
Team 6: ACU RN Staffing N=30

<table>
<thead>
<tr>
<th>Site</th>
<th>Prep Work</th>
<th>StDev</th>
<th>Phone Call/Visit</th>
<th>StDev</th>
<th>Post Work</th>
<th>StDev</th>
<th>Total Process Time</th>
<th>StDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canton</td>
<td>0:18</td>
<td>0:08</td>
<td>0:23</td>
<td>0:07</td>
<td>0:21</td>
<td>0:08</td>
<td>1:03</td>
<td>0:18</td>
</tr>
<tr>
<td>Domino’s</td>
<td>0:14</td>
<td>0:07</td>
<td>0:30</td>
<td>0:08</td>
<td>0:25</td>
<td>0:05</td>
<td>1:08</td>
<td>0:10</td>
</tr>
<tr>
<td>All Sites</td>
<td>0:17</td>
<td>0:08</td>
<td>0:24</td>
<td>0:08</td>
<td>0:21</td>
<td>0:08</td>
<td>1:04</td>
<td>0:16</td>
</tr>
</tbody>
</table>

Table 3 depicts that RNs working with Transition of Care patients spend an average time of 17 minutes on prep work, an average time of 24 minutes on a phone call or visit, and an average time of 21 minutes on post work. The total process time equates to 1 hour and 4 minutes with a standard deviation of 16 minutes.

Table 4: Average Time Per Patient in Minutes for PCMH
Team 6: ACU RN Staffing N=48

<table>
<thead>
<tr>
<th>Site</th>
<th>Prep Work</th>
<th>StDev</th>
<th>Phone Call/Visit</th>
<th>StDev</th>
<th>Post Work</th>
<th>StDev</th>
<th>Total Process Time</th>
<th>StDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briarwood</td>
<td>0:08</td>
<td>0:05</td>
<td>0:27</td>
<td>0:15</td>
<td>0:15</td>
<td>0:07</td>
<td>0:51</td>
<td>0:19</td>
</tr>
<tr>
<td>Domino’s</td>
<td>0:13</td>
<td>0:03</td>
<td>0:42</td>
<td>0:20</td>
<td>0:36</td>
<td>0:19</td>
<td>1:17</td>
<td>0:32</td>
</tr>
<tr>
<td>All Sites</td>
<td>0:09</td>
<td>0:05</td>
<td>0:36</td>
<td>0:20</td>
<td>0:31</td>
<td>0:19</td>
<td>1:10</td>
<td>0:31</td>
</tr>
</tbody>
</table>

Table 4 depicts that RNs working with PCMH patients spend an average time of 9 minutes on prep work, an average time of 36 minutes on a phone call or visit, and an average time of 31 minutes on post work. The total process time equates to 1 hour and 10 minutes with a standard deviation of 31 minutes.

**Data Analysis**

The data in this study was analyzed per site and for all three sites. The main findings are stated below.

**Percentage of Time Spent Per Task**

The percentage of time that an RN spends per task in the chronic care process was calculated and illustrated below. Figures 3 and 4 show the percentage of time that RN’s spend on each task for Transition of Care and PCMH for All Sites, respectively.
Figure 3: Percentage of Time Spent per Task for Transition of Care at All Sites
Team 6: ACU RN Staffing N=30

Figure 3 illustrates that nurses performing Transition of Care across Canton Health Center and Domino’s Farms spend 39% of their time on phone call/visit, followed closely by post work at 34%. Prep work is the least time-consuming part of the process at 27% of the total process time.

Figure 4: Percentage of Time Spent per Task for PCMH at All Sites
Team 6: ACU RN Staffing N=48

Figure 4 illustrates that nurses performing PCMH at all sites spend 47% of their time on phone call/visit, followed closely by post work at 40%. Prep work is the least time-consuming part of the process at 13% of the total process time.
Figure 4 illustrates that nurses performing PCMH across Briarwood Family Medicine and Domino’s Farms spend 47% of their time on phone calls/visits, followed closely by post work at 40%. Prep work is the least time-consuming part of the process at 13% of total process time. Although the order of tasks from most time-consuming to least time-consuming (phone call/visit, post work, prep work) is the same for both Transition of Care and PCMH, Figures 3 and 4 show that these are two distinct processes and cannot be equated in terms of data analysis.

**Average Task Time Per Patient**
Figures 5 and 6 show the average total process times per patient for Transition of Care and PCMH, respectively.

![Chart showing average task time per patient for Transition of Care at all sites](image)

Figure 5 illustrates that for the phone call/visit and post work tasks, the average time per patient is longer at Domino’s Farms then at Canton Health Center. However, for prep work the average time per patient is shorter at Domino’s Farms. This point may be attributed to the complexity of or familiarity with the patient, and will be addressed later in the study.
Figure 6 illustrates that for all three tasks in the PCMH process, the average time per patient is longer at Domino’s Farms then at Briarwood Family Medicine. This point may be attributed to the nurse performing the care, and will be addressed later in the study.

**Histograms of Average Process and Task Times**

Figure 7 illustrates the distribution of total process times for the Transition of Care process with a sample size of 30 patients. The vertical black lines at 1 hour and 20 minutes and at 47 minutes indicate the mean plus and minus one standard deviation, respectively.
Through inspection, it was determined that the data in Figure 7 is closer to a bimodal distribution as opposed to a normal distribution; this can potentially be attributed to a small sample size, a difference in type of patient, or a difference in the experience of the nurse collecting the data. Figure 8 below illustrates the distributions of individual task times for Transition of Care into prep work, phone call/visit, and post work.
By inspection, the distribution of task lengths for the phone call/visit also follows a bimodal distribution. Figure 9 illustrates the distribution of total process times for the PCMH process with a sample size of 48 patients. There appears to be an outlier over 2 hours and 15 minutes. The vertical black lines at 1 hour and 42 minutes and at 38 minutes indicate the mean plus and minus one standard deviation, respectively.
Through inspection, it was determined that the data in Figure 7 is closer to a bimodal distribution as opposed to a normal distribution; this can potentially be attributed to a small sample size, a difference in type of patient, or a difference in the experience of the nurse collecting the data. Figure 10 illustrates the distributions of individual task times for PCMH into prep work, phone call/visit, and post work.

Determined by inspection, the distribution for prep work does not appear to fit any distribution. This can be attributed to the small sample size of 12 patients. By inspection, the distribution of task lengths for the phone call/visit also follows a bimodal distribution.

**FTE calculations**
The student team conducted a full-time equivalent (FTE) analysis. FTE is a unit utilized to measure employees in a way that makes them comparable although they may work a different number of hours per week. The student team decided to conduct FTE analysis to find the number of patients per week per FTE because the RNs work a different number of hours per week.

Assuming a full-time employee works 2080 hours a year, at a rate of 20% non-productive hours, the FTE will have 1664 productive hours per year. This equates to 32 hours per week. At Canton Health Center, the average Transition of Care length is 63 minutes per patient. Therefore a FTE at Canton will be able to handle 30.47 or approximately 30 patients per week. The average Transition of Care length at Domino’s Farms is 68 minutes. So a FTE would be able to handle 28.23 or about 28 patients per week. The
overall average of 1 hour and 4 minutes per patient equates to 30 patients per week for each FTE. Table 5 below summarizes these calculations.

Table 5: Estimated Number of Patients Handled Per FTE Per Week for Transition of Care

<table>
<thead>
<tr>
<th>Observation</th>
<th>Total Process Time (Min)</th>
<th>Approximate Patients per Week per FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canton</td>
<td>1:03</td>
<td>30</td>
</tr>
<tr>
<td>Domino’s</td>
<td>1:08</td>
<td>28</td>
</tr>
<tr>
<td>All Sites</td>
<td>1:04</td>
<td>30</td>
</tr>
</tbody>
</table>

At Briarwood Family Medicine, the average PCMH length is 48 minutes per patient. So a FTE at Briarwood would be capable of handling 40 patients per week. The average PCMH length at Domino’s Farms is 1 hour and 17 minutes. This equates to 24.93 or about 24 patients per week per FTE. The overall PCMH average length of 1 hour and 10 minutes per patient corresponds with 27.43 or 27 patients per week per FTE. Table 6 below summarizes these calculations.

Table 6: Estimated Number of Patients Handled Per FTE Per Week for PCMH

<table>
<thead>
<tr>
<th>Observation</th>
<th>Total Process Time (Min)</th>
<th>Approximate Patients per Week per FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briarwood</td>
<td>0:48</td>
<td>40</td>
</tr>
<tr>
<td>Domino’s</td>
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<td>All Sites</td>
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Conclusions

The student team determined the following conclusions from this study. From the initial client meetings and observations, the team determined that the data collected through self-reporting was being recorded accurately and precisely. The averaged data from the self-reporting tools and from the data analysis on the percentage of time spent per task illustrated that the Transition of Care and PCMH processes are two distinct processes. The process times are too different so that they cannot be averaged and/or considered together when determining optimal staffing levels.

The student team examined the histograms of total process times and task times and determined that a greater amount of data was needed to report any significant findings. Also, the student team discovered large standard deviations with regards to the PCMH task time data; additional data would allow for a smaller standard deviation and further investigation into the large discrepancies and outliers.

The team also noticed that the average total process times fell more closely to a bimodal distribution than a normal distribution. This could be attributed to three potential entities: small sample sizes, differences between new/complex patients and recurring patients, and/or differences in the experience of the nurse administering care. With a larger sample
size, the studied distributions may come to resemble a normal distribution as initially expected. The RN administering care may spend more time on unfamiliar or complex patient cases than for recurring or simple patient cases; this could result in two modes for the distribution. The experience level of the nurse providing the care could also create a bimodal distribution, as experienced nurses would on average spend more time, and new or inexperienced nurses would on average less time. As for the FTE calculations, the team determined optimal staffing levels for FTEs per site per type of care as summarized in Tables 5 and 6. The optimal levels are relatively similar for Transition of Care across all sites, but are distinctly different for PCMH across all sites.

Recommendations

The following recommendations were developed based on the findings from the observations, self-reporting, and data analysis.

**Continuing the Data Collection Process**
One limitation in this study is the availability of data. Continued data collection would allow for more accurate results with smaller standard deviations to represent the staffing requirements to provide chronic care services. From this, management will be better equipped to meet patient demand when implementing these services in new sites. Further ways to improve data collection include:

- Verify that nurses have a thorough understanding of the data collection process (i.e., data collection tool).
- Collect over different times of the year to realize potential seasonal changes in patient demand or nurse performance.
- Study the influence of PCMH illness classification (e.g., hypertension) on average total task time and/or average individual task times.

**Studying Recurring vs. New/Complex Patient Times**
The data of average total process time does not follow a normal distribution. Looking at the histogram, the student team believed that the data seemed to form a bimodal distribution. Nurse management should study the differences in process times between recurring patients versus new or complex patients. The voids in the histogram and the high standard deviation in the data could correlate to the patient type. For example, if an RN was familiar with a patient she could quickly move through the documentation process; however, if an RN was not familiar with a patient, or the patient was a complex one, the RN might take a longer time to complete the work. This study would allow nurse managers to understand how long processes take with different patients.

**Staffing Based on FTE Calculations**
Based on the FTE calculations, the student team recommends that nurse management plan to staff Transition of Care FTEs at a level to handle 30 patients per FTE and staff PCMH FTEs on a location basis. Briarwood should be staffed to handle 40 patients per week per FTE, while Domino’s should be staffed to handle 24 patients per week per FTE. Due to the great differences in PCMH times, the student team recommends that the FTEs are staffed based on location FTE rather than process FTE. However, once more data is
gathered, the student team believes that nurse management will be able to confidently staff the PCMH process.

**Expected Impact**

The findings and recommendations of this study will provide a better understanding of the current state and time requirements of Transition of Care and PCMH across UMHS ambulatory care sites. This understanding will allow nurse management to effectively implement these chronic care initiatives at 11 additional UMHS sites by allowing management to estimate the staffing level prior to implementation. In addition, nurse management will be able to implement the “best practice” work procedure that was studied in this project. Most importantly, the output of this study will potentially lead to increased RN and patient satisfaction.
Appendix A: Self-Reporting Tools

Transition of Care Self-Reporting Tool:

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<th>Prep Work Begin</th>
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<th>Phone Call/Visit Begin</th>
<th>Phone Call/Visit End</th>
<th>Post Work Begin</th>
<th>Post Work End</th>
<th>Notes</th>
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PCMH Self-Reporting Tool:

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<th>Post Work Begin</th>
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Alternative PCMH Self-Reporting Tool:

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