An Analysis and Recommendations for Improvements to the Oakville Trafalgar Memorial Hospital Emergency Department

by

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A thesis submitted in conformity with the requirements for the degree of Master of Applied Science Graduate Department of Chemical Engineering and Applied Chemistry
University of Toronto

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Abstract

In an attempt to improve patient care and compensate for growing demands, new tools and strategies are under constant review and development for improvements and analyses. Advances in technology, analyses of the use of public funding, acquiring additional capital, and adapting practical tools and resources from other industries are commonly considered to improve the situation.

This work provides a series of recommendations and analyses of solutions for emergency healthcare developed with Oakville Trafalgar Memorial Hospital (OTMH) in mind that can be scaled and adapted for all hospitals and emergency departments. Solutions applied were analyzed for their effect on patient care and health care providers. Recommendations for future improvements and work have been made and numerous concepts were drawn from previous studies and applications in other industries, and adapted for OTMH. It is concluded that the solutions had a positive effect on both the staff experience as well as patient throughput.
Acknowledgements

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Last, but certainly not least, I would like to thank my entire family, especially my parents Young-Wook and Young-Hee Kim. Their unwavering love and dedication for my education has been an intense source of motivation. The magnitude of their sacrifices for me and my sister is the absolute example of love. I can only hope that my future endeavours and aspired success will do them justice, however impossible that may seem. I love you, and words cannot express that enough. 엄마, 아빠 – 사랑해요.
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1.0 Introduction

1.1 The Challenge

Oakville Trafalgar Memorial Hospital (OTMH) is situated in a rapidly growing town, and the year-to-year patient demand continues to increase. As it was originally designed for a small community, resources to accommodate rising needs are largely absent and/or limited. In addition, as a new facility will soon be under construction, the availability of funds for improvements to the current hospital is limited. The implementation of cost-effective solutions that can be transitioned into the new facility is paramount to serve the current and future needs of OTMH.

A patient’s interaction with health care professionals within the system is impacted in several ways. For optimal and timely care, multiple steps must be considered and their impact on treatment time, as it affects other patients and services within the hospital. The intention of the Emergency Department (ED) care is to provide quality, expedient treatment in acute care settings. However a growing population, evolving processes, and growing health care costs increasingly apply pressure on the system. Issues arise including longer wait times, employee and patient dissatisfaction, as well as service errors. There is a constant need for sustainable solutions for issues within the ED. In order to formulate and implement such improvements, constant observations are necessary for a holistic view of the department’s daily operations. Patients’ experience in the OTMH ED was observed and various tools have been recommended in an attempt to increase patient throughput, minimize delays, and facilitate the workflow within the department.

The aim of this thesis is to provide some practical tools and resources to OTMH to improve the ED experience for both patients and employees. Throughout the study period, several projects were initiated, implemented, and evaluated and a number of proposals included in this report are suggestions for the future that have not been implemented due to financial, time, and resource constraints.
1.2 Oakville Trafalgar Memorial Hospital (OTMH)

Oakville Trafalgar Memorial Hospital (OTMH), a member of Halton Healthcare Services, is a full-service acute care community hospital. In conjunction with Milton District Hospital and Georgetown Hospital, surrounding communities Milton, Oakville, Clarkson, and Halton Hills are served within this integrated network. These three hospitals are part of the Mississauga-Halton Local Health System Integration Network (LHIN). The LHIN is responsible for planning, funding, and integrating local health services to provide comprehensive and quality care. There are 3 main sectors of the OTMH: East (E), West (W), and Central (C). In 2008, OTMH provided care and treatment for more than 15,000 inpatients and has major medical departments and services including diagnostic imaging, geriatrics, rehabilitation, and psychiatry [Halt05W3].

As of 2009, the new OTMH was in the planning stages by Halton Health Services (HHS). Construction of a new facility is necessary to accommodate the growing and changing population of the area, and construction is scheduled to begin in 2011 to be completed by 2013. The hospital will be relocated and expanded, but is expected to serve the same community which itself is expanding. The consideration of innovative tools and resources is critical to the long-term success and future expansion of this facility.

Plans for the new hospital include more single rooms for infection control. This is particularly important for Emergency Department (ED) patients, as contagious individuals cannot be admitted onto the floor if single rooms are not available. The number of acute beds in the hospital will increase from 230 to 500, and the ED will have 50 beds as opposed to the current 21. However, the ED will not operate at full capacity immediately – the availability of beds and other resources will increase incrementally according to community growth. One of the main concerns with respect to patient flow is the rate at which the surrounding communities are growing, and the fact that this has not been accounted for in the new Oakville Hospital patient capacity planning. Milton is rapidly growing, and the limited capacity of
their current hospital will encourage community members to travel to OTMH. This, in addition to the increasing population of Oakville, will add further pressure on the overall ED.

1.3 University of Toronto Involvement

The Centre for Management of Technology and Entrepreneurship (CMTE) of the University of Toronto focuses on the study of managing the multiple effects of technology on the workplace and society. One of the core pillars of its philosophy centres on the fact that entrepreneurial and innovative thinking are fundamental for the success of any organization. The CMTE through this work, in collaboration with Oakville Trafalgar Memorial Hospital, is to provide innovative and effective tools for their Emergency Department.

The analysis of the current tools as well as potential aids and solutions is critical to completely and objectively view the situation. It is often the case that the people themselves are not to blame, but broken processes can be an issue that can be approached from an engineering point of view. The presence of a person educated in another field may uncover issues upon assessment as they observe the environment from a different perspective.

2.0 Canadian Healthcare System

According to the Organisation for Economic Development [OECD], Canada spends more than the average OECD country on healthcare per capita, at $4,069 USD in 2008 and growing. Trends showed that this was to continue to increase while critical resources such as the number of hospital beds were decreasing. In 1990, the share of public spending on health care in Canada was reported as 74.5%, which has been decreasing since. Canada spends 70.2% on health care, while the average OECD country spends 72.8% [OECD09W3]. Such are indicators that the pressure on the healthcare system will continue to rise without some means of intervention and improvement.
In addition, reports indicate that federal funding increases have been below inflation, while public expenditures have been increasing well above inflation. As shown below, hospitals take the highest proportion of healthcare spending in our system.

![Figure 1: Distribution of health spending in Canada in 2009, adapted from the Canadian Institute of Health Information [CIHI09W3].](image)

Statistics show that the pressure within healthcare, particularly on the ED, has significantly increased over the past decade. Within Ontario, hospitals are considered private corporations that receive block funding that is updated annually for inflation, volume growth, new programs, and the life support program. Institutions are simply provided with a fixed budget and must manage their own grant while avoiding a deficit each fiscal year [SHAH03W3]. Drastically increasing costs of health care has created a demand for more efficient and cost-effective solutions.
3.0 OTMH Emergency Department

3.1 Demographics

OTMH provides care to the community of Oakville, parts of Mississauga, and is a member of the Halton Healthcare Services network. Oakville is a growing city, projected to reach a population of 180,400 people by 2011 from 165,613 in 2006 [OAKVW3]. According to a 2006 census, the median age of the population is 38.4 years and Figure 2 below depicts the age distribution of the city.

![Age Distribution](image)

**Figure 2:** Population age distribution of Oakville as of 2006 according to a Statistics Canada Census. Figure adapted from the Oakville Economic Development [OAKVW3].

According to data gathered from February 2008 to September 2009, the majority (87%) of ED patients arrive “walk-in wounded” as opposed to in an ambulance. In addition, the highest traffic was observed between 9AM and 9PM, while the least amount occurred between 2AM-6AM (Figure 3).
Figure 3: Distribution of visits to the ED throughout the day.

A significant portion of the patients were infants and children, mostly those below the age of 4 years old. In addition, patients between the ages of 45 and 55 were prevalent. Although a significant portion of the population in Oakville is between 25-44 years old (Figure 2), this age bracket did not dominate the ED visits (Figure 4). This is most likely because adults in this age bracket are relatively less likely to require emergency health services due to their age, as well as their work schedules.

Figure 4: Distribution of age of patients who visited the ED between February 2008 and September 2009.
3.2 Emergency Department Zones

There are several components in the Emergency Department (ED). The triage and registration areas are located at the main entrance to the department beside the waiting room. Within the resuscitation area, there are 3 patient care stations. As this area is not always in use, the stations are often used for non-resuscitation patients during high volume periods. The Fast Track (FT) area is dedicated to patients classified as “non-urgent” and “semi-urgent” according to the Canadian Triage and Acuity Scale (CTAS). This scale categorizes patients in one of 5 levels: Resuscitation, Emergent, Urgent, Semi-Urgent, and Non-Urgent which are 1 – 5 respectively. CTAS 4 and 5 patients (Semi-Urgent and Non-Urgent) are most often seen in Fast Track, whereas other rooms surrounding the nurse’s station are for levels 2 and 3. A psychiatric room is monitored by ED personnel and via security cameras and is centrally located. A tracking board is located in the center of the department, which provides visual information concerning each patient. The tracking board is connected to the computer system, thus enabling each patient to be clearly represented upon admittance to the ED.

There are currently 21 and 230 beds within the ED and hospital respectively. The 21 beds in the ED also function as stretchers for ease of transport. Future development plans suggest that the capacity in the ED will be increased from 21 to 50 beds for the new hospital. In addition, glassed areas for each patient have been considered for the new hospital’s layout, which would be customized to shade the patient from view when a corresponding light is applied that triggers a darkening effect. Along with the increase in beds for the emergency department, the new hospital floor plan includes individual patient areas separated by glass. This is an enhancement from the current infection control and privacy strategy of curtains. The types of glass to be used should also improve privacy with the use of specialized lights that dim (“fogs”) the glass upon contact. In addition, the general layout of the rooms will be along the perimeter of the department, around the centralized nursing/physician stations. This increases visibility and reduces subsequent reaction times for nurses to address patients’ needs.
Mondays are often viewed as the busiest day of the week for various reasons. Namely, physicians often do not work on the weekend and beds are subsequently full. Thus, beds are not available for emergency department patients who wish to be admitted to various floors. This creates a backlog and create areas of stress within the queue. Upon completion of treatment, patients are either discharged or admitted to the hospital as inpatients.

### 3.3 National Ambulatory Care Reporting System (NACRS) Data Collection

The availability of historical data for the ED at OTMH is limited to previous studies and the National Ambulatory Care Reporting System (NACRS) at the Canadian Institute for Health Information (CIHI). While the database as started in 2001 [CIHI09W3], OTMH’s ED began rigorous data collection only in February of 2008. Data collected includes disposition times, patient presenting complaints, and visit disposition diagnosis. In order to assess any changes to ED wait times, the following indicators are reported in Table 1.

#### Table 1: ED wait time indicators through the National Ambulatory Care Reporting System (NACRS), submitted on the monthly basis (Table adapted from CIHI website [CIHI09W3])

<table>
<thead>
<tr>
<th>Report Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Physician Initial Assessment</td>
<td>Registration to first assessment from an MD</td>
</tr>
<tr>
<td>Time to Disposition</td>
<td>Registration to decision about the patient’s disposition</td>
</tr>
<tr>
<td>Time Waiting for Inpatient Bed</td>
<td>Decision to admit position to patient leaving ED for room or Operating Room (OR)</td>
</tr>
<tr>
<td>ED Length of Stay</td>
<td>Registration to physically leaving the ED</td>
</tr>
</tbody>
</table>

### 3.4 Personnel and Stakeholders

Physicians, nurses, volunteers, and clerks collaborate to provide patient service. Various areas of the emergency department have different staffing and resource requirements. The Fast Track area requires at least 1 nurse and 1 physician. However, the physician is not always completely available. Due
to scheduling, s/he is often taking care of acute care patients that they were responsible for prior to the beginning of their Fast Track shift. Also, in case that the number of acute patients is particularly high, the physician may split his/her time between acute care and Fast Track in an attempt to ease the workload.

Figure 5: The Critical Resource Nurse (CRN) oversees the entire department, and is expected to be aware of each component of the department. Other staff members are found throughout the floor, some areas in particular.

3.4.1 Clerks

Clerks play a multi-faceted role within the department. Their duties include entering order information, connecting consultants and physicians via telephone, sending requests to various departments, seeking staff to fulfill empty shifts, and directing visitors upon arrival to patients’ locations. This individual is expected to be knowledgeable about the health care system and ED from prior experience or education; however specific educational requirements do not exist.
3.4.2 Nurses

Clinical Resource Nurses (CRNs) serve as “Charge Nurses” of the emergency department. One is employed per shift, and they oversee all operations and patients in the department. When the main Charge Nurse is not on duty, there are other well-experienced nurses who can fulfill the role. They must be fully capable of working in Fast Track, triage, RAZ, and other facilities of the department. Lastly, they oversee and organize all staff including physicians and other nurses.

3.4.2.1 Registered Practical Nurses (RPN) and Registered Nurses (RN)

RNs are nurses who have received a degree in nursing, able to perform duties such as giving medications, administering narcotics and IVs, and directing Licensed Practical Nurses (LPNs) on their duties if they are in the department. RNs are expected to be able to assess issues as they arise, take a leadership role with LPNs, and evaluate the patient’s well-being.

3.4.2.2 Charge Nurse

The Charge Nurse, also referred to as “the nurse in charge”, is a senior RN who is responsible for managing the ED along with all of his/her regular nursing duties, has additional authority, and provides aid and education to staff members when needed. Additional responsibilities include ensuring that staff members are appropriately distributed throughout the department, awareness of the overall state of the department and patient queue, ensuring that staff member’s break times are equitable and appropriately timed, as well as fulfilling duties when others are unable due to overwhelming traffic or lack of experience. This role is critical in the department, as his/her awareness of the overall state helps adjust the queue and responsibilities of staff, which in turn may promote efficiency and patient throughput.

3.4.3 Patient Assistant Liaisons (PALs)

This volunteer service is used in various capacities and depends on availabilities. They are often paged and asked to escort patients to departments for diagnostic tests, cardiology or the fitness testing area, except for the ICU. ICU patients must be accompanied by a nurse as a precaution.
3.4.4 Director of Patient Flow

The director of patient flow of all three hospitals in this LHIN is a highly trained and experienced individual. Formerly from Hamilton’s St. Joseph’s Hospital she brings valuable experience to lead the Patient Flow Team, which consists of medical liaison nurses, also known as patient flow coordinators. She reports to the hospital VP. While she recognizes that Blackstone Consulting recommended 2 Equivalent Full Time Employees (EFTs) for optimal patient flow, this is currently impossible due to the lack of funds.

In order to maintain connectivity throughout the hospital, the director spends 7:30AM – 9:30AM of each day to establish the “lay of the land”. She essentially visits what she considers to be “hot spots” and talks to the staff. She often uses the Institute for Healthcare Improvement as a resource for patient flow. As previously discussed, s/he attends the daily meetings with nurses in order to establish a plan for the day’s patient flow situation throughout the hospital, and acquires a good insight of the overall day.

The director must also work to identify vacancies and match them appropriately. Alternative Level of Care (ALC) metrics are recorded in real-time with respect to patient flow with a MediTech system in pivot tables. However, the main problem stems from the multiple sources of charts.

3.4.5 Director of Client Services

This role acts as a liaison between Community Care Access Centres (CCACs) and the hospital. She is responsible for maintaining a relationship with effective and positive communications. The “Home First” approach has seen great success, as patients are sent home from acute care prior to admittance to a CCAC. As opposed to sending a patient to a Long Term Care (LTC) facility, they are sent to “age” at home or an alternate community setting. This has resulted in a drastic reduction in the ALC population waiting for LTC. There are several benefits of the “Stay at Home” strategy. Patients may avoid hospitalization, frail/elderly kept at home with many services, it has a high MAPLE score, and it allows greater admittance from other patients into acute care. These patients are typically over 75 years of age,
and receive approximately 90 hours of care worker service per month. There are a total of 108 people in the program from this hospital. The success of this program affects the emergency department, as the greater the number of vacancies within the hospital, the faster emergency department patients may be admitted as inpatients.

### 3.4.6 ED Improvement Working Groups

To ensure continuous improvement in the Emergency Department, various working groups are formed for projects that typically involve a variety of staff members. For instance, when the communications system was to be upgraded, a physician spearheaded a group that included the Charge Nurse, a senior registered nurse, the director of IT, and the Director of Patient Flow. This ensures that several aspects of the issue are examined from various points of views and encourages equitable resource management, distribution, and improvement for all members of staff.
4.0 Research Method & Current Applications of Information Technology

Throughout the study period, constant observations were made in the OTMH ED in order to continuously gather data, formulate ideas, establish connections, and maintain a presence. Initially, emphasis was made on expressing genuine interest in learning about the Canadian healthcare system and the situation at OTMH. As a student with no formal training in the healthcare system, a key aspect of the educational process was the sharing of information and experience from staff members. As a consequence of daily interaction and discussion, personal relationships were formed and staff became more comfortable imparting knowledge and opinions on a variety of matters. In addition, such establishment early in the study period facilitated future research, interviews, and surveys as staff were able to trust that all results would remain anonymous and were highly valued. Data collection periods typically spanned at 12 hours, which is a common length of staff shifts and therefore helped create a presence within the ED. All staff members were highly welcoming and eager to share knowledge, and this provided valuable qualitative insight concerning the system in a atypical manner.

There are several approaches to improving the work environment of the ED, patient safety, and the overall quality of care. Common processes include statistical modelling of gathered data, application of technology/practices shown to be successful in other industries, and trial-and-error of changes that could hypothetically improve the situation. There are several advantages and limitations associated with each, and the ED is an environment complicated by human factors and rigid financial restrictions. Any improvements to the ED working environment must be made with patient safety and quality of care in mind. Regardless of the degree of increased efficiency and efficacy of changes that could be made to the ED, neither patient safety nor quality of care can be sacrificed. According to the Ontario Health Quality Council, there are 9 attributes of high performing health systems [OHQC05W3]:

1. Safe
2. Effective
3. Patient-Centred
4. Accessible
5. Efficient
6. Equitable
7. Integrated
8. Appropriately resourced
9. Focused on population health

All of these must be taken into account when implementing any changes and/or conducting any studies in healthcare. In addition, current processes used to improve health care, specifically emergency departments, were researched with a focus on information technology applications. Applications were inconsistent throughout Canada; however several are applicable to OTMH such as Electronic Medical Records (EMRs) and paging systems.
4.1 Telecommunication System

There are several issues involving the telephone hardware used in the ED. Each phone has the ability to connect to 3 out of the 5 telephone lines in the ER. However, the order and availability of the telephone lines differ for each phone. Therefore, clerks must explicitly communicate the extension that a physician or nurse requires and the nearest free telephone may not accommodate this phone line.

Due to the current infrastructure of Oakville Trafalgar Memorial Hospital, the integration of a Voice Over-Internet Protocol (VOIP) system throughout the entire organization is not practical. VOIP is another method of delivering voice communications throughout a network other than the traditional Public Switched Telephone Network (PSTN), but over an IP network. The analog voice signal is simply converted to a digital format prior to translation of the signal into IP packets to be delivered to the other end of the line. Essentially this service would mimic the traditional PSTN and dedicated VOIP phones would not require a computer if they are connected directly to the IP network.

For mid-December, the implementation of such a network for just the ED was proposed. This initiative was headed up by one of the emergency physicians of OTMH, who requested funds from the Local Health Integration Network (LHIN). Along with the IT department at the hospital, members of Decision Support, and the Program Coordinator of the ED, they developed an implementation strategy for this communication system in the ED that involves wireless signals through routers. The telephone calls will be directed towards the nursing and clerk stations, and the attendants will streamline the phone calls directly to handsets that accompany specific physicians.

4.2 Paging Systems

Paging systems are a staple improvement to the hospital’s environment to communicate a variety of needed information. Overhead loud speakers and individual pagers are used to connect staff members depending on the urgency and nature of the message. Various colour-based codes are utilised with hospital-wide pagers in order to alert staff of global emergency issues, request immediate attention from
specific teams/individuals throughout the hospital, or communicate threats that affect the entire hospital. In order to protect patient privacy and to avoid causing stress amongst patients, these codes are used to represent a wide variety of scenarios ranging from cardiac arrests to infant abductions.

In addition, some physicians choose to carry personal pagers so that they may be reached throughout the hospital and return calls at their convenience. They may also use them outside of the hospital, which a number of on-duty consulting doctors choose to do as they prefer to remain at home during their shift if it occurs during non-peak hours.

4.3 Patient Tracking

Currently, patients are tracked once they are entered into the system at registration. If the system does not have their current location in the ED, it is typically assumed that they are in the waiting room. The patient tracking software is connected to the ED’s tracking board – a large electronic panel that provides a visual representation of the ED with respect to rooms filled, patients that need to be evaluated, the symptoms patients are expressing, and the overall traffic within the department. Information concerning the patients’ whereabouts and how far along they are in the treatment process may be entered, and thus also times tamped, via the display board or the computer. These times are gathered on a regular basis to generate reports for the Ministry of Health’s reporting mandate.

4.4 e-Triage

This tool aids in the electronic registration of patients and acts as a decision support system for the Canadian Triage Acuity Scale (CTAS). CTAS is a scale used to prioritize patients according to their urgency of need for care, where 1 is assigned to the most urgent cases and 5 is for the least. This tool is used in combination with traditional triage techniques in order to evaluate patients more effectively, consistently, and efficiently.

This web-based application provides triage decision support as the Registered Nurse (RN) collects information from the patient; it helps to assign a score automatically. This promotes equitable
classification of patients between staff members and hospitals. Due to the increased reliability between RNs, patient safety is enhanced and standardized.

Studies have shown significant improvement from the application of e-Triage. For instance, the application of e-Triage at The Scarborough General Hospital in 2008 was the first in Ontario, and managed to decrease their average triage time by half. They applied multi-lingual kiosks to serve the growing multicultural population. Nurses directed patients who were stable to swipe their health card at the kiosk in order to begin the process, and upon completing a series of questions, with or without the aid of the nurse, a triage score is automatically generated from the analyzed data. While the nurse can override the system, they can only triage the patient to a more acute scale than what the computer had assigned. The kiosk also allows patients to update their condition and is often used when the triage desk is quite busy.

4.5 Medical Records

Currently, OTMH does not employ the use of electronic charting in the Emergency Department (ED). Interviews with staff members revealed that there is strong opposition to electronic charting as it is generally believed that it is unsuitable for the hectic environment. However, several staff members also revealed that finding old charts in the archives can be cumbersome for other staff members, as they often have to be manually retrieved. This can prove to be inefficient and relatively labour-intensive particularly if the physician/nurse requires the old chart in a timely manner.
5.0 Department Zones

5.1 Triage

Triage takes place within the ED upon patient arrival. Based on presentation, patients are categorized and subsequently prioritized according to the Canadian Triage and Acuity Scale (CTAS). In the case of the Oakville Trafalgar Memorial Hospital (OTMH), triage often occurs prior to registration due to time and resource constraints. The patient experiences a preliminary “registration” period at the triage station, where the nurse inquires about personal information including insurance status and prior visits to the OTMH ED. Registration is completed after triage, in order to expedite the throughput of patients in line due to potential health risks. Triage is a critical component of the process, as the nurse must be able to correctly identify the patient’s needs and acuity level.

According to the Canadian Association of Emergency Physicians (CAEP), resource needs, acuity level and performance are measured against certain operating objectives, thus allowing the Emergency Department (ED) to more accurately define the patients’ need for timely care [CAEP10W3].

Triage is a dynamic processes – “patients move up or down on the urgency continuum while waiting for access to treatment areas” [BEVE98W3]. Triage has protocols for several components of treatment:

- Time between complaint and consultation
- Frequency of reassessing the triage category, what types? Overview? Vital signs?
  - Helps provide a framework for providing quality/outcomes and preventing patient deterioration
- How to categorize patients based on a chief complaint
- What types of interventions are expected in triage

Both verbal and non-verbal communication is used when assessing a patient through triage. Open-ended questions are encouraged as these give the patient the ability to express feelings and perceptions along with vital information in order to make a clinical judgement, although not a medical diagnosis.
5.1.1 Canadian Triage Acuity Scale

According to the Canadian Association of Emergency Physicians (CAEP), CTAS is a tool used by nurses, physicians, and Emergency Department (ED) managers. The following information was taken directly from their website:

“The CTAS allows the ED to:
- Prioritize patient requirements
- Examine patient care processes, workload, and resource management relative to case mix and community needs

The CTAS allows ED nurses and physicians to:
- Triage patients according to the type and severity of their presenting signs and symptoms
- Ensure that the sickest patients are seen first when ED capacity has been exceeded due to visit rates or reduced access to other services
- Ensure that a patient’s need for care is reassessed while in the ED

The CTAS allows ED managers to:
- Measure the case mix (volume and acuity) of patients who visit the ED
- Determine whether the ED has an operational plan and the resources to meet patient needs
- Assess the ED’s role within the hospital and health care region” [CAEP10W3].

This tool is used in all Canadian hospitals, the results of which are collected and reported to the Canadian Institute for Health Information (CIHI). When designing this scale, three important concepts were included in its design: Utility, Relevance, and Validity.

Each hospital community’s demographics, cultural differences, disease patterns, or other available resource such as walk-in clinics or type of ambulance services will have some influence on the “usual” way that patients present their conditions. These influences will become more apparent on different triage levels [CAEP10W3].
Hospitals of the same size and designation may experience similar mixes of patients in each triage and acuity levels. However, each hospital’s ability to achieve their time objectives will vary as a result of the various factors, including:

- Available resources
- Efficiency of system design
  - Computerization
  - Bed numbers
  - Room Size
  - Physical layout
  - Appropriate equipment
- Overcrowding (inability to transfer patients)

According to the Canadian Association of Emergency Physicians [CAEP10W3] the following should be kept in mind during triage and assigning CTAS scores:

- Ideals (objectives) – *not* established care standards
- Based on:
  - A patient focus (what would we want for ourselves/family members)
  - Need for timely intervention to improve outcome (i.e. bronchodilators for acute asthma)
- Each triage level is given a fractile response objective
  - Ideals cannot always be achieved without unlimited resources
  - Wide variations in demands for care
  - Fractile: A level II patient should be seen within 15 minutes, 95% of the time
- Fractile Response: “Proportion of patients visits for a given triage level where the patients were seen within the CTAS time frame for that level” [CAEP98W3].
  - i.e. if 85% of Level 3 patients are seen in a month, the fractile response is 85%
  - Does not deal with whether the absolute delay for an individual is reasonable or unacceptable

Assignment of a CTAS score is based on several factors. However, a list of symptoms and patient presentations has been clearly defined in order to help standardized triage decision making. Table 2 shows CTAS levels, usual patient presentations, and the recommended maximum time to MD assessment.
Table 2: CTAS levels and their corresponding presentations and time to physician assessment [CAEP10W3].

<table>
<thead>
<tr>
<th>Level</th>
<th>Time to Physician</th>
<th>Usual Presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Resuscitation</td>
<td>Immediate</td>
<td>• Code/arrest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Major trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Shock states</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unconscious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Severe Respiratory Distress</td>
</tr>
<tr>
<td>II Emergent</td>
<td>≤15 min</td>
<td>• Altered mental state</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Head injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Severe trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Neonates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Eye pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Chest pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Overdose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Abdominal pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GI bleed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CVA</td>
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<tr>
<td></td>
<td></td>
<td>• Asthma</td>
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<tr>
<td></td>
<td></td>
<td>• Dyspnoea</td>
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<tr>
<td></td>
<td></td>
<td>• Anaphylaxis</td>
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<tr>
<td></td>
<td></td>
<td>• Vaginal Bleeding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Serious Infections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fever</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Children</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vomiting/diarrhoea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Acute psychosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CVA/Abdominal/groin pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hypertension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Headache</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Severe pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Abuse/Neglect/Assault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Drug withdrawal (severe)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Chemotherapy</td>
</tr>
<tr>
<td>III Urgent</td>
<td>≤30 min</td>
<td>• Head injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Moderate trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Asthma (mild/moderate)</td>
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<tr>
<td></td>
<td></td>
<td>• Dyspnoea</td>
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<td></td>
<td></td>
<td>• Chest pain</td>
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<tr>
<td></td>
<td></td>
<td>• GI bleed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vaginal bleeding/pregnant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Seizure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Acute psychosis/suicidal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Acute pain severe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Acute pain moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vomiting/Diarrhoea ≤ 2 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dialysis/Transplant patients</td>
</tr>
<tr>
<td>IV Semi-Urgent</td>
<td>≤1 hour</td>
<td>• Head injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Minor trauma</td>
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<tr>
<td></td>
<td></td>
<td>• Abdominal pain</td>
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<tr>
<td></td>
<td></td>
<td>• Headache</td>
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<tr>
<td></td>
<td></td>
<td>• Ear ache</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Chest pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Suicidal/Depressed</td>
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<tr>
<td></td>
<td></td>
<td>• Corneal foreign body</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Back pain, chronic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• URI symptoms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vomiting/Diarrhoea but no signs of dehydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Acute pain-moderate</td>
</tr>
<tr>
<td>V Non-Urgent</td>
<td>≤ 2 hours</td>
<td>• Minor trauma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sore throat, URI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vaginal Bleeding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Abdominal pain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vomiting alone, Diarrhoea alone no signs of dehydration ≥2 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Psychiatric</td>
</tr>
</tbody>
</table>
The adult CTAS guidelines were revised in 2008 based on a Canadian Emergency Department Information Systems (CEDIS) complaint list, research, and stakeholder feedback. Due to the unique aspects of children’s health and presentations, the Paediatric CTAS Implementation Guidelines (PaedCTAS) for youth (including teenagers) was developed by CAEP. Guidelines were recently revised in 2008 to adhere to a standardized CEDIS complaint list [CAEP10W3].

The recommended length of stay for each patient is determined by their CTAS score. The length of stay shown in Table 3 is not an average – rather, 90% of the patients should be discharged within these time frames. Times are measured from the patient’s initial triage assessment to the time that they leave the emergency department, either as an inpatient or discharged patient, all recorded by hand. While the tracking board within the department records time-related data, it is deemed unacceptable. Approximately 15% of ED patients are admitted into the hospital, typically with CTAS scores of 1, 2, and 3 as opposed to 4 or 5. A table with prior performance is made available for all staff, with data as shown in Table 3. This provides a sense of the department’s previous performance in accordance to the standards set by the Ministry of Health.

Table 3: CTAS score and Oakville performance results as of January 2009.

<table>
<thead>
<tr>
<th>CTAS Score</th>
<th>Length of Stay</th>
<th>Jan 09 Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>5 hours</td>
<td>87%</td>
</tr>
<tr>
<td>3</td>
<td>6 hours</td>
<td>90%</td>
</tr>
<tr>
<td>4, 5</td>
<td>8 hours</td>
<td>87%</td>
</tr>
</tbody>
</table>

The length of stay (LOS) for each patient is given within the emergency department’s reporting system. This is done according to the Ontario Emergency Department wait strategy. Reports are sent monthly to the board. As shown below in Figure 6, most of the patients that are treated in the ED are of CTAS 4 and 5, and are therefore expected to be seen, treated, and discharged within 8 hours. These patients have non-urgent needs or are able to sit comfortably in the waiting room. These include many Canadians who do not have an established family physician, and rely on emergency health services for various ailments, and those who wish to be seen immediately to ease anxiety.
Figure 6: Distribution of patients according to CTAS level, from February 2008 to July 2010.

In addition, Figure 7 shows that most patients arrive without the use of an ambulance with the exception of patients of CTAS 1. These are the most critical cases that often require resuscitation. Similarly, all CTAS 5 patients did not arrive by ambulance, as these are relatively non-urgent cases such as psychiatric issues and minor cases of trauma.
The majority of patients who visited the ED between February 2008 and September 2009 were classified as CTAS 3 patients. Within these subsets, CTAS 3 patients also had the most instances of arrival by ambulance. CTAS 1 patients almost always arrived by ambulance.

5.1.2 Patient Entrance and Initial Assessment

Patients who are treated by the emergency department are either classified as “walking wounded” or “ambulance-entry”. In general, the Charge Nurse is aware of the overall flow of patients in the department, and organizes staff and resources accordingly.

Patients who enter the emergency department through the ED entrance are called “walking wounded”. These individuals are typically considered of a relatively low priority, as they are usually conscious and breathing with relatively minor injuries. Upon arrival, they undergo a preliminary assessment by the triage nurse. If there is a queue and the patient’s presentation is not urgent, s/he is asked to sit in the waiting room for triage. Triage is performed adjacent to the initial assessment desk. It is highly visible due to the electronically operated glass doors which allow the triage nurse to visually assess the waiting room, while maintaining a level of privacy for the patient that she is assessing. This
discourages other patients from disrupting the triage process with questions, but allows them to see where the nurse is in the case of an emergency.

Patients who enter via ambulance are never refused, due to Oakville’s no-offloading policy. Thus, all ambulatory patients are seen regardless of the current volume within the department. If a patient has a relatively low CTAS score, s/he may be asked to wait in the waiting room rather than on the ambulance stretcher. Patients who exhibit serious symptoms (i.e. yelling in pain, unconscious) are immediately admitted. The head nurse must be aware of the overall condition within the department, and ideally finds the patient a room immediately.

Vitals are recorded from the patient and they are assigned a CTAS score. The triage nurse is responsible for several tasks, and must have appropriate communications skills. They are expected to interact with several people including patients, family/friends of patients, police, and the other nurses throughout the department. In addition, they must be able to present themselves with patience, tact, understanding, and discretion [CAEP10W3]. These qualities help the nurse assess the patient efficiently and appropriately. It was often noted that the nurse was highly capable of assessing the needs of the patients and communicating with children in an open and friendly manner. This appears to be particularly important with children, who may not be able to present their situation effectively or have unobvious symptoms. Experience, skill, and expert clinical judgement play a role in the nurse’s ability to recognize key signs of illness [CAEP10W3].

During the initial assessment, the patient is asked to describe their situation. The nurse promptly replies with key questions, but does not take vitals unless the situation appears to be quite serious. Typical questions that are asked in this stage include:

- Are you experiencing a shortness of breath? Have you had a cough/cold (new) in the last 3 days?
- Are you covered under OHIP?
- Do you have any allergies to food/drugs?
- Are you on any medication?
5.1.3 Triage Assessment and CTAS Assignment

Subsequent to this initial stage, the patient must be properly assessed to ensure that the appropriate triage score is assigned, whether orders for tests should be initiated prior to physician examination (i.e. blood tests, x-rays), and the overall severity of their condition. The time that the patient must wait before this assessment begins varies depending on how busy the department is. The order in which the patients are triaged is determined by the patient’s time of arrival, perceived acuity of the situation, and the nurse’s overall assessment of the situation. There aren’t any strict guidelines for queuing patients, and it is based on the nurse’s discretion. The following are typically performed by the triage at this stage:

- Nurse asks the patient to elaborate on their story, and asks follow-up questions
- Asks about the patient’s medical history, seeks “red flags” or special points of interest
- Assesses the patient’s current condition
- Measurements, including:
  - Blood pressure
  - Temperature
    - Adults: Under the tongue
    - Children: Chest
    - Infants less than 12 weeks old: Rectal
  - Heart rate (via finger-clip)
- Verifies their allergies
- Determines their level of pain using the Wong-Baker scale [BORL02]
  - This scale communicates via numbers and visuals. By rating pain on a scale of 1-10, the triage nurse has an idea of how long the patient can wait before seeing a physician. The visuals are particularly useful when dealing with children who have a hard time expressing their perception of pain on a scale.
- If applicable:
  - Vomiting?
  - Sense of touch?
  - Have you travelled recently and where?
  - Last time you took any form of medication?
  - Immunization shots?
The nurse may administer some medication at this point to ease distress during the waiting process. Advil and Tylenol were offered to a number of adults, and Pedia-light (freezie) was offered to children. This process takes longer for children than adults. A triage nurse was interviewed and she estimated that children take around 10 minutes whereas many adults may be finished in around 3 minutes.

Upon completion, the nurse has two options. If the patient is able (i.e. sufficiently healthy, able to walk, has a friend/relative who can help them), they may be directed to test-related departments. For example, a patient with a broken wrist may be asked to go to the X-Ray department immediately after triage prior to completing registration if this is deemed more efficient. If no such tests are required, the patient is asked to exit the triage area and complete the registration process. In either case, the patient is asked to leave the triage area through the glass doors, and the next patient in the triage queue (if there is one) is asked to enter. While the patient is settling down in the triage assessment chair, the nurse is free to greet any incoming patients at the front desk. The nurse must be able to efficiently communicate with the patient and tell them how to access required areas of the hospital if they are not accompanied by a staff member or volunteer.

In addition, the triage nurse acts as the overall communication link between the emergency department and incoming traffic. For instance, if a person arrives looking for a patient, the triage nurse has access to the current roster of patients as well as their location. However due to limited space within the ED, patients who are being treated may not be in a room but on gurneys along a wall or other temporary areas. It is the duty of the triage nurse to locate these patients, and it was observed that the head nurse was often contacted for help when patients’ locations were not immediately known. The head nurse has an overall understanding of the current situation in the department, and is a great source of quick and efficient information. Alternatively, the triage nurse may look at the tracking board for information. This includes patients who are admitted in Fast Track. Patients who have been admitted to the hospital may also be found through the computer; however it is not immediately obvious to the triage nurse if they have been admitted. An overview of the typical patient flow in the ED is outlined in Figure 8.
Figure 8: Typical patient flow within the ED, with indications of where improvements have been made which will be discussed throughout this document.
5.2 Patient Registration & Waiting Room

5.2.1 Patient Registration

There are two registration clerks – one adjacent to the triage desk, and another within the acute care area. The former is dedicated to registering “walking wounded” patients, whereas the latter is for ambulatory care patients as well as other duties including entering orders for blood work.

Registration clerks (who do not need to be registered nurses) collect personal information including:

- Name, full address, etc.
- If they have been previously admitted to the hospital
  - Will find the previous record if this is the case
  - Will proceed to verify the information on the previous record
- Identify the patient’s emergency contact, and family physician

With this information, a green “charge card” is created by the clerk, along with the documents required for the patient’s chart. The information documented by the registered nurse in triage is written on a sticker, and is affixed on the patient’s chart by this clerk. A wristband with a barcode that corresponds to the Positive Patient Identification Device (PPID) system is assigned to the patient, and other paperwork is given depending on the patient’s unique situation. For example, a workplace injury requires a worker’s compensation form in order to receive coverage.

As of mid-April of 2009, the registration nurse is required to affix a red sticker upon every patient’s chart that indicates the maximum allowable discharge time, according to CTAS standards. CTAS level 4 and 5 patients should be seen, treated, and discharged within 8 hours, CTAS 3 within 6 hours, and CTAS 1 and 2 patients within 4 hours.

Both the Charge Nurse and the triage nurse may change the order of the charts, although the triage nurse usually leaves notes for the Charge Nurse in order to clarify the reasoning behind the changes. Also, if certain resources are not being used and a patient requires it, they may be treated a lot sooner simply due to the availability of the resources. An example of this is sending a patient to the “eye room” even though they arrived much later than a patient with a fracture.
5.2.2 Patient Wait Times and Waiting Room

Patient satisfaction is often correlated to waiting time within a hospital setting. However, the level of patient awareness with respect to the projected waiting time as well as the overall situation within the department varies. Without providing the proper tools and opportunities for patient education, patients are more likely to become agitated and consult the triage nurse for time estimates and updates on the situation.

To avoid misleading patients, the triage nurse does not voluntarily provide wait time information. According to the head nurse, patient dissatisfaction is often alleviated by announcing the overall situation within the department to the waiting room, particularly in times of unexpected demand for services. While not observed throughout the study period, the head nurse may communicate that the volumes are higher than normal, thus patients must expect to wait for a longer than average period of time. During the waiting process, patients may begin preliminary steps of their analysis – such as blood tests. This is often done to save time, at the discretion of the triage nurse. Priority is given to children, which is often a source of frustration for other patients. However, children are typically smaller therefore infections can worsen relatively quickly.

The queue is dictated by the order of charts behind the triage desk – located in between triage and acute care. The head nurse often changes this queue based on his/her own discretion, however the triage nurse may suggest changes and leaves notes for clarification. Patients may move relatively quickly in the queue if a particular resource that they require is currently unoccupied, such as the “eye room”.

The patients are not told how long they should expect to wait before receiving physician care. Dynamic changes in the department that correlate to the priorities and needs of other patients, may lead to patient dissatisfaction due to lengthy and/or longer than projected wait times, see Figure 9 for historical wait times.
Figure 9: Distribution of wait times for patients from February 2008 to September 2009.

As part of Ontario's Emergency Room Wait Time Strategy, as of 2004 several hospitals list wait times online. In an effort to reduce wait times, the aim of this initiative is to encourage patients who have the time and foresight to check the estimated wait times of their surrounding hospitals and make their choice accordingly. These patients are most likely not in critical condition, as they or someone they know have the time to locate this information on http://edrs.waittimes.net. While the information is not real-time, it can be used to help patients make informative decisions and potentially decide against visiting the ED as their General Practitioner may be the practical alternative. In turn, these choices may alleviate stress within the department. Currently, OTMH reports the average total time spent in the ED for both patients with conditions that are considered complex or require more time for diagnosis, treatment, or hospital bed admission as well as patients who have experienced minor or uncomplicated conditions that require less time for diagnosis, treatment, or observation. The provincial times are also provided for comparative purposes.
5.2.3 Alleviating Patient Dissatisfaction

Patient complaints regarding ED wait times are typical and increase stress levels for staff. During staff interviews, nurses and clerks expressed that they periodically communicate the state of the ED with the waiting room. However, this is not always possible and patients are often unaware of their position in the queue and their expected wait time. While it is generally understood that patients of relatively low acuity must expect longer wait times, many choose to go to the ED as opposed to finding a walk-in clinic or visiting their general practitioner. The fact that they are required to remain within the ED throughout their wait in order to be immediately available when their name is called increases the number of patients and those accompanying them in the waiting room.

5.3 Treatment and Disposition

Once the patient is triaged, they are expected to wait until the nurse calls them to enter the main ED treatment area. There are several areas within the department, and changes are often applied to how patients are organized. At the beginning of the study period, the following zones were observed.

1. Fast Track
2. Observation Unit
3. Acute Care
4. Treatment
5. Resuscitation Unit

As of June 1st, 2009 the Observation Unit was eliminated in favour of a new area called the Rapid Assessment Zone. In an effort to streamline patients to enhance the efficiency of patient care, this zone was implemented with the intention of serving mainly CTAS 3 patients.

Once the patient enters the appropriate zone, they are seen by a nurse and an MD for assessment, treatment and disposition. They may require orders/tests such as blood work, x-rays, or diagnostic imaging (Figure 8) depending on their situation. These times are recorded through the computer system in accordance with NACRS. Table 4 shows the different options that the nurse or physician may choose
when entering the disposition of the patient. These categories will be used for further analysis throughout this document.

Table 4: Visit disposition descriptions for ED patients, recorded by the National Ambulatory Care Reporting System.

<table>
<thead>
<tr>
<th>Visit Disposition Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharged To Place of Residence</td>
</tr>
<tr>
<td>Left Without Being Seen/Receiving Treatment - Before Triage</td>
</tr>
<tr>
<td>Left Without being Seen/Receiving Treatment</td>
</tr>
<tr>
<td>Client triaged and left ER. Not seen by Health Care Provider</td>
</tr>
<tr>
<td>Left Without being Seen/Receiving Treatment</td>
</tr>
<tr>
<td>Client Left Without Treatment - After Pt Triaged</td>
</tr>
<tr>
<td>Client Left Against Medical Advice Before Treatment completed - After Pt Triaged</td>
</tr>
<tr>
<td>Admitted as an In-patient to Critical Care Unit or Operating Room</td>
</tr>
<tr>
<td>Admitted as an In-patient (in own facility)</td>
</tr>
<tr>
<td>Transferred to Another Acute Care Facility</td>
</tr>
<tr>
<td>Transferred to Another Non-Acute Care Facility</td>
</tr>
<tr>
<td>Death After Arrival/Death in Emergency</td>
</tr>
<tr>
<td>DOA (includes in ER) - No Vital Signs Apparent and No Intervention Initiated</td>
</tr>
<tr>
<td>Intra-Facility Transfer to Day Surgery</td>
</tr>
<tr>
<td>Intra-facility transfer to the Emergency Department</td>
</tr>
<tr>
<td>Intra-Facility Transfer to Clinic</td>
</tr>
<tr>
<td>Discharged to Place of Residence (Institution i.e. Nursing/Retirement, Jail etc)</td>
</tr>
</tbody>
</table>

Table 5 shows the number of patients under the visit dispositions listed in Table 4, and indicate that more patients are admitted than discharged from the ED.
**Table 5:** Visit disposition of OTMH patients from February 2008 to July 2010

<table>
<thead>
<tr>
<th></th>
<th>Discharged</th>
<th>Admitted</th>
<th>LWBS</th>
<th>Left Against Medical Advice</th>
<th>Death in ER</th>
<th>Inter-Facility Transfer</th>
<th>Intra-Facility Transfer</th>
<th>Grand Total</th>
</tr>
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<td>56</td>
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<td>72</td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>53,195</td>
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<td>4,407</td>
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<td>100</td>
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<td>35</td>
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<td>80</td>
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<td>20</td>
<td>80</td>
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<td>4,564</td>
<td>591</td>
<td>50</td>
<td>40</td>
<td>160</td>
<td>132</td>
<td>9,760</td>
</tr>
</tbody>
</table>

**Grand Total** 123,767 132,818 13,996 1,760 1,297 3,372 3,842 280,852
5.4 Fast Track

Upon triage, patients may be directed towards the “Fast Track” area. There are 4 beds in this area, which may be enclosed with curtains for privacy and infection control. Additional seating for Fast Track patients is available as some patients do not require a bed, thus increasing the potential capacity of the area. The charge card created during registration is also employed in this area. As with the rest of the ED, the Charge Nurse must be aware of the patients within this area.

Orders include x-rays, blood tests, and medical imaging. Whether patients are sent to Orders right after registration (before Fast Track) is dependent on the traffic within the department. During high volume times, patients are often directed straight to Orders. However, the additional 2-3 minutes needed on the computer to direct these patients often create more backlogs in the queuing system. This is done as patients who are sent to Fast Track and need orders result in vacant beds during test. Patients may be sent to a chair to alleviate this situation, as more critical patients may be seen in the meantime on a bed.

In addition, the type of patients who are directed to Fast Track varies with the situation in the department. For instance, if it is quite busy CTAS 2 and 3 patients may be treated in Fast Track instead of just CTAS 4 and 5 patients in order to address the most critical patients’ needs.

Physicians are usually assigned to a specific area, such as Fast Track. However, due to shift organization, the physician may leave the Fast Track area frequently in order to care for patients in the ED that they were assigned to prior to the physician’s FT shift. S/he will return to the patient when the Re-evaluation button on the Tracking Board is lit. S/he charts the results of the assessment, makes recommendations and discharges the patient if appropriate. Both physicians and nurses are expected to serve patients in other areas of the department during their Fast Track shifts if the patients were initially assigned to them.
This area has its own tracking board/charting system. There are 7 screens, which track patients from FT22 to FT28. TR25 to TR28 are chairs within the Fast Track area. If the board becomes full and more patients may be seated in the Fast Track waiting area, charts are simply added on a table adjacent to the board with notes.

Table 6 shows the typical schedule for Fast Track. It should be noted that an overlap of patients occurs between areas of the department. While the hours of operation technically begin at 12PM, it is often opened at 10AM because this is a time when the department is busy with doctors and float nurses. One doctor and one RPN are needed in the department, and one RN is often present for administering IVs or narcotics. Patients who are assigned to Fast Track are still expected to tend to their patients in acute care and typically travel between the two areas for the entirety of their Fast Track shift.

Table 6: Fast Track typically operates from 12PM – 12AM on a daily basis. Doctors who serve the rest of the department are expected work in the Fast Track area for at least 2 hours.

<table>
<thead>
<tr>
<th>Physician</th>
<th>Shift</th>
<th>Time in Fast Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>8AM – 3PM</td>
<td>12PM – 2PM</td>
<td></td>
</tr>
<tr>
<td>10AM – 6PM</td>
<td>2PM – 4PM</td>
<td></td>
</tr>
<tr>
<td>12PM – 7PM</td>
<td>4PM – 6PM</td>
<td></td>
</tr>
<tr>
<td>1PM – 7PM</td>
<td>6PM – 8PM</td>
<td></td>
</tr>
<tr>
<td>6PM – 1AM</td>
<td>8PM – 10PM</td>
<td></td>
</tr>
<tr>
<td>4PM – 1AM</td>
<td>10 PM – 12AM</td>
<td></td>
</tr>
</tbody>
</table>

Patients are sent to other parts of the department if their condition worsens, or they are prescribed drugs that require monitoring.
5.5 Observation Unit

In general, this unit serves as an intermediate between the emergency department and beds on other floors of the hospital. This area of the department contains 12 holding beds. Although it was initially intended as a clinical unit, it became a holding area due a lack of funding. As a result, it acts as more of an isolation unit, despite the fact that there aren’t any isolated rooms. The curtains serve as infection control, and patients may have pneumonia or flu-like symptoms. Although the curtains are not a complete barrier to infections, particularly in the case of patients who are contagious via droplets, this is an acceptable situation according to the Ministry of Health. The charge card is used in this area, and they are discharged via the emergency department tracking board. Patients are kept in this area until they are admitted to other floors, and ICU nurses come down to this unit for critical cases. In the case of the observation unit, ordered samples are only picked up at 5AM. Otherwise, “pals” or other volunteers are relied upon for delivery.

In lieu of a tracking board, this area employs a simple whiteboard with all of the information. Similar to the tracking board, each bed has a designated code – ranging from OB32 – OB43. These profiles are recorded in the emergency department computer. The whiteboard contains the following information:

- Patient Name
- MRP/Consult
- Stat tests
- IV
- Diet
- Misc
- Notes for Doctors
- (D) Droplet contact (nurses must wear a mask)
- (C) Contact (nurses must use a gown and gloves)
- Telemetry (heart monitor)
As this tracking system is not computerized, all changes and notations must be done manually. When patients are seen by physicians, a simple checkmark is added next to their names. A corkboard beside the whiteboard is used to pin labels that indicate outstanding orders (i.e. blood work).

Patients may stay in this unit for weeks depending on the availability of beds in other wards. The organization of paperwork has a system that is different from the acute care and Fast Track part of the department. Binders for each ward have identical information and dividers as available on each floor, which are sent with each patient along with any assigned medication when patients are admitted. Patients are transported when called by hospital staff.

The general design of the department involves highly visual cues. For instance, each binder has a colour coded system on the back. A plastic, circular disk may be turned to only show one colour at a time. For instance, red indicates that the doctor has orders and blue means that the chart needs to be double checked. For instance, the following represents the general procedure involving the colour scheme:

1. Doctor writes an order
2. Doctor turns the “wheel” to red
3. Binder is placed on a trolley
4. Unit clerk enters the order
5. Wheel is turned to blue
6. Nurse checks the order and signs to show that it has been checked
7. A second nurse double checks to verify that all of the paper has been adequately completed

The unit clerk does not need to be an RN, but is expected to have some medical knowledge from various sources of education.

While the general consensus from the staff is that the Observation Unit (“OBS”) was quite effective with helping alleviate pressure within the ED during the initial stages of implementation, the effect became less significant as the population of Oakville grew. Therefore, as the size of the ED remained constant but the number of patients increased it became apparent that a greater patient capacity was required. It was decided that the need for additional space in the department was greater than the
need for a space for patients to be admitted, as those patients often remained in “OBS” for several days or
even weeks at a time.

As of May 28\textsuperscript{th} 2009, the Observation Unit was closed for a combination of reasons. With the
increasing number of ED patients as well as efforts to move patients “up” through the system (out of the
ED, admitted to the hospital, and then to Alternate Long-term Care (ALC) facilities) the ED managerial
staff felt that converting the Observation Unit into a Rapid Assessment Zone (RAZ) would be a more
effective use of resources and space. Staff members who worked at the Observation Unit were added to
the ED team, as they were already familiar with the tools and the surroundings. Despite some initial
resistance from staff, the overall perception is that RAZ has been a great improvement to the department.

5.6 Rapid Assessment Zone (RAZ)

5.6.1 Background

To improve throughput of emergency patients, a Rapid Assessment Zone (RAZ) have been
implemented in several existing EDs across Canada including York Central and Credit Valley Hospital
(CVH). CVH worked with 3M using Lean-Six Sigma methodology to improve the management of CTAS
level 3 patients and wait times. Serving as a parallel process to the department, RAZ works to improve
wait time from triage to physician assessment, reduce patients’ length of stay, decrease patient risk,
improve patient satisfaction, and reduce “left without being seen” (LWBS) occurrences. Patients are
moved between stretchers and chairs based on clinical status and assessment needs [CHEQ09W3].

5.6.2 Credit Valley Hospital and 3M

Similar to OTMH, Credit Valley Hospital did not have a specified zone or protocol to deal with
CTAS Level 3 patients as a separate entity prior to RAZ. Thus, the overall department had to be assessed
prior and during RAZ implementation, and several measures were captured to gauge success. The 3M
Corporation collaborated with CVH to facilitate this process using Six Sigma methodology. In the case of
CVH, CTAS Level 3 patients comprises 50\% of their ED volume, thus improving their patient experience
is critical for the overall environment, with respect to satisfaction and ensuring that care is received

[CHEQ09W3]. OTMH has adopted a similar strategy in the development of RAZ – a working group with
multidisciplinary members including senior leadership representation.

Instead of leaving patients in designated areas, they were moved between stretchers and chairs
according to relative needs and health status. In addition, a team approach was taken for RAZ with
designated lead RNs as well as education and feedback sessions to encourage continuous improvements.
Leads and patient flow coordinators worked together to provide consistent leadership of the project
[CHEQ09W3]. Lastly, physical renovations were completed to improve documentation and order entry, a
new reassessment room was created, and visual barriers now provide a clear distinction between zones.

RAZ facilitates the overall management of the department’s throughput for CTAS level 3
patients, and serves several objectives. According to Credit Valley, the RAZ has several objectives:

- Reduction in wait time from triage to physician assessment
- Decreased overall length of stay
- Reduced number of patients leaving without being seen
- Increased patient satisfaction
- Decreased patient risk

5.6.2.1 Data Collection

Contracted “process watchers” gathered time measurement data over three weeks and statistical
analyses with respect to lags for bed assignments, initial MD assessment, time between order entry and
diagnostics, as well as the second MD assessment were performed. These measurements were considered
critical to assessing changes in patients’ length of stay (LOS). These were presented to the stakeholders to
encourage support and develop key improvement strategies [CHEQ09W3].
5.6.2.2 Results

While RAZ improved LOS for patients, the changes were not sufficient to meet the goals. This was partially attributed to physician scheduling, which was addressed by redesigning the staffing to provide RAZ with a dedicated physician during peak hours [CHEQ09W3].

Credit Valley Hospital experienced an increase in ED volumes by 10%, which was a concern raised during an OTMH RAZ working group meeting. However, this should not be seen as a deterrent to implementing RAZ, as the average length of stay decreased by 20 minutes and the time for the initial physician assessment decreased by 17 minutes. Lastly, patients who left without being seen (LWBS) decreased from 9.2% to 5% over a one year period [CHEQ09W3]. Numerous measures were taken in order to assess the efficacy of the RAZ. For instance, bed lag time, order entry to diagnostic return lag time, physician assessment lag time, and 2nd physician assessment lag time were recorded [CHEQ09W3].

5.6.2.3 Complications during Study Period

Complications with respect to collecting data from the hospital computer system resulted in delays to the project timeline, which Credit Valley Hospital believes may have been avoided with a detailed analysis to data accessibility and expectations earlier in the project. This may help develop realistic expectations and project timelines. In addition, Credit Valley Hospital noted that the management of expectations, complex changes, as well as multidisciplinary teamwork required intense resource commitments that were not fully anticipated. These challenges should be implemented into the charter for future and similar projects [CHEQ09W3].

5.6.3 Patient Care

The target patient audience of RAZ are CTAS Level 3 patients. However, in order to determine relative priorities within this group, patients must be re-triaged and assessed for RAZ. For instance, admitted patients are typically not allocated to RAZ, whereas most walking wounded patients are. According to the nurses of OTMH, OR patients are not ideal for RAZ. Once they have been classified as
OR patients, they are simply moved to the treatment area in any case, thus their presence in RAZ would not be the optimal use of resources. It should be noted that a relatively high number of CTAS Level 3 patients are not new ED patients, but recurrent or scheduled individuals.

5.7 Orders and Testing

Upon a physician’s recommendation, orders may be taken for patients. This includes requests for laboratory work on various specimens (blood, urine, etc.), CT scans, and x-rays. Typically, this occurs after the patient has been admitted in the ED and seen by a physician. However during high volume periods patients may be asked to proceed to this stage immediately. For instance, blood work may be conducted on a patient while they are in the waiting room to minimize their time in the ED on a bed. Similarly, patients may be immediately sent to the x-ray department right from triage.

After receiving the results from tests, physicians may require consults from specialists in the hospital. After paging the consultant, subsequent recommendations may be made over the phone or the consultant may travel to the ED to see the patient. If there are differences in opinion (i.e. a physician and a radiologist do not agree on the meaning of the lab results) the Charge Nurse and a third doctor will be asked to discuss the case. This may occur when the physician assesses an order without the radiologist, as physicians receive x-ray results electronically and immediately in the ED through PACS: iSite Radiology.

5.7.1 Previous Specimen Retrieval Method

When a physician recommends a specimen test (i.e. urine, blood, spinal fluid), they fill out an order request form. The physician or a nurse hands this form to the clerk, who enters the information into the “order-entry” system. Stickers with barcodes identical to one on each patient’s wristband along with specimen and patient information are printed at the clerk station. The clerk is then responsible for affixing these labels to the chart and returning the chart to the designated area in Fast Track, RAZ, or the Main Emergency Department Area. Upon collection, the specimen containers are labelled by the nurse and they are sent to the lab via Pneumatic Tube Transport (PTT). This system uses a network of pipes throughout
the hospital and partial vacuum to send documents, specimens, and other items between departments are equipped with PTT, due to funding issues this system is only employed by the ED and laboratory for blood work.

5.7.2 Issues Arising from Specimen Retrieval

Records indicated that there were consistently numerous errors in specimen labelling and retrieval, particularly in the ED. While understandable due to the relatively busy nature of the department, this posed a number of potentially serious issues, including compromising patient safety and unnecessary repeat specimen withdrawals. Incomplete or incorrect forms on containers, when noted by staff in the laboratory, led them to return specimens to the ED for re-collection, form completion, or information correction. This adds pressure due to the additional time and resources required to amend any errors as well as patient discomfort in the case of repeat withdrawals. In addition, accidental unnecessary withdrawals may pose a health risk to the patient and decrease their faith in the health care provided. A six-month study revealed that six samples were sent from the ED that were not labelled, and five cases where the specimen was collected from the wrong individual.

5.8 Consultants

Consultants from various specialities in the hospital are contacted for ED patients that require specific medical expertise. When an ED physician determines that a consult is required, s/he communicates this request to a nurse or a clerk who proceeds to contact the appropriate department via the hospital switchboard. The system within the hospital uses a public switched telephone network (PSTN) and fixed telephones (landlines). The general process is outlined in Figure 10.
Figure 10: Typical process when a consultant is requested by an ED physician.
There are a number of issues with the current system, including:

1. **Identification of the patient case/requesting ED physician**

   When the clerk/nurse contacts a department, if the consultant is not immediately available a message is left to return the phone call. However, the phone call is not streamlined to a particular phone within the department, and a different nurse/clerk often answers the phone call. S/he may not be aware of the physician’s location and neither the clerk nor the consultants are necessarily aware of which case or physician they are responding to.

2. **Access to the consultant and ED physician in a timely manner**

   As a result of #1, the ED physician may not be immediately connected with the consultant upon returning a phone call. The nurse/clerk that answers the telephone may be unaware of the physician’s location, which creates a delay in service for both the ED patient and those that could be served by the consultant during this time.

3. **Patient safety is at risk**

   If the consultant is unable to locate the requesting physician, the patient may not receive service in a timely manner. A significant amount of time may pass prior to acknowledgement of this error, during which serious complications may occur.

   These issues add pressure on the emergency department, as delays in care prolong the length of stay of a patient. To evaluate and address this issue, the Ministry of Health mandated that the time between consultant request and service fulfillment be collected as of April 2010. The current system makes this quite difficult to measure, as not all phones service the same lines within the emergency department, different nurses/clerks answer the telephones (dependent on relative location to the phones), and the telephones use the traditional landline networks and are in fixed locations in the ED. Figure 11 depicts the time between receiving a phone call (most often by the clerk) and connecting the party to the appropriate physician. As shown in Figure 12, there are various outcomes of the phone call and the clerk
or nurse who answered the phone had to physically search for the physician throughout the department to notify them of the call.

**Figure 11:** Length of time it took to connect a physician to a consultant upon receiving the phone call, pre-telecommunications upgrade. Instances where physicians were paged and verbally notified were combined.

**Figure 12:** Various telephone logs, pre-communication system upgrade, when consultants contacted the ED for a physician.
5.9 Scheduling

Complexities in scheduling vary across different industries and environments. Research and development has been conducted to improve and facilitate scheduling in several industries such as the airline industry, however operations research (OR) applications as well as industrial engineering has been relatively under-represented in healthcare. Due to the high number of human factors, degree of complexity with respect to different staffing and client requirements, as well as financial barriers, healthcare poses a unique challenge for efficient and effective scheduling.

5.9.1 Oakville Trafalgar Memorial Hospital (OTMH) Scheduling Procedures

OTMH employs several different types of staff in each department (RNs, RPNs, Clerks, etc.) at various levels of the organization. Nurses and Unit Clerks are manually scheduled on a rotating self-scheduling system in accordance with the Nursing Employment Policies (RN Scheduling Guidelines, Required Availability, and the CUPE Collective Agreement. There is a mixture of Full-Time (FT), Regular Part-Time (RPT), Registered Nurse (RN), Registered Practical Nurse (RPN), junior staff, and experienced staff which affects the nature of the rotation system. The application of a self-scheduling system is positively received by staff members as it allows them a degree of freedom over their work schedule. Experienced staff members are given priority on a rotating basis to schedule their own shifts. A set of guidelines encourage schedule equality and efficacy, and a scheduling facilitator oversees the process along with senior management. This is an established regular pattern in order to meet the unit and staff scheduling requirements.

On any day shift, there must be at least 3 full time staff (including the Nurse in Charge). These three people must have adequate experience (2 years ED experience). This is because the role of Nurse in Charge as well as triage must be fulfilled with an experienced staff member. During night shifts, there must be at least 2 full-time members, with at least one that has sufficient experience to take charge.
There are a number of different shifts that staff may work. They are listed in Table 9, along with the code entered when creating the schedule.

**Table 7:** Different types of shifts at the OTMH ED.

<table>
<thead>
<tr>
<th>Shift</th>
<th>Scheduling Code</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Tour</td>
<td>D</td>
<td>11.25 hour day tour</td>
</tr>
<tr>
<td></td>
<td>d</td>
<td>7.5 hour day tour</td>
</tr>
<tr>
<td>Evening Tour</td>
<td>E</td>
<td>7.5 hour evening tour (4PM-12AM)</td>
</tr>
<tr>
<td>Night Tour</td>
<td>N</td>
<td>11.25 hour night tour (8PM-8AM)</td>
</tr>
<tr>
<td></td>
<td>10-22</td>
<td>12 hours (10AM – 10PM)</td>
</tr>
<tr>
<td></td>
<td>12-24</td>
<td>12 hours (12PM – 12AM)</td>
</tr>
<tr>
<td>Vacation</td>
<td>VAC</td>
<td>Vacation (11.25 hours)</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>Vacation (7.5 hours)</td>
</tr>
<tr>
<td>Float Holiday</td>
<td>FL</td>
<td>N/A</td>
</tr>
<tr>
<td>Statutory Holiday</td>
<td>ST</td>
<td>N/A</td>
</tr>
<tr>
<td>Orientation</td>
<td>OR</td>
<td>Varies</td>
</tr>
</tbody>
</table>

Nurses and unit clerks use a different scheduling system than physicians. A printed spreadsheet (see Table 10) with all of the nurses’ and unit clerks’ names, telephone numbers and 4 weeks’ worth of dates is available, and preferences are entered by hand onto the sheets in the aforementioned order.

**Table 8:** Example of the OTMH ED scheduling spreadsheet

<table>
<thead>
<tr>
<th># (rotation order)</th>
<th>Name</th>
<th>Phone</th>
<th>M 2</th>
<th>T 3</th>
<th>W 4</th>
<th>T 5</th>
<th>F 6</th>
<th>S 7</th>
<th>S 8</th>
<th>…</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMITH, John</td>
<td>905-555-555</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td></td>
</tr>
</tbody>
</table>

Upon completion, a facilitator enters this information in the electronic version of the spreadsheet and it is made available at the clerk station. Staff members are expected to sign in on these sheets at the start of their shift for accountability. In addition, if shifts are changed (i.e. two members switch their shifts), a note is made on these printed sheets. The composition of the staff members is as follows in Table 9:
<table>
<thead>
<tr>
<th>Position</th>
<th>Number of Staff Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency and Ambulatory Care</td>
<td>1</td>
</tr>
<tr>
<td>Patient Care Manager</td>
<td>1</td>
</tr>
<tr>
<td>Charge Nurse</td>
<td>1</td>
</tr>
<tr>
<td>Permanent Nights</td>
<td>1</td>
</tr>
<tr>
<td>Permanent Shift</td>
<td>3</td>
</tr>
<tr>
<td>Senior Staff</td>
<td>15</td>
</tr>
<tr>
<td>Junior Staff</td>
<td>24</td>
</tr>
<tr>
<td>Part-time Staff</td>
<td>17</td>
</tr>
<tr>
<td>Casual Staff</td>
<td>27</td>
</tr>
<tr>
<td>Full-Time RPN</td>
<td>4</td>
</tr>
<tr>
<td>Casual RPN</td>
<td>0</td>
</tr>
<tr>
<td>Unit Clerk</td>
<td>10</td>
</tr>
</tbody>
</table>

Due to the large number of patients in the ER, several pages are necessary for the schedule every month. To easily communicate to the personnel on each shift, a weekly document is made available. As shown in Table 10, all of the names per shift are recorded in pencil; therefore staff members can easily see who they are working with, what roles they must fulfill, and have the ability to easily change the schedule if necessary.

Table 10: Format of the weekly schedule for nursing staff.
5.9.2 Current Benefits

One of the key perceived benefits of the current procedure is the open management system. Staff members are empowered to schedule their own shifts, and the rotating nature ensures that each person will eventually be able to schedule their shifts first. This sense of freedom as well as the ability to switch shifts with other members without contacting senior management or complex administrative issues provides a great sense of control over the work and personal life balance. As the process is highly interactive, communication is improved throughout the department and understanding over scheduling conflicts. This may address absenteeism and frequency of subsequent schedule changes, as personal preferences are accounted for. A sense of understanding over the complexities relating to scheduling is gained, and individuals may feel more inclined to accommodate others’ needs. It also eliminates the need for a manager to schedule the entire staff population while accounting for individual requests. Overall, these factors create a positive environment over the scheduling system, and therefore self-scheduling must be preserved.

However, it should be noted that the manual scheduling methodology has disadvantages such as the inability to review your schedule offsite. In addition, when a staff member calls in sick, the clerk must find a replacement. If nurses wish to fulfill extra shifts during the week in such a case, there is an open schedule, however, not many nurses use this method as they do not want to commit their time. Therefore, the clerk often calls nurses at random from the schedule log to find a replacement. If a replacement cannot be found within a reasonable amount of time, or if there is not enough time to search for one with this method, the last resort is contacting a nursing agency. While the agency often provides service within a short time frame, the financial burden is relatively high as this service costs at least 50% more than regular ED staff. Currently, only the physicians use an online system (www.docroster.com).

The measurement and subsequent analysis of improvements as a result of the implementation of scheduling software is critical to gauge the success of implementation. Both qualitative and quantitative improvements must be assessed, and will provide evidence that the integration of information technology
within the healthcare system is cost-effective, improves workflow and efficiency, and is critical for the future success of quality patient care.

5.10 Admitting

Patients are admitted from the Emergency Department to other floors or clinics of the hospital based on physician discretion. The nurse in charge of the patient retrieves the necessary paperwork from the printers when the physician recommends admission so the patients may give consent to be moved. A nurse who was interviewed indicated that non-digital paperwork was preferred due to signature options.

The following is the general procedure for admitting a patient:

1. Patient is ready to be admitted, based on physician discretion
2. Physician pushes “Admit” on the tracking board
3. Physician fills out the appropriate admittance form (“Physician’s Orders”)
4. ER Admission form is filled out:
   - ER Location
   - Admitted By
   - MD Admitted Under
   - Consulting MD
   - Diagnosis
   - Telemetry
   - Bed Requirements (ICU, Medical, Surgical, Mat Child, Psych)
   - Precautions
   - Date, Time, Initials
5. Admission clerk is given the form
   - Prior to 6pm, they are located across from the ED in the Admitting Office
   - Afterwards, the admission clerk is often (not always) in the registration office in the ED
   - Between 12AM-8AM, one clerk is responsible for both registration and admitting
6. Admitting clerk recommends the appropriate room in a particular ward based on the computer-based room availability.
7. Admitting clerk obtains the appropriate paperwork and speaks to the patient concerning their coverage and their overall stay in the hospital. They place all of the paperwork with the charts into the appropriate container of the Tracking Board.
8. Admitting clerks calls or speaks to a nurse in the emergency room
9. Nurse tries to admit the patient
   - The clerk cannot admit the patient directly, as the nurse has medical/situational knowledge that may need to be communicated
10. Floor may refuse the patient (i.e. Ask the nurse to call later, say that they are busy, etc.) or accept the patient
5.11 PACS: iSite Radiology

When x-rays are completed, they are sent to the iSite Radiology system. This is only accessible at certain dedicated terminals. There are 2 terminals in the emergency department – one in Fast Track, and another by the registration clerk desk. These are the only two terminals in the hospital network that allow images to be automatically sent between departments. Otherwise, the ED relies on a physical vacuum-tube network to transfer documents and specimens. Many staff members expressed that the system is of great value as it saves time and effort, and allows the laboratory to send lab results immediately upon completion. Such technology would be useful for other applications such as sending pharmaceutical requests or transferring patient documents to various departments, especially if electronic medical records and charts were implemented at OTMH.

5.12 Patient Tracking and Records

There are a number of ways that are used to monitor patients. For instance, the computer software allows physicians and nurses to see a quick overview of the registered patients, complaints, CTAS level, and their status – status being “Due” or “Overdue”. This refers to the amount of time that the patient has been waiting to see a physician in relation to the official requirements and the likely time required to attend to CTAS patients according to Ministry guidelines. Each patient has a projected timeline according to CTAS scores.

In terms of monitoring this at a process level, it is possible to take all of the patients, except for the last, to calculate the back-log. The last one should not count because their assessment is already in progress. The Fast-Track physician uses the chart to assess the situation.
5.12.1 Tracking Board

There are two “tracking boards” for the ED. The main board is located within the core of the department and serves as a communication tool between nurses, clerks, and physicians. Another board is located in Fast Track, and is dedicated to those patients. There is no board in the Rapid Assessment Zone.

On the tracking board, each designated area of the department has a screen, a detachable white board, as well as a “cubby” for patient charts and other important documents. The highly visible nature of the board has made it an asset for quick and effective communication between physicians, nurses, and specialists. The electronic portion of each board prominently displays the name of the patient, the time of admittance to the ED, physician name, key symptom, as well as CTAS designation. All of this information is entered via computer stations throughout the department, typically by the head nurse or registration clerk. The RN1 symbol is supposed to indicate when an RN is supposed to visit the patient, however realistically this is a perpetual process and is therefore ignored. A whiteboard adjacent to each screen allows staff to communicate which the nurse associated with each patient the important information. Slots next to the patients who are not acute care (AC) are used for clipboards.

The main advantage of this board is the fact that it is relatively big and highly visible due to the colours and lights. The panels to the right of the whiteboards contain the buttons that physicians and nurses push to communicate specific components. Table 11 provides a list of the buttons found on each individual panel and their corresponding functions.
Table 11: Labels and corresponding purpose of each tracking board function, corresponding to the board available in the Fast Track section of the department.

<table>
<thead>
<tr>
<th>Label</th>
<th>Definition</th>
<th>Who Activates</th>
<th>Who Deactivates</th>
<th>Timer</th>
</tr>
</thead>
<tbody>
<tr>
<td>REASSESSMENT</td>
<td>Reassessment of patient needs to be performed</td>
<td>Automatic, when timer runs out</td>
<td>Nurse When patients is reassessed</td>
<td>Based on acuity</td>
</tr>
<tr>
<td>NEXT</td>
<td>Next new patient to be seen by physician Automatically prioritized by acuity and arrival</td>
<td>Automatically activated when patient is assigned to a room</td>
<td>Physician When physician sees patient</td>
<td>Resuscitation: 15 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Emergent: 15 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Urgent: 30 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semi-urgent: 60 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Non-urgent: 120 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Observe/Consult: 240 min</td>
</tr>
<tr>
<td>RE-EVAL</td>
<td>Patient ready to revisit by doctor after test(s) results are available and/or orders are completed</td>
<td>Nurse When patient is ready for re-evaluation (results available, orders complete, etc)</td>
<td>Physician Upon completion of re-evaluation</td>
<td>20 minutes</td>
</tr>
<tr>
<td>NURSING ORDER</td>
<td>Nursing orders pending completion</td>
<td>Physician</td>
<td>Nurse Upon completion of order</td>
<td>15 minutes</td>
</tr>
<tr>
<td>LAB</td>
<td>Lab tests status lights</td>
<td>Nurse or clerk When order is entered into HIS</td>
<td>Nurse advances to ON when specimen is drawn</td>
<td>60 minutes to results are late</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nurse/clerk deactivates when results are available</td>
<td></td>
</tr>
</tbody>
</table>

The data from the board is recorded and can be accessed from any of the terminals throughout the department. Additional information is available on the tracking board and the computer system, including patients’ arrival times and assigned location in the department, both of which are displayed on the tracking board. The codes used on the tracking board to communicate the various areas of the department are listed in Table 12.
Table 12: Areas of the main ED facility, as are shown on the tracking board.

<table>
<thead>
<tr>
<th>Department Area</th>
<th>Tracking Board Label</th>
<th>Patients</th>
</tr>
</thead>
</table>
| Acute Care        | AC 4-10              | CTAS 1& 2 patients
Monitored area (cardiac, overdose, bleeding, sedations (conscious) |
| Resuscitation     | RESUS 1-3            | Patients who may require resuscitation (typically CTAS 1)                |
| External          | X 44-47              | Patients can be *anywhere* in the department, including RAU and in the hallways – must be aware of where they are |
| Seclusion         | SECL                 | Secluded for their safety and that of others
Observation patients |
| Treatment         | TR 12-18             | Patients who do not need to be constantly monitored                      |
| Ears nose throat  | ENT                  | Scopes, washes, etc.                                                    |
| Gynaecology       | GYN                  | Gynaecology patients (pregnancies, other women’s health issues), has its own bathroom |
| Isolation         | ISOL                 | Highly contagious, negative pressure room                               |
| Paediatrics       | PAED                 | Children                                                                 |
| Green Room        | Green Room           | Patients who do not need a stretcher (are able to sit)                  |

5.12.2 Charge Card

The current system uses “charge cards” for patient records. This card contains the patient’s identification number as well as personal information. However, the very existence of this card correctly implies that the majority of the information is recorded on paper, rather than by electronic means. This holds true for physician assessments, orders, and triage notes.

These charge cards have corresponding impression machines, which are used together to leave an impression on documents (i.e. order forms and test results. Each card has the following information:

- Unique patient identification number
- Last Name, First Name
- Gender
- Age
- Month & Year of birth
- Complete address

These cards are made at the registration desk, and ideally discarded when the patient is discharged to avoid future confusion. However, many patients prefer to retain these cards for future visits.
or to destroy them themselves. As they are not stored in a locked box, there is a potential privacy issue and the rules regarding keeping charge cards and ensuring each patient returns his/her card are not stringent.

### 5.13 Hospital-ED Communication

Every morning, the overall state of the hospital is assessed in a 9:30AM meeting in admitting. According to staff, the simple application of a white board that communicates the inpatient bed situation has drastically improved their capability to predict and identify future pressure points throughout the hospital. Rather than focusing on moving patients *out*, the mentality is to move the patients *up*. Overall daily resource requirements, the need to query discharges, and the overall flow between the hospitals in Oakville, Milton, and Georgetown are assessed accordingly. The Director of Patient Flow discusses the situation with the nurses, and determines the “wants” verses the “needs”, and gives them an idea of whether or not the day will “flow” nicely. These meetings are critical for the flow coordinator, as it gives him/her great insight and it has proved to be more time-efficient and effective than the previously required hourly meetings. In general, the impression is that gridlocks are no longer the usual state, and greater communication has been achieved.
6.0 Solutions

6.1 Rapid Assessment Zone

6.1.1 Pilot Program

In an effort to improve patient wait times at Oakville Trafalgar Memorial Hospital (OTMH), a Rapid Assessment Zone (RAZ) was initially implemented on a trial basis in the ED for CTAS Level 3 patients. The pilot program was held in a single-patient room in the ED 5 days a week, for one shift. The temporary location was not equipped with all of the equipment provided to acute care and Fast Track.

The pilot RAZ allowed two patients to be served at once. A physician may attend to a patient in the temporary RAZ room (PRC1) while a Registered Nurse (RN) assessed another in the hallway adjacent to the private room.

According to an RN, the queue for RAZ patients was determined by the “charge” and RAZ nurses based on patient charts. Patients are often moved from room to room – the RAZ room, the hallway, and the “Green Room”, named after the painted wall colour. The “Green Room” acts as a holding area for patients who do not require a stretcher or constant supervision as well as family members accompanying patients. Physicians only assessed patients in the RAZ room, critical for patient privacy and infection control.

The RAZ nurse must be aware of the number of people in the queue, their location in the department, as well as the overall ED situation. A tracking system similar to that of acute care and Fast Track was not been implemented and there is not strict set of guidelines as to who enters the RAZ queue and when – it was based on the joint discretion of the head and the RAZ nurse. To account for the additional zone and necessary resources, an additional person was hired during this program. Data from this program indicated that the objectives outlined in Section 5.6.2 were met, thus justifying its implementation as a permanent fixture in the ED. The pilot RAZ did not include a dedicated computer, phone, or ECG unit which requires the attending nurse to spend time seeking these resources throughout
the department. To operate efficiently, nurses require these resources – which are all available in Fast Track and the Observation Unit. Such delays were taken into consideration when interpreting the data.

### 6.1.2 Development Strategies

In order to assess the needs and potential issues with the introduction of RAZ, a working group was created. This group includes the head nurse of the department, a senior nurse, two physicians, and the Program Leader of the Emergency/Ambulatory Care Program. This multi-disciplinary team ensures that opinions and concerns from all levels of involvement are considered, and helps develop advocates/champions of the Rapid Assessment Zone in advance. The senior nurse working in RAZ indicated that the current set up within the Fast Track Zone would be ideal for RAZ, due to the number of resources (i.e. computer stations, carts, etc.), proximity to the triage station/waiting room, and the number of beds and chairs available for patients. All parties involved in the working group agree that there must be a clear distinction between the RAZ and Fast Track areas and physicians to maintain order and flow.

As 25% of physicians’ salary is related to the number of patients seen, there were concerns over physician scheduling and subsequent support. The nature of RAZ will allow RAZ-dedicated physicians to serve a higher number of patients in a period of time, which acute treatment physicians may view as unfair or “cherry-picking”. It is important to have members from all areas of staffing involved in the development and implementation of RAZ for success.

According to the OTMH RAZ working group, most hospitals employ 2 nurses for RAZ. During the planning stages, a lack of funds suggested that OTMH could only finance a single nurse, which could potentially be insufficient for an effective RAZ program. It is important to note that the goal of this initiative is not to just create a RAZ, but a productive and effective nurse assignment schedule for 12 or so patients as opposed to 4. Several barriers due to budget restrictions have been mentioned, including limited staffing and hours of operation. According to the working group, RAZ may function with one RN and one RPN or phlebotomist (a trained individual who may draw blood), although the efficiency is
uncertain. These two people are not independent, but will work as a team. The main concern of this scenario is a disproportionate increase of patient demand to available staff.

In addition, ongoing discussions and general uncertainty with the future use of the ED Observation Unit has prevented proper financing and implementation of RAZ. The observation unit may become open real estate for the emergency department, due to the Wait-At-Home strategy for Alternate Long Term Care, a program designed to encourage and support patients who receive care at home while awaiting placement into a long-term care home. In general, this is predicted to drastically decrease the number of inpatients in the observation room due to the increase in space on the floors. However, this has not yet come into complete practice. The “pulsing” nature of RAZ suggests that there are various periods of high practice and low demand.

The area previously dedicated as the Observation Unit was a prime candidate for the permanent home of RAZ, however several scenarios were considered as space within the hospital is very limited. The working group was asked to determine the optimal use of this space. The Observation Unit was equipped with 12 beds and all of the resources available in Fast Track. Potential conversions of the Observation Unit included:

1. **Clinical Decision Unit**

   A “Clinical Decision Unit” would be dedicated to non-critical and non-admitted patients who must wait for a lengthy period of time for a service. These individuals would require little supervision and care, however their condition would qualify them as an ED patient. For example, an emergency patient who arrives after diagnostic imaging hours and is required to wait until the morning for an ultrasound. S/he would be placed in the Clinical Decision Unit to free valuable resources in the main ED.
2. **Fast Track**

RAZ may be implemented in the current Fast Track Zone, which will be moved to the Observation Unit. ED data indicates that CTAS 3 patients are higher in volume and on average experience a longer throughput time.

3. **Rapid Assessment Zone**

RAZ may be designated in the Observation Unit in conjunction with the “Green Room”, a holding area for patients who do not require a stretcher or constant supervision as well as family members who accompanying patients. The Green Room would serve as a RAZ waiting room, and provide additional seats for patients who do not require a stretcher or constant supervision.

Due to previous success with Credit Valley’s Rapid Assessment Zone as well as the temporary RAZ unit, the last two options were the top candidates. The resources available and type of patients that would be guided to each zone were considered.

The following are examples of data available to the working group during the decision making process. CTAS 1 patients would never be placed in RAZ or Fast Track as they are classified as Resuscitation patients. CTAS 4 and 5 patients were combined as they typically go to Fast Track and have the lowest level of acuity. Interviews with staff suggest that differentiating the two is not a high priority; therefore categorizing them together would be a fairer representation. While RAZ is typically for CTAS 3 patients, CTAS 2 patients were included in the following analyses due to changes within the CTAS metrics. Patients who were previously classified as CTAS 2 may now be triaged as CTAS 3 patients. Figure 13 observes the number of patient visits prior to removing outliers and cases with missing points. Monthly averages of patient visits were 1,082 and 1,943 CTAS 2 and 3 patients respectively, and a combined average of 1,175 for CTAS 4 and 5 patients’ visits. Data from this analysis is available in Appendix D.
Figure 13 indicates that most ED patients are CTAS 3, whereas CTAS 2 and 4 patient visits are relatively close compared to the other categories. Keeping in mind that RAZ would primarily service CTAS 3 patients, this is particularly noteworthy as it suggests that streamlining and finding other opportunities to increase the efficiency of CTAS 3 patients’ visits would improve the overall throughput of the department due to the relative volume.

**Figure 13:** Number of patients who visited the Emergency Department at OTMH from February 2008 to July 2010. CTAS 3 patients are the target for the Rapid Assessment Zone, whereas CTAS 4 and 5 patients are often sent to Fast Track. RAZ was implemented in June 2009.

It is apparent from Figure 14 below that the distribution of the length of stay of CTAS 2 and 3 patients is widespread relative to CTAS 1, 4, and 5 patients. Therefore, throughput of these patients is less predictable than others and streamlining such patients into a different treatment area may improve the overall efficiency of the department due to improved forecasting. Thus Figure 13 suggests that a focus on improving throughput of CTAS 3 patients would be beneficial for the overall ED experience.
While observing other factors, missing data points and outliers were considered. Several data points for the time of ED disposition and when the patient left the ED were missing, as shown below in Table 13. However, upon examining the data there are a couple of points to note. Over half of the patients are recorded to have left the ED less than 5 minutes after physician disposition. During interviews, it was revealed that the nurse often entered both timestamps after the patient left the ED, as physicians did not always enter their disposition time in the system. It should also be noted that 97% of the missing data points for “Patient Left ED” time occurred in February and March of 2008, right at the beginning of data collection. Therefore, it is likely that this time stamp was not strictly enforced until the missing data points were detected and alternative standards were enforced. However, no recollections of changes in policies or NACRS guidelines were noted by staff during interviews. In addition, 91% of these points were from patients who were admitted into the hospital, whether another ward, the OR, or the Critical Care Unit, which most likely contributed to the high proportion of data that had no difference between time of disposition and leaving the ED.

<table>
<thead>
<tr>
<th>Time between disposition and physically leaving ED</th>
<th># Cases</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cases (Feb 2008 – March 2009)</td>
<td>59,985</td>
<td>-</td>
</tr>
<tr>
<td>Total Cases with Available Data</td>
<td>6,049</td>
<td>10.1%</td>
</tr>
<tr>
<td>&lt;5 min</td>
<td>3,209</td>
<td>53.1%</td>
</tr>
<tr>
<td>[5-30)</td>
<td>1,938</td>
<td>32.0%</td>
</tr>
<tr>
<td>[30-60)</td>
<td>463</td>
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<tr>
<td>[60-90)</td>
<td>271</td>
<td>4.5%</td>
</tr>
<tr>
<td>[90-120)</td>
<td>119</td>
<td>2.0%</td>
</tr>
<tr>
<td>≥120</td>
<td>49</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

When comparing trends for CTAS 2, CTAS 3, and CTAS 4 and 5 combined in Figure 14, they appear consistent, which suggests an external environmental factor beyond the ED’s control. However, the trends are not apparent when observing the average length of stay (LOS) of an ED patient (Figure 15).
This suggests that the time between disposition and when the patient leaves the ED is heavily influenced by patient acuity.

Figure 14 and Figure 15 indicate that CTAS 4 and 5 patients experience a shorter LOS than those classified between CTAS 1 and 3. This is because CTAS 4 and 5 patients are not likely to take long to be disposed once they are seen as they typically do not require admission or extensive tests relative to the other patients. In addition, they are less likely to require a consult from specialists throughout the hospital, which also shortens their overall LOS relative to CTAS 1, CTAS 2 and CTAS 3 patients.

**Figure 14:** Average time patient spent in the ED from triage to disposition. Disposition is the last time stamp recorded in the NACRs reporting system, and is used as patients’ length of stay (LOS).

**Figure 15:** Average length of stay (LOS) of ED patients, from triage to physically leaving the ED.
Figure 15 indicates that the LOS increased and experience more volatility after July 2008 for CTAS 2 and CTAS 3 patients. This was interesting to note, as the same volatility was not observed in Figure 14, thus suggesting that a change occurred between disposition and when the patient physically left the ED. According to staff interviews, this parameter was required for NACRS and the accuracy of its collection was stressed during this time period. As such, staff members were often reminded to record the disposition and time that the patient left the ED separately, rather than inclining to record both when the patient left.

As the volatility increased with acuity, it is most likely that these patients remain in the ED for further service within the hospital (i.e. admission) or a transfer to another center. As shown in Table 13, only 10.1% of the data showed any difference between the time of disposition and time that the patient physically left the ED. This is important to note many staff members indicated that when times were quite busy, the disposition time and the “Patient Left ED Time” were recorded simultaneously, therefore providing an inaccurate set of data for this time period. Despite this observation, this small subset of data will be used for patients who were admitted into the hospital, for which there are two categories: “Admitted as an In-patient to Critical Care Unit or the Operating Room” as well as “Admitted as an inpatient (in own facility)” as listed in Table 4.

It is apparent from Figure 16 that CTAS 2 and 3 patients who are to be admitted typically stay in the ED after disposition longer than CTAS 4 & 5 patients. The only exception was noted in February, where 20% of the cases had times greater than 2 days. Overall, from February 2008 and March 2009 only 10% of CTAS 4 and 5 patients had times greater than 2 days.
Figure 16: Time from disposition to bed for patients who were admitted to the hospital from the ED.

As CTAS 3 patients often need ED beds and share the main ED with CTAS 1 and 2 patients, long periods between disposition and admission can significantly impact wait times. The Observation Unit was used to house these patients until beds were available in other wards of the hospital. This would ideally vacate a bed within the main ED. However, Figure 16 suggests that a focus on moving CTAS 2 and 3 patients would benefit the overall patient flow in the ED. CTAS 4 and 5 patients are less likely to require a bed while waiting to be admitted as an inpatient.
There are several advantages of converting the Observation Unit to a Rapid Assessment Zone (RAZ) as opposed using it for Fast Track:

1. **Infection Control and Patient Privacy**

   Patients classified as CTAS 3 are “Urgent” and more likely to require infection control measures than CTAS 4 and 5 patients (“Semi-Urgent” and “Non-Urgent”, respectively). The Observation Unit has an isolation area, more beds surrounded with curtains and further removed from the main ED than Fast Track. This is important, as CTAS 1 and 2 patients are already in critical condition, and additional health risks due to factors such as hospital-acquired infections should be minimized. For instance, patients with flu-type of symptoms are often classified at CTAS 3 patients and would be placed in RAZ.

2. **Capacity**

   CTAS 3 patients consistently experience longer ED visits in higher volumes than CTAS 4 and 5 individuals (Figure 13, Figure 14). The Observation Unit would most likely be used in conjunction with the Green Room and therefore have a higher capacity for patients than the Fast Track zone. This would also remove patients from the main ED waiting room. For throughput purposes, it would appear that using the Observation Unit and the Green Room for the RAZ would be preferred over Fast Track. Nurses within the RAZ working group have expressed the need for more than 1 room for effective patient flow. Tests and orders such as ECGs take time, during which physicians leave. This was problematic during the Pilot Program as there was not a dedicated RAZ physician. Thus, nurses must seek or wait for the return of the physician to continue service. In addition, confidentiality issues arise with the use of the hallway as part of the RAZ, and the Green Room was often not big enough as acute treatment care shares this space.

   Several staff indicated that only 2 beds would be sufficient for RAZ, as it would allow greater control over patient and visitor flow. Ideally, these beds would be located in separate private rooms as was used during the pilot program. More than 2 beds may create a “mini-ER” environment, thus creating more pressure within the department due to a potentially disproportional increase in patient capacity. In
this case, a couple of rooms would be dedicated to RAZ while the Observation Unit would be converted to either a Clinical Decision Unit or an extended part of acute care. However, this area is relatively removed from the main ED and there would be a need for at least one dedicated RN in this area for patient safety and monitoring.

3. Resources

Fast Track is adequately equipped to run a RAZ. One of the two ED PACS systems is located in Fast Track. This is a network connected to the x-ray department in order to allow physicians and nurses to receive images directly onto the computer. Patients who typically require this system are usually CTAS 4 and 5 patients who are sent to Fast Track, hence its placement. If Fast Track was moved to the Observation Unit, the PACS system would need to be re-routed. In addition, the Green Room is adjacent to the Observation Unit. This room would either be used as a separate waiting room for patients in the RAZ queue, or a secondary unit of Fast Track. Similar to the current Fast Track system, patients who are able to comfortably sit for extended periods of time can be sent to the Green Room to provide a vacant bed.

6.1.3 RAZ Implementation

The Rapid Assessment Zone (RAZ) serves as a treatment area for CTAS 3 patients. This zone was implemented on a trial basis in early April, 5 2009 days a week. Upon assessment of its success, RAZ became a permanent fixture within the department. The observation unit was converted into the ED’s RAZ between May 28 and 29 of 2009.

Prior to RAZ, CTAS 3 patients entered the queue along with all of the other patients, based on the Charge Nurse’s discretion. The intention of RAZ was to facilitate the care of ambulatory CTAS 3 patients by expediting access to service.

RAZ is currently open 7 days a week from 9:30AM to 9:30PM. An additional RPN and RN are scheduled to service this ED zone, identical to the number that worked in the Observation Unit. The MD
schedule remained the same when RAZ was implemented – 3 physicians are in the ED during those hours and must service all patients during their shift.

To maintain the relatively quick nature of the zone, strategies should be developed to minimize the time and effort spent on minor tasks. For instance, time between each patient may be decreased by using papers for each bed as opposed to bed sheets. Currently, between each patient the nurse must replace the cloth sheets with fresh ones, and place the used sheets in designated laundry areas. Alternatively, by applying large rolls of paper on top of each bed, this process may be hastened. The increase in waste will be offset by improved patient care.

6.1.4 Staff Support and Perception

The general response to RAZ is positive – senior and junior nurses interviewed about this new initiative indicated that it relieved a great deal of stress from the acute area of the department. In addition, the perception is that the focused nature of the zone helps streamline the process as variation between capabilities and conditions of the patients is a bit lower. As patients are generally able to move between the RAZ room, hallway, and the Green Room with relative ease the nurse and the physician are able to work together in an efficient manner. The mobility of the patient greatly facilitates the process.

To assess the reception of RAZ, a satisfaction survey was administered and the results were compared with data gathered through NACRS. Employee satisfaction and safety is critical for the success of any project, and results may be further used for future initiatives.

The survey and complete results are available in Appendix A. The majority of participants stated that both the workload and the working environment remained the same and 35% of respondents consider that RAZ is effective at streamlining patients, thus improving workflow while 30% believe that RAZ has improved patient safety (Figure 17). In both cases, 40% of respondents do not believe that RAZ had any effect. 60% of staff members responded positively to the overall implementation of RAZ and 50% of
them believe that it was an improvement to the ER. Lastly, as shown in Figure 18 most respondents do not believe that the overall quality of care has changed in the ED as a result of RAZ.

**Figure 17:** Most respondents believe that RAZ had no affect on global patient safety, however many think that there has been an increase, according to satisfaction surveys.

**Figure 18:** While most participants reported no perceived change in quality of care, almost the same number believes that it has increased by varying degrees according to satisfaction surveys.

Figure 19 indicates that many staff members feel that RAZ allows them to better focus on their patients while a few indicated that they were not affected. This is interesting compared to the results in
Figure 18, which indicates that the interpretation of “quality of care” is subjective among staff.

Nonetheless, it is important to consider such perceptions as they serve as indicators for the overall acceptance of these projects.

![Bar chart showing perceptions since RAZ](chart.png)

**Figure 19:** Perception of the effect on RAZ on the work environment, according to satisfaction surveys.

### 6.1.5 Data Analysis

Prior to analysis, data were plotted on scatter plots to detect and remove outliers using SPSS 17.0 software. The dataset was then utilized to assess the quantitative affects of RAZ and compared with the qualitative results from Section 6.1.4 (Staff Support and Perception) and Appendix A. To determine if there was a significant change due to RAZ four time periods were to be considered:

1. **Prior to RAZ:** February 2008-March 2009
   - Earlier data is unavailable as it was not required to be collected for the National Ambulatory Care Reporting System (NACRS)
2. **RAZ Pilot Program:** Monday, April 6 – Friday, April 10 2009
3. **Observation Unit ➔ RAZ Conversion Period:** May 28-29 2009
4. **Post-RAZ:** June 1 2009 – July 31 2010

To assess the effect of RAZ on the emergency department, 3 variables were analyzed:

1. **Number of patients who left without being seen (LWBS)**
2. **Length of stay (LOS) for CTAS 2 and 3 patients who were not admitted**
3. **Time from MD assessment to disposition**
Due to the limited availability of data, it is difficult to account for seasonal and population factors.

1. Patients Left Without Being Seen (LWBS)

Preliminary analysis of the data suggested that RAZ had an effect on the number of patients who left without being seen. Assuming similar seasonal patterns, a decrease in LWBS patterns was observed from June 2009 to August 2009, and a slight increase (0.4%) for September when comparing 2008 to 2009. However, the pattern shown in Figure 20 makes it difficult to assess the long-term effects of RAZ.

**Figure 20:** Total number of patients and percentage that left without being seen (LWBS). RAZ was implemented in June 2009.

Figure 20 shows that the percentage and patient count of those who LWBS remained consistent in pattern throughout the data collection period. To visualize the affects of RAZ and account for seasonal changes, Figure 21 and Figure 22 depicts the patient count and percentage on an annual basis. While inconclusive without further data, this suggests that the number of patients who left without being seen (LWBS) decreased since 2008, except in the latter months of the 2009 winter season. However, it should be noted that an H1N1 epidemic-scare occurred around this time, therefore resulting in a higher-than-normal traffic during flu season as the public was encouraged to go to the ED if they were experiencing any flu-like symptoms. A possible affect was that many patients who were experiencing such symptoms...
made the conscious decision to leave the ED as they perceived an improvement in their health in the ED or did not want to be in an environment where H1N1 posed a higher-than-average threat to surrounding people.

Figure 21: Total number of patients that left without being seen (LWBS) by year. RAZ was implemented in June 2009
Figure 22: Percentage of patients that left without being seen (LWBS) by year. RAZ was implemented in June 2009.

The data from Figure 22 is available in Table 14 and indicates that the proportion of patients who left without being seen from all CTAS categories is lower for the first half of 2010 relative to 2008 and 2009. This is worth noting as from February 2008 to July 2008 OTMH treated 25,910 ED patients and in 2009, the same time range, 26,460 were treated. Both periods saw fewer patients than February 2010 to July 2010, where 27,033 patients were treated. Despite the increase in volume, the proportion of patients who left without being seen decreased, potentially an improvement influenced by RAZ.
Table 14: Patients who left without being seen (LWBS) from all CTAS categories.

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<tr>
<th></th>
<th>Treated</th>
<th></th>
<th>LWBS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>% Total</td>
<td>Count</td>
<td>% Total</td>
<td>Count</td>
</tr>
<tr>
<td><strong>2008</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FEB</td>
<td>45,805</td>
<td>3.43%</td>
<td>1,627</td>
<td>3.43%</td>
<td>47,432</td>
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<td>4.31%</td>
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<td>AUG</td>
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<td>3.61%</td>
<td>4,326</td>
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<td>4,199</td>
<td>2.58%</td>
<td>111</td>
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<td>4,310</td>
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<td>2.79%</td>
<td>116</td>
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<td>DEC</td>
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<td>2.54%</td>
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<td>JAN</td>
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<td><strong>2010</strong></td>
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<tr>
<td>JAN</td>
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<td>3.92%</td>
<td>190</td>
<td>3.92%</td>
<td>4,850</td>
</tr>
<tr>
<td>JUL</td>
<td>4,534</td>
<td>3.45%</td>
<td>162</td>
<td>3.45%</td>
<td>4,696</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>127,421</td>
<td>3.36%</td>
<td>4,433</td>
<td>3.36%</td>
<td>131,854</td>
</tr>
</tbody>
</table>

*a* Pilot program run in the ED from April 6th-April 10th  
*b* Permanent RAZ unit implemented in the ED starting June 1st, 2009
The previous notion that the relatively high proportion of LWBS patients were from the winter months of 2009 is supported by Figure 23. Figure 24, expressed in percentage, indicates that CTAS 3 patients were the ones who most frequently left the ED prior to treatment and/or physician consultation and this remained quite consistent throughout the years. A peak is observed during the 2009 flu season. While CTAS 4 & 5 patients are rated those who have minor or uncomplicated conditions and therefore require less time for diagnosis, treatment or observation included in these categories those with conditions who require specialists or tests, such as those who have broken or fractured bones. They are also the smallest group per time period. In contrast, CTAS 3 patients include those who are often experiencing symptoms of viral infections or headaches – issues that may dissipate with time or lead patients to believe it will pass upon growing restless in the waiting room.

Figure 23: Number of patients who left without being seen by CTAS categories. RAZ was implemented in the ED starting June 1st, 2009.
2. Length of Stay (LOS) of CTAS 2 and 3 Non-Admitted Patients

Patients who are classified as CTAS 2 and 3 are most likely to be placed in the Rapid Assessment Zone. In addition, in early 2010 recent changes to the triage procedure and CTAS definitions made it more likely for patients who were previously classified as CTAS 2 patients to be classified as CTAS 3 afterwards. Figure 25 and Figure 26 indicate that the majority of patients who are not admitted to the hospital are of CTAS 3.
Figure 25: Number of patients who were not admitted to the hospital or died in the ED. Data available in Appendix D. RAZ was implemented in the ED starting June 1st, 2009.

Figure 26: Percentage of patients who were not admitted to the hospital or died in the ED. Data available in Appendix D. RAZ was implemented in the ED starting June 1st, 2009.
Table 15 and Table 16 suggest that, on average, the length of stay for the overall ED department patients did not vary by a notable amount. Fluctuations in CTAS 2 and 3 patients LOS mainly occur during the winter season, which aligns with flu season and a general increase in ailments due to the colder weather. Figure 27 indicates that the majority of CTAS 3 patients consistently had shorter LOS than CTAS 2 patients most likely due to seasonal and external environment influences. In addition, the LOS of CTAS 4 and 5 patients appear to be on a slow but steady decline.
### Table 15: Average length of stay (LOS) per month for all patients in minutes

<table>
<thead>
<tr>
<th></th>
<th>LOS - CTAS 2</th>
<th>LOS - CTAS 3</th>
<th>LOS - CTAS 4 &amp; 5</th>
<th>Average</th>
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</thead>
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<tr>
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<td></td>
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<td>JAN</td>
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<td>MAY</td>
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<td>311</td>
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<td>JUN</td>
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<td>159</td>
<td>289</td>
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<td>JUL</td>
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<td>380</td>
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<td>353</td>
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<tr>
<td><strong>Average</strong></td>
<td>453</td>
<td>325</td>
<td>165</td>
<td>310</td>
</tr>
</tbody>
</table>

*Pilot program run in the ED from April 6th-April 10th*

*Permanent RAZ unit implemented in the ED starting June 1st, 2009*
Table 16: Average length of stay (LOS) per month for patients not admitted to the hospital or died in the ER.

<table>
<thead>
<tr>
<th></th>
<th>LOS - CTAS 2</th>
<th>LOS - CTAS 3</th>
<th>LOS - CTAS 4 &amp; 5</th>
<th>Average</th>
</tr>
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<tr>
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</tr>
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<td>DEC</td>
<td>270</td>
<td>213</td>
<td>134</td>
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</tr>
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<td><strong>2010</strong></td>
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<td>266</td>
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<td>JUN</td>
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<td>210</td>
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<td>JUL</td>
<td>294</td>
<td>240</td>
<td>145</td>
<td>219</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>267</td>
<td>221</td>
<td>151</td>
<td>207</td>
</tr>
</tbody>
</table>

*a* Pilot program run in the ED from April 6th-April 10th

*b* Permanent RAZ unit implemented in the ED starting June 1st, 2009
Figure 27 supports the previous observation that the length of stay of CTAS 2 and 3 patients are likely affected by the same external factors due to similar trends. However, the variations between patients who were not admitted to the hospital are far less significant than that of the overall patient population, as shown in Figure 28. In addition, the difference between these two figures suggests that most of the variation for CTAS 4 and 5 patients came from those who were admitted to the hospital as they had to wait for a bed, porter-services, or other post-disposition activities.

Figure 27: Average length of stay (LOS) of patients who were not admitted to the hospital or died in the ED. RAZ was implemented in the ED starting June 1st, 2009.
Figure 28: Average length of stay (LOS) of all CTAS 2 and 3. RAZ was implemented in the ED starting June 1st, 2009.

To assess the effects of RAZ on patients’ length of stay (LOS), monthly averages were compared for CTAS 2, CTAS 3, as well CTAS 4 and 5 patients combined for each year of available data. Observing both Figure 29 and Figure 30 suggests that CTAS 2 patients were not negatively affected by RAZ. Figure 29 shows that the sudden increase in the length of stay of non-admitted patients was experienced for both CTAS 2 and CTAS 3 patients. Figure 29, Figure 30, and Figure 31 do not suggest that RAZ had a significant effect on patients in each individual category. However, from 2008 to 2009 each category observed an increase in length of stay after RAZ was implemented for CTAS 2 patients (Figure 29) and a decrease for CTAS 4 and 5 patients combined (Figure 31). Figure 30 shows an increase in November, however considering the pattern observed in Figure 27 for this month, it is reasonable to discount this increase.
The peak in LOS for CTAS 2 and CTAS 3 patients in November 2009 was due to the H1N1 scare that prompted numerous patients to visit the ED when experiencing any flu-like symptoms (Figure 29 and Figure 30).

Figure 29: Monthly averages for the length of stay for CTAS 2 patients per year. RAZ was implemented in the ED starting June 1st, 2009.
Figure 30: Monthly averages for the length of stay for CTAS 3 patients per year. RAZ was implemented in the ED starting June 1st, 2009.

Figure 31: Monthly averages for the length of stay for CTAS 4 and 5 patients per year. RAZ was implemented in the ED starting June 1st, 2009.
3. Time from MD initial assessment to disposition

The same seasonal trends were observed in Figure 32 as the overall length of stay in Figure 27, including the sudden increase in time in the month of November 2009. However, there was less variation for the average time between MD assessment and disposition for the study period as a whole compared to the overall length of stay.

****Figure 32:**** Average time from MD Assessment to disposition for CTAS 2, CTAS 3, as well as CTAS 4 and 5 patients combined.

Relative to 2008, Figure 29, Figure 30, and Figure 31 indicate that, on average, patients experienced similar times from MD Assessment to disposition in 2009 and 2010. These figures also suggest that CTAS 4 and 5 patients received their disposition in less time after RAZ was implemented. However, the trends and results were very similar for CTAS 2 and 3 patients. This is a contrast to Figure 29, Figure 30, and Figure 31 where variations were observed for the entire length of stay of patients. This suggests that most of the issues that prolong a patient’s length of stay occur between triage and MD assessment, such as orders where results are delayed from the lab.

Lastly, the time between the initial MD assessments to final disposition can be observed for patients by CTAS categories in Figure 33, Figure 34, and Figure 35. Figure 35 suggests that patients of
low acuity (CTAS 4 & 5) were not affected by the aforementioned increase in 2009. This is likely due to the tests required during the height of H1N1 event performed for CTAS 2 and 3 patients, but not necessary for CTAS 4 or 5 patients.

**Figure 33:** Average time from MD Assessment to disposition for CTAS 2 patients per year. RAZ was implemented in the ED starting June 1st, 2009.
Figure 34: Average time from MD Assessment to disposition for CTAS 3 patients per year. RAZ was implemented in the ED starting June 1st, 2009.

Figure 35: Average time from MD Assessment to disposition for CTAS 4 and 5 patients per year. RAZ was implemented in the ED starting June 1st, 2009.
6.2 Positive Patient Identification Device (PPID)

Due to numerous errors in specimen labelling, such as incomplete or incorrect forms on containers, an electronic method for verifying the patient and the corresponding specimen (i.e. blood, spinal fluid) was implemented in April 2009. After the clerk enters the order information into the order-entry system, the data is sent wirelessly through the PPID network to the hand-held PPID devices throughout the department. These devices are able to print the labels and scan the barcodes. Unlike the previous system, the nurse must positively identify the patient and the specimen several times to ensure accurate collection, therefore increasing patient safety, decreasing unnecessary/repeat specimen collections, and reduce labelling errors. The hardware and software interface, Mobilab, is provided by Iatric Systems.

The typical procedure for collecting specimens is:

1. Physician requests order (i.e. Blood work, urine sample, spinal fluid)
2. Physician or Nurse completes appropriate order request form
3. Order is given to clerk, who enters it into the "Order-Entry" database
4. Data is sent wirelessly to the PPIDs around the department
5. Nurse positively identifies patient with barcode on their wristband with the PPID scanner
6. Labels are printed, nurse checks the information
7. Nurse collects and labels specimens
8. Nurse positively identifies specimen by scanning its barcode
9. Nurse/Clerk sends orders to laboratory for testing

6.2.1 Resultant Improvements to Patient Care

In order to monitor improvements to patient care as a result of enhanced specimen collection, order errors were recorded six months prior and post PPID implementation. As there was no formalized
method of collecting such errors, staff members in the lab were asked to document them for the purposes of this study for the Lab Quality Control Office. The data was recorded for both ED and ICU errors, and in both cases significant improvements were observed. The ED experienced a 60% improvement to errors caused by specimen collected from the wrong patient and an 83% improvement to errors caused by specimens not being labelled (Figure 36). The ICU experienced a complete elimination in errors caused by collecting specimen from the wrong patient (Figure 37).

The general impression was that the ED likely did not experience a complete elimination in errors due to the higher-stress environment which leads to additional human error. As the throughput of the ED is higher than that of the ICU, the frequency of using PPID with different patients is higher. In addition, several issues with PPID has led many staff members to find “work-arounds” to the system in an attempt to complete each order more quickly. Such changes to the systematic process can lead to improper patient identification and errors. In contrast, the ICU staff often deal with the same patients on a regular basis, and are more likely to use PPID on a regular routine on the same individuals. Less variation in the process would make errors less likely to occur.

Figure 36: Number of errors incurred 6 months before and after PPID was implemented in April 2009 in the Emergency Department.
While results show that PPID is quite effective at decreasing errors related to collection (i.e. labelling), it should be noted that it will not affect other errors such as incomplete or incorrect draws.

### 6.2.2 Integration and Staff Acceptance

Full results of a satisfaction survey are available in Appendix B. Staff members were asked to participate in an anonymous satisfaction survey concerning PPID. 75% of respondents felt that the new system is not user-friendly, 92% claim that the time to complete an order has increased, and 79% reported that they do not prefer it over the old system, see Figure 38.
In addition, 46% of respondents feel that PPID is an unnecessary burden, 75% believe that there are areas of improvement, and only 29% feel that it is necessary for patient safety. 58% of those surveyed believe that PPID has increased patient safety and 50% think that order errors have decreased. During personal interviews, none of the staff members were aware of the results of the study. To ease integration and subsequent staff acceptance, such results should be made available for staff members. The high level of dissatisfaction amongst workers could be alleviated if they were made aware of the vast improvements to patient safety as a result of PPID.
Figure 39: Staff members believe that order-completion times have significantly increased due to PPID, according to results from a satisfaction survey administered in the ED post-PPID integration.

From personal interviews, most of the frustration and general aversion to PPID are from numerous system faults (Figure 38) which has led to an increase in time required per order (Figure 39). In addition, an aversion to change must be considered as the survey’s results record the feelings and perceptions of staff members – and these may change as staff members adapt to the new technology.

While many stated that they appreciate the concept behind PPID and value patient safety, the simple fact that the time it takes to complete an order and the errors incurred during the process creates an frustrating experience. In addition, several staff members admitted to seeking a “work-around” to PPID steps in order to try to avoid these issues. While efficiency is valued in the ED, technology that encourages staff members to find ways to avoid using it for its purpose clearly has opportunities for improvement.
Firstly, the issues shown in Figure 38 must be addressed. These are technical issues and must be fixed by the vendor. Improved hardware for scanning barcodes and adjustment to the software would greatly improve the efficiency of the process, but as important, the acceptance by staff.

**Figure 40:** Staff members do not prefer PPID over the previous system, according to results from a satisfaction survey administered in the ED post-PPID integration.
Most staff members believe that patient safety has most likely either increased or not changed due to PPID, according to results from a satisfaction survey administered in the ED post-PPID integration.

Staff members seeking work-arounds and results shown in Figure 40 and Figure 41 clearly indicate a level of dissatisfaction throughout the department. While the consensus indicates that most staff members believe that order errors have either not changed or decreased, and patient safety has increased overall their frustrations with the technology itself decreases their satisfaction. Thus, while patient safety is the primary concern in the ED, this indicates a need for greater emphasis on usability and technological improvements in the ED for an efficient and satisfactory work environment.

6.3 Telecommunications Upgrade

In January 2010, the integration of a VOIP system began in the ED. This was one of the initial suggestions that were discussed at the beginning stages of this research. Employee interviews indicated that the idea of the application of a VOIP system has been discussed prior to the involvement of the University of Toronto, however it was not implemented until relatively recently. This initiative was spearheaded by one of the emergency physicians of OTMH, who requested funds from the Local Health Integration Network (LHIN). Along with the IT department at the hospital, members of Decision Support,
and the Program Coordinator of the ED, they developed an implementation strategy for this communication system in the ED that involves wireless signals through routers. Telephone calls are directed towards the nursing and clerk stations, and the attendants streamline the phone calls directly to handsets that accompany specific physicians.

### 7.0 Recommendations & Future Work

#### 7.1 Paging Systems

One method of communicating with the patients is creating a sense of awareness in the ED. Physicians are equipped with personal pagers to ease direct communications. Similarly, patients can be connected to this system upon arrival at the Emergency Department. For instance, many popular restaurants use pagers to communicate with patrons as to when their table is ready. Therefore, clients are not required to remain within a single designated waiting area for their wait and may find a more enjoyable and relaxing area/activity in the meantime. Similarly, patients with low acuity who are still able to move around and eat may go elsewhere in the hospital such as the cafeteria or wait outside if they had a pager. The use of personal cellular devices can be integrated into the system, or the provision of personal pagers for those who do not wish to associate their cell phone with the system or do not own one can be implemented.

There are numerous signs throughout the hospital discouraging patients from using their personal cell phones due to interference with the medical equipment. However, limiting the use of these devices to just those waiting should not interfere with critical care equipment, particularly since they would not be used in the acute care area. The focus of the use of these devices would be for those in the waiting areas or further away from the ED.

Equipping patients with personal pagers throughout their wait would improve the environment within the waiting room. These wireless devices can be set up to work within the limits of the hospital or a certain region surrounding the building depending on the acuity of the patient. For instance, if a patient
is classified as CTAS level 4 and 5, and is expected to wait 6-8 hours s/he may be provided with a pager
and given the freedom to return home or wait in other areas of the hospital such as the cafeteria, gift shop,
or right outside the building. This would reduce congestion within the waiting room, alleviate stress
amongst both staff and other patients from a crowded room, and provides a heightened sense of privacy
for the patient’s well-being. Less traffic within the waiting room would reduce noise and allow the triage
nurse to view patients of higher acuity levels with greater ease, thus improving patient safety. In addition,
a relief in stress from patients may increase co-operation and satisfaction, thus improving the likelihood
of efficient patient communication and shorter ED visits. Lastly, encouraging patients to leave the waiting
room may also have the side benefit of increasing revenue from the cafeteria and gift shop of the hospital.

The distribution of the pagers would be at the discretion of the triage and Charge Nurse. In
addition, if the pagers were only meant to work within the hospital, wireless terminals for a network could
be set up throughout the hospital boundaries. Thus, patients would be asked to stay within the hospital
and they would be alerted once they were relatively close to the top of the queue. In order to maintain a
sense of efficiency, patients would most likely be asked to return selectively in advance of their expected
treatment time. Even if they are expected to wait for an hour, considering that many patients of relatively
low acuity often wait in the waiting room for upwards of 5 hours, this can relieve a considerable amount
of stress on both the patient and the staff.

Alternatively, external pagers can be provided and some patients can be given the option of going
home if the wait is expected to be extremely long. This will also encourage patients to perhaps leave the
ED and visit their general practitioner during business hours, thus alleviating pressure from the system.
While the hospital may gain substantial value from this investment, the patient’s own time saved should
also be considered. The cost/benefit received by the patient for the option of a comfortable environment
while waiting would greatly improve their experience with OTMH.
A deposit system could be implemented in order to ensure that the hardware is returned upon the patient’s admittance to the ED. While the triage nurse can track pagers using the chart, the likelihood of patients returning hardware increases if a potential monetary loss is involved. Also, an alert system can be applied to recall the device if it leaves designated boundaries or is not returned after the patient is recorded to have left the ED. This would minimize hardware replacement costs and avoid staff complaints when integrating the new system.

Even if they are asked to wait a few moments upon being paged, patients who are expected to wait many hours would benefit from the option of leaving waiting room for at least a portion of this time. Upon receiving the pager or obtaining their cellular phone information, it should be requested that they stay within 30 minutes travel time to ensure that they are able to return to the ED in reasonable time. If they are not in the waiting room when they are called, they will simply be moved back in the queue. While this may elongate their overall waiting time, the added benefit of their freedom during the period outweighs the disadvantages.

There are several vendors that specialize in paging systems, most, if not all, can all be adapted to suit the hospital. In addition, there are a few who work specifically with hospitals (i.e. HME Healthcare) that offer several different types of pagers. Additional features include text messaging capabilities, which would allow hospitals to communicate delays or general status reports of the ED to patients.

### 7.2 Social Networking Tools

Popular social networking tools such as Twitter could be implemented in order to communicate with the public. This can include updates regarding the overall state of the department that may affect people’s decision to use OTMH and the general status of patients using unique identification numbers. Currently, when observing the distribution of patients, a higher proportion is within their late 40s and early 50s. It is reasonable to assume that many of these patients do not make regular use of such social
networking tools. However, as the population ages such integration can prove to be quite practical and worth exploring.

In the case of Twitter, short messages, “Tweets”, can be published online at a maximum of 140 characters. Messages can be published on the account’s homepage for the public or subscribers can “follow” accounts and have messages appear on their individual feeds.

For instance, when a patient checks into the ED, a family/friend can be asked to provide their Twitter account information. Updates to patients’ status can be automatically published on Twitter (i.e. “Patient # has been admitted”, “Patient # has been discharged”, “Patient # has registered”). When the patient’s unique identification number is linked to a Twitter account, these updates can be directed towards that Twitter account. Thus, when specific updates pertaining to that individual are published, they will receive a direct notification. In addition, updates regarding the overall state of the department can be published (i.e. “ED traffic much higher than normal – longer than average wait times to be expected”) and users can easily filter these using “hashtags”. Hashtags are used to quickly categorize messages in order to facilitate searching for specific Tweets. For instance, hashtag “#EDWaitTimes” can be attached to periodic updates concerning projected wait times. This way, users can quickly find the most recent message by simply looking at this category.

Upon updates, the ED can send a message via Twitter specific to the patient and direct it towards the family member/friend. This way, the state of their companion can be communicated if they are unable to remain in the ED with them or they wish to share this tool with other friends/family. The integration of a Twitter application to send notifications would be useful as updates can be received via SMS, Smartphone applications, or e-mail. This, along with the paging/cellular phone system described in Section 7.1 would provide patients with a better understanding of the overall state of the department, and would most likely aid in patient satisfaction. While notifications revealing that the department is under a
great deal of pressure and wait times are longer than normal would be displeasing, simply communicating
this information to patients would be nonetheless beneficial.

7.3 Orders and Testing upon Triage

As mentioned in Section 5.7 Orders and Testing. When the ED is experiencing a high patient
volume, the triage nurse may direct them to proceed to this stage immediately. According to staff
interviews, while it is not ideal for patient privacy, in order to save time there has been instances of blood
being drawn in the waiting room or patients being sent directly to diagnostic imaging immediately after
triage. As opposed to this being an occasional decision upon patient arrival, this can be made a rule in
order to increase efficiency of the process. In all cases, patients may be sent for tests if there is an obvious
need in the opinion of the Triage or Charge Nurse.

7.4 Unique Identification Numbers for Consults

As mentioned in Section 6.3, a VOIP system has been integrated in the ED in order to facilitate
consultant-physician communication. An additional feature that may streamline this process would be the
assignment of unique serial numbers through the hospital switchboard when requests are made. These
numbers would be associated with the patient chart, and help identify cases for which consultants are
returning phone calls. This would address the instances where consultants have returned calls and the
clerk was unaware of the physician/case for which the call was made.

This serial number may also be associated with the telephone that the physician is carrying, which
can be used by the switchboard/consultant to call the physician directly as opposed to sending a request
through the clerk.

7.5 Wait Time Communication within ED

In order to improve communication between the waiting room and the department, a computer
terminal may be made available for patients for updates concerning the general ED and individuals. Even
with the implementation of paging systems (Section 7.1) and social networking tools (Section 7.2), patients may wish to remain in the ED waiting room or unable to leave due to their medical state. A simple touch-screen system can be integrated so patients can enter their unique identification number to obtain a projected wait time and various updates. General updates regarding the ED can also be made available via this terminal.

### 7.6 Patient Tracking

Currently, the tracking board in the main area of the Department serves as the main tool to communicate patients’ whereabouts within the ED. Every area of the ED has a designated code, as described in Table 12 of Section 5.12 with the exception of patients located in the Rapid Assessment Zone (RAZ). While recorded in the computer system (under Observation Unit as the labels have not been modified since the implementation of RAZ), when staff members are seeking a patient in the ED who is in RAZ, they often deduce this by asking the Charge/Triage Nurse or checking the patient roster after noting the absence on the board. Many staff members expressed the view that this tracking board is integral to the efficient communication of the department’s state to all staff members. A number also showed concern that the new hospital would not implement this type of board, as the distributor of this system no longer existed.

The application of a large, easy-to-read, colour-coded system for the department can be retained; however there are several potential enhancements to the system that can be applied. For instance, instead of one large board built into the wall of the ED, this information can be communicated with several large-screen wall-mounted LCD displays throughout the department. This was observed at several hospitals, including Toronto General Hospital (TGH) as well as a West Palm Beach Hospital in Florida (Figure 42).
The board shown above in Figure 42 is quite similar to OTMH’s current system with respect to the information being communicated. The OTMH tracking board also has a quick synopsis of the patient’s ailment(s), however if desired this can be easily programmed into the software. Staff members also expressed that they liked how the current OTMH tracking board is built into the wall as it provides a space adjacent to each screen for charts and other paperwork, however the space that would be saved with the LCD screens would provide sufficient room for chart storage and access. While staff members also communicated that they appreciate the large, colour-coded buttons of the system to quickly timestamp order requests, MD assessments, and discharge, these can completed using keyboard shortcuts from individual computer terminals throughout the department. Thus, staff members would not be required to keep returning to the main area to check the status of the department or enter these changes.
One or more larger LCD screen can still be implemented in the main area of the department with touch screen technology to mimic the current system and have copies of this in desirable locations. A larger screen in the centre of the department would be useful as more staff members are likely to cluster in that area and discuss the overall state. In addition, the touch screen would eliminate the need for a computer/keyboard in front of this screen, which would be ideal for a high traffic area to reduce clutter.

### 7.7 e-Triage

There are several applications to e-Triage that would improve the work environment, patient safety, and patient-staff communication. While there are various systems and interfaces available for e-Triage, one of the key features that many staff members expressed interest in are the additional visual aids. Due to the changing demographics, the newly-landed Canadian population are visiting the ED more frequently than before. However, problems arise when language and cultural barriers may compromise the safety of the patient particularly when there are few means of translating their language for the staff. Demos seen at healthcare shows showcased systems that employed interactive images that the staff can use alongside such patients to pin point areas of the body and describe symptoms.

Other systems include kiosks where patients can be asked to triage themselves. While these would greatly alleviate the work for the triage nurse, many staff members adamantly expressed dislike of this system due to the patient risk. Poor communication of symptoms may lead to incorrect assignment of CTAS scores, prolonged treatment times, or erroneous specimen collection. Therefore, it is ideal to choose a system that both the nursing staff and patients can use together. Studies have shown that e-Triage helps improve the consistency of triage score assignments, which would help nurses make objective and equitable decisions when assigning CTAS scores and determining the queue.

### 7.8 Electronic Medical Records

Over the past decade, there was been a progression towards eliminating paper in favour of electronic medical records systems. Software developments in order to replace the traditional “paper-and-
pen” documentation system with electronic medical records are highly favoured by the new generation of healthcare workers. Patient errors due to legibility and slow medical record access could be decreased with such applications, as well as enhanced patient data collection (i.e. improved wait time collection and other management reporting trends). In addition, several processes could be improved including patient admission. For instance, currently ED staff members are required to physically transfer patient charts to the admitting office which is not located within the main ED area. The efficiency of this process would greatly improve if such records and requests could be transferred electronically and automatically.

There are concerns regarding electronic medical records that pose barriers to full integration throughout the Canadian healthcare system. Criticisms regarding confidentiality issues and subsequent patient safety have arisen as part of the resistance against electronic medical records. In addition, many staff members within the OTMH ED claim that they have worked with wards that utilize electronic medical records, and they believe that it would impede the efficiency within the ED. The shared belief amongst those who do not support electronic medical records within the ED is that it would simply require additional time for the physician, clerk, or nurse to enter information into their system using an electronic device and be difficult to adequately record symptoms. For instance, on the current chart there is a diagram of the human body which staff members often use to communicate patient symptoms. While technology is certainly capable of integrating software that will have this functionality in an electronic medical record, there is great scepticism that it will be well-designed and user-friendly. Unfortunately, numerous staff members experienced applications of technology throughout the ED that they feel either impeded their workflow or poorly designed, which subsequently led to hesitation to additional changes within the ED. In addition, many staff members have been employed within healthcare and/or the ED for a long time and may find the idea of additional training and changes to their routine undesirable.

### 7.9 Bar-code Identification System

Currently, “charge cards” are used for each individual patient, which contains unique identification numbers. Ideally, such cards are to be destroyed after each use as they are disposed of in a
bin in the department. However, this is not always the case as many patients who frequent OTMH often prefer to keep their card on hand for future visits or destroy them on their own for confidentiality purposes. The use of a large receptacle for these cards poses a security risk, as it is possible for others to gain access to these cards and subsequently personal information concerning each patient.

The application of bar-coding technology would create a greater sense of continuity, patient safety, and efficient record-keeping. Electronic Medical Records (EMRs) have become of great interest to the health services industry, and there is great potential for growth, application, and experimentation in this area. The integration of these two systems together would be ideal and instead of charge cards, magnetic cards and/or bar-coded bracelets may be applied. A complex barcode, such as the one shown in Figure 43, as well as photo-identification can be applied to each card and upon arrival; the triage and registration staff may use this to generate individual ID bracelets. The barcode system can be integrated with the PPID system for orders, assigning patients to rooms and verifying their placement, and associating them with charts as well as physicians.

Figure 43: Example of a complex barcode that can be used to individually identify patients.

7.10 Electronic Admitting Requests

Several hospitals employ electronic requests to staff members for various requests including janitorial staff, porters, and volunteers. For instance, St. Michael’s Hospital in downtown Toronto has an
automated process for accessing porters when they are required. Such a system would be useful at OTMH; as such services are usually requested through the clerk who must subsequently contact the correct department by telephone.

Staff members could be able to request janitorial or porter services via the computer system. Therefore, it will be eventually received by the janitorial staff regardless of their activities at the moment of the request, and the system could also include options that allow staff to indicate when they were complete and/or a room is available for another incoming patient. A similar application would be highly useful for the ED with respect to requesting admission to the hospital. As this would result in a “first-in-first-out” style of queue, fairness would be assured.

7.11 Potential Improvements to Scheduling

In order to remove redundancies, enhance management reporting, and streamline internal processes, several improvements to the current system may be made. Any changes to the system must not compromise the self-scheduling nature of the system. In addition, it should be user-friendly and cost-efficient for financial viability and user acceptance. A solution should ideally have the following characteristics:

1. **Electronic Recordkeeping**

   To facilitate recordkeeping and transfer of information, the scheduling system should be done electronically. This would be beneficial for several reasons. As several changes to the schedule occur on a regular basis, the electronic record initially created by the facilitator does not accurately represent the shift as it occurs. Currently, changes to the schedule spreadsheet must be electronically reconciled after the schedule of shifts is over and require additional input by the facilitator.

   An electronic database would facilitate and reduce errors for payroll and future scheduling purposes, as employees will also confirm their attendance in a shift via this application. Employee-related metrics could quickly and efficiently be populated and subsequently analyzed with the most current and
accurate data available. Lastly, by consolidating all of the current scheduling records to a single online database the integrity of the data would be improved, eliminate multiple and redundant interfaces, and simplify analytical and reporting processes.

2. Dynamic Interface

The application of a dynamic Interface would maintain the sense of empowerment for the staff through a self-scheduling system, and provide an up-to-date presentation of the schedule. The application of a web portal, similar to www.docportal.com, would allow staff members to access their schedule from any location with an Internet connection. In addition, several capabilities could be added to this system such as uploading contact information, shift changes, vacation and other requests as well as integration with personal scheduling software (i.e. smart phones, online calendars, etc.). This would be particularly helpful to staff, as they would have the benefit of accessing their schedule and send requests from home. Throughout the study period, many instances of staff members telephoning the ED in order to verify shift schedules was observed and this can be eliminated with the Internet-based scheduling system.

3. SMS or E-mail Notifications & Shift Requests

As the presence of smart phones and the general public’s familiarity with technology advances, more individuals have become reliant and accustomed to receiving information through e-mail and SMS. When a staff member calls in sick/unavailable, a request to an appropriate employee via SMS and e-mail would facilitate shift fulfilment. If this was integrated with a Web 2.0 interface, an employee may respond via the web or SMS. When a shift is filled, another email/SMS may be generated to notify staff in order to prevent phone calls to the clerk afterwards. General announcements to all staff can also be communicated via SMS and e-mail.

4. Barriers to Scheduling Shifts that Violate Halton Healthcare Service Scheduling Guidelines

Programming rules can be set in order to monitor shift scheduling and changes. In order to ensure that all employees are adhering to the HHS Scheduling Guidelines, managers and scheduling facilitators are expected to review schedules and prohibit such behaviour. However, realistically, this is a very time
consuming task and it is possible the units are not aware of repeat, purposeful offenders. Ideally, approval for schedules that violate the guidelines would require approval from senior management.

In summary, the following benefits can be realized from an upgraded scheduling system:

- **Access to personal data:** Employees may be able to view personal information including pay stubs, previous, current, and future work schedules as well as vacation banks.

- **Accountability:** All shift changes and other requests can be tracked with respect to time and employee identifiers.

- **Decreased Agency Use:** Automated electronic messages (SMS, e-mail) would allow the ED to search for replacement staff much more efficiently. Subsequent responses could be recorded.

- **Data Integrity:** Changes are immediately recorded, decreasing the number of interfaces and eliminating multiple records.

- **Employee records:** Vacation/Leave requests as well as shift change requests can be made online. An employee may also propose changes, which can be subsequently approved by colleagues and/or senior staff.

- **Increased Awareness:** All employees can have access to the schedule on and offsite.

The most cost-efficient solution would fully involve the IT staff of the hospital. However, realistically this is likely not logistically possible due to time, workload and cost restraints. Therefore, a vendor would most likely be chosen and collaboration between their staff, senior managers in the ER, as well as the OTMH IT department would be necessary.

**7.11.1 Developing and Gathering Success Metrics**

In order to measure the success of the anticipated improvements, quantitative and qualitative metrics must be developed. Measureable metrics would provide clear and concise evidence of financial and time-related gains. In addition, satisfaction surveys would offer an overview of the perceived benefits and overall acceptance of changes within the system.
7.11.1.1 Violations of Halton Healthcare Service Scheduling Guidelines

A complaint often communicated by staff as well as managers involve certain employees abusing the self-scheduling system to accommodate their preferred work regime. There are strict guidelines provided by Halton Healthcare Services (HHS) that limit the number of certain shifts and hours that an employee may work for each period. In addition, employees who exchange shifts with Part-Time Employees (PTEs) and Casuals may cause future disruptions in schedules as they may be unavailable when a shift needs to be re-staffed. Such offences should be recorded. The new system should have programmed rules against such scheduling practices. This measure would indicate an increase in an equitable and complying work environment. The following is a list of possible metrics that can be used to evaluate efficiency and pin-point violators. General metrics should be created for simplicity, ease of data capture and subsequent analysis, as well as quick communication. Thus, when possible, the complexity of the metrics should be reduced by combining certain categories. Upon further discussion and deeper inspection of the guidelines, additional metrics will most likely be added.

1. **Numbers of staff on each shift for each day of the week**

   Each unit has a specific maximum budgeted number of Charge Nurses, RNs, and RPNs for each day of the week. The frequency of shifts that do not fulfill the minimum requirements should be recorded, and compared after implementing the new scheduling system.

2. **Number of 12 and 8 hour rotations per day for each category of staff**

   The number of tours required varies from days, nights, or 8 hour tours and these vary from day to day for each category of staff. The balance between the two should be observed and correlated to the occurrence of excessive overtime as well as the appropriate balance of the mixture of staff members during a shift.

3. **Staff commitments per scheduling cycle (4 weeks)**

   Every type of staff is required to fulfill a minimum number of shifts in the following categories: Weekend, Day (11.25 hour and 7.5 hour from 8AM), Evening (7.5 hour from 4PM), and Night (11.25
hours from 8PM or 12AM). There are further rules and factors that must be considered, including Job Share partners, statutory holidays, and the various types of Regular Part-Time (RPT) staff.

4. Percentage of day shift to non-day shift work

FTEs require 30% of their shifts to be during the day, while RPT employees require 50% or “as needed” by the department. As it is difficult to measure “as needed”, simply recording the average percentage would be preferable for part time staff, and assessing the correlation between changes in FTE and RPT schedules.

5. Number of senior staff on any shift

There must be a minimum of 3 full-time staff (including the Nurse in Charge) on a day shift. At night, there must be at least 2 full time staff with at least one full time with sufficient experience to take the role of Nurse in Charge. Certain units have a maximum number per shift, and this should be considered on a unit-to-unit basis. This can be used to assess if the distribution of senior staff has improved due to scheduling changes. If there is a marked improvement in the ratio of days with an appropriate number of senior staff to the days without, then this indicates a positive change in scheduling.

7.1.1.2 Facility of Re-Staffing Shifts

When a replacement is unexpectedly needed for an unavailable employee (i.e. illness, personal issues) the current protocol requires clerks to systematically call employees that may be available. While employees have the option of indicating ahead of time if they would be available for additional shifts on certain days, several do not exercise this option. Therefore, in an attempt to avoid using agency nurses the clerk is expected to contact all possible staff within a reasonable time frame. The frequency of these instances should be recorded in order to assess the time saved upon improvements to the scheduling system.

In order to facilitate data collection, the current staff roster can be used as follows:
**Figure 44:** Example of the data collection method for capturing the frequency of calls. This represents the manual work performed by clerks when re-staffing is necessary.

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact</th>
<th>Called (✓)</th>
<th>Scheduled (✓)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOE, Jane</td>
<td>905-555-5555</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>SMITH, John</td>
<td>905-555-5556</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STOVE, Val</td>
<td>905-555-5557</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date: ___/____/___
Shift: ___/____/___ (DD/MM/YY)  _____:_____ to _____:_____ 
Position:  (i.e. RPNN, RPNn, RPNe, RNd)
Reason for Absence (Circle one):  Illness  Scheduling Error  Other:  

Agency Used (If Applicable): ____________________________
Therefore, the frequency of calls per attempt to re-staff a shift may be recorded while providing a useful information sheet to facilitate calling. In addition, there have been instances where staff members have been contacted multiple times for the same shift. Often, this occurs when there is more than one person attempting to fulfill the shift and the phone calls were not being recorded.

7.11.1.3 Frequency Shift Changes and Absenteeism

The number of shift swaps and absenteeism should be measured in order to assess the effect of the new scheduling system on employees’ inclination to project their work-life balance requirements. As the employees will be able to schedule their shifts at home with the new system, they may have more resources (i.e. personal calendars, family reminders) to appropriately assess their preferred work schedule. Alternatively, if the employee is able to submit shift change, leave, and vacation requests online they may be more predisposed to changing their schedule due to the increased access.

7.11.1.4 Occurrence of Pre-scheduled Relief Staff

The facilitator is contacted when there are an unusual number of uncovered shifts (i.e. long-term illness). However, if there is a decrease in the need of pre-scheduled relief staff this may indicate an improvement of shift planning and coping with absenteeism.

7.11.2 Unit-Specific Scheduling Costs

Each unit has a specific budget for FTEs. If there is a decrease in overtime paid for FTEs while other staff categories (i.e. RPT, Casuals) remain within reasonable limits then this is a positive indicator of scheduling improvements.

7.11.2.1 Satisfaction Surveys

Satisfaction surveys provide valuable qualitative metrics from employees. Questions may relate to changes in performance, culture, job satisfaction, and ease of software use. There are several potential metrics that may be captured at various times. In order to encourage maximum feedback, only one survey should be administered with various incentives. Therefore, this survey should be performed after
sufficient time has passed for staff to become accustomed to the new software and scheduling procedures. This survey can be administered after two shift cycles (8 weeks) after implementations, or one cycle (4 weeks) at minimum if results are desired as soon as possible. This will provide staff an opportunity to submit requests, familiarize themselves with the user-interface and generate some feedback for potential improvements. In addition, this will allow senior management to alter the process, if necessary.

7.11.3 New Software Implementation

Participation in the implementation of the new scheduling software will provide HHS and OTMH several benefits. Firstly, an analysis of the statistical significance of any changes in the metrics will be performed by an experienced individual, which can be subsequently used for reports, case studies, and evidence of progressive improvements at OTMH. In addition, the integrity of the results will be sufficiently robust that they may be formally submitted for funding requests for future IT integration initiatives at both the current and new OTMH. The efficient use of funds with both positive qualitative and quantitative results will help establish OTMH as progressive members of the healthcare industry.

7.12 Improvements at OTMH

7.12.1 Summary of Solutions and Recommendations

Numerous solutions were implemented during the study period, with varying degrees of influence from CMTE. A summary of the issues and solutions discussed in this section are outlined in Table 17:

<table>
<thead>
<tr>
<th>Issue(s)</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Patient wait times                    | **Rapid Assessment Zone**
|                                       | Streamline CTAS 3 patients into a dedicated area in the department serviced by a specific physician and nurse. |
| Order errors in specimen labelling    | **Positive Patient Identification Device**
|                                       | Electronic method for verifying patients and corresponding specimens |
| Issues connecting specialists to requesting physicians | **Upgraded telecommunication systems**
|                                       | Each physician and the head nurse is provided with a |
Wireless handset, and can be reached in any part of the department by consultants, clerks, and other staff members.

Table 18: List of issues and recommendations for future work at OTMH

<table>
<thead>
<tr>
<th>Issue(s)</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient wait times &amp; satisfaction</td>
<td><strong>Paging system</strong>&lt;br&gt;Equip patients with the means of being notified via pagers or cellular devices when it is their turn in the queue&lt;br&gt;&lt;br&gt;<strong>Social Networking Tools</strong>&lt;br&gt;Popular social networking tools can use unique patient identification numbers to send notifications to family members and patients&lt;br&gt;&lt;br&gt;<strong>Orders and testing upon triage</strong>&lt;br&gt;Based on triage nurse’s discretion, direct patients to orders/testing prior to initial MD and nurse assessments, and have them return to the waiting room.</td>
</tr>
<tr>
<td>Issues connecting specialists to requesting physicians</td>
<td><strong>Enhanced VOIP System</strong>&lt;br&gt;In order to track the time required for consultants to reach requesting physician and ensure that the correct physician is notified, a unique numbers may be assigned with patient charts.</td>
</tr>
<tr>
<td>Issues connecting specialists to requesting physicians</td>
<td><strong>Upgraded telecommunication systems</strong>&lt;br&gt;Each physician and the head nurse is provided with a wireless handset, and can be reached in any part of the department by consultants, clerks, and other staff members.</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td><strong>Computer terminals</strong>&lt;br&gt;Patients may have a terminal available that provides information concerning their wait times and the situation in the ED.</td>
</tr>
<tr>
<td>Patient tracking</td>
<td><strong>Numerous Tracking Boards</strong>&lt;br&gt;Large, colour-coded LCD screens may be placed throughout the ED in order to provide all staff members with the idea of the state of the department.</td>
</tr>
<tr>
<td>Patient satisfaction and communication</td>
<td><strong>e-Triage</strong>&lt;br&gt;A computer tool that helps standardize the triage process amongst nurses. In addition, multilingual options are also available and have shown to be quite beneficial for those who do not speak the native language.</td>
</tr>
<tr>
<td>Patient tracking</td>
<td><strong>Electronic Medical Records</strong>&lt;br&gt;As opposed to physical charts per patients, laptops may be provided to physicians where they are able and archive all of the information in an electronic database.</td>
</tr>
<tr>
<td></td>
<td><strong>Barcode Identification System</strong>&lt;br&gt;Barcoded wristbands may be used for tracking patients, instead of just for PPID. These codes can be scanned upon the patient’s arrival at each different point along the process. This will encourage more data gathering, as it will be more convenient</td>
</tr>
</tbody>
</table>
### Electronic Admitting Requests
Currently, requests are handled on a per-person basis and handed to the admissions office by hand. Electronic requests will be completed through the network and the admissions office can likewise reply with confirmations.

<table>
<thead>
<tr>
<th>Scheduling equity and inconvenient scheduling style</th>
<th>Electronic Scheduling (Application began late 2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Staff are able to schedule their shifts online with an interface that has built-in scheduling rules.</td>
</tr>
</tbody>
</table>

### 7.12.2 Final Words
In addition, OTMH’s agreement to the participation of a MASc student from the University of Toronto confirms the value it places on education and developing young leaders in healthcare from various backgrounds. From an educational standpoint, I, as a MASc student, have gained valuable insight into the effects of technology in a publicly funded and very dynamic system with a high level of human factors. This, in combination with other technology-related improvements, will provide strong evidence that engineering and technical applications provide a valuable perspective in the health care industry that is largely absent at the present time.
8.0 References


9.0 Bibliography


[CIHI09W3] CIHI: Canadian Institute of Health Information. [Online]. CIHI. <http://www.cihi.ca/>


# 10.0 Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Acute Care</td>
</tr>
<tr>
<td>Acuity</td>
<td>Degree of perceived severity of subject’s condition</td>
</tr>
<tr>
<td>ALC</td>
<td>Alternative Level of Care</td>
</tr>
<tr>
<td>CCAC</td>
<td>Community Care Access Centre</td>
</tr>
<tr>
<td>CRN</td>
<td>Critical Resource Nurse</td>
</tr>
<tr>
<td>CTAS</td>
<td>Canadian Triage and Acuity Scale</td>
</tr>
<tr>
<td>CUPE</td>
<td>Canadian Union of Public Employees</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>EFT</td>
<td>Equivalent Full-time Employees</td>
</tr>
<tr>
<td>FT</td>
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<tr>
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<td>Licensed Practical Nurses</td>
</tr>
<tr>
<td>LTC</td>
<td>Long Term Care</td>
</tr>
<tr>
<td>LWBS</td>
<td>Left Without Being Seen</td>
</tr>
<tr>
<td>OBS</td>
<td>Observation Unit</td>
</tr>
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<td>OR</td>
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</tr>
<tr>
<td>OTMH</td>
<td>Oakville Trafalgar Memorial Hospital</td>
</tr>
<tr>
<td>PALs</td>
<td>Patient Assistant Liaisons</td>
</tr>
<tr>
<td>PPID</td>
<td>Positive Patient Identification</td>
</tr>
<tr>
<td>PTEs</td>
<td>Part Time Employees</td>
</tr>
<tr>
<td>RAZ</td>
<td>Rapid Assessment Zone</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Nurse</td>
</tr>
<tr>
<td>RPN</td>
<td>Registered Practical Nurses</td>
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<tr>
<td>RPT</td>
<td>Registered Part Time</td>
</tr>
<tr>
<td>Walking-Wounded</td>
<td>Patients who enter the ED on their own, often do not require constant monitoring</td>
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</table>
Appendix A: Rapid Assessment Zone (RAZ) Satisfaction Survey Results

Employees were given surveys in order to assess their perception of RAZ.

**Anonymous RAZ (Rapid Assessment Zone) Satisfaction Survey**

1. **I am a:**
   - Clerk
   - Nurse
   - Physician
   - Other: _____________

2. **I work in RAZ…(% shifts)**
   - Very Often
   - Often
   - Half/Half
   - Sometimes
   - Rarely
   - Never
   - 95%+
   - ~75%
   - ~50%
   - ~25%
   - < 10%
   - 0%

3. **How RAZ affected your workload?**
   Please circle one:
   - 1  2  3  4  5  6  7
   - Significant Decrease
   - No Change
     
4. **Since RAZ, I have been…(check all that apply)**
   - Seeing more patients per shift
   - Physically moving more around ER
   - Better able to focus on my patients
   - Unaffected

5. **RAZ has helped smooth workflow as it streamlines patients.**
   Please circle one:
   - 1  2  3  4  5  6  7
   - Completely Disagree
   - Neutral
   - Completely Agree

6. **How has RAZ affected the overall atmosphere of the Emergency Department?**
   Please circle one:
   - 1  2  3  4  5  6  7
   - Much Quieter
   - No Change
   - Much Busier

5. **Overall, due to RAZ, global patient safety has:**
   Please circle one:
   - 1  2  3  4  5  6  7
   - Significantly Decreased
   - No Change
   - Significantly Increased

6. **Overall, due to RAZ, it appears that patients’ length of stay have:**

Please circle one:

1 2 3 4 5 6 7

Significantly Decreased No Change Significantly Increased

7. Overall, due to RAZ, it appears that the quality of care has:

Please circle one:

1 2 3 4 5 6 7

Significantly Decreased No Change Significantly Increased

8. RAZ… (Please check all that apply)

☐ is essential for the ED ☐ is unnecessary
☐ can be improved ☐ is a burden

9. Overall, creating RAZ was an improvement to the ER.

Please circle one:

1 2 3 4 5 6 7

Completely Disagree Neutral Completely Agree

10. Overall, I am happy with the implementation of RAZ.

Please circle one:

1 2 3 4 5 6 7

Completely Disagree Neutral Completely Agree

Thank you! Your feedback is valuable and appreciated 😊

How can RAZ and/or patient allocation be improved?

Additional Comments:
Participants

I work in RAZ...(% shifts)

How has RAZ affected your workload?

Since RAZ, I have been:

RAZ has helped smooth workflow as it streamlines patients.

How has RAZ affected the overall atmosphere of the Emergency Department?
Appendix B: Positive Patient Identification Device (PPID) Satisfaction Survey Results

Employees were given surveys in order to assess their perception of PPID.

Anonymous PPID Satisfaction Survey

7. I am a:  □ Clerk  □ Nurse  □ Physician  □ Other: _____________

8. PPID is user-friendly.
   Please circle one:
   
   1  2  3  4  5  6  7
   
   Completely Disagree  Neutral  Completely Agree

9. Due to PPID, patient safety has probably:
   Please circle one:
   
   1  2  3  4  5  6  7
   
   Significantly Decreased  No Change  Significantly Increased

10. Due to PPID, the time to complete an order has:
    Please circle one:
    
    1  2  3  4  5  6  7
    
    Significantly Decreased  No Change  Significantly Increased

11. Due to PPID, order errors have probably:
    Please circle one:
    
    1  2  3  4  5  6  7
    
    Significantly Decreased  No Change  Significantly Increased

12. PPID malfunctions/"glitches" occur:
    □ Very Often  □ Often  □ Sometimes  □ Rarely  □ Never
13. The most common problems with PPID are:
   - Difficulty scanning barcodes
   - Disconnects from network
   - Does not print labels
   - Printing errors
   - Freezes
   Other: ____________________

14. PPID… (Please check all that apply)
   - is necessary for patient safety
   - has not affected my workload/workflow
   - is an unnecessary burden
   - can be improved
   - is an improvement over previous system

15. Overall, I prefer PPID over the previous system.
    Please circle one:
    
    1  2  3  4  5  6  7
    Completely
    Disagree  Neutral  Completely
    Agree

Thank you! Your feedback is valued and appreciated ☺☺
Comments about PPID & potential improvements:
Appendix C: Scheduling

Anonymous Scheduling Survey

I am a... (Please check all that apply)

☐ Clinical Resource Nurse  ☐ Registered Nurse  ☐ Registered Practical Nurse
☐ Scheduling Facilitator  ☐ Unit Clerk  ☐ Other: _________

16. I have been employed at OTMH for:

☐ < 1 year  ☐ 1-3 years  ☐ 3-5 years  ☐ 5+ years

17. My current schedule is developed using: (Please circle one)

☐ A master rotation  ☐ Self-scheduling

18. On average, I spend _____ choosing my shifts for my schedule per cycle (Please check one).

☐ < 30 minutes  ☐ 30-60 minutes  ☐ 1-2 hours  ☐ 2+ hours
☐ I don’t choose

19. The time I spend choosing my shifts per cycle is reasonable:

<table>
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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>Completely Disagree</td>
<td>Neutral</td>
<td></td>
<td></td>
<td>Completely Agree</td>
</tr>
</tbody>
</table>

20. Please list the benefits of your current scheduling process:

21. Please list the drawbacks of your current scheduling process:

22. How many weeks are in your scheduling cycle?

☐ 4 weeks  ☐ 6 weeks  ☐ 8 weeks  ☐ Other: _________
23. On average, how often do you request shift changes per cycle?

- □ Never
- □ 1-3 times
- □ 3-5 times
- □ more than 5 times

24. My current scheduling process... (Please check all that apply)

- □ Helps me plan my work around my life
- □ Helps me plan my life around my work
- □ Makes it easy to request shift changes
- □ Is time consuming
- □ Would be easier if electronic
- □ Meets my needs
- □ Is fair and equitable for all staff
- □ Needs improvement
- □ Ensures that the scheduling guidelines are followed e.g. fair distribution of shift work and weekends.

25. My current scheduling process encourages... (Please check all that apply)

- □ Fair distribution of shifts
- □ Fair distribution of weekends
- □ Fair distribution of required long weekends to work
- □ Staff members to be responsible for their posted shifts
- □ Scheduling to fulfil the minimum number of required hours
- □ Every effort to be made to avoid incurrence of overtime
- □ Equal access to preferred tours on a rotational basis
- □ An appropriate mix of staff expertise for patient needs and continuity of care per shift

26. Self-scheduling gives me flexibility and control over my schedule:

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<tr>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>Completely Disagree</td>
<td>Neutral</td>
<td></td>
<td></td>
<td>Completely Agree</td>
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</tbody>
</table>

27. It is easy to follow scheduling rules/guidelines with my current scheduling process:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
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<td>Completely Disagree</td>
<td>Neutral</td>
<td></td>
<td></td>
<td>Completely Agree</td>
</tr>
</tbody>
</table>

28. My current scheduling process is fair for me:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
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<td>Completely Disagree</td>
<td>Neutral</td>
<td></td>
<td></td>
<td>Completely Agree</td>
</tr>
</tbody>
</table>

29. If available, I would use the following features (check all that apply):

- □ Ability to schedule my shifts online from home
- □ Ability to request shift changes online
- □ E-mail alerts for available shifts
30. I feel that closer monitoring of scheduling rules/guidelines would improve fairness and equity for all employees on my unit.

   1  2  3  4  5
   Completely Disagree Neutral Completely Agree

Comments:

31. Self-scheduling helps minimize employee-absenteeism

   1  2  3  4  5
   Completely Disagree Neutral Completely Agree

32. A master rotation allows employees to plan their life around their work

   1  2  3  4  5
   Completely Disagree Neutral Completely Agree

Comments:

33. Self-scheduling allows employees to plan work around their life

   1  2  3  4  5
   Completely Disagree Neutral Completely Agree

Comments:

34. How can my current scheduling process be improved? Please list any thoughts that come to mind.
35. I have experience with (Please circle all that apply):

Master Rotation  Self Scheduling

Additional Comments:

Thank you! Your feedback is valuable and appreciated 😊
Appendix D: NACRS Data

Table D 1:  ED visits from February 2008 to July 2010. RAZ was implemented in March 2009.

<table>
<thead>
<tr>
<th></th>
<th>CTAS 1</th>
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<th>CTAS 3</th>
<th>CTAS 4</th>
<th>CTAS 5</th>
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### Table D 2: Patients who left without being seen (LWBS) according to CTAS categories.

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<td>JUL</td>
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<tr>
<td><strong>Grand Total</strong></td>
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<td><strong>2,406</strong></td>
<td><strong>1,533</strong></td>
<td><strong>4,433</strong></td>
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</tbody>
</table>

*a* Pilot program run in the ED from April 6th-April 10th

*b* Permanent RAZ unit implemented in the ED starting June 1st, 2009