

Chapter (I): Introduction

This chapter will introduce the study topic under the following three headings:

1.1. Background

1.2. Problem statement

1.3. Rationale for the study

1.1. Background

Saint Rita's Regional Hospital is a level II hospital with a capacity of 400 approved beds and 306 actual usable beds. The Hospital was established in 1929 as a mission hospital. Saint Rita's hospital acts as a referral hospital for the Sekhukhune district which has 6 district hospitals (Philadelphia, Matlala, Jane Furse, Mecklenburg, Groblersdal, Dilokong), 78 clinics, 18 mobiles clinics and 5 community health centers.

It is situated at the Southern outskirts of Limpopo where it borders between Limpopo and Mpumalanga at Makhuduthamaga local municipality in Glen Cowie next to R579 road to Nebo.

The estimated population catered for by the hospital is about 1, 056 842 according to 2006 mid year estimate. The Sekhukhune District is rural and the unemployment rate is the highest of all the districts in the province.

The languages spoken are Sepedi 83,3%, Ndebele 4,49%, Zulu 2,77%, Swati 2,28%, Tswana 2,28%, Tsonga 2%, English 0,22%, Afrikaans 0,82%, Tshivenda 0,17% and other 1,67% -obtained from 2001 census.

The Emergency Department at Saint Rita's hospital is operating in a small area facility as project for expansion is still undergoing. The Emergency Department include casualty and medical emergencies. OPD patients also use the same area. Although the paediatrics, Obstetrics & Gynae clinics operate separately, patients are initially sorted at the same point in the Emergency Department then dispatched thereafter. Inside the Hospital there is also a Primary Health Care clinics as well as an HIV clinic named 'Dira Go Direge', meaning in the local language: 'Make it happen! '. These two clinics operate from 07h00 -16h30 and they refer more complicated cases to the Emergency Department. An average of 2400 patients per month (120 patients per day) visits the Saint Rita's Emergency Department.

Waiting time is an important measure of quality of care in ED (Asplin, 2006). Prolonged waiting time in ED leads to crowding.

Crowding of the emergency department (ED) has become an increasing problem for Hospitals around the world. This has multiple effects, including poor patient outcomes, prolonged pain, patient dissatisfaction, patients leaving without being seen, increased frustration among medical staff, and violence (Derlet and Richards, 2000).

1.2. Problem statement

There are recurrent complaints from patients about prolonged waiting time in the Saint Rita's hospital Emergency Department.

The ED at Saint Rita's is the first and most critical point of contact with the health care system in the hospital. The excessive lengths of time patients may wait before treatment in the ED may negatively color their perceptions of care provided during the visits.

Decreasing the waiting time in South Africa has been one of the high priority areas for the South African National Department of Health. As a result, several initiatives have been introduced in an attempt to solve this problem. SATS (South African Triage Score) developed by the South African Triage Group is an example of these initiatives.

Solving the problem of prolonged waiting time will help achieving timely delivery of service in ED and this has significant implications for population health.

1.3. Rationale for the Study

Many EDs all over the world have been struggling with crowding for several years; this is also the situation for Saint Rita's Hospital ED.

Attempts to solve the problem of waiting time in ED implies a need to explore factors causing increased waiting time in the ED. Literature shows that causes of ED crowding

varies according to country, hospital status: teaching versus non teaching, rural versus urban (Lambe et al., 2003; Hoot and Aronsky, 2008).

Numerous causes of ED prolonged waiting time and crowding in ED have been identified (Derlet and Richards, 2000; Hoot and Aronsky, 2008). However, these studies were done in areas where there were integrated health care systems already established, unlike in South Africa, particularly patients attending Saint Rita's hospital in Limpopo province where patients do not have an identifiable primary care provider.

Additionally, research done internationally may not always be applicable to our practice in South Africa; because of difference in the context, disease pattern and cultural background. Therefore this study sought to determine waiting time of patients who present at Saint Rita's hospital Emergency Department, Limpopo province, South Africa.

Chapter (II): Literature Review

This chapter explores the literature available on overcrowding at various Emergency departments and their solutions to this common problem. The literature will be discussed under the following broad headings.

2.1. Introduction

2.2. Causes of EDs crowding

2.3. Effects of EDs crowding

2.4. Solutions to EDs crowding

2.5. Summary of literature review

2. 1. Introduction

Accidents, injuries, and acute illnesses happen at any time and people may require urgent health care. Often, the first contact service to access is the emergency department of a hospital (Trzeciak and Rivers, 2003; CIHI., 2005). Unfortunately, many EDs around the world are crowded on a daily basis (Derlet and Richard, 2000; Trzeciak and Rivers, 2003).

EDs are supposed to provide fast appropriate responses to life threatening situations. They are first responders to disasters. Emergency care is available at any hour of the day, every day of the year (Trzeciak and Rivers, 2003).

In addition to caring for acutely ill or injured patients, EDs help ensure that basic health care is available to anyone, regardless of ability to pay (Trzeciak and Rivers, 2003).

In practice, however, EDs strive to provide timely care to all patients regardless of why they are seeking care (Shute and Marcus, 2001; Derlet and Richard, 2003).

EDs have unique characteristics; the majority of visits to EDs is unexpected and unscheduled and involves immediate assessment. At times, decisions about treatment need to be made very rapidly and actions need to be taken immediately (CIHI., 2005).

Therefore, the role of the ED is crucial for public health. Any threat to the EDs ability to provide quality emergency care constitutes a public health crisis (Trzeciak and Rivers, 2003). Currently the greatest threat to the viability of the US emergency care system is reported to be ED overcrowding (Trzeciak and Rivers, 2003).

There is no universally accepted definition of crowding (Fee et al., 2007). Although no precise definition exists, ED overcrowding refers to an extreme excess of patients in the treatment areas (Trzeciak and Rivers, 2003; Hoot and Aronsky, 2008).

In US, crowding has been defined by a national survey of ED directors as waiting more than 1 hour to see a physician, a wait considered likely to result in adverse outcomes (Lambe et al., 2003).

In Canada, the definition of Crowding is associated to: Access to Emergency Care. Here ED is expected to provide access to appropriate assessment and treatment within time frames specified by the Canadian Triage and Acuity Scale (CIHI, 2005).

In Australia, terminology used in association with crowding is Access Block. Access block is defined as the proportion of ED patients requiring admission whose total time within the ED exceeds 8 hours (Sprivulis et al., 2006).

ED overcrowding could potentially affect anyone who suffers unexpected severe illness or injury requiring time sensitive emergency treatment. Overcrowding has dramatic consequences, and has been associated with poor outcome for the patient. Effects of Crowding in ED are numerous: patient dissatisfaction, patients leaving without being seen, delay patient treatment, increased pressure on health care workers, and increased violence in EDs (Derlet and Richards, 2000; Trzeciak and Rivers, 2003).

Emergency Department (ED) overcrowding is an international crisis and many ED have been struggling with overcrowding for more than a decade (Derlet and Richards, 2000).

In South Africa, Public sector Emergency Departments are under enormous pressure with large patient numbers, understaffing, poor resources and patients have to wait long time in most hospitals (Gottschalk et al., 2006; Bruijns, Wallis & Burch, 2008; Rauf et al., 2008). Decreasing waiting time in hospital Emergency Departments in South Africa is one of the preoccupations of the National Department of Health (Gottschalk et al., 2006; Bruijns, Wallis & Burch, 2008).

Literature review in the following paragraphs will discuss in chapter 2.2, issues related to the common causes of EDs crowding. Chapter 2.3 will be focussing on issues of effects of EDs crowding on patient health. In the last part of chapter 2, literature about solutions to EDs crowding will be reviewed.

2.2. Causes of overcrowding in Emergency Departments

Crowding is a complex issue and no single factor can explain why it occurs (Arkun et al., 2010) According to Derlet and Richards (2000), multiple factors contribute to ED crowding, and the relative contribution of each factor varies between EDs. Crowding differ between urban and rural hospitals; as well as between country, academic, and private hospitals (Derlet and Richards, 2000).

In literature, causes of ED crowding have been divided into: input factors, throughput factors, and output factors (Asplin et al., 2003).

Input factors reflect sources and aspects of patient inflow. Input factors include: patient volume, age, sex, acuity of illness: non-urgent cases versus high acuity cases, mode of arrival in the ED.

Throughput factors reflect what is called “bottlenecks” within the ED. Throughput factors include those influencing efficiency of assessment and treatment; such as triage, registration process, laboratory work, x-ray work, shortage of doctors and nurses, presence or not of a Fast Track which processes low acuity cases (Arkun et al., 2010).

Output factors reflect bottlenecks in other parts of the hospital that might affect the ED. Output factors include: inpatient boarding and hospital bed shortage. Critically ill or injured patients may have extended stays in the emergency department until hospital beds become available. This practice is known as “boarding” (Mohsin et al., 2007).

Other factors cited in literature that affect crowding in ED include:

Static factors such as teaching hospital status and size of ED,

Dynamic factors such as sudden surges in patient presentations: this can happen when multiple motor vehicle crashes occur and during natural disasters or local epidemics, such as the flu.

Contextual factors such as time and day of the week.

In the following paragraphs, we will respectively review literature around some of the causes of ED crowding particularly: Triage inefficiency and non-urgent visits in ED.

2.2.1 Triage inefficiency

Triage is the process of sorting patients into different priorities based upon their degree of illness or injury. In this process, the sicker patients receive treatment sooner than less sick patients, rather than using a first-come first-served system (CIHL, 2005; Gottschalk et al., 2006).

Triage, meaning “to sort or choose,” developed from the need to prioritize and provide immediate care of injured soldiers in battlefield settings. This concept was practiced in France in the early 1800s. Baron Dominique Jean Larrey (1766–1842), Napoleon’s chief surgeon, recognized the need for quickly evacuating and then treating all the injured in an area close to the front lines. This was done using the first-ever ambulances, which were horse drawn vehicles that picked up people from the front lines (Blagg, 2004).

In South Africa, The South African Triage group has developed a tool called South African Triage Scale (SATS). This scale is now nationally used in many hospital Emergency Departments. The South African Triage Scale assigns the following priority groups and targets times: Red: immediate; Orange: within 10 minutes; Yellow: within 60 minutes; Green: within 240 minutes; Blue: dead (Gottschalk et al., 2006).

Emergency units throughout the world have triage systems in place.

The UK has been using the Manchester triage protocol for many years. It is a 1 to 5 number system developed by the Manchester Triage Group in 1997. Unfortunately, it is based on 52 algorithms and is a large, unwieldy instrument requiring extensive training and practice. Many accident and emergency units in the UK are now moving away from this system, or are adapting it to ensure better patient throughput in their units. The Manchester system uses the following targets: triage 1: immediate; triage 2: 10 minutes; triage 3: 60 minutes; triage 4: 120 minutes; triage 5: 240 minutes (Gottschalk et al., 2006)

In Australia, the main tool is The Australian Triage Score (ATS). It is also a 1 to 5 system based on a long list of patient conditions. Although easier to implement than the Manchester protocol, it also requires training and lengthy assessment time (Gottschalk et al., 2006)

In Canada they use The Canadian Triage and Acuity Scale (CTAS) with goals of time to physician initial assessment as follow: CTAS I : Resuscitation, immediate; CTAS II : Emergent, 15 minutes (time to physician assessment); CTAS III : Urgent, 30 minutes (time to physician assessment); CTAS IV : Less-Urgent, 60 minutes (time to physician assessment); CTAS V : Non-Urgent, 120 minutes (time to physician assessment).

Those who developed the CTAS were clear that these times are not established standards of care and might not make sense for all facilities. However, they do allow for some comparisons across different facility types and even with other countries that are using the same assessment goals (CIHI., 2005).

Literature has shown that triage reduces the overall waiting time for all patients (Chan et al., 2005; Travers et al., 2006; Bruijns, Wallis & Burch, 2008).

Bruijns, Wallis & Burch (2008) evaluated the Effect of introduction of nurse triage on waiting times in a South African emergency department. Results showed that introduction of nurse triage, using the Cape Triage Score (CTS), resulted in an overall reduction in waiting time from 237 min to 146 min. Patients triaged “red” (highest priority) demonstrated a mean reduction in waiting time from 216 min to 38 min.

It was concluded that use of the Cape Triage Score, as implemented by trained nurses, dramatically reduced the waiting time of patients attending a busy public hospital ED in South Africa (Bruijns, Wallis & Burch, 2008).

Travers et al. (2006) examined the pattern of waiting time by placing a senior emergency physician with the triage nurse. A senior emergency physician was placed with the triage nurse in the Department of Emergency Medicine at Alexandra Hospital during peak busy periods of patient attendance over a period of 2 months. Measures were made of waiting

time (registration to doctor consult). Result of their study showed that the average waiting time for walk-in patients was 19 min on experimental days as compared with 35.5 min on control days, with 78% being seen within 30 min in the experimental group compared with 48% on control days. It was concluded that placing a senior emergency physician with the triage nurse reduced waiting times for walk-in cases. One third of attendances were treated and discharged quickly, allowing the consulting room doctors to act more efficiently (Travers et al., 2006).

Chan et al. (2005) sought to determine the effect of a new ED rapid entry and accelerated care at triage (REACT) process on the frequency of patients who leave before being seen. They conducted a before and after intervention design to study the effect of Rapid Entry Triage Accelerated Triage for ambulatory patients presenting to an urban academic center ED. Outcome measures included the average monthly rate of patients who left before being seen during the 6 months before the Rapid Triage and 6 to 12 months after (post-rapid triage) its initiation. In their founding, there was a significant decrease in leave before being seen frequency from the pre-REACT to post-REACT periods. Average mean monthly patient wait times decreased by 24 minutes after the initiation of REACT, as did overall ED length of stay by 31 minutes. It was concluded that: the initiation of a rapid entry and accelerated care process significantly decreased patient leave before being seen rates, average wait times and length of stay, despite an overall increase (Chan et al., 2005).

2.2.2. Non-urgent patients in ED

Non-urgent patients as cause of crowding in ED has been largely reported (Ardagh et al., 2002; Trzeciak and Rivers, 2003; Afilalo et al., 2004; Vertesi, 2004; Schull, Kiss & Szalai, 2007).

Schull, Kiss & Szalai (2007) studied the effect of low-complexity patients on ED waiting times. The goal of their study was to test the extent to which patients presenting to EDs with minor conditions contribute to delays the treatment of the higher-acuity patients. The design of their study was a retrospective study of patients presenting for treatment in an emergency department from April 1, 2002, to March 31, 2003, in Ontario, Canada's largest province, with a population of 12 million people.

They obtained patient records from an administrative database that contains abstracts of all ED visits in Ontario.

Exclusion criteria consisted of: any health insurance number or postal code that was invalid (e.g., non-Ontario citizens) to ensure a sample representative of the Ontario population. To ensure a comparable measure of patient acuity across different hospitals, they used the Canadian Triage and Acuity Scale was used.

To increase specificity, they defined low-complexity patients according to 3 factors: a Canadian Triage Acuity Score of less urgent (4) or non-urgent (5), ED arrival not by ambulance, and discharged home. High-complexity patients were defined to be those who were admitted to the hospital, given that these patients generally require more intensive assessment and treatment in the ED.

This was a large study of more than 4 million patient visits at 110 EDs.

In their results, the authors found that for each low complexity patient who arrives in the ED, the remaining patients experience an increased ED length of stay of 32 seconds and an increased time to be treated by a physician of 13 seconds.

They concluded that: “Low-complexity ED patients are associated with a negligible increase in ED length of stay and time to first physician contact for other ED patients. Reducing the number of low-complexity ED patients is unlikely to reduce waiting times for other patients or lessen crowding”.

Implication on clinical practice from this study is awareness about that: low-complexity patients had a relatively small effect on the timeliness of care for more complex ED patients. This suggests that attempts to divert low complexity ED patients to alternative sites for clinical care are unlikely to substantially improve either ED waiting times or ED crowding.

Limitations in Schull, Kiss & Szalai (2007) study are numerous: firstly, there is no standard definition of a low-complexity patient; hence, they chose a definition based on features at presentation and disposition, which was intended to result in a more specific definition, not one that could be used prospectively to identify such patients.

Secondly, they relied on administrative data that are not collected primarily for research purposes. Finally, they did not have information on the number of physicians on duty (which could influence the effect of patient volume) or the time of patient arrival in the ED (which would be the ideal starting point for length of stay).

Ardagh et al. (2002) examined the effect of diverting low acuity to a rapid assessment unit when they required only brief assessments and simple interventions and had a disposition that was apparent at triage. This was a single-center study and they found that ED length of stay and time to treatment by a physician improved for low-acuity patients, including those diverted to the rapid assessment unit, but did not change for sicker patients who remained in the ED (Ardagh et al., 2002).

Similarly Schull, Kiss & Szalai (2007) results suggest that reducing the number of low-complexity patients in EDs would do little to improve ED performance for sicker patients and hence do little to reduce crowding (Schull, Kiss & Szalai, 2007). The likely reasons

are that most low-complexity patients are not placed in the treatment spaces used for sicker patients, the resources they require are generally simple and readily available (hence, their use does not affect sicker patients), and staff are either dedicated to their treatment (e.g., fast-track units) or allocate time to these patients in lower priority than they do for sicker patients (Vertesi, 2004).

Trzeciak and Rivers (2003) performed a review of literature in order to describe how ED overcrowding threatens patient safety and public health and to explore the complex causes and potential solutions for the overcrowding crisis. It was reported that, although in the past, ED overcrowding was attributed to inappropriate use of the ED by a large volume of non-urgent patients, there has never been a consensus definition of “non-urgent”, and opinions about the appropriateness of an ED visit have been widely divergent. High subsequent hospitalization rates have been reported for patients who were initially denied ED care. Trying to determine the appropriateness of an ED visit has been considered a risky practice (Trzeciak and Rivers, 2003).

Non-urgent visits are no longer believed to be the main cause of overcrowding. To understand this last concept, overcrowding of the triage area (that is, waiting room) must be differentiated from overcrowding of the patient treatment areas. Non-urgent visits cause extremely crowded waiting rooms but reportedly do not cause crowding in the ED treatment areas, because the highest acuity patients are always brought into the treatment areas first. In addition, the total number of ED visits has been reported to poorly correlate with ED overcrowding. The notion that non-urgent patients are the main cause of the ED overcrowding crisis has now been abandoned (Trzeciak and Rivers, 2003).

2. 3. Effects of EDs crowding

2. 3. 1. Adverse outcome: Patient mortality

Emergency Department Crowding is associated with a decreased health care quality (Miro et al., 1999). Miro et al. (1999) found a significant increase in mortality associated with weekly Emergency Department volume. Richardson (2006) in Australia also found that presentation during high Emergency Department occupancy was associated with increased in-hospital mortality at 10 days.

Sprivulis et al. (2006) examined the relationship between hospital and emergency department (ED) occupancy, as indicators of hospital overcrowding, and mortality after emergency admission. It was found that there is an increased risk of mortality at day 2, 7, and 30 after hospital admission. It was concluded that Hospital and ED overcrowding is associated with increased mortality (Sprivulis et al., 2006).

2. 3. 2. Treatment delays

Several literatures have shown that Emergency department crowding is associated with patient's treatment delay.

Liu et al. (2003) conducted a study to compare measurements of emergency department (ED) patient flow during periods of acute ED overcrowding and times of normal patient volume. They found that patients who arrived at one ED during crowded periods waited 30 minutes longer for an ED bed.

Schull et al. (2004) in Canada, Toronto, conducted also a study to estimate the effect of emergency department crowding on door-to-needle time for patients given intravenous thrombolysis for suspected acute myocardial infarction. They found that ED crowding is associated with increased door-to-needle times for patients with suspected acute myocardial infarction and may represent a barrier to improving cardiac care in EDs.

Hwang et al. (2006) studied the effect of emergency department crowding on the management of pain in older adults with hip fracture. They found that high ED occupancy levels were associated with delayed pain assessment and lower likelihood of pain documentation among hip fracture patients.

2. 3. 3. Patient leaving without being seen: Patient elopement

Emergency Department crowding has been associated with patients leaving without being seen (Mohsin et al., 2007).

Mohsin et al. (2007) in Australia conducted a study to describe the population of emergency department patients who leave without being seen by a medical officer, to investigate the circumstances of their visit and to ascertain whether they subsequently receive alternative medical care.

Results from their study showed that walkout rates significantly varied by sociodemographic and clinical characteristics of the patients. Young patients aged 0–29 years, and those with longer waiting time for triage and triaged as “less urgent” were more likely to walk out than others. Overcrowding in the emergency department had a significant association with walkout of patients. Prolonged waiting time was the most common reason for leaving emergency departments without being seen by a doctor.

It was concluded that the number of patients who leave an emergency department without seeing a doctor is strongly correlated with waiting time for medical review. Achieving shorter emergency department waiting times is central to reducing the numbers of people leaving without being seen. The rate of patients who leave without being seen is also strongly correlated with triage category (Mohsin et al., 2007).

Kyriacou et al. (1999) also conducted a 5-year time study analysis of emergency department patient care efficiency. It was found that the rate of patients leaving without being seen closely correlates with emergency department waiting times.

According to Polevoi, Quin & Kramer (2005), Patients are more likely to leave without being seen when ED occupancy exceeded 100% of the total capacity.

Baker, Stevens & Brook (1991) conducted a study to determine whether patients who sought care at a public hospital emergency department and left without being seen by a physician needed immediate medical attention and whether they obtained care after leaving. It was found that among patients who left without being seen, 46% needed urgent medical attention, and 11% were hospitalized within a week. They concluded that Overcrowding in public hospital's emergency department restricts access to needed ambulatory medical care for the poor and uninsured (Baker, Stevens & Brook, 1991).

Bindman et al (1991) found that patients who left the ED without being seen were twice as likely to report worsened health problems.

Rowe et al. (2006) in Alberta, Canada, conducted a study to determine the acuity level, reasons, and outcomes of leaving without being seen cases. They found that the most common reason for leaving without being seen is impatience during peak ED periods. Many of these patients seek medical care within one week. Complications occurred rarely; however, "high-risk" patients who leave without being seen do experience adverse health outcomes.

2. 3. 4. Patient dissatisfaction

Patient satisfaction has been increasingly used as an outcome measure for health care system performance.

According to Toma, Tiner & McNutt (2009), ED patient satisfaction is an incompletely understood concept. Providers may find themselves carrying out activities to enhance satisfaction without fully knowing whether that activity does improve satisfaction (Toma, Tiner & McNutt, 2009).

Literature shows that Crowding in Emergency Department is associated with decreased patient satisfaction (Hansagi, Carlsson & Brismar, 1992; Thompson et al., 1996; Sun et al., 2000; Taylor and Bengler, 2004; Mohsin et al., 2007; Anderson et al., 2007; Toma, Tiner & McNutt, 2009).

According to Taylor and Bengler (2004) improving patient satisfaction provides several benefits. Related benefits may include improved morale and job satisfaction in ED staff, increased patient adherence, a reduced tendency for patients to seek further opinions, a reduced incidence of complaints and litigation. Improving satisfaction in EDs is also likely to have a significant impact on the public view of hospital and emergency care in general (Taylor and Bengler, 2004).

When delivering services in ED, quality should not just be restricted to clinical aspects of care, but should include the entire patient experience. In the quest to improve the science of medicine, medicine as an art should not be suffering if we succeed in identifying and responding to the patient's needs (Taylor and Bengler, 2004).

It is true that in ED, we will never please all of the people all of the time, but it is possible to investigate measures that will please more of our patients most of the time in Emergency Department (Taylor and Bengler, 2004).

In literature, patient factors that influence satisfaction include: age, sex, social status, ethnicity, severity of illness and triage category (Taylor and Bengler, 2004).

Sun et al. (2000) in Boston, USA, conducted a study to identify emergency department process of care measures that are significantly associated with satisfaction and willingness to return. In their results, patient-reported problems that were highly correlated with satisfaction included: help not received when needed, poor explanation of causes of problem, not told about potential wait time, not told when to resume normal activities, poor explanation of test results, and not told when to return to the ED. Other process of care measures correlated with satisfaction include nonacute triage status and

number of treatments in the ED. Patient characteristics that significantly predicted less satisfaction included younger age and black race.

Hansagi, Carlsson & Brismar (1992) in a study conducted in a Swedish suburban Emergency Department found that satisfaction with the treatment and services was significantly lower among patients who were triaged nonurgent than among the immediate and urgent triage patients.

In literature, service factors that influence satisfaction include: interpersonal skills (perceived staff attitudes), provision of information (explanation), and aspects related to waiting times, particularly the perceived waiting time in relation to the patient's expectation (Thompson et al., 1996; Taylor and Bengner, 2004; Toma, Tiner & McNutt, 2009).

Toma, Tiner & McNutt (2009) conducted a study to measure the effect of meeting emergency department patients' expectations for diagnostic and therapeutic interventions on patient satisfaction.

No important associations between meeting patient expectations for specific diagnostic and therapeutic interventions and patient satisfaction were found.

They concluded that overall satisfaction was strongly correlated with patient's assessment of the physician's interpersonal skills and was not correlated with whether the physician had met expectations about diagnostic and therapeutic interventions (Toma, Tiner & McNutt, 2009).

Thompson et al. (1996) found in their study that perceptions regarding waiting time, information delivery, and expressive quality predict overall patient satisfaction, but actual waiting times do not. Providing information, projecting expressive quality, and managing waiting time perceptions and expectations may be a more effective strategy to achieve improved patient satisfaction in the ED than decreasing actual waiting time.

2. 4. Solutions to Emergency Department overcrowding

In literature, several strategies have been tried in attempt to provide solutions to ED crowding such as increasing resources, demand management and Crowding measures (Derlet and Richard, 2000; Hoot and Aronsky, 2008).

2.4.1. Increasing resources

Bucheli and Martina (2004) in Switzerland reported a permanent increase in the number of physicians during a busy shift, reducing the outpatient length of stay by 35 minutes.

A rural hospital in Australia, New South Wales, which previously did not have an attending physician present during the night shift, found that the presence of an attending physician improved several throughput measures of ED crowding (Donald et al., 2005).

One hospital in Philadelphia, USA, activated reserve personnel as needed during the viral epidemic season, reducing the waiting time by 15 minutes and the rate of patients leaving without being seen by 37% (Shaw and Lavelle, 1998).

Short stays units in Emergency Department have also been used as an increasing resource strategy.

Bazarian et al. (1996) examined the impact of reducing ED boarding through the use of a short-stay unit. They reported that short-stay medical unit reduced the length of stay for outpatients with chest pain and asthma exacerbation.

Kelen, Scheulen & Hill (2001) from Baltimore, USA, reported that the addition of an acute medical unit reduced the median number of boarding patients from 14 to 8 during a 2-year period.

Ross et al (2001) in Michigan, USA, proposed a hybrid observation unit, which was designed to use resources effectively and substantially decreased the length of stay for scheduled procedure patients.

Hospital beds access have also been used as strategy to decrease crowding.

Dunn (2003) from Australia reported that: Modest decreases in hospital occupancy resulted in highly significant reductions in ED waiting times.

2.4.2. Demand management: especially management of nonurgent referrals

Grumbach, Keane and Bindman (1993) conducted a study to evaluate whether referral to primary care settings would be clinically appropriate for and acceptable to patients waiting for emergency department care for nonemergency conditions. It was found that 38% would swap their ED visit for a primary care appointment within 72 hours.

Washington et al. (2002) conducted a randomized, to determine the effects on health status and access to care of referring patients with nonacute conditions to next-day primary care. They found that they may be deferred for next-day primary care without worsening self-reported health status on follow-up.

Derlet et al. (1992) conducted a study to describe the characteristics of individuals who were referred to community-based services, their condition after 72 hours, and their use of follow-up health care services. This study was motivated from observations that there were large numbers of patients seeking primary care for non-emergent conditions in emergency departments. In response, a system was implemented in which persons with non-emergent medical conditions, following a medical screening examination, did not receive further ED assessment or treatment and instead was referred to community resources. When following up nonurgent patients who were triaged to receive care elsewhere, they found that there were no major adverse outcomes, and 42% of the patients received same day care elsewhere (Derlet et al., 1992).

In a similar study done by Diesburg-Stanwood et al. (2004) it was found that 94% of nonurgent patients who were referred to community-based care reported that their condition was better or unchanged.

Multifaceted administrative interventions have also been used as strategy to solve problem of ED crowding.

Cameron, Scown & Campbell (2002) in Australia, suggested for management of access block a broad intervention consisting of 51 actions that reduced ED length of stay and ambulance diversion in Melbourne.

Solution to Emergency Departments crowding problem has been addressed by several authors in literature.

According to Derlet and Richards (2008) multiple factors contribute to ED crowding, and the relative contribution of each factor varies between EDs. Circumstances differ between urban and rural hospitals, as well as between county, academic, and private hospitals. Multiple simultaneous steps are necessary to solve ED crowding (Derlet and Richards, 2008).

Derlet and Richards (2008) presented 10 putative solutions on actions in their institution to counter the problem: Expanding Hospital Capacity; Stopping to regulate hospitals to the extreme; Providing care only to patients with emergencies; Providing alternatives for primary care of the uninsured; Stopping to board admitted patients in the Emergency Department; Using evidence-based guidelines to address imaging over utilization; Change admitting patterns; Expanding the role of ancillary ED staff and hallway care; Calling the nurse first; preventing disease and injury.

In Australia, Richardson (2003) reported that most of the solutions for reducing patient's time in ED lie beyond the Emergency Department. The primary problem is lack of acutely available beds. Queuing for bed is managed by bed allocation, which tends to

stratify patients by their nursing load with the least intensive cases generally having the shortest queues. Elementary queuing theory predicts the accumulation of patients, but the daily variation in emergency medical activities can not allow the emergency staff to predict what is going to happen (Richardson, 2003).

In South Africa, Rauf et al. (2008) conducted a quality improvement (QI) cycles that reduced waiting times at Tshwane District Hospital Emergency Department in Pretoria. The QI cycles identified some problems causing prolonged waiting times in Tshwane District Hospital Emergency Department. The following aspects of the plan were carried out successfully: functional triage system, improved referral system, availability of reference books and speaker phone, easy availability of stock, reorganizing the duty roster and academic programme, notification of waiting time and nurses carrying out minor procedures (Rauf et al., 2008).

In USA, according to Trzeciak and Rivers (2003), there is no easy answer for ED overcrowding. There are, however, several measures that could help to alleviate the strain on EDs. Measures cited by Trzeciak and Rivers (2003) to alleviate crowding included:

- Early warning systems: when regional ED capacity is in danger of being exceeded, a civil emergency designation could trigger health department contingency plans to expand acute care capacity. Early warning systems may also serve as a key component of disaster preparedness.

- Strategic planning for delivery of care to patients who must be placed in temporary bed locations; coordination with long term health facilities and home health agencies to expedite hospital discharges. The strategic planning initiative is intended to help hospitals anticipate and prepare for ED overcrowding, rather than react to ED overcrowding after it has occurred.

- Multidisciplinary approach as the main causes of ED overcrowding seem to originate outside the emergency department (Trzeciak and Rivers, 2003).

In Canada, it is not most of the time possible to obtain government funding to improve facilities and staffing, each health institution tries to find alternative solutions.

At Scarborough (Ontario, Canada) General Hospital, the hospital committee instituted a series of changes that dramatically improved the problem of crowding in their emergency department (Feferman and Cornell, 1989).

Fraser Health Authority in British Columbia (Canada) also implemented hospital and community initiatives that assisted in reducing crowding (Harwood, 2005).

There is also in Canada, focus strategies on recruitment of the healthcare professionals specifically physicians and nurses. There are strategies to meet their quality of work life issues, and strategies for retention initiatives (Harwood, 2005).

In UK, a study was conducted by Muro, Mason & Nicholl (2006) to determine what measures were introduced by emergency departments in response to the national monitoring week in March 2003, and which, if any, of these measures were most effective in reducing waiting times. It was concluded that improved waiting time performance may depend, at least in the short term, more on the amount of effort expended than on introducing a single effective change (Muro, Mason & Nicholl, 2006).

Chapter (III): Methodology

The research methods used for this study will be described in this chapter, under the following headings:

- 3.1. Aim of the study
- 3.2. Objectives of the study
- 3.3. Research question
- 3.4. Study design
- 3.5. Study population
- 3.6. Sampling frame and sampling size
- 3.7. Inclusion criteria
- 3.8. Exclusion Criteria
- 3.9. Variables and measurement of variables
- 3.10. Data collection
- 3.12. Data analysis
- 3.13. Reliability and validity
- 3.14. Study bias
- 3.15. Limitations
- 3.16. Ethical considerations

3.1. Purpose of the study:

The aim of the study was to investigate waiting time of patients who present at the Saint Rita's Hospital Emergency Department(ED), Limpopo province, in Republic of South Africa.

3. 2. Objectives of the Study:

1. To determine the mean waiting time for stable patients in Emergency Department,
2. To identify where the longest time is spent by patients in Emergency Department,
3. To identify areas of inefficient patient flow.

3. 3. Research Question:

“What is the waiting time of patients who present at of Saint Rita's Hospital Emergency Department, Limpopo Province, South Africa?”

3. 4. Study Design :

This was a descriptive cross-sectional study done over a period of five consecutive days in the month of July 2010.

3. 5. Study Setting:

Saint Rita's Hospital(Regional level II hospital) is situated at the Southern outskirts of Limpopo province where it borders between Limpopo and Mpumalanga province, in Glen Cowie, next to R579 road to Nebo.

The hospital is a referral hospital for the whole Sekhukhune district which has 6 district hospitals (Philadelphia, Matlala, Jane furse, Mecklenburg, Groblersdal, and

Dilokong), 78 clinics, 18 mobile clinics and 5 community health centers. Saint Rita's Hospital serves a population of about 1,056,842 according to 2006 mid-year estimate.

3.6. Study Population:

All patients who attend the Emergency Department at Saint Rita's Hospital.

An average of 2400 patients per month (120 patients per day) visits the Saint Rita's emergency department.

3.7. Sampling frame and Sample size:

A random sample of 30 patients per day who attended the Saint Rita's Hospital Emergency Department during five consecutive days period: Monday to Friday when the study was conducted.

The systematic sampling was done by enrolling every third patient in the queue who gave consent to participate in the study.

3.8. Inclusion criteria:

- All patients attending Saint Rita's emergency department who gave their consent to participate in the study.
- Caregivers of sick children.
- Being literate.

3.9. Exclusion criteria:

- Caregivers of stable patients at the paediatric clinic,
- Stable and unstable patients of Obstetrics & Gynaecology clinic.
- In patients.
- Illiterate patients

3. 10. Variables and measurement of variables

The variables used in the study were as follow:

a) Acuity;

The South African Triage Scale was used to assign the following priority and targets times: Red: immediate; Orange: within 10 minutes; Yellow: within 60 minutes; Green: within 240 minutes; Blue: dead.

b) Time of arrival; was defined as the time that the patient approached the help desk to express his or her desire to be treated.

c) ED waiting Time was defined as the time from arrival of the patient at help desk in Emergency Department until the start of the consultation by the medical Officer (Physician).

d) ED Length Of Stay (EDLOS): was defined as time from arrival to final disposition (Admission or discharge).

e) Age, was obtained from patient chart.

f) Gender: male or female

g) Diagnostic category; patients were grouped by specialities: Paediatrics, Surgical, Medicine, General medicine, or Psychiatry.

h) Day of arrival; this was Monday, Tuesday, Wednesday, Thursday or Friday.

3. 11. Data collection:

- A Time Survey sheet data collection instrument was developed based on the patient flow through the Saint Rita's hospital Emergency Department. Two nurses working at Help desk in ED were explained the study and they enrolled the participants.

Patients were given the Time-Survey sheet as well as a Stop-Watch once they were randomly selected and they gave their consent to participate in the survey. Demonstration and explanations were provided on how to use the two instruments.

- The time of arrival in the Emergency Department was noted at the help desk and subsequently, throughout the patient's flow through different stations, the time-In and the time-Out was entered by the patient in the Time-Survey sheet.

Frequently the participants asked for help from the health providers at different stations for use of these two data collection instruments.

- A five day data collection was done starting every morning at 07:00 when the registration of patients start, until the end of the Shift at 16:30.

- Digital timers (Stop-Watches) were purchased from Wall-Mart shop Montreal Canada. A total number of 30 timers were purchased. All 30 Stop-Watches demonstrated a perfect functioning. Calibration of all these timers was done during the pilot study period and ensured that it was still equal every subsequent morning and end of each day. All were calibrated equally on the first day of the pilot study. On the first day of pilot study, all the participants failed to use the Stop-Watches properly to record waiting time at different stations. Participants on that day were all literate and a good demonstration was provided. Initially, the chronometer mode was tried, but as all the participants were unable to use it. It was then decided to change to mode watch-time, so that participants had just to read the four digits appearing and record it on the Survey time sheet at the time-in as well as at the time-out of each station. It worked well on the second day of pilot study and it was then decided to proceed with the methodology for the study.

- Triage system used at Saint Rita's hospital did not change during the collection of data period. The South African Triage scale is being used at Saint Rita's hospital, meaning that the Red SATS and the Orange SATS did not queue; they were taken directly to the Medical Officer. There was no interference from the researcher in the normal proceedings of the Emergency Department.

3. 12. **Data Analysis:**

- Tables, graphs, and patients flow diagrams are used for presentations.
- Statistical software SPSS 17 was used to process data.
- Descriptive statistics such as the mean waiting time as well as the range of the waiting times were calculated.
- Frequencies of the times lengths were calculated from the frequency distribution table.

3. 13. **Reliability and Validity:**

Reliability was achieved by ensuring an optimal functioning and equally calibration of the timers on every sampling day. Reliability of data capture onto the software will be ensured by having someone check the data that is captured.

Validity in this study was achieved by conducting a pilot study. This pilot study took place the week preceding the collection of data on two consecutive days Wednesday and Thursday.

3.14. **Study Bias:**

The performance can improve if workers know about the study and information bias can be increased if personnel know about the study and then try to improve their performance time just for the research period. To minimise this, clinic personnel including nurses, doctors on duty, radiologists, and clinical pharmacists were not aware about the study. Neither the doctors nor the nurses were involved in the times recording. However, personnel at different stations realised that a study was going on because of frequent questions from patient on the appropriate filling of survey sheet or the good reading of the stop-watch timers.

There was no interference from the researcher in the normal proceedings of the Emergency Department.

This study is subject to confounding bias due to the effect that waiting time can be affected if the turnout of patients varies significantly. This could have been affected the results if all data collection were collected at the beginning of the month concerned, or during the summer season when the Emergency Department is very busy. However, data from the Saint Rita's hospital statistics shows the same pattern of ED frequentation for this period of the year.

3.15. **Limitations:**

- Patients and staff satisfaction in this study were not assessed.
- Results from this study can not be generalized as it focuses on the context of Saint Rita's hospital, and the sample is not representative of all hospitals in South Africa.
- The study was carried out over a short period of time.
- Sample selection was not random.

3.16. **Ethical considerations:**

- This study was conducted according to a research protocol submitted to and approved by the Medical University of Southern Africa Project number MREC/M/80/2010. Permission for the study was also obtained from Saint Rita's Hospital Management and from The Department of Health and Social Development, Limpopo Province (Attached in appendix).
- All participants were asked to sign the consent form before participating in the study.
- A patient information leaflet was not used in this study as this is not an intervention study and the study was explained verbally to patients.

All costs for the conduction of this study were the responsibility of the researcher.

Chapter IV: Results of the study

This chapter presents the results of this survey. The results are presented under the following headings:

4.1. Characteristics of study patients

4.2. Waiting times by patient's age

4.3. Waiting time and day of presentation

4.4. Interaction times and patient flow stations

4.5. Waiting times at various flow stations

4.6. EDLOS and ED waiting time

4. 1. Characteristics of study patients

During the study period, 150 patients were randomly surveyed. Data were initially captured on Windows Excel software and the analysis was done using the statistical software SPSS 17. Descriptive statistics for different variables is presented below.

Table 1. Characteristics of study patients (n = 150)		
Variables	Number	Percentages
Age		
0 - 13	12	8.0
14 - 28	16	10.7
29 - 42	42	28.0
43 - 57	36	24.0
58 - 71	32	21.3
72 - 86	10	6.7
87 - 100	2	1.3
Gender		
Male	52	34.7
Female	98	65.3
Acuity (SATS)		
Green	119	79.3
Red	8	5.3
Orange	9	6.0
Yellow	14	9.3
Diagnostic		
General	21	14.0
Medical	100	66.7
Paeds	6	4.0
Psyc	11	7.3
Surgical	8	5.3
MVA	3	2.0
Gynae	1	.7
Disposition		
Discharge	135	90.0
Admitted	15	10.0

Table II: Distribution of patients by age category

Age	Frequency	Percentage
0-13	12	8.0
14-28	16	10.7
29-42	42	28.0
43-57	36	24.0
58-71	32	21.3
72-86	10	6.7
87-100	2	1.3

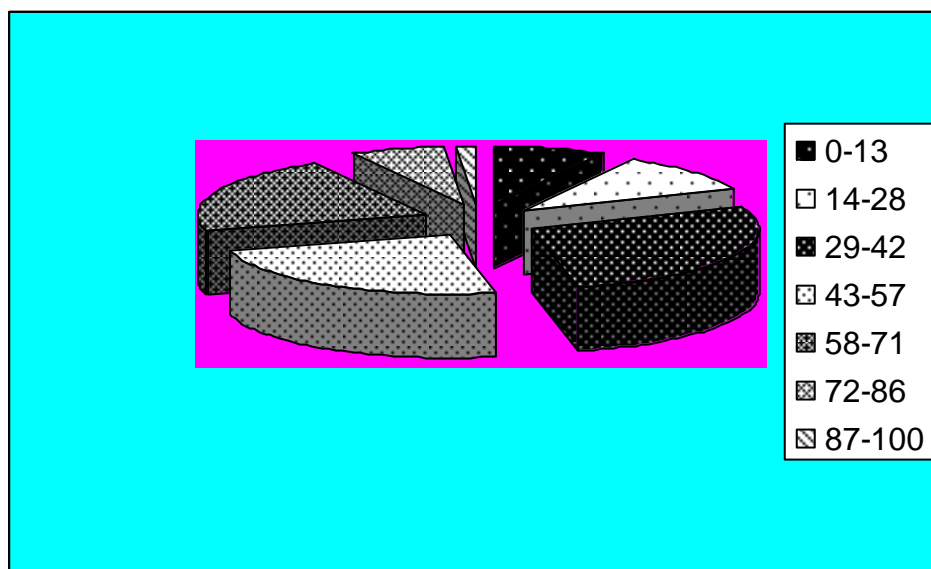
**Figure 1: Age category distribution of patients.**

Figure 1 shows that 8 % of patients were aged 0-13 year-old; 11 % were aged 14-28 years; 28 % aged 29-42 years; 24 % aged 43-57 years; 21% aged 58-71 years; 7 % aged 72-86 years; 1 % aged 87-100 years.

Table III: Distribution of patients by gender

Gender	Frequency	Percentage
Male	52	35
Female	98	65

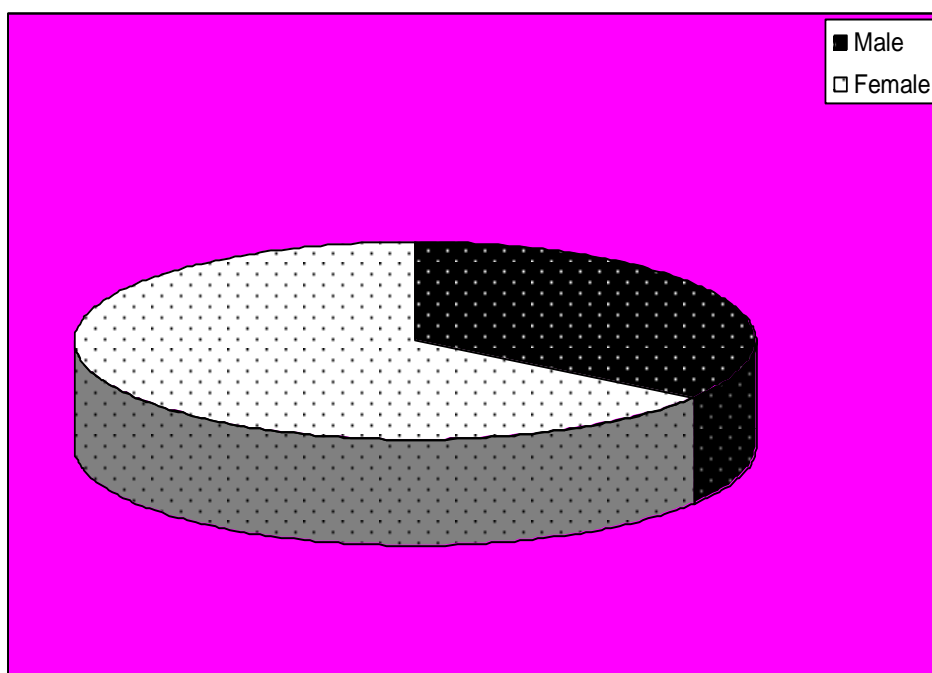
**Figure 2: Gender distribution of patients.**

Figure 2 shows that 35% of patients were male and 65 % were female.

Table IV: Distribution of patients by Acuity (SATS)

Acuity	Frequency	Percentage
Green	119	79.3
Red	8	5.3
Orange	9	6.0
Yellow	14	9.3

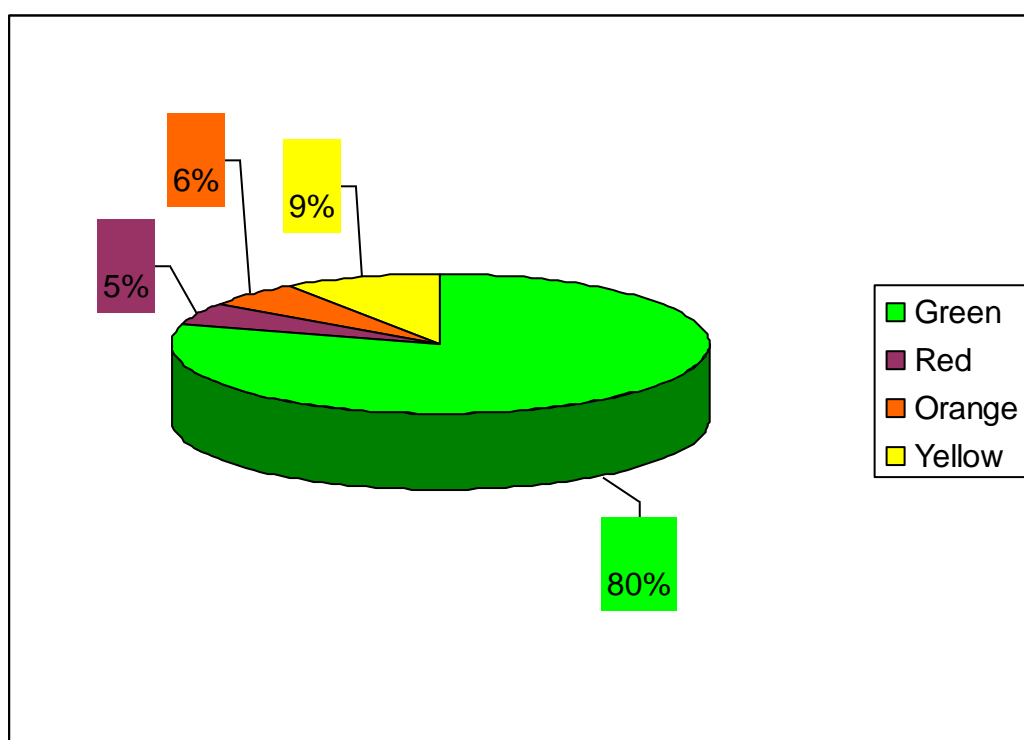
**Figure 3: Acuity distribution of patients**

Figure 3 shows that 80 % of patients were SATS-Green, 5 % of patients were SATS-Red; 6 % of patients were SATS-Orange and 9 % of patients were SATS-Yellow.

Table V: Distribution of patients by diagnostic category

Diagnostic category	Frequency	Percentage
General	21	14.0
Medical	100	66.7
Paediatrics	6	4.0
Psychiatry	11	7.3
Surgical	8	5.3
MVA	3	2.0
Gynaecology	1	1

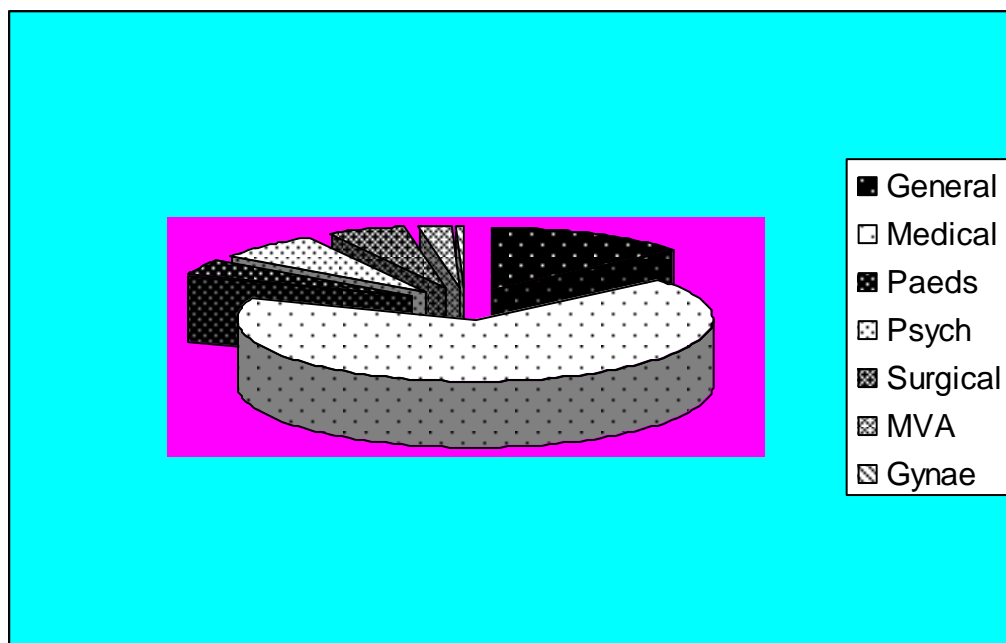
**Figure 4: Diagnostic category distribution**

Figure 5 shows that 14 % of patients were General medicine diagnostic category; 67 % of patients were Medical diagnostic category; 4 % of patients were paediatrics (Paeds) diagnostic category; 7% of patients were Psychiatry (Psych) diagnostic category; 5 % of patients were Surgical diagnostic category; 2 % of patients were Motor-Vehicle-Accident (MVA) diagnostic category and 1 % of patients were Gynaecology (Gynae) diagnostic category.

Table VI: Distribution of patients by final disposition

Final disposition	Frequency	Percentage
Discharge	135	90.0
Admission	15	10.0

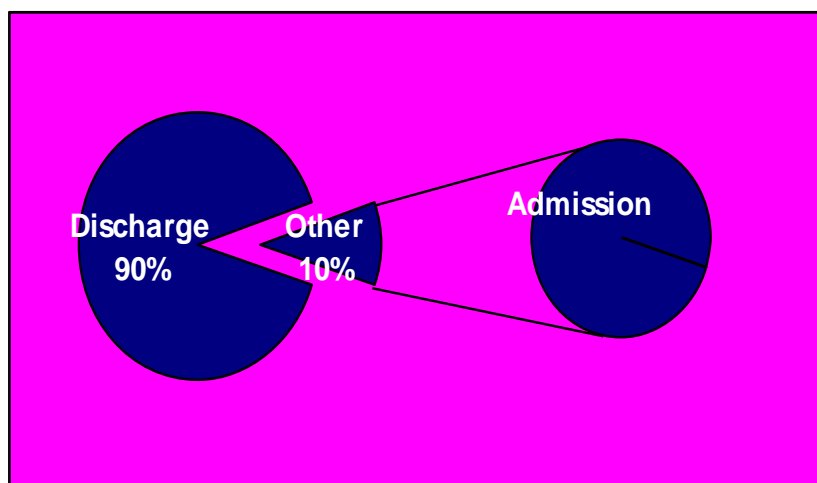
**Figure 5: Final disposition distribution of patients**

Figure 5 shows that 90 % of patients were discharged home and only 10 % were admitted.

4. 2. Waiting times in Emergency Department

Table VII: Waiting times in Emergency Department by patient's age groups

Age	Median	Standard deviation	Mean waiting time
0-13	132.0	93.2	118
14-28	120.5	195.1	176.5
29-42	121.5	99.9	130
43-57	147.5	146.4	184.3
58-71	206.0	121.9	218.8
72-86	180	137.1	185.8
87-100	112.5	7.77	112.5

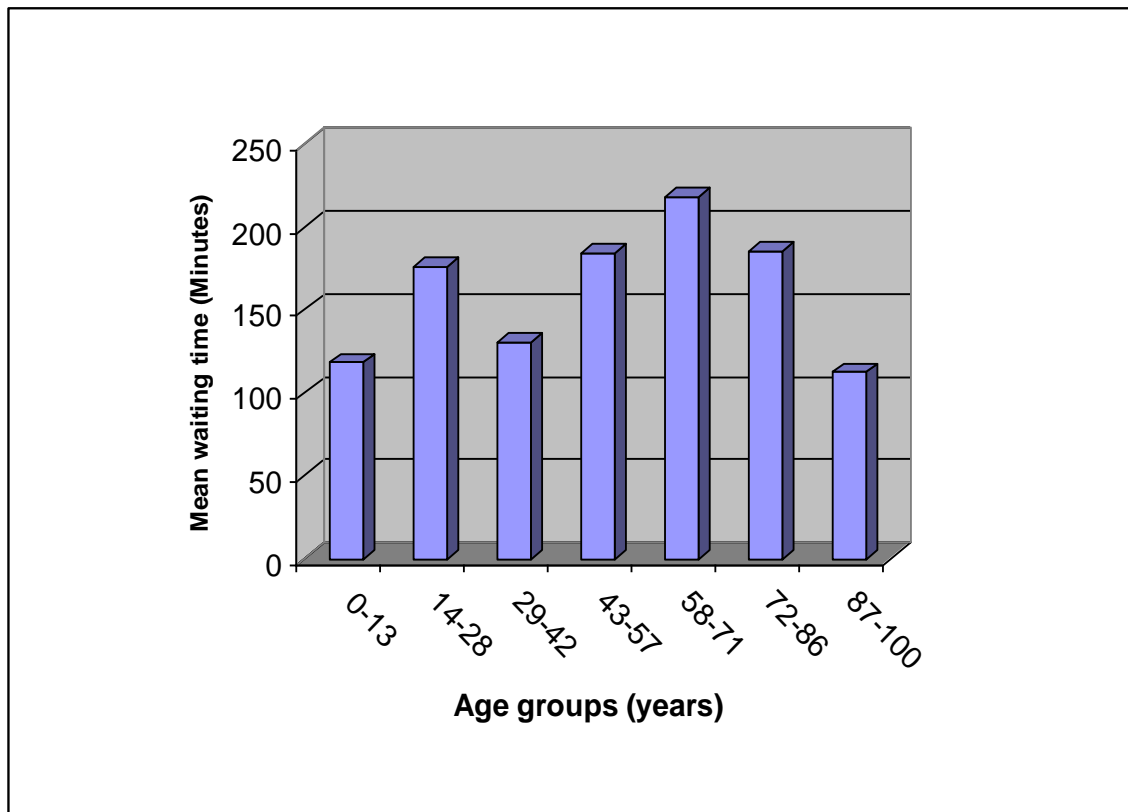


Figure 6: Mean waiting times in Emergency Department by patient's age groups.

Figure 6 shows that the mean waiting time was 132 minutes for patients aged 0-13 years; 120.5 minutes for patients aged 14-28 years; 121.5 minutes for patients aged 29-42; 147.5 min for patients aged 43-57 years; 206 minutes for patients aged 58-71 years; 180 minutes for patients aged 72-86 years and 112.5 minutes for patients aged 87-100 years.

Table VIII: Waiting times in Emergency Department by day of presentation (in minutes)

Day of presentation	Median	Standard deviation	Mean waiting time
Monday	179.0	249.1	254.5
Tuesday	115.5	55.9	118.7
Wednesday	158.0	52.2	166.9
Thursday	154.5	77.5	144.1
Friday	205.5	80.2	164.0

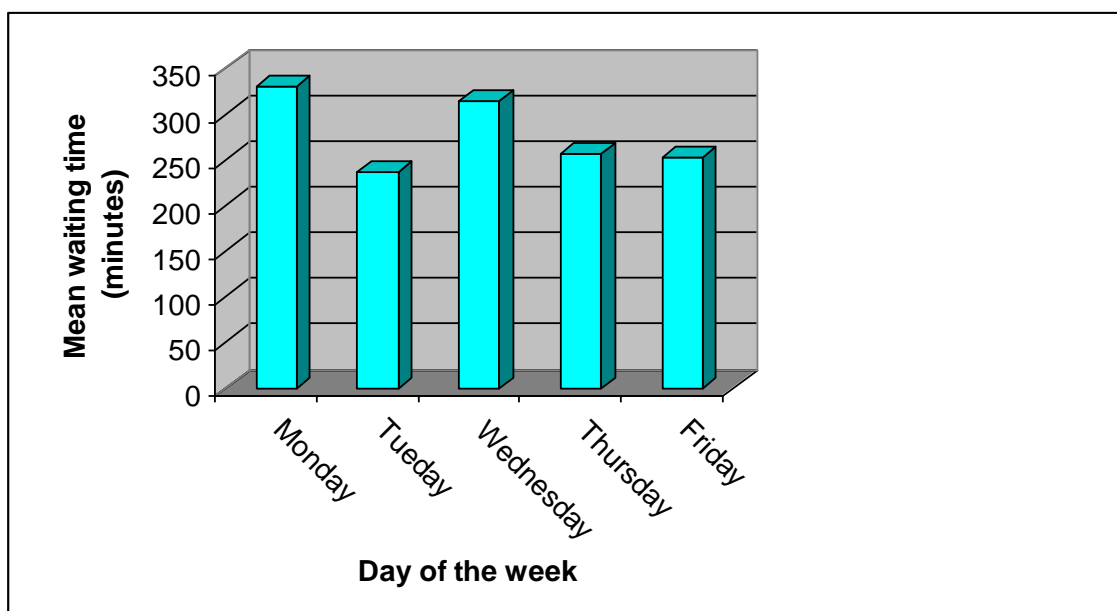


Figure 7: Mean waiting times in Emergency Department by day of presentation (in minutes)

Figure 7 shows that patient's mean waiting time was 254.5 minutes for Monday; 118.7 minutes for Tuesday; 166.9 minutes for Wednesday; 144.1 minutes for Thursday and 164 minutes for Friday.

Table IX: Patient's interaction times at various flow stations in ED (in minutes).

Flow station	Median	Range	Minimum	Maximum	SD	Mean
Registration	2	102	0	102	8.3	3.10
Vital Signs	3	23	0	23	2.3	2.83
History taking	3	930	0	930	75.7	9.11
Time with doctor	6	310	0	310	48.5	21.08
Pharmacy	9	117	0	117	13.9	13.13

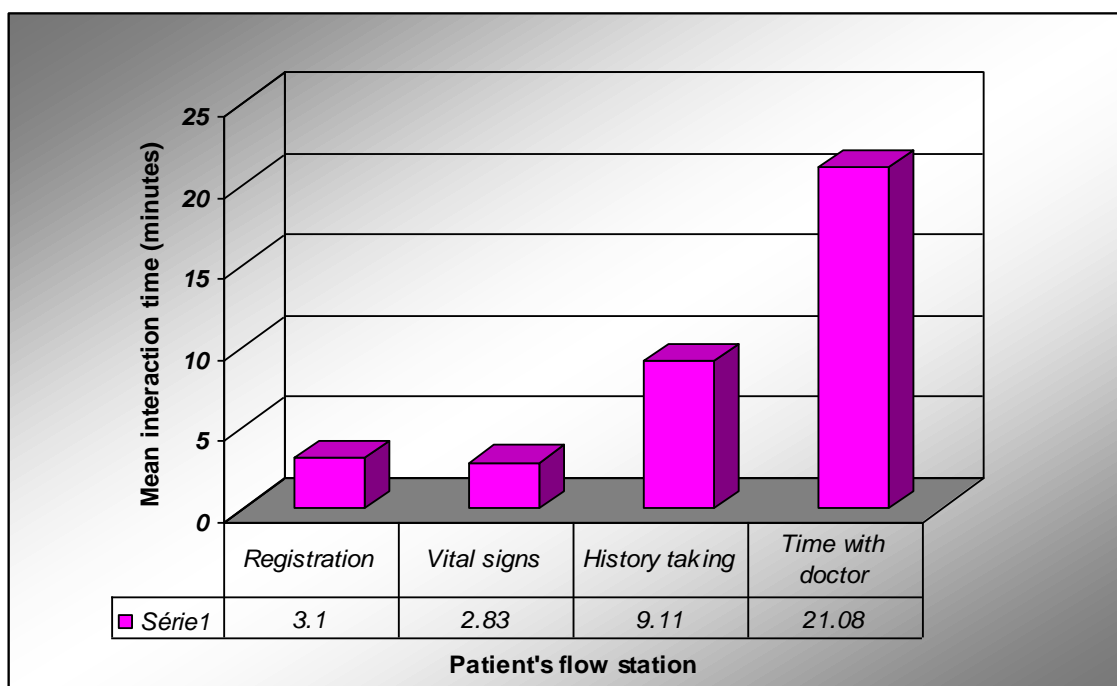
**Figure 8: Patient's mean interaction times at various flow stations (in minutes)**

Figure 8 shows that patient's mean interaction time was 3.1 minutes at Registration station; 2.8 minutes at Vital-Signs station; 9.1 minutes at History-taking station; 21.0 minutes with Doctor and 13.2 minutes at Pharmacy station. Interaction time at pharmacy station is not included in this figure.

Table X: Waiting times of patients at various flow stations in ED (in minutes).

Flow station	Median	Range	Minimum	Maximum	SD	Mean
Waiting Registration	33	304	0	304	66.2	60.4
Waiting Vital Signs	49.5	322	0	322	55.8	57.2
Waiting History taking	12.0	119	0	119	34.55	27.9
Waiting for doctor	111.0	337	0	337	71.0	91.7
Waiting at Pharmacy	24	1305	0	1305	186	73.48

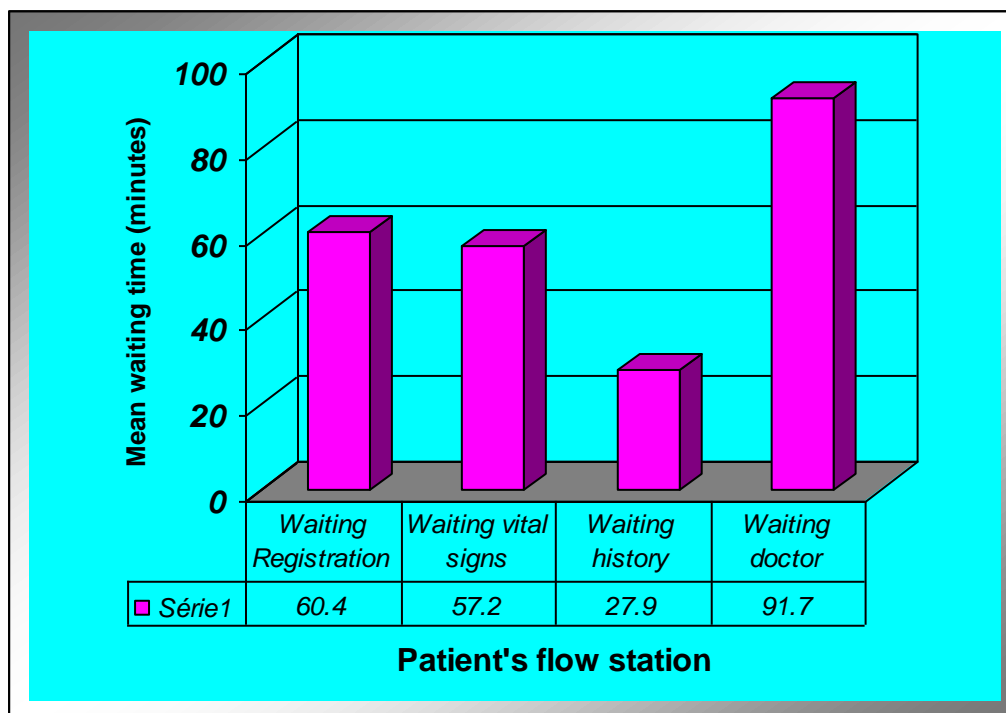
**Figure 9: Mean waiting times of patients at various flow stations in ED (in Minutes).**

Figure 9 shows that patient's mean waiting time was 60.4 minutes at Registration station, 57.2 minutes at Vital-signs station, 27.9 minutes at History-taking station and 91.7 minutes waiting for doctor. Waiting time at pharmacy station is not included in this figure.

Table XI: Emergency Department Waiting time and Length of Stay (in minutes).

Variable	Time(in minutes)
ED Waiting time	252.3
EDLOS	360.0

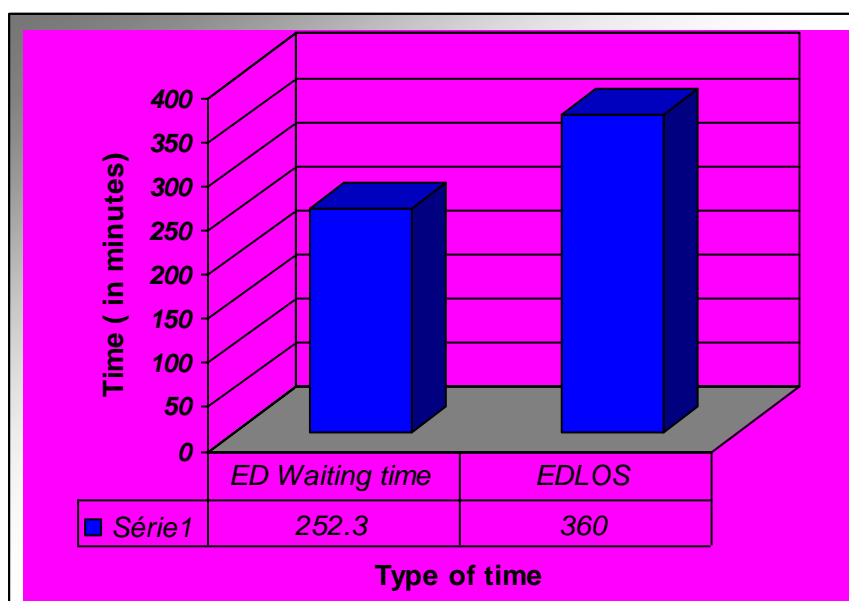
**Figure 10: Waiting time and Length of Stay in Emergency Department (in minutes).**

Figure 10 shows that patient's Emergency Department Waiting time (ED Waiting Time) was 252.3 minutes and patient's Emergency Department Length Of Stay (EDLOS) was 360 minutes.

Chapter V: Discussion

The results of this study will be presented in this chapter under the following headings:

5.1. Characteristics of study patients

5.2. Waiting times and Interaction times

5.3. Effect of Acuity on patient's waiting time in ED

5.4. Effect of Age on patient's waiting time in ED

5.5. Effect of day of attendance on patient's waiting time in ED

5.6. Effect of Delays in Laboratory and Radiology on patient's waiting time

5.7. Summary of discussion

5.1. Characteristics of study patients

5.1.1. Age of Participants

Our results show that the population in the study was predominantly aged 29 to 42 years (28%); with 24% of population aged 43-57 years, and 21.3 %aged 58-71 years. In other words, 73.3 % in total of Saint Rita's Emergency Department users are 29-71 year-old.

Similar findings relating to an elderly population user of Emergency Departments were also reported in a study of waiting and interaction times in Barbados Accident and Emergency Department by Banerjea and Carter (2006).

5.1.2. Gender of participants

In our study, female patients represented 65.3 % of Emergency Department users, whereas male patients represented a proportion of 34.7 %.

Elkum et al. (2009) conducted a study of waiting times in Riyadh Emergency Department, Saudi Arabia. In contrast to our findings, they reported a large proportion of male patients (1024 / 2187) among Emergency Department users, with female patients representing 978 / 2187 of ED users. The difference may probably be explained on a cultural background of Saudi Arabia as a Moslem country.

On the other hand, Banerjea & Carter (2006) reported an equal proportion of male and female among Emergency Department users in their study.

5.1.3. Acuity of participants

Results from this study show that 80 % of participants were low-acuity patients. According to the South African Triage Scale (SATS), these patients are categorized as "Green" patients, meaning Non-urgents, and the SATS target waiting time for these patients is 120 minutes (Gottschalk et al., 2006; Mac Farlane & Naidoo, 2006).

The proportion of 20.7 % of participants in our study were either SATS-Red (5.3%), Orange (6.0 %), or Yellow (9.3 %).

These results relating to large proportion of Non-urgent patients users in Emergency Departments have been reported in numerous international literatures (Burnett and Grover, 1996; Sempere-Selva et al., 2001; Lambe et al., 2003; Abd Elaal and Ibrahim, 2006).

Non-urgent visits have been cited in several literatures as cause of crowding in Emergency Departments (Washington et al., 2002; Diesburg-Stanwood et al., 2004; Afilalo et al., 2004; Abd Elaal and Ibrahim, 2006).

On the other hand, some authors are not of the opinion that Non-urgent patients are the cause of Emergency Departments crowding (Derlet and Richards, 2000; Trzeciak and Rivers, 2003; Schull et al., 2007).

5.1.4. Diagnostic categories

Findings from this study show that Medical category of patients represented the largest proportion of patients attending Saint Rita's ED: 66.7%. General medicine category of patients represented 14%; Psychiatric category of patients represented 7.3% and surgical category of patients represented 5.3% of Saint Rita's ED users.

Paediatrics (4%) reflect only children with acute problem that can not be directed to paediatric clinic. This applies also for Gynaecological patients (0.7%) as in the hospital, each of these specialities run their clinics separately to Emergency Department.

These findings correlate with results from Banerjea and Carter (2006) study where medicine represented the largest proportion of patients (42%) in Accident and Emergency Department, whereas all other specialities had low proportion of ED use.

5.1.5. Patient's disposition in Emergency Department

This study shows that 90% of patients who present in Saint Rita's hospital ED are discharged home. Only 10% qualify for admission.

Banerjea and carter (2006) also reported low proportion of patients admitted among ED users.

5. 2. Waiting times and Interaction times

Findings from this study show that the average patient waited for long period of time for each interaction. However, interaction times were short (Table 2).

Of the total ED Length of Stay (EDLOS) of 397 minutes, 49 minutes (12 %) was interaction time and the rest was waiting time.

No one likes to wait. Long waiting time in ED is associated with dissatisfaction, delay in treatment and adverse outcomes for patients (Trzeciak and Rivers, 2003).

Only 21 minutes (5% of total EDLOS) average was spent with the doctor. The remaining 28 minutes of patient interaction time was spent at registration, vital signs, history taking and other such activities. These activities are unfortunately not valuable for the patient as the main service the patient came to look for is the encounter with the doctor. This is an important potential source of dissatisfaction.

Frequent literature reports on the effects of increased waiting time in EDs show that: long waiting time in ED is bad; short interaction time with doctor in ED is bad, but combination of both is worse.

5.2.1. Triage issue

Results from this study show that patients in ED waited an average two hours before triage: 60 minutes for registration, 3 minutes interaction at registration and 57 minutes waiting for vital signs taking. This is potentially dangerous and negates the basic principal of triage.

Triage as process of sorting out patients on the basis of their acuity and not on the basis of first come first served, triage must quickly process patients into categories so that those who need urgent health care will receive it (CIHI, 2005; Gottschalk et al., 2006).

The South African Triage Scale assigns the following priority groups and targets times: Red: immediate; Orange: within 10 minutes; Yellow: within 60 minutes; Green: within 240 minutes; Blue: dead (Gottschalk et al., 2006).

Saint Rita's hospital is using the SATS in the emergency Department. However, nurses working at triage station are changed on a daily basis. Sometimes, these nurses change more than two times per shift if it happens that the nurse who was allocated at the triage station has to be out for any reason.

This creates a situation where any nurse or enrolled nurse may be asked to fill up the gap. The problem is that those healthcare workers personal are not all trained for triage. Some have attended formal workshop on triage, but several months or years have elapsed. No update courses or workshop plan exist. Therefore, it is not surprising that many patients are kept in a queue for hours jeopardizing the triage system.

One hour or more to wait in a queue as shown in the result of this study is too much, as the condition of the patient can quickly change. A patient who was initially stable can easily become unstable and collapse because of long wait. It is therefore clear that triage issue at Saint Rita's hospital need to be readdressed.

Numerous studies have shown that efficient triage clearly reduces waiting times of patient in Emergency Department (Spaite et al., 2002; Cooke et al., 2002; Ardagh et al., 2002; Vertezi, 2004; Raulf et al., 2006; Bruijns, Wallis & Burch, 2008; Kantonen et al., 2010).

In literature, several strategies have been tried to improve triage process in EDs. Some of these strategies have consisted of:

- A trained nurse at triage (Bruijns, Wallis & Burch, 2008);
- Putting a senior doctor at triage(Travers et al., 2006);
- Having a Fast track unit that quickly processes the low complexity cases. This strategy is used increasingly in different countries. It has proven efficacy by sensibly reducing waiting time in EDs (Levsky et al., 2008).
- “See and treat” strategy for minor injuries (Tessa et al., 2004).

This study did not assess patient satisfaction in Saint Rita’s ED. But as there is an issue of prolonged waiting time in Saint Rita’s ED, this unavoidably brings us to discuss about patient’s dissatisfaction.

Despite the long waiting time that Saint Rita’s ED is experiencing, level of satisfaction is not really bad among patients attending Saint Rita’s ED; according to several audit performed at Saint Rita’s hospital. This may be due to several valuable measures implemented by the Saint Rita’s hospital management in the past years. These measures have been reported in literature (Rauf et al., 2008) to improve patient satisfaction in ED’s. Some of these measures consist of:

- Addressing the waiting time at patient arrival; Announcement of waiting time
- Use of speaker (Rauf et al.,2008)
- Presence of two nurses in the waiting area who address patient’s need frequently and answer to their questions (Arendt et al., 2003; Rauf et al., 2008).

As a consequence of all these measures to improve patient satisfaction at Saint Rita’s Hospital, patients leaving before being seen that is common in many ED’s worldwide (Mohsin et al., 2007) is rare in Saint Rita’s ED.

This low rate of patient leaving without being seen at Saint Rita's hospital ED may also be explained by the fact that, Saint Rita's hospital is in a rural area. Patients do not have alternative place to get medical care.

Local clinics exist in all neighbourhoods of Saint Rita's hospital, but these local clinics have persistently problems of not having drugs in stock to help patients at a primary health care level. Therefore, patients who were supposed to be treated at local clinic are frequently referred to the hospital.

This contrasts to what happens in many hospitals located in urban areas in South Africa as well as internationally. These hospitals in urban areas are having considerable number of patients leaving before being seen by the doctor (Arendt et al., 2003; Goldman et al., 2005; Mohsin et al., 2007; Rauf et al., 2008), because of availability of alternative places where they can receive medical attention more quickly.

5.2.2. Registration issue

Findings in this study show that waiting time for registration is 60 minutes on average with 3 minutes for interaction time.

A similar study of waiting time in developing country ED done in Barbados, in Eastern Caribbean by Banerjea and Carter (2006) showed an interaction time for registration of 1.8 minutes, with waiting time for registration of 18.4 minutes. These results are largely different from what is observed in this study.

Even if Banerjea and Carter (2006) conducted their study in Barbados which is an urban area, whereas St Rita's hospital is in rural area; the cause of huge differences in registration waiting times remains questionable.

Explanation can be found maybe in local and internal issues at Saint Rita's hospital:

1. Registration process

Registration process at Saint Rita's hospital is computerized. This provides advantage of entering quickly patient information for new patients. However, retrieving files for return visit patients is manually done and this is really time-consuming. Another reason for this long waiting time at registration desk is the volume of patients.

2. Volume of patients

The volume of patients presenting in the ED at Saint Rita's hospital is very high in the early morning. Registration desk is processing files not only for patients coming to ED, but also for all other visits in the hospital such as Physiotherapy, Audiologist visits, Psychologist visits, Gynaecology clinic, paediatrics clinic and other services.

Patients come to queue as early as from 6:00 o'clock, but registration desk opens and start processing patient's files at 7:00 o'clock. This creates then a situation where patients have to wait for a long time in a queue to get registered.

As the day goes on, number of patients at registration desk declines and the waiting time for registration improves. It was evidenced from data collected that patients who presented at registration desk after 10:00 AM had very short waiting time for registration. However, these patients waited very long to get triaged. Further more, if these late coming patients were triaged as green, they had also to wait very long to be seen by the doctor. This explains why some of patients where found to have ED waiting time of 5 to 6 hours (Data not shown).

Number of clerks at registration desk is another reason to explain long waiting time at this station.

3. Clerks number

When the gate for registration opens at 7:00 o'clock, it has been found that for some hours, the number of clerks at registration desk was not enough to deal with the great volume of patients at that peak hour.

Insufficient number of clerical staff and shortage of administrative personal has been reported in literature as one of the factor contributing to increase waiting time (Derlet and Richard, 2000). These workers are very important for patient flow.

Results in this study show that interaction time at registration is very short (3 min average) while the waiting time at this same station is too long. Explanation to this is that, it takes very long time to retrieve manually old file. Initially, when patients come in at registration desk, their appointment cards are collected. Two clerks collect a set of 15 to 20 appointment cards and go to retrieve manually files for these patients.

Once patient's file has been retrieved, patient is called at the registration desk and the remaining information is processed on computer, making therefore the interaction time very short.

5.2.3. Waiting to see the doctor after triage

Findings in this study show that after completion of triage, there is an average waiting time of 91.7 minutes to be seen by the doctor. This waiting time is an addition to time that patient has already spent waiting for registration (60.04 min), waiting for vitals (57.2 min), and waiting for history taking (27.93 min).

Similar finding was reported by Banerjea and Carter (2006) in developing countries like Barbados. Banerjea and Carter (2006) reported that after triage, patients had to wait 92.5 minutes for cubicle.

In the situation of Saint Rita's ED, this high waiting time after completion of triage is multifactorial. Some of these factors are presented below.

1. Complexity of patient problems being attended by the doctor. Some patients require more time than others. Patients requiring admission for example require a number of paper work filling and a proper clerking. Most of the time the doctor is the only one who has to fill all these papers, in addition of clerking readably. As all this information for patient is manually entered, a lot of time is required. This will delay the processing of the queue and, this will result in a crowding in ED.

Literature support that complexity of patient problems and acuity as factor causing increased waiting time in EDs (Derlet and Richard, 2000; Hoot and Aronsky, 2008). With a large proportion of the population aging, having chronic diseases and comorbidity; evaluation process of this kind of patient becomes time consuming (Derlet and Richard, 2000).

2. Doctor performing procedures in his consultation room.

There is no procedure room in Saint Rita's ED. Doctors are requested to perform all the procedures in their respective consultation rooms. These procedures may be one of the following: intravenous cannulation, blood sampling, wound suturing, wound dressing, Foley catheter change or insertion, ect. All these procedures are time-consuming and are not planned in advance. This means that, doctor doesn't know which case is next or which problem the next coming in patient is bringing in. One of the common scenarios is that three consecutive patients may need procedures that take 30 to 40 minutes each. Therefore, that doctor is stuck for the next 2 hours just with three patients. With this scenario, the queue quickly increases; crowding occurs; dissatisfaction among patients is generated; stress among nurses and doctor increases; and the risk of violence in the Emergency Department is increased.

It has been reported in literature that waiting time can be reduced significantly, if there is a procedure room with a nurse doing minor procedures (Raulf et al., 2008).

3. The number of doctors on duty is another factor contributing to increased waiting time for patient before being seen by the doctor. During our study period, the ED was functioning with three doctors on duty. Among these three doctors on duty, one is allocated on daily basis to deal with unstable patients. This doctor works in so called “Resuscitation room”. Occasionally when there are no unstable patients; he attends to stable patients.

For an average of 120 patients per day in ED, a number of three doctors on duty seem reasonable in the South African context of public sector. In addition, if applying Family Medicine principal of Patient Centred Care (Mash, 2005); each patient being given 10 to 15 minutes, 3 doctors will reasonably handle an average of 120 patients per day. However with the complexity of patient problems and doctors performing at the same time all minor procedures, this number of doctors becomes insufficient to avoid overcrowding in ED.

The Literature reports that the number of doctors and nurses on duty play an important role in reducing patient’s waiting time in Emergency Departments (Derlet and Richard, 2008; Hoot and Aronsky, 2008; Raulf et al., 2008).

5.3. Effect of Acuity on patient’s waiting time in ED

5.3.1. Low-Acuity patients in ED

Results in this study show that 80% of Saint Rita’s ED users are SATS green cases, meaning non-urgent cases.

These results are similar to the findings in a study on waiting time conducted in Khartoum State (Abd Elaal and Ibrahim, 2006) where 77% of ED users were found to be Cold cases and 23% Hot cases. This may reflect the reality in developing countries.

In Canada, a survey of ED users from 2003-2004 found that cold cases represented only 54% of ED users with 46% Hot cases (CIHI., 2005).

Numerous studies in literature have documented non-urgent visits in ED as cause of crowding (Burnet and Grover, 1996; Sempere-Selva et al., 2001; Washington et al., 2004; Afilalo et al., 2004; Abd Elaal and Ibrahim, 2006).

On the other hand, some studies advocates that non-urgent visits in ED are not cause of ED crowding (Derlet and Richards, 2000; Gordon et al., 2001; Trzeciak and Rivers, 2003; Schull, Kiss & Szalai, 2007). These authors claim that overcrowding of the triage area (waiting room), must be differentiated from crowding of the treatment areas. Non-urgent patients cause crowded waiting room areas but do not cause crowding in the ED treatment areas, because highest acuity patients are always brought into the treatment areas first (Derlet and Richard, 2000).

According to (Schull, Kiss & Szalai, 2007), low complexity patients in Emergency Department are associated with a negligible increase in ED Length of Stay and time to first physician contact for other Emergency Department patients. Reducing the number of low-complexity Emergency Department patients is unlikely to reduce waiting time for other patients or crowding (Schull, Kiss & Szalai, 2007).

For these authors, the most important cause of ED crowding is boarding of patients (Derlet and Richard, 2008). According to these authors, the issue of non-urgent patients is debated in the context of Emergency Department volume, but if the problem of crowding is due to admitted patients, then non-urgent patients are less of an issue with respect to overcrowding of EDs.

5. 3.2. Boarding of ED

Boarding of ED occurs when the average hospital bed occupancy remains at or above 90% of capacity resulting in an inpatient bed shortage. Therefore, EDs are forced to hold patients in ED for several hours until inpatient bed becomes available (Derlet and Richards, 2000; Gordon et al., 2001; Trzeciak and Rivers, 2003).

Boarding causes Emergency Departments to be filled beyond capacity with the highest acuity patients (Trzeciak and Rivers, 2003). The Emergency Department is neither designed nor equipped to provide longitudinal care.

In addition, patient safety may be compromised when there is not enough staffing in Emergency Department to give a severely ill patient undivided attention over a long period of time. These severely ill patients may be so labour intensive that others ED patients cannot receive the necessary attention from emergency department staff (Trzeciak and Rivers, 2003).

At Saint Rita's hospital, non-urgent visits in Emergency Department are different from what is said in above literature. Non-urgent visits which represent 79.3% of our ED users are indeed cause of crowding in Saint Rita's Emergency Department.

Trzeciak & Rivers (2003) and Derlet & Richard (2000)'s idea of Non-urgent patients causing overcrowding is in the past, at Saint Rita's hospital, this is a fact in the present.

Some local factors can explain this fact:

1. Non-urgent patients in Saint Rita's Hospital ED use the same area as those who are severely ill. This contrast to what is described in literature (Derlet and Richard, 2000) where waiting room area is used by non-urgent patients, and treatment area by severely ill patients.

There is a problem of physical space in the Saint Rita's facility. Casualty and OPD (Outpatient) are mixed together.

2. Saint Rita's hospital doesn't have problem of boarding of patients in our ED. Therefore, crowding when it happens in our ED is from patients being attended to at that particular moment.

In addition, statistics at Saint Rita's hospital show that our hospital bed occupancy is always below 70%; making Saint Rita's to be far from a situation of boarding, which occurs when hospital bed occupancy is or remains above 90% (Trzeciak and Rivers, 2003).

On the other hand, one can say that Non-urgent patients (SATS-Green patients), especially at Saint Rita's hospital are victims of prolonged waiting time and appear to be wrong persons, at wrong place, and often at wrong time. They appear to be wrong persons because they are not urgent. They are at a wrong place because ED is for people who really need urgent medical care. They are often present at wrong time because when ever happen a disaster like MVA (Motor Vehicle Accident), they are left unattended.

Non-urgent patients may be easily seen at Primary Health Care or at the local clinics. Good utilisation of PHC will allow for optimal care of hot cases in Emergency Departments, and this will result in a shorter waiting time and better quality of health services. Several studies in literature support need of directing non-urgent patients to Primary Health Care or local Clinics (Burnett and Grover, 1996; Sempere-Selva et al., 2001; Washington et al., 2002; Abd Elaal and Ibrahim, 2006).

Opinions about the appropriateness of non-urgent patients in Emergency department have been widely divergent in the literature. Trzeciak and Rivers (2003) have mentioned that High subsequent hospitalisations rates have been reported for patients who were initially denied Emergency Department care. Trying to prospectively determine the appropriateness of an ED visit is considered a risky practice (Trzeciak and Rivers, 2003).

5.3.3. High acuity patients in ED

Several studies in literature have demonstrated that waiting time in Emergency Department strongly correlates with acuity of patient's condition (Derlet and Richard, 2000; Hoot et al., 2008; Elkhum et al., 2009; Arkun et al., 2010).

This was also situation in this study; patients with high acuity had a short waiting time, but they spent more long time with the doctor.

5.4. Effect of Age on patient's waiting time in ED

Results from this study show that 0 to 13 year-old patients have the shortest mean waiting time (118 minutes), where as 58 to 71 year-old patients have the longest mean waiting time (218 minutes).

These findings correlate with what is described in literature: Aging population have increased prevalence of high complexity medical problems (Derlet and Richard, 2000 Trzeciak and Rivers, 2003; Lambe et al., 2003; Hoot and Aronsky, 2008; Elkum et al., 2009).

In similar study in Barbados, Banerjea and Carter (2006) found that Paediatrics patients 0-11 years had the shortest waiting time and Length of Stay (235 minutes) in ED, where as older patients more then 50 years had the highest Length of Stay in ED (448 minutes).

Elkum et al. (2009) in Saudi Arabia had similar findings. Age was among factors associated significantly with waiting time in ED. Patients aged more then 65 years waited longer (45 minutes) before being seen, where as paediatric patients 0-14 years were seen the quickest (Median Waiting time: 31 minutes).

Findings from this study differ slightly with what is described in literature. These results show that patients aged 87-100 years have a waiting time similar to patients 0-13 years. Possibly meaning that those extremities of life have almost the same waiting time.

Explanation to this may be that these very old patients are no more independent. They are brought in hospital by relatives (Guardians) who are young adults for a precise reason of

consultation. Just like those aged 0-13 years who are also brought in ED for a fixed reason of consultation. These two categories of patient are unable to express themselves their needs; therefore, complaints presented by guardians for them are short and limited, thus reducing complexity of case and the waiting time becomes also short.

5.5. Effect of day of attendance on patient's waiting time in ED

Results from this study show that waiting time fluctuates according to the day of the week. Monday had the longest mean waiting time (254 minutes); Tuesday had the shortest mean waiting time (118minutes).

These results correlate with the literature (CIHI, 2005; Hoot and Aronsky, 2008; Elkum et al., 2009). Elkum et al (2009) found that patients attended in ED on Sunday had the longest waiting time and Tuesday the shortest waiting time.

A study done in Alberta, Canada found also that ED waiting time was higher on Sunday and holidays (CIHI., 2005).

In contrast, in both UK and USA, Mondays were reported to be the busiest day of the week (Lambe et al., 2003; CIHI., 2005).

Arkun et al. (2010) conducted also a study about Factors Influencing flow in ED; they also found that the day of the week correlates with fluctuations in door to door time, with Monday having the highest waiting time.

This general spike in patient visits on Monday could be attributed to patients who wait over the weekend to see their primary health care or local clinics for an urgent condition and are therefore referred to the Emergency Department.

5.6. Effect of Delays in Laboratory and Radiology on patient's waiting time in ED

Research has cited laboratory and radiology delays as one of the causes of increased waiting time in EDs. Delays from these two services have been included in the list of “Bottleneck” culprits in EDs. The bottleneck effect refers to areas of low patients flow in Emergency Departments (Arkun et al., 2010).

In this study however, we could not confirm this bottleneck effect from radiology service or laboratory. The reason for this is that, during the study period, very few patients had to wait for laboratory result before admission, and very few patients had to get X-rays before getting decision on their final disposition for admission or discharge.

Other reasons are that:

1. Radiology Department at Saint Rita's hospital is located in the area of Emergency Department. Most of the time, patients are served very quickly without delay. In addition, radiology department is equipped with a mobile X-Ray machine which is used for fast response when they are called for any patient that can not be moved safely from Resuscitation room.
2. The laboratory in contrast is located out and far from Emergency Department. Laboratory results most of the time; it takes too long to come even ordered as urgent. For this reason, as the space in Emergency Department is very limited and the turn over for resuscitation room is high, samples for laboratory are taken, sent to laboratory, but results will be available in the ward. If the patient doesn't qualify for admission, the laboratory result will be given to him at a subsequent visit.

5.7. Summary of discussion

Saint Rita's hospital Emergency Department users are predominantly non-urgent patients. These patients create overcrowding for patients who really need urgent care. Appropriateness of referrals from Primary Health Care and local clinics is challenged.

Only 10 % of Saint Rita's Emergency Department users qualify for admission.

Medical category patients represent the biggest proportion of Emergency Department users.

Emergency Department waiting time for unstable patients is zero, meaning that SATS target for this category of patients has been reached. However, Saint Rita's hospital Emergency Department is struggling to reach the target waiting time for stable patients.

Results from this study correlate with the literature about variation of waiting time in term of patient's age and the day of attendance.

At the best of my knowledge, this is the first study of its kind at Saint Rita's Hospital and it serves as a point for further studies in Emergency Department for better decision making of the health care system in South Africa particularly, but also in other developing countries.

Chapter VI: Conclusion and Recommendations

This chapter will describe some Conclusions and recommendations from this survey taking into cognizance the results and discussion above. The following headings will be discussed.

6. 1. Conclusion

6.2. Recommendations

6. 1. Conclusion

Overcrowding and prolonged waiting time of hospitals Emergency Departments represent an international crisis. This is also the situation for Saint Rita's hospital Emergency Department. Prolonged waiting time in Emergency Department has dramatic consequences on patient's health.

Numerous adverse effects of crowding in ED are documented: patient dissatisfaction, patients leaving without being seen, delay in treatment, adverse outcome, increased complaints, and increased pressure on health care worker.

Saint Rita's hospital Emergency Department meets the South African Triage Scale target for stable patient's waiting time. However Saint Rita's ED is struggling with the problem of waiting time for stable patients which represent 80% of emergency department users.

Registration process and triage have been identified as areas of inefficient patient flow. Recommendations for solving the problem of waiting time in Saint Rita's ED have been formulated.

6.2. Recommendations

1. There is a need at Saint Rita's hospital to separate Casualty and OPD (Outpatient Department) as 79% of Saint Rita's ED users are non-urgent patients. Management at Saint Rita's hospital are urged to make this happen in order to avoid unnecessary crowding of treatment area for those who really need urgent care.
2. Registration reorganisation is needed at Saint Rita's hospital. It is important to make sure that there is enough clerks at registration desk during peak hours when greater number of patient are in the ED; mainly early morning at the beginning of shift.
3. Update courses and workshops on triage to be regularly offered at Saint Rita's hospital.
4. A procedure room in the Saint Rita's Emergency Department is needed. Literature has documented that minor procedures such as intravenous cannulation and minor suturing can be performed by trained nurses (Rauf et al., 2008).
5. Require adequate number of nurses and doctors, especially, at peak hours in the Emergency Department.
6. Regular follow up is needed for all measures implemented to ensure their effectiveness in reducing waiting time in ED, since waiting time in Emergency Department is dynamic.

References

- Abd Elaal S AM and Ibrahim Y A. The waiting time at Emergency Departments at Khartoum State-2005. *SJPH* 2006; 1:2.
- Afilalo J, Marinovich A, Afilalo M, Colacone A, Léger R, Unger B, Giguère C: Nonurgent emergency department patient characteristics and barriers to primary care. *Acad Emerg Med*. 2004; 11:1302-1310.
- Anderson R, Camacho F T, Balkrishnan R. Willing to wait? The influences of patient wait time on satisfaction with primary care. *BMC Health Services Research* 2007, 7:31.
- Ardagh M W, Wells JE, Cooper K, Lyons R, Patterson R, O'Donovan P. Effect of a rapid assessment clinic on the waiting time to be seen by a doctor and the time spent in the department, for patients presenting to an urban emergency department: a controlled prospective trial. *N Z Med J*. 2002; 115:1-7.
- Arkun A, Briggs W M, Patel S, Datillo P A, Bove J, Birkhahn R H. Emergency Department Crowding: Factors Influencing Flow. *West J Emerg Med*. 2010; 11(1):10-15.
- Arendt K W, Sadosty A T, Weaver A L, Brent CR, Boie ET. The left-without-being-seen patients: what would keep them from leaving? *Ann Emerg Med* 2003; 42:317–23.
- Asplin BR, Magid DJ, Rhodes KV, Solberg LI, Lurie N, Camargo CA Jr. A conceptual model of emergency department crowding. *Ann Emerg Med*. 2003; 42: 173-180.
- Baker DW, Stevens CD, Brook RH. Patients who leave a public hospital emergency department without being seen by a physician. Causes and consequences. *JAMA*.1991; 266:1085-1090.

- Banerjea K, Carter AO. Waiting and interaction times for patients in a developing country accident and emergency department. *Emerg Med J* 2006; 23:286–90.

- Bazarian JJ, Schneider SM, Newman VJ, Chodosh J. Do admitted patients held in the emergency department impact the throughput of treat-and-release patients? *Acad Emerg Med*.1996; 3:1113-1118.

- Bindman AB, Grumbach K, Keane D, Rauch L, Luce JM. Consequences of queuing for care at a public hospital emergency department. *JAMA*. 1991; 266:1091-1096.

- Blagg CR. Triage: Napoleon to the present day. *J Nephrol* 2004; 17:629–32.

- Bucheli B, Martina B. Reduced length of stay in medical emergency department patients: a prospective controlled study on emergency physician staffing. *Eur J Emerg Med*. 2004; 11:29-34.

- Burnett M G, Grover S A. Use of the emergency department for nonurgent care during regular business hours. *CMAJ*. 1996; 154: 1345-1351.

- Bruijns S R, Wallis L A, Burch V C. Effect of introduction of nurse triage on waiting times in a South African emergency department. *Emerg Med J* 2008; 25:395–397.

- Cameron P, Scown P, Campbell D. Managing access block. *Aust Health Rev*. 2002; 25:59-68.

- Canadian institute for health information. Understanding Emergency Department waiting times. Who is using Emergency Departments and how long are they waiting? (Ottawa CIHI, 2005).

- Chan TC; Killeen JP; Kelly D; Guss DA. Impact of rapid entry and accelerated care at triage on reducing emergency department patient wait times, lengths of stay, and rate of left without being seen. *Ann Emerg Med*. 2005; 46(6):491-7

- Cooke MW, Wilson S, Pearson S. The effect of a separate stream for minor injuries on accident and emergency department waiting times. *Emerg Med J* 2002; 19:28–30.
- Corbett SW, White PD, Wittlake WA. Benefits of informational videotape for emergency department patients. *Am J Emerg Med* 2000; 18:67–71.
- Diesburg-Stanwood A, Scott J, Oman K, Whitehill C. Nonemergent ED patients referred to community resources after medical screening examination: characteristics, medical condition after 72 hours, and use of follow-up services. *J Emerg Nurs*. 2004; 30:312-317.
- Derlet RW, Nishio D, Cole LM, Sylvia J Jr. Triage of patients out of the emergency department: three-year experience. *Am J Emerg Med*. 1992; 10:195-199.
- Derlet RW, Richards JR. Overcrowding in the nation's emergency departments: complex causes and disturbing effects. *Ann Emerg Med* 2000; 35:63–8.
- Derlet RW. Overcrowding in emergency departments: increased demand and decreased capacity. *Ann Emerg Med* 2002; 39:430–2.
- Derlet RW, Richards JR. Ten solutions for Emergency Department crowding. *West J Emerg Med*. 2008 January; 9(1): 24–27.
- Donald KJ, Smith AN, Doherty S, Sundararajan V. Effect of an on-site emergency physician in a rural emergency department at night. *Rural Remote Health*. 2005; 5:380.
- Dunn R. Reduced access block causes shorter emergency department waiting times: an historical control observational study. *Emerg Med (Fremantle)*. 2003;15:232-238.

- Elkum N, Fahim M L, Shoukril M, Madouj A A. Which patients wait longer to be seen and when? A waiting time study in the emergency department. *La Revue de Santé de la Méditerranée orientale*, Vol. 15, N° 2, 2009.

- Fatovich DM, Nagree Y, Sprivulis P. Access block causes emergency department crowding and ambulance diversion in Perth, Western Australia. *Emerg Med J*. 2005; 22:351–354.

- Fee C, Weber E J, Maak C A, Bacchetti P. Effect of Emergency Department Crowding on Time to Antibiotics in Patients Admitted With Community-Acquired Pneumonia. *Ann Emerg Med*. 2007; 20:30.

- Feferman I., Cornell C. How we solved the overcrowding problem in our emergency department. *CMAJ*, VOL. 140, Feb. 1, 1989.

- Goldman RD, Macpherson A, Schuh S, Mulligan C, Pirie J. Patients who leave the pediatric emergency department without being seen: a case-control study. *Can Med Assoc J* 2005; 172:39–43.

- Goodacre S, Webster A. Who waits longest in the emergency department and who leaves without being seen? *Emergency medicine journal*, 2005, 22(2):93–6.

- Gottschalk SB, Wood D, DeVries S, Wallis LA, Bruijns S. The Cape triage score: A new triage system in South Africa. Proposal from the Cape triage group. *Emerg Med J* 2006; 23:149-53.

- Grumbach K, Keane D, Bindman A. Primary care and public emergency department overcrowding. *Am J Public Health*. 1993; 83:372-378.

- Hansagi H, Carlsson B, Brismar B. The urgency of care need and patient satisfaction at a hospital emergency department. *Health Care Manage Rev* 1992; 17:71–5.

- Harwood G. Emergency Department Overcrowding. Honourable Mention – 2006 SDL Paper Award. October 7, 2005.
- Hoot N R, Aronsky D. Systematic Review of Emergency Department Crowding: Causes, Effects, and Solutions. *Ann Emerg Med.* 2008; 52:126-136.
- Hwang U, Richardson LD, Sonuyi TO, Morrison RS. The effect of emergency department crowding on the management of pain in older adults with hip fracture. *J Am Geriatr Soc.* 2006; 54:270-275.
- Kantonen J, Kaartinen J, Mattila J, Menezes R, Malmila M, castren M, Kauppila T. Impact of the ABCDE triage on the number of patient visits to the emergency department. *BMC Emergency Medicine* 2010, 10:12.
- Kelen GD, Scheulen JJ, Hill PM. Effect of an emergency department (ED) managed acute care unit on ED overcrowding and emergency medical services diversion. *Acad Emerg Med.* 2001; 8:1095-1100.
- Kolb E M W, Schoening S, Peck J, Lee T. Reducing Emergency Department overcrowding. Five patient buffer concepts in comparison. Proceeding of the Winter simulation conference 2008.
- Krishell S, Baraff LJ. Effect of emergency department information on patient satisfaction. *Ann Emerg Med* 1993; 22:568–72.
- Kyriacou DN, Ricketts V, Dyne PL, McCollough MD, Talan DA. A 5-year time study analysis of emergency department patient care efficiency. *Ann Emerg Med.* 1999; 34: 326-335.

- Lambe S, Washington DL, Fink A, Laouri M, Liu H, Scura Fosse J, Brook RH, Asch SM. Waiting times in California's emergency departments. *Ann Emerg Med.* 2003; 41: 35-44.
- Mac Farlane C, Naidoo S. Triage in South African hospitals. *S Afr Med J* 2006; 96 (7): 570-1.
- Mash B. *Handbook of Family Medicine.* Fifth Ed. Oxford South Africa, 2005: 42.

- McCarthy M L, Zeger SL, Ding R, Levin S R, Desmond J S, Lee J, Aronsky D. Crowding Delays Treatment and Lengthens Emergency Department Length of Stay, Even Among High Acuity Patients. *Ann Emerg Med.* 2009; 54:492-503.
- McCarthy ML, Zeger SL, Ding R, Aronsky D, Hoot N R, Kelen G D. The challenge of predicting demand for emergency department services. *Acad Emerg Med.* 2008; 15:337-346.
- Miro O, Antonio MT, Jimenez S, Dios D A, Sanchez M, Borrás A, Milla J. Decreased health care quality associated with emergency department overcrowding. *Eur J Emerg Med.* 1999; 6:105-107.
- Mohsin M, Forero R, Ieraci S, Bauman AE, Young L, Santiano N. A population follow-up study of patients who left an emergency department without being seen by a medical officer. *Emerg Med J* 2007; 24:175–179.

- Muro J., Mason S, Nicholl J. Effectiveness of measures to reduce emergency department waiting times: a natural experiment. *Emerg Med J* 2006; 23:35–39.

- Pines JM, Hollander JE. Emergency department crowding is associated with poor care for patients with severe pain. *Ann Emerg Med.* 2008; 51:1-5.

- Potisek NM, Malone RM, Shilliday BB, Ives TJ, Chelminski PR, DeWalt DA and Pignone MP. Use of patient flow analysis to improve patient visit efficiency by decreasing waiting time in a primary care-based disease management programs for anticoagulation and chronic pain: a quality improvement study. *BMC Health Services Research* 2007; 7:8.

- Rauf W, Blitz JJ, Geyser MM and Rauf A. Quality improvement cycles that reduced waiting times at Tshwane District Hospital Emergency Department. *SA Fam Pract* 2008; 50(6): 43.
- Richardson DB. Increase in patient mortality at 10 days associated with emergency department overcrowding. *Med J Aust.* 2006; 184:213-216.
- Ross MA, Naylor S, Compton S, Gibb KA, Wilson AG. Maximizing use of the emergency department observation unit: a novel hybrid design. *Ann Emerg Med.* 2001; 37:267-274.
- Rowe BH, Channan P, Bullard M, Bltiz S, Saunders D, Rosychuk RJ, Lari H, Craig WR, Holroyd BR. Characteristics of patients who leave emergency departments without being seen. *Acad Emerg Med.* 2006; 13:848-852.
- Schneider SM, Gallery ME, Schafermeyer R, Zwemer FL. Emergency department crowding: a point in time. *Ann Emerg Med.* 2003; 42: 167-172.
- Schull MJ, Kiss A, Szalai JP. The effect of low-complexity patients on emergency department waiting times. *Ann Emerg Med.* 2007; 49:257-264.
- Schull MJ, Vermeulen M, Slaughter G, Morrison L, Daly P. Emergency department crowding and thrombolysis delays in acute myocardial infarction. *Ann Emerg Med.* 2004; 44:577-585.
- Schwab RA. Emergency department customer satisfaction: the point of view paradox. *Ann Emerg Med* 2000; 35: 499–501.
- Sempere-Selva T, Peiro S, Sendra-Pina P, Martinez-Espin C, Lopez-Aguilera I. Inappropriate use of an accident and emergency department: magnitude, associated factors, and reasons: an approach with explicit criteria. *Ann Emerg Med.* 2001; 37: 568-579.

- Shaw KN, Lavelle JM. VESAS: a solution to seasonal fluctuations in emergency department census. *Ann Emerg Med*. 1998; 32:698-702.

- Shute N, Marcus MB. Code blue: crisis in the ER. *US News and World Report*. September 10, 2001:54-61, 64, 66.

- Shute N, Marcus M. Crisis in the ER. *US News and World Report*. 2001; 10:54-61.

- Spaite DW, Bartholomeaux F, Guisto J, Lindberg E, Hull B, Eyherabide A, Lanyon S, Criss EA, Valenzuela TD, Conroy C. Rapid process redesign in a university-based emergency department : Decreasing waiting time intervals and improving patient satisfaction. *Ann Emerg Med* 2002 Feb; 39(2):168-77.

- Sprivulis PC, Da Silva JA, Jacobs IG, Frazer A, Jelinek GA. The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments. *Med J Aust*. 2006; 184:208-212.

- Sun BC, Adams J, Orav EJ, Rucker DW, Brennan TA, Burstin HR. Determinants of patient satisfaction and willingness to return with emergency care. *Ann Emerg Med* 2000; 35:426-34.

- Taylor C, Bengner JR. Patient satisfaction in emergency medicine. *Emerg Med J* 2004; 21:528-532.

- Thompson D, Yamold PR, Williams DR, Adams SL. Effects of actual waiting time, information delivery and expressive quality on patient satisfaction in the emergency department. *Ann Emerg Med* 1996. Dec; 28(6):657-65.

- Thompson DA, Yarnold PR, Adams SL, Spacone AB. How accurate are waiting time perceptions of patients in the emergency department? *Ann Emerg Med.* 1996; 28:652-656.
- Toma G, Triner W, McNutt L. Patient Satisfaction as a Function of Emergency Department Previsit Expectations. *Ann Emerg Med.* 2009; 54:360-367.
- Travers JP, Lee FC, Travers J, Lee F. Avoiding prolonged waiting time during busy periods in the emergency department: Is there a role for the senior emergency physician in triage? *Eur J Emerg Med* 2006 Dec;13(6):342-8
- Trzeciak S, Rivers EP. Emergency department overcrowding in the United States: an emerging threat to patient safety and public health. *Emerg Med J.* 2003(5); 20:402-5.
- Vertesi L. Does the Canadian Emergency Department Triage and Acuity Scale identify non urgent patients who can be triaged away from the emergency department? *Can J Emerg Med.* 2004; 6: 337-342.
- Washington DL, Stevens CD, Shekelle PG, Henneman PL, Brook RH. Next-day care for emergency department users with nonacute conditions. A randomized, controlled trial. *Ann Intern Med.* 2002; 137: 707- 714.
- Waseem M, Ravi L, Radeos M, Ganti S. Parental perception of waiting time and its influence on parental satisfaction in an urban pediatric emergency department: Are parents accurate in determining waiting time? *South Med J* 2003; 96(9):880–3.
- Yamane K. Hospital Emergency Departments: Crowded Conditions Vary Among Hospitals and Communities. Washington, DC: US General Accounting Office; 2003.

Annexures:

1. Clearance certificate MEDUNSA Research & Ethics Committee.
2. Department of Health and Social Development, Limpopo Province Authorization.
3. Approved research protocol and consent forms.