University of Michigan Health System

Implementing an Ambulatory Diagnostic & Treatment Center at the Taubman Health Center to Provide Specialty Outpatient Services

Final Report

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EXECUTIVE SUMMARY

The Emergency Department (ED) at the University of Michigan Hospital treats approximately 87,000 patient visits over the course of a year. These patients range from various departments of the hospital and community, including a significant subset of patients from the Taubman Health Center outpatient clinics. Patients from this subset were sent to the ED to treat flare ups of their previously diagnosed conditions. Although patients experiencing flare ups require a higher degree of care than what is available in their home clinic, they do not require the degree of services provided by the ED. Furthermore, given that patients sent to the ED may be subjected to long wait times and potential exposure to harmful situations, a separate treatment center that bridges the gap in service between the clinic and the ED is preferred to meet the needs of these patients. Therefore, an Ambulatory Care Committee at the University of Michigan Health System is proposing the development of an Ambulatory Diagnostic and Treatment Center (ADTC) to serve the needs of this unique subset of patients. This proposed ADTC will be similar to the Cancer Center Acute Treatment Center (ATC). This is a similar ‘urgent care’ facility that caters to the needs of cancer patients who are experiencing flare ups. The client, who is the Senior Project Manager of the Ambulatory Care Services team, asked an IOE 481 student team from the University of Michigan to assist with the progression of the ADTC. The goal of this project is to develop an ADTC patient workflow and define the patient population, which includes the medical symptoms that will be treated at the center.

The team observed the workflow at the ATC and conducted interviews with medical staff to develop a proposed ADTC workflow. This proposed ADTC workflow includes the usage of electronic documents to aid the ADTC triage process and the recommendation for a Medical Doctor trained in Emergency Medicine to be in charge of this process. Through the cross referencing of Taubman Patient Appointment Data as well as ED Referral Data, the team defined the unique subset of patients and symptoms to be treated in the ADTC. The project did not account for the financial cost or staffing levels required to implement the recommendations, but the objectives focus on aiding the progression of the ADTC.

Methods and Findings

The team collected data for the ADTC project in the form of observations, interviews, Taubman ED referral studies and patient data queries. Observations and interviews were performed to determine the ATC actual patient workflow in order to benchmark a patient workflow for the ADTC. Taubman ED referral studies were returned by four Taubman Clinics to the client. This study determined if a clinic nurse would send a patient to the ADTC. Patient data queries on completed patient appointments and ED referrals were performed to determine the Taubman patients who made appointments as well as the subset of Taubman appointments who were referred to the ED. These two datasets, consisting of 65,500 patient appointments in the Fiscal Year 2013 (FY13), were cross-referenced to define the proposed ADTC patient population.
including symptoms to be treated at the center. After the team identified the list of potential symptoms to be treated in the ADTC, interviews with Medical Directors were conducted. The physician used her medical expertise to further outline the patient population and symptoms to a list which was appropriate for treatment in the ADTC.

**ATC Patient Workflow**
During observations of the ATC patient workflow and nurse interviews, the team discovered that there were two versions of this workflow: Theoretical and Actual. This discrepancy in the type of workflow occurs when the nurse at the home clinic is unable to get a hold of the attending physician to complete the triage and referral processes. The actual ATC patient workflow is therefore different from the theoretical workflow since the absence of the attending physician results in the nurse having to decide whether to refer the patient on his or her own. Also, due to the finite operating hours of the ATC, 76.47% of patients who were being treated in the center after 5:00 PM were admitted to inpatient services or referred to the ED. This information was based on a sample of 342 ATC patient visits from October 2012 through September 2013. The team identified inefficiencies in the triaging process due to the difficulty in relaying patient information from the nurse who performed the initial phone triage in the clinic to the nurse at the ATC. These problems stem from the lack of a formal process to share referral information.

**Taubman ED Referral Studies**
The client distributed ED Referral surveys to all Taubman Health Center clinic triage nurses. Survey information was collected over a span of two weeks and resulted in 50 Taubman ED referrals from Internal Medicine (IM), General Surgery, Transplant, Neurology and Otolaryngology. Analysis of the surveys showed that the distribution of patient symptoms were reflective of the overall Taubman symptoms used as initial treatment recommendations for the ADTC. This study also highlighted that the Transplant Clinic will potentially refer a significant amount of patients to the ADTC requiring the concluded services.

**ADTC Patient Population and Symptoms**
The team cross referenced completed Taubman Patient Appointment Data with ED referral data to define the potential ADTC patient population. This list was examined by Medical Directors to settle the actual population that was appropriate for outpatient treatment in the ADTC. Based on the Medical Director’s feedback, five symptoms were identified as appropriate symptoms for treatment in the ADTC: Abdominal Pain, Fever, Hypertension, Irregular Heartbeat and Dehydration. These symptoms account for 15% of all ED referrals at UMHS. Although these symptoms were identified as potential treatments to be covered at the ADTC, Medical Directors advised that each patient will present a unique case. Therefore, ADTC admission will have to be determined carefully on a case by case basis by a knowledgeable medical personnel.
Conclusions and Recommendations

Based on the aforementioned findings, three conclusions were made. First, the ADTC patient workflow must be robust to varying patient and operational factors, therefore, nurses do not have to work around standard procedures. Second, the ADTC should publish the list of symptoms that will be treated at the center so the ADTC does not get overwhelmed by incorrect referrals. Last, due to the uniqueness of each patient case, a knowledgeable medical personnel should be in charge of triaging patients at the ADTC to implement robust triaging protocols.

Based on the conclusions made above, the following recommendations were developed:

**ADTC Patient Workflow Recommendations**
A proposed ADTC patient workflow has been developed. The proposed workflow includes recommendations for improving the triage process through the use of electronic patient documents in MiChart. Utilizing electronic patient information in the MiChart system will improve the efficiency of the patient triage process. This will enable ATC nurses to view the information the clinic nurse recorded during the initial phone triage. Based on the Transplant Medical Director interview, the team found that the Transplant Department currently has a similar communications strategy for referrals. The team recommends to conduct further benchmark studies on the Transplant Communications Strategy that can potentially be adopted throughout all Taubman Health Center clinics.

**ADTC Patient Population and Symptom Recommendations**
A vetted list of patient symptoms that should be treated at the ADTC is found below:

1. Abdominal Pain - Generalized
2. Fever
3. Hypertension
4. Irregular Heartbeat
5. Dehydration

Although the above symptoms are potential treatments covered at the ADTC, since each patient case is unique, Medical Directors recommend that the center should be staffed by a Doctor or provider who is trained in Emergency Medicine. This will help the ADTC establish a more robust triage process because physician knowledge is crucial to admitting patients best served by the center and not by the ED. Furthermore, the service coverage of the ADTC should not be limited to the above list but can be expanded after initial implementation to include more clinic-specific scenarios throughout Taubman. This will require further analysis of each Taubman clinic, their patient population and symptoms.
INTRODUCTION

Hospital-based emergency care in the US is experiencing significant challenges. The number of hospitals and emergency departments is decreasing while demand for care is increasing rapidly (Medeiros). Symptoms of this demand-capacity mismatch include Emergency Department (ED) crowding, ambulance diversion, and boarding of admitted patients due to the lack of hospital beds (Medeiros). The Taubman Health Center at the University of Michigan Hospital treats a high volume of outpatient visits each year. The ED at the University of Michigan Health System has approximately 87,000 patient visits from various departments and communities over the course of a year [1]. A significant subset of these patients are from Taubman Ambulatory Care Units who have been diagnosed with chronic diseases and are sent to the ED while experiencing a flare up. Although these patients need a higher degree of care than what is available in their home clinic, they do not require the degree of services provided by the ED. In addition, given that patients sent to the ED may be subjected to long wait times and exposure to harmful situations, a separate treatment center that bridges the gap in service between the clinic and the ED is required to meet the needs of these patients. Therefore, the Ambulatory Care Unit of the Taubman Health Center is planning to create an Ambulatory Diagnostic and Treatment Center (ADTC). This center will treat Taubman patients who are experiencing chronic flare ups and will allow them to receive the appropriate care.

The client, the Senior Project Manager of the Ambulatory Care Services team, asked an IOE 481 student team to assist with the preliminary planning of the ADTC. The goal of this project was to develop a patient workflow and define the patient population, which includes the medical symptoms that will be treated at the ADTC. This proposed ADTC will be similar to that of the Cancer Center Acute Treatment Center (ATC), which is an ‘urgent care’ facility that caters to the needs of cancer patients experiencing flare ups of their chronic conditions. Through observation of the ATC patient workflow, a proposed ADTC patient workflow was developed, which begins when a patient contacts or visits his or her home clinic and ends when the patient is discharged from the ADTC. The patient population and the recommended medical conditions have been defined through the analysis of completed patient appointment data and ED referral data. The team has delivered a finalized ADTC patient workflow as well as a recommendation of the patient population which includes medical symptoms to be treated at the center. The purpose of this final report is to discuss the findings, conclusions and recommendations for the ADTC that were derived from the analysis of data collected through the course of this project.

BACKGROUND

The University of Michigan Taubman Health Center plans to introduce an Ambulatory Diagnostic and Treatment Center to provide appropriate care for current Taubman patients. Individuals with both pre-existing and complications of chronic conditions will be treated in this center. Currently, the Taubman Health Center does not have an outpatient service department
that provides urgent care services. Through the development of this center, patients will be able to experience efficient and optimal care in a comfortable setting since they will be able to avoid long wait times and potentially harmful conditions in the ED.

Clinical data has indicated that patients who experience multiple acute problems have been increasing at a rate of 25% [1 “Refer to data attained”]. This is a key issue that influenced the development of the ADTC. The current model in Taubman requires patients experiencing chronic flares to use ED services for treatment, even if this level of treatment is not required. Utilization of ED services instead of a center such as the ADTC has both operational and cost implications. Hospitals lose approximately $200 each time a patient enters the ED, even if the patient does not require ED services [1].

Preliminary data from the University of Michigan’s Cancer Center ATC indicate that, on average, 750 patients visit the center per year, of which only 25% require treatment of an inpatient capacity [1]. Extrapolating this data to the context of the Taubman Health Center ADTC, the team expects a significant utilization of this center, potentially reducing the operation costs of the hospital. Therefore, based on the current situation, the implementation of a unit like the ADTC at the Taubman Health Center is beneficial to the hospital.

The location for the proposed ADTC has been allocated to the current office space beside the existing Infusion Services Department. The initial space mockup was provided by the client and shown in Figure 1.

![Figure 1. Initial ADTC Space Mockup](source: Ambulatory Services, UMHS)
Figure 1 shows the proposed layout of the ADTC space. Currently the ADTC is expected to have approximately four beds serviced by two or three staff members. The location of the ADTC will also be adjacent to the Infusion and Transplant clinics.

The implementation of the ADTC is particularly challenging since the Taubman Health Center has 25 listed departments spanning from musculoskeletal to gastrointestinal units. The ADTC will function to serve patients that require an elevated form of treatment above that of their home clinic, but not at the level of the ED. In essence, the new center will serve to narrow the gap in services between the clinic and the ED to meet the needs of chronic patients.

KEY ISSUES

The following key issues were driving the need for this project.
- Increase in acute patient population
- Exposure to improper treatment settings (infection control conditions, long wait times)
- Operational costs resulting from ED bed usage for non-emergent treatment
- Vast treatment coverage across Taubman Clinics requires study of ADTC treatment criteria

GOALS AND OBJECTIVES

The primary goal of this project was to develop an ADTC patient workflow backed by a patient population estimate that includes the type of symptoms treated in the center. To complete these deliverables, the team has completed the following tasks:
- Benchmarked ATC patient workflow
- Conducted an ED referral study on Taubman clinics
- Cross-referenced patient appointment and ED referral data
- Interviewed Taubman and Cancer Center medical staff

With this information the team has delivered the following recommendations:
- Workflow of ADTC patients
- List of symptoms to be treated in the ADTC
- Estimation of patient population based on treatment recommendations

PROJECT SCOPE

This project focused on developing a patient workflow for future ADTC operations and defining the patient population, which includes symptoms to be treated at the center. The project included conducting observations and interviews with staff to benchmark ATC patient workflow to develop an ADTC patient workflow. The workflow begins when a patient calls or is being seen in clinic and ends when the patient has been discharged. However, the workflow will not cover the treatment processes within the ADTC. Also included in the project scope is the analysis of
Taubman ED referral data as well as patient data queries. The analysis of data was used to define the ADTC patient population including symptoms treated in the center. This is a comprehensive list of symptoms Taubman patients have experienced when referred to the ED. Additional interviews with Medical Directors to further narrow the patient population and at the ADTC was also included in the project scope.

This project is not a business case stating the return on investment of the model. A financial analysis of the recommendations is not included because this project has not reached that stage of development. Analysis of suitable staffing levels required to implement the recommendations in this report are not in scope. All recommendations will be solely based on Taubman Health Center’s needs, not urgent care requirements across the entire hospital. Finally, when the Cancer Center ATC was evaluated, pre-hospitalization and overflow patients were not utilized in the analysis.

METHODS

The team focused on both ATC and Taubman patients, ATC staff, Taubman Medical Directors and clinic personnel to collect data. All university hospital staff were considered a potential reference because patient routing is a major aspect of healthcare processes. The team concentrated on the Taubman Health Center and the Cancer Center because the Taubman Health Center ADTC will be based on the existing Cancer Center ATC.

Data Collection

Data for the ADTC project was collected through observations, interviews, Taubman ED referral surveys, and patient data queries. The team also performed a literature research to gain knowledge and a better understanding of how to improve patient flow in a hospital. All forms of data collection required for the ADTC project are complete.

Observations

The team performed an hour-long site visit to the future ADTC space to gauge perspective. Additionally, the team has visited the ATC four times, each visit approximately two hours in length, to review the ATC triage process. A total group of four physician’s assistants and nurses working in the ATC were interviewed to help the team understand how the center operates. The team also interviewed an additional two clinic nurses of the Cancer Center on-site for their expertise on the process of how patients are referred to the ATC. This process continued through the entirety of the project and provided a detailed benchmark to further the development of an ADTC workflow. Observations officially concluded on November 15, 2013.
Medical Director Interviews
The team interviewed individuals who currently utilize the ATC and the Medical Directors in Taubman clinics that will be covered by the future ADTC. To determine which clinics to focus on, information on potential “high usage” clinics within Taubman was collected through the ED referral study distributed by the Client and shown in Appendix 1. Interview questions focused on conditions in which clinics would refer patients to the ED and background information of the patient triage process. These questions provided the framework for both the requirements of the ADTC as well as its admissions process. Interviews conducted throughout November provided information on the ED referral processes, touch-back processes and symptom routing. All interviews concluded on November 15, 2013.

ED Referral Survey
Surveys for patient ED referrals were distributed as paper surveys by the client, Project Manager of ADTC development, shown in Appendix 1. These surveys were distributed to all Taubman clinics and requested nurses to document patients that were successfully transferred to the ED. The clinics that returned the survey include: General Surgery, IM, Neurology, Otolaryngology and Transplant. Information requested on the survey includes:

- Patient Name
- Patient MRN
- Date of Encounter
- Symptoms
- Phone versus In-person Triage
- Recommendation of ED vs. Urgent Care

ED Referral data was used in conjunction with the aforementioned patient population appointments to cross-reference ED referral symptoms to confirm symptom recommendations to the ED. The survey was conducted over a two week time period from September 30, 2013 to October 11, 2013. The survey provided 50 ED referrals from the five clinics that participated in the survey. Results were delivered to the team on October 22, 2013 by the ADTC Project Manager.

Patient Population Data Query
The team requested data on ED referrals and patient appointments to estimate the future patient volume of the ADTC. This data was compiled by the client, the Project Manager of ADTC development, and helped the team focus on clinics that will utilize the new center. Queries for years 2013 and 2014 patient appointments helped the team identify “high-usage” clinics in Taubman. Additionally, data on ED referrals with the associated patient Medical Record Numbers (MRNs) allowed the team to cross reference patient appointment data with ED referral data. Next, an estimate of Taubman patients treated in the ED in FY13 was concluded. The above data on Taubman patients combined with data from the ED referral survey included the
team to develop reasonable conclusions regarding the proposed ADTC patient population. These answers include the percentage of total patients sent to the ED, of which, a subset can be treated in the ADTC. Further analysis of the data helped the team define the patient population as well as conditions that will be treated at the ADTC. This data was compiled and delivered to the team on October 22, 2013.

**Literature Research**

The team performed a literature research to understand some of the most important modern-day challenges that hospitals encounter with patient flow. The article by Medeiros, D. J., Eric Swenson, and Christopher DeFlitch titled "Improving Patient Flow in a Hospital Emergency Department" provided the team with insight on how engineering principles can be applied to situations in the ED to aid operational constraints. The awareness of these constraints in the ED environment helped the team determine and conceptualize the limitations of an out-patient “urgent care” clinic such as the proposed ADTC.

**Data Analysis**

The quantitative data from the ED referral study and data queries were synthesized with information from interviews and observations to determine applicability of the results. The information contributed to defining the patient population which included symptoms to be treated at the ADTC. With the patient population and treatment coverage defined, conditional scenarios were formed and built into a more robust ADTC patient triage workflow.

**Interview and Observation Data Analysis**

The data collected from interviews and observations were used to assess the validity of quantitative results. Given that each medical case is unique as different patients present different symptoms, a modified way to approach the quantitative implementation of solutions was required to ensure the highest quality patient care. Therefore, these observations and interviews separated bias in quantitative data collection methods and aided the team to form appropriate decisions. Information collected through interviews and observations were considered “soft” data; however, this data influenced avenues of research more heavily than quantitative results as the ADTC currently does not exist resulting in the applicability of quantitative results to be limited. The recommendations provided by hospital staff who work closely with this project also highly influenced the team’s recommendations for future operations of the ADTC.

**Population and Survey Analysis**

The team identified Taubman patients who were transferred to the ED by cross-referencing patient name and unique ED referral date. The team also analyzed this population to determine the percentage of Taubman clinic patients who could be ADTC patients. This analysis mainly used the ED Referral Survey data and Medical Director interviews to estimate the percentage of total referrals that may be treated in the ADTC. This potential patient population depends on the
evaluation of the referring nurse and is therefore subject to large variations in estimates. Thus, the team is only able to provide a rough estimate of the potential usage of the ADTC and common conditions of referred patients to develop appropriate treatment coverage for the patient population.

All data was used to create the ADTC patient workflow. This workflow contains the process by which patients can be referred to the ADTC as well as the conditions that a patient needs to fulfill to be seen in the center. This patient workflow will be the baseline of ADTC operations and will provide future insight into facility planning and staffing.

**FINDINGS**

Data was analyzed to identify the potential ADTC patient population, the most common symptoms causing ED referrals and screening criteria for patient referrals.

**ADTC Patient Population Estimated at 1,700 Patients per Year**

To determine the patient population, a study of 65,500 Taubman patient appointments identified patients referred to the ED. The data query identified 1,692 unique patients who were referred to the ED. Therefore, the team expects that about 1,692 ED referrals from the Taubman patient population occur on a yearly basis. However, the ED referrals of Taubman patients with an appointment do not represent the entire potential patient population of the ADTC. Additionally, all referrals will not be treated in the center. This provides a significant estimate on potential patient volume and the team recommends that this estimate should be taken into consideration to develop a facility capable of meeting this volume requirement.

Additional analysis was conducted on the generic breakdown of Taubman patients to their respective units to identify which unit should be the major focus of the ADTC. Table 1 shows the breakdown of patient referrals by clinic.

Analysis of the table clearly shows that Internal Medicine (IM) is a significant percentage of total patient referrals measuring at 47.22%. Further inquiry on the high volume of patient referrals identified Transplant as a major component of all IM appointments. From this finding, the team utilized IM personnel to identify potential symptoms that can covered in the ADTC.

Next page...
Table 1. Breakdown of Patient ED Referrals by Ambulatory Care Unit (ACU)
Sample Size: 1692; Collection Period: FY13

<table>
<thead>
<tr>
<th>ACU</th>
<th>Patients</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tbmn Int Med</td>
<td>799</td>
<td>47.22%</td>
</tr>
<tr>
<td>Tbmn Oto</td>
<td>160</td>
<td>9.46%</td>
</tr>
<tr>
<td>Tbmn Gen Med</td>
<td>145</td>
<td>8.57%</td>
</tr>
<tr>
<td>Tbmn Srg</td>
<td>123</td>
<td>7.27%</td>
</tr>
<tr>
<td>Tbmn MedDerm</td>
<td>121</td>
<td>7.15%</td>
</tr>
<tr>
<td>Tbmn Uro</td>
<td>90</td>
<td>5.32%</td>
</tr>
<tr>
<td>Tbmn Neurog</td>
<td>85</td>
<td>5.02%</td>
</tr>
<tr>
<td>Tbmn OrthoSg</td>
<td>85</td>
<td>5.02%</td>
</tr>
<tr>
<td>Tbmn NeurosG</td>
<td>59</td>
<td>3.49%</td>
</tr>
<tr>
<td>Tbmn Opthy</td>
<td>17</td>
<td>1.00%</td>
</tr>
<tr>
<td>Tbmn Peds</td>
<td>6</td>
<td>0.35%</td>
</tr>
<tr>
<td>Tbmn LsrDerm</td>
<td>2</td>
<td>0.12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1692</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Top 20 Common Causes for ED Referrals

Through analysis of both a database query and the ED referral study, the team has identified common symptoms listed as causes for ED referrals. Analysis of the total UMHS ED referrals highlight the following symptoms, in order of frequency, as the cause for referral.

Table 2. Common Taubman Referral Symptoms compared to UMHS Rank
Sample Size: 65,000; Collection Period: FY13

<table>
<thead>
<tr>
<th>Taubman Rank</th>
<th>Symptom</th>
<th>% Total</th>
<th>UMHS Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abnormal Lab</td>
<td>9.60%</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Chest Pain</td>
<td>8.59%</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Shortness of Breath</td>
<td>8.08%</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Abdominal Pain - Generalized</td>
<td>3.54%</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Fever</td>
<td>3.54%</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Hypotension</td>
<td>3.54%</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>Leg Pain</td>
<td>3.54%</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Altered Mental Status</td>
<td>2.53%</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>Edema</td>
<td>2.53%</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Fatigue</td>
<td>2.53%</td>
<td>17</td>
</tr>
<tr>
<td>11</td>
<td>Hypertension</td>
<td>2.53%</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>Irregular Heartbeat</td>
<td>2.53%</td>
<td>19</td>
</tr>
<tr>
<td>13</td>
<td>Respiratory Distress</td>
<td>2.53%</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Vomiting</td>
<td>2.53%</td>
<td>8</td>
</tr>
<tr>
<td>15</td>
<td>Wound Check</td>
<td>2.53%</td>
<td>7</td>
</tr>
<tr>
<td>16</td>
<td>Back Pain</td>
<td>2.02%</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>Dehydration</td>
<td>2.02%</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>Seizures</td>
<td>2.02%</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>Syncope</td>
<td>2.02%</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>Wound Infection</td>
<td>2.02%</td>
<td>-</td>
</tr>
</tbody>
</table>
Cross-referencing of the complete Taubman patient appointment data to the ED referral study conducted returned similar results. Common Taubman referral symptoms by unit are shown in Table 3.

**Table 3.** Common Referral Symptoms by Ambulatory Care Unit from Referral Study  
Sample Size: 50; Collection Period: September 30, 2013 - October 11, 2013

<table>
<thead>
<tr>
<th>ACU</th>
<th>Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Medicine</td>
<td>Diarrhea, Hypoxia, Nausea, SOR, Ulcers</td>
</tr>
<tr>
<td>General Surgery</td>
<td>Emergency, Abscess, Dehydrated</td>
</tr>
<tr>
<td>Transplant</td>
<td>Diarrhea, Abdomen Pain, Dehydrated, Emesis, Fever, Nausea</td>
</tr>
<tr>
<td>Neurology</td>
<td>Emergency, Nausea</td>
</tr>
<tr>
<td>Otolaryngology</td>
<td>Bleeding, SOB</td>
</tr>
</tbody>
</table>

The subset of 50 Taubman ED referrals from Internal Medicine, General Surgery, Transplant, Neurology and Otolaryngology had similar ED referral causes as the total general population, validating the results in Table 3.

The common rankings of symptoms across the three analysis methods support the significance of the findings and therefore the top 20 Taubman symptoms are considered to be the potential list of symptoms treated in the ADTC.

**Applicability of Symptoms for ADTC Referral**

After identifying common ED referral symptoms, the information was evaluated by the Medical Director of Transplant. The appropriateness of treatment for each symptom in an outpatient setting was established. Of the top 20 symptoms identified through analysis of the patient population data set, five symptoms were determined to fit the capabilities of the proposed ADTC and were therefore chosen to be treated at the center. The five symptoms are listed below:
1. Abdominal Pain - Generalized
2. Fever
3. Hypertension
4. Irregular Heartbeat
5. Dehydration

The remaining symptoms were identified as either appropriate to be treated within clinic or too serious for ADTC referral. The five symptoms listed above however is not a comprehensive list of all symptoms that can be treated in the ADTC. Medical symptoms in each patient case can be from different ailments and it is ultimately up to the referring provider to decide on the correct treatment setting for that particular patient. These findings will be used equip the ADTC to deal with the potential patient population and symptoms. The team conducted further analysis on potential ADTC treatments from the Transplant department. The Medical Director from the transplant department identified the following additional symptoms that may be treated in the ADTC from a Transplant referral:

- Allergic Reaction
- Bradycardia
- Hyperglycemia
- Hypertension
- Hypotension
- Leg Pain
- Urinary Tract Infection
- Urinary Retention

Variation in ATC Patient Workflow

The team observed and analyzed patient workflow and operations at the Acute Treatment Center (ATC) to develop the ADTC patient workflow.

During the analysis of the ATC patient workflow, the team noticed a difference in theoretical and actual patient workflow. Through the analysis of triage processes, the team determined that the deviation from the theoretical workflow was a result of complex communication processes between different departments of the Cancer Center. This discrepancy in the type of workflow occurred when the nurse at the home clinic was unable to contact the attending physician to complete the triage and referral process. The actual ATC patient workflow was different from the theoretical workflow since the absence of the attending physician resulted in the clinic nurse’s decision of where to send the patient for treatment.

In addition, during interviews with ATC and clinic nurses, the team found that there were lapses in the patient triage process. These delays occurred during the initial triage of the patient when
clinic nurses failed to collect specific information required by the ATC nurse to determine the suitability of admitting each patient. This lapse forced the clinic nurses to contact the patient again to retrieve the additional information or caused the clinic nurse to infer on his or her own, even if the necessary information was not correct.

Further analysis of triage criteria revealed the variation in acceptance of patients based on different clinic referral preferences. This variation identified the necessity to develop a robust workflow for the ADTC because it consists of more clinics than the ATC. To accurately depict the differences in theoretical and actual workflow, the team developed workflows for both scenarios. The ATC theoretical workflow is shown in Appendix 2 and the ATC actual workflow is shown in Appendix 3.

The team analyzed the two versions of the ATC patient workflow and in conjunction with medical personnel, determined that there is a need to have an effective communications strategy for the referral process. This is particularly important to relay patient information from the clinic nurse doing the initial phone triage to the ADTC nurse given that such referral and touch-back processes are usually time consuming.

Additional analysis was conducted on the relationship between patient discharge figures and the time-of-day arrival to the ATC. This relationship was highlighted when the data showed a significant increase in the proportion of patients admitted to the hospital when the patient arrival time was past 5:00 PM. Of the total population studied, which was 366 patient visits, 68 patients were admitted. Approximately 76% of admitted patients entered the ATC after 5:00 PM. This is a 225% increase in admissions over patients who entered the center before 5:00 PM.

Additional Findings

Throughout the data collection and analysis phase, the team received many recommendations for the future ADTC that were valuable, yet outside the scope of this project. Therefore, the team has summarized these additional findings in the additional recommendations section at the end of the report.

CONCLUSIONS

Based on project findings the team has concluded the following in relation to the estimated patient population, ADTC treatment coverage and patient workflow:

- Patient Population
  - Expected patient volume of 1,693/year
- Symptoms to be Treated at the ADTC
  - Common (and applicable) Symptoms include:
    - Abdominal Pain - Generalized
- Fever
- Hypertension
- Irregular Heartbeat
- Dehydration

○ Treatable symptoms are concluded at the clinic level and subject to provider discretion

● Patient Workflow
  ○ Variation in theoretical and actual work
  ○ Problems with communication between ATC and clinic
  ○ Referral is highly dependent on provider discretion
  ○ Patient treatment is affected by non-controllable factors (Time-of-Day)

**RECOMMENDATIONS**

The following recommendations consider both the initial project deliverables backed by hard quantitative data and additional recommendations that the team identified as essential for further ADTC development.

**ADTC Treatment**

The ADTC should treat the following general symptoms:

1. Abdominal Pain - Generalized
2. Fever
3. Hypertension
4. Irregular Heartbeat
5. Dehydration

These symptoms encompass approximately 15% of total Taubman ED referrals. As the ADTC is considered an intermediary level of treatment to the ED, this represents a significant proportion of referrals to the ED that can be avoided. However, these are not the only symptoms that can be treated in the center. This recommendation is based on the analysis of data provided through hospital records and surveys. Each clinic should be approached by future ADTC development teams to identify certain symptoms that are common within the clinic and that the staff feels can be treated in a non-ED environment. However, as a reference point, these symptoms listed above are common throughout all Taubman clinics and is a good representation of future requirements.
ADTC Patient Workflow

After analyzing the differences in theoretical and actual patient workflow in the ATC, the team has developed a realistic robust ADTC patient workflow. The recommended ADTC patient workflow is shown in Appendix 4. The key differences of the ADTC patient workflow from that of the actual ATC workflow shown in Appendix 4 are listed below:

1. Addition of capability of different provider levels to refer patient to the ADTC
2. Addition of patient admission time-of-day decision node
3. Addition of Mi-Chart electronic patient memo entry process
4. Addition of ADTC nurse retrieving patient information for triage from Mi-Chart

During the referral process, the team found that the Attending Physician was not always needed. Therefore, the team recommends that providers of different levels, such as nurses, be empowered to refer patients to the ADTC. Although this is already the case in the actual ATC patient workflow, adopting it officially as the standardized ADTC patient workflow will allow greater transparency and accountability in the process.

Since the ADTC has specific operating hours, the workflow was stratified based off of the time-of-day at the ATC. The time-of-day proved to be significant during the analysis of patient hospital admission rates and arrival times to the center. However, if a patient is admitted to the ADTC after 5:00 PM, the servicing staff should ensure that the patient can receive all required care within operating hours.

The team also recommends the addition of electronic patient referral processes to the ADTC workflow. This will help reduce inefficiencies during the patient triage process. It will be particularly helpful due to the fact that collection of patient information occurs during the initial phone triage by the clinic nurse. An ADTC nurse will be able to access all necessary information during the second triage, thereby reducing repeated work. In addition, this standardized patient information form will help to reduce errors in the collection of patient information. Further explanation of this communication strategy can be adopted and is explained below under the section of Benchmark Transplant Communications Strategy.

Continual Analysis of Treatment Service Times

To accurately determine the exclusion criteria for patient arriving after a specified time, the ADTC should implement a system to record service times based on symptoms. This data can then be used to determine effective “closing” times based on patient symptoms and will ensure adherence to ADTC operating hours and patient care.
Benchmark Transplant Communications Strategy

The ATC experiences communication issues with clinics for the triage process and for the home provider follow-up process. The follow-up process is where ATC/ADTC nurses will inform the home provider of the patients’ status. The recently implemented MiChart system should be utilized to list patient symptoms for the ADTC nurse triage and the home provider follow-up through inserted notes. An interview with Transplants Medical Director made it apparent that Transplant has a more defined process for referrals and the use of MiChart. Therefore, the team recommends for further benchmarking studies to be conducted on the Transplant Communications Strategy as a “best practice.” This can potentially be adopted to improve communications throughout all Taubman Health Center clinics.

Additional Recommendations

Additional recommendations that were made by various sources during the course of the project that the team determined were important for the successful development of the ADTC are summarized below:

- Need to re-evaluate ADTC capacity to potentially add more beds
- Need to consider having a specialized emergency medicine doctor to run the ADTC
- Facility design suggestions:
  - Semi-enclosed unit for each patient
  - Patient to be in full-view of nurses station
  - Built-in commodes
  - Stationary computers (no COWs)
- Need to evaluate how Taubman clinics are able to refer patients to the ADTC since there is a significant effect on referral rates.

EXPECTED IMPACT

Treatment
The goal of the Ambulatory Service team is to provide the right care, at the right place, at the right time. Through the implementation of the ADTC, Taubman patients will no longer have to be referred to the ED and be subject to long wait times and potentially harmful situations for treatments of certain chronic flares. This center will be a specialized care unit for Taubman patients meeting certain screening criteria and will expand treatment options for home providers without sending patients to the ED.

Communications
Adoption of the Transplant department’s communication strategy across Taubman clinics would significantly increase efficiency in the triage process through reduction of repetitive work,
improve patient record keeping and improving patient experience. By improving patient record keeping home providers and future doctors will have a better understanding of patient history and will serve to improve patient treatment. The ADTC workflow is highly dependent on a robust communications process as the center will potentially service all Taubman clinics. Utilizing an electronic system, MiChart, will improve documentation in the triage process and significantly improve screening criteria.
REFERENCES


[1] Katie Konson, Project Manager Ambulatory Diagnostic and Treatment Center
Appendix 1: ED Referral Study Survey

**Clinic Referrals an Emergency Room**

Please record the information below for all patients who were sent to the ER for evaluation and/or admission, either through a clinic encounter or through phone triage

ACU:

Team (if applicable):

Submitted by:

<table>
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<tr>
<th>Patient Name</th>
<th>MRN</th>
<th>Date of Encounter</th>
<th>For what symptoms did you refer patients to an ED? Examples: Nausea/vomiting, fever, calf pain</th>
<th>Referred to ER via Phone Triage</th>
<th>Send to ER from Clinic</th>
<th>Indicate if could have referred to an Urgent Care vs. ER</th>
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Comments:

CHECK ONE
Appendix 2: Theoretical ATC Workflow
Appendix 3: Actual ATC Workflow
Appendix 4: ADTC Workflow