

**An audit of the workload of an Acute Care Surgery Unit in a  
Tertiary Academic Hospital before and after the closure of a  
referring Community Hospital**

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## **Table of contents**

<b>Chapter 1: Research Proposal</b>	<b>Page 1</b>
<b>Chapter 2: Literature Review</b>	<b>Page 5</b>
<b>Chapter 3: Study, Results and Discussion</b>	<b>Page 25</b>

# **Chapter 1**

## ***Research Proposal***

# **An audit of the workload of an Acute Care Surgery Unit in a Tertiary Academic Hospital before and after the closure of a referring Community Hospital**

## **Aim**

An audit of the workload of an Acute Care Surgery Unit in a Tertiary Academic Hospital and an assessment of the impact on this Unit by the closure of a busy Community Hospital.

## **Background**

The primary mission of the Acute Care Surgery service is to provide timely surgical assessment, operative and/or non-operative management of the acutely ill non-trauma surgical patient.

Both locally and internationally, fewer surgeons are perusing general practice, opting instead for subspecialty training, with no or only minimal time spent in emergency surgical care. This is demonstrated for example by evidence that some colorectal surgeons refer diseases of the appendix to the general surgeon, reflecting the narrow point of care that is being practiced in certain fields of surgery. In many cases acute care surgery has been described as a multidisciplinary approach involving Emergency and Trauma Surgery, and Critical Care Medicine.(1-3)

In South Africa the rules and regulation by the Health Professions Council stipulates the requirement of training and qualifying as a General Surgeon, before pursuing Fellowship training in a field of subspeciality. As treatment paradigms shift and surgical emergency disease management evolves, we need properly trained surgeons that are

willing to pursue the optimal emergency care (surgical or non-operative) for specific conditions in patients presenting with these acute surgical emergencies.(2,4)

Groote Schuur Hospital (GSH) is privileged in its provision of an Acute Care Surgical Unit (ACSU) that functions in a tertiary environment and is affiliated with the University of Cape Town (UCT), the leading ranked University on the African Continent.

The ACSU in GSH has 28 dedicated beds, and functions as a secondary and tertiary level General Surgery Unit excluding all acute trauma care. Provision is also made for the management of primary level surgical diseases. A neighboring surgical referral hospital, GF Jooste Hospital (GFJH), has 90 dedicated surgery beds. It is a Community Hospital, which caters for primary and secondary level diseases. Acute care is also given to tertiary level trauma and emergency surgical diseases. The unit at GFJH will be closing to allow for a reconstruction of the building, and thus the patient population will require access to alternate facilities whilst awaiting the reopening. A subset of these patient will have to be accommodated at GSH.

### **Patients and Methods**

The study will comprise the review of a three month workload of the ACSU at GSH preceding the above mentioned closure of GFJH and comparing it to a three month period after closure of the aforementioned.

The following data point will be collected as variables for statistical comparison:

ICD-10 diagnosis codes

Age

Gender

Suburb of origin

Surgical procedure(s) performed

Triage colour of emergency operation bookings

### **Ethical Considerations**

This study will not make use of any personal details (name, folder numbers etc). This study adheres to the Declaration of Helsinki 2010.

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## **Chapter 2**

# ***Literature Review***

## **Introduction**

The management of patients presenting with acute surgical emergencies presents an enormous challenge to the medical profession. It challenges healthcare providers and medical institutions, as well as placing an immense strain on the National Healthcare System (1,2,3). At the center of these issues is the patient (4)

In the past, surgical emergencies were managed by an “on-call” team, which was also responsible for elective surgery. In other words, the emergencies were only attended to after the elective commitments, in the form of an elective surgical list or an out-patient clinic, had been completed. This was obviously far from ideal, thus opening a new pathway for acute care surgery to develop.

Acute surgical care refers to the surgical management of serious, emergency conditions, requiring some form of immediate surgical care or intervention. This offers the surgeon a unique opportunity to make a working diagnosis, and to intervene appropriately and thereby to instantaneously have an impact on the outcome of the critically ill patient (1).

The last decade has seen a major growth in the field of acute care surgery, and to some extent has become the standard of care.

## **Reasons for establishment of Acute Care Surgery**

There have been several factors which have contributed to the development of “acute care surgery” as a separate entity:

- (1) Firstly there was an urgent need to improve the quality of care given to patients with surgical emergencies. Traditionally surgical emergencies were managed by a team of doctors who were on-call for that day or week for emergencies, but who also had elective commitments in the form of an elective theatre list or an outpatient clinic. As a result the emergencies were only attended to after the elective commitments had been attended to. This invariably resulted in considerable delays in the management of the emergencies and it almost invariably occurred after normal working hours. The overall impact was that these patients with surgical emergencies often received suboptimal care.
  
- (2) Secondly, there has over the last few years been a trend for general surgeons to want to subspecialize i.e. general surgeons have wanted to focus their interest on a particular area in general surgery, such as breast surgery, vascular surgery or gastrointestinal surgery. Most of this work is in the form of elective surgery. As a result surgeons have become de-skilled in managing patients with acute surgical emergencies.
  
- (3) Thirdly, there is a trend for older surgeons to not want to do emergency calls and to come out to operate in the middle of the night. As a result it has become

increasingly difficult to maintain an adequate roster of surgeons, on-call for emergencies.

- (4) Another challenge has been the impact of the increasing conservative approach to many of the trauma patients. For example, many patients with blunt and penetrating abdominal trauma can now be managed non-operatively. As a result the amount of surgery being performed by trauma surgeons has decreased considerably and trauma surgeons are becoming de-skilled. There is therefore a need to increase the surgical load for trauma surgeons

Acute Care Surgery Units (ACSU) provide acute surgical management in a timely manner i.e. management which includes both diagnostic and therapeutic services. Cases include emergency abdominal surgery, such as removal of the gallbladder or appendix, management of acute bowel obstruction, and reduction of, and surgical intervention for, acute hernias. It often even incorporates the intricate management of life threatening surgical infection. (5)

Both locally and internationally, fewer surgeons are pursuing general surgical practice, opting instead for subspecialty training, with no or only minimal time spent in emergency surgical care. Currently, almost 80% of general surgery residents finishing Accreditation Council for Graduate Medical Education (ACGME)-approved programs in the United States of America (USA), pursue fellowships and become subspecialists. This is demonstrated by reports that some colorectal surgeons refer diseases of the appendix to the general surgeon, reflecting the narrow point of care that is being practiced in

certain fields of surgery. This move to sub-specialization has resulted in fewer general surgeons being available to take emergency department calls to care for patients with time-sensitive general surgical conditions. This is where the role of acute surgical care comes into play.

### **Acute Care Surgery models**

Several different models for providing care for surgical emergencies have been described:

- Combination of acute care surgery, trauma and critical care:

In many cases acute care surgery has been described as a multidisciplinary approach involving Emergency and Trauma Surgery, and Critical Care Medicine (6,7,8). This model would be applicable in a society where the trauma load is small, or to a regional hospital which does not have a stand-alone Trauma Unit.

- Team of dedicated “on-call” doctors (one week at a time); the team would be free of their normal elective commitments for that week:

This model would be applicable to most regional hospitals.

- Dedicated, stand-alone Acute Care Surgery firm (non-trauma):

This model would apply to an institution that has a dedicated stand-alone Trauma Unit and carries a substantive trauma load.

In South Africa the rules and regulations, set by the Health Professions Council of South Africa, previously stipulated the requirements for training and qualifying as a General

Surgeon, before pursuing Fellowship training in a field of subspecialty. In recent years, changes to this rule have allowed for direct specialization in areas such as Paediatric Surgery, since it has now been recognized as a surgical discipline on its own, adding to a long list of now established specialties that have emanated from General Surgery. Other examples include Urology, as well as Orthopaedic and Cardiovascular Surgery. As treatment paradigms shift and emergency surgical disease management evolves, there will be a need for properly trained Surgeons, who are willing to pursue the optimal urgent care (surgical or conservative) for these conditions. In addition to this, the amount of knowledge available in medical science has grown exponentially. It has become increasingly difficult to be an expert in every aspect of General Surgery after only four or five years of training. This has contributed to the current fragmentation manifesting as a plethora of subspecialty disciplines. (7,9,10)

### **International models of Acute Care Surgery**

When considering a global outlook, the development of an acute care surgical model has been driven mostly by research and literature from the United States of America (USA), together with first-world settings in Europe. The USA and Europe have different views and ideas on the various issues related to acute care surgery, with the two continents permanently scrutinizing developments on either side of the Atlantic. One of the obvious differences which comes to light revolves around the terms of employment and remuneration of doctors, which determines the extent to which emergency call is mandatory or voluntary. The USA relies on the basic emergency service that is provided

by residents and interns, whilst being covered by fully trained Specialists. This allows the latter to focus more on elective surgery, but also offers the residents more opportunities to practice skills and techniques. The European system differs in that doctors are generally employed directly by hospitals and are obligated to take calls on the basis of a duty roster, thus covering all fields of emergency and elective surgery. [11,12,13]

In most hospitals throughout the USA, surgical emergencies include trauma and acute surgical diseases, as well as incorporating Critical Care as part of their functional unit. This acute care paradigm is anticipated to relieve some of the strain on the surgical workforce. It is aimed at maintaining or improving patient care, and increasing the attractiveness of Trauma and Emergency Surgery to surgical trainees (14). The combination of emergency and general surgical care by Trauma Units has allowed the Trauma Surgeon to maintain operative skills in an era of increased non-operative management (15).

The various models of acute care surgery are well documented in the literature. At the one end of the spectrum is Denver Health Medical Center in Denver, Colorado, where most of the work of the Acute Care, Trauma Care, and Critical Care are combined and run as a single service (16). At the other end of the spectrum are institutions such as Vanderbilt in Nashville, Tennessee, and Yale in New Haven, Connecticut, which have separate services for Trauma, Emergency General Surgery, and Surgical Critical Care. Between these two extremes are institutions which base their service on the number of surgeons available and the spectrum of surgical disease presenting at the

institution. These institutions may have a two- or three-team approach to the management of their patient populations, often combining their Trauma and Emergency General Surgery services, at the same time maintaining a separate Surgical Critical Care service (17,18).

In times of challenge, creative solutions often arise. The initial driving force behind the specialty in Trauma Care was the special need for the injured patient. Thus the special needs of the severely ill surgical patient, requiring emergency intervention, should be used as the driving force in recognizing the need for the Acute Care Surgeon. Regardless of how emergency or acute care is administered, the aim is that the trauma or non-trauma related acute surgical patient receives optimal care from the moment that he or she presents, until discharge from the hospital (4,14). In response to the need for better access to urgent surgical care and other pressing issues, such as the workforce shortage, one of the potential solutions is the establishment of Acute Care Surgery as a subspecialty (19).

Data from the National Center for Health Statistics in the USA has shown, that between 1993 and 2003, an increase of approximately 26% in the number of patients receiving care in emergency rooms across the country. During this same period, there was the unfortunate closure of 703 hospitals, resulting in the total loss of 198,000 hospital beds. This was also amplified by 425 fewer Emergency Departments. By 2005 nearly half of all hospital Emergency Departments reported either being at 100%, or beyond capacity. Major teaching institutions reported that their Emergency Rooms were on average at, or over 79% of their allotted capacity. (9)

Globally, hospitals have noted an increased acuity of patients presenting to them. It is estimated that over 35 million Americans are older than 65 years of age. This accounts for approximately 12% of the overall population, and the projections for population growth indicate that this portion of the population is expected to make up at least 20% by the year 2030. Presenting with acute surgical disease, patients tend to have considerably more co-morbidities and active medical problems. This then leads to a multi-disciplinary approach that may be challenging, and very often, time-consuming. In contrast, in patients presenting electively, more time can be spent on managing the co-morbid issues. Emergency conditions present at all hours of the day and night and often do not allow much time for management and preoperative preparation, leading to an increased morbidity and mortality within this group. In addition to this, surgeons are increasingly pressured to maximize their productivity (1,15). This also means that the demand for Intensive Care Unit services is projected to grow rapidly during the next decade, as the average acuity of hospitalized patients rises with the growth in the elderly population. Likewise, realizing the benefit and cost savings associated with Intensivist oversight of Critical Care, as proposed by the Leapfrog Group, the demand for Intensivists will continue to increase to support the aging population (20,21)

### **Health Care issues in South Africa**

Health care in South Africa varies from the most basic primary health care, offered free by the state, to highly specialized, hi-tech health services available in the both the public and private sector. However, the public sector is stretched and under-resourced in

places as it is a solely tax funded public health system, and equates to approximately 8% or more of the gross national product per year. While the state contributes about 20% of all expenditure on health, the public health sector is under pressure to deliver services to about 80% of the population. There are approximately 4 200 public health facilities in South Africa with an average of 13 718 people per clinic, exceeding WHO guidelines of 10 000 per clinic. Many problems in our health care system related to quality have also been identified and these need attention and constant work to improve the service. These shortcomings endanger the health and lives of all patients, add costs to the health care system, and reduce productivity. To achieve the necessary improvements, a national policy on quality in health care is needed, and commitment from all stake-holders in our healthcare system (22,23).

While it is sensible to have a national policy and develop national standards for both public and private health care, it is the task of staff in each sector to deliver the quality improvements. This requires a Quality Assurance culture and approach to the delivery of health care. For the public sector this requires action at all levels. This part of the policy document should propose methods to be used that follow the approaches outlined above (22).

Consistent local action is needed to ensure that national standards and guidelines are reflected in the delivery of services. The District Health System, that offers primary health care, is ideally positioned to facilitate this local action, because it is close enough

to the community to be responsive to their needs, and is a powerful vehicle for improving the quality of care (22).

However, Secondary (Regional), Tertiary and Specialized Hospitals also require special attention. The need for action at the local and hospital level demands that competent health professionals are available to assure quality in health care and to continuously improve the care that is being provided. Competent and skilled health professionals can only be obtained by continual training and professional development (22,23).

The creation of an extensive primary, secondary and tertiary health system with appropriate referral pathways required an enhancement of the National Planning Framework for the provision of hospital services throughout the country. This enhancement includes guidelines for the number of beds needed at different levels and the affordability. It also deals with the planning and funding options available for the provision of tertiary and highly specialized services, allowing for the possibility for patients in need of this specialized care to be referred from one province to another(23,24).

Under the National Health Insurance, a hospital is expected to provide service to patients based on its category, e.g. tertiary hospitals should provide specialist level services (provided by regional hospitals, subspecialty care, and critical care under the supervision of a specialist) and should receive referrals from secondary level hospitals, not limited to provincial boundaries as mentioned above. Therefore secondary level and primary or district hospitals should be able to cater for other levels of care.

Unfortunately, because of the geographical placement of many of the tertiary hospitals, in reality, they have to offer all levels of care, including primary and secondary. This has resulted in poor quality of care because of the burden of an excessive unnecessary work-load and over-expenditure of the facility's budget i.e. providing basic services (primary and a certain degree of secondary level care) in a tertiary institution's emergency department creates problems for the department itself, and for the entire healthcare system (22,25).

### **Acute Care Surgery in South Africa**

In the current setting in South Africa, General Surgery continues to be the main surgical discipline responsible for acute surgical emergencies. Critical Care Units (ICU's) continue to function separately. The rules and regulations of the Health Professions Council of South Africa stipulate the requirement to train and qualify as a General Surgeon, before pursuing Fellowship training in a subspecialty. South Africa has also followed the international trends with the development of certain subspecialties. In contrast to the USA, South Africa has separate sub-specialties for Trauma Surgery and Critical Care, and the remaining non-trauma acute surgical emergencies are managed by general surgeons. As treatment paradigms shift and surgical emergency disease management evolves, we need properly trained surgeons who are willing to pursue the optimal emergency care (surgical or non-operative) for specific conditions in patients presenting with these acute surgical emergencies (26,27).

## **The Acute Care Surgical service at Groote Schuur Hospital**

Four years ago a decision was taken to establish an Acute Care Surgery Unit (ACSU) at Groote Schuur Hospital and is affiliated with the University of Cape Town (UCT). The dedicated ACSU was introduced during 2010, and functions as a unit which is responsible for all the non-trauma acute surgical emergencies, including all the after-hour surgical admissions. It aims to provide improved patient care within the constraints of modern safe work hours and in an era of limited resources. The ACSU in GSH has 40 dedicated beds in a single unisex ward with multiple separate cubicles, and functions as both a tertiary and secondary level General Surgery Unit. It excludes all acute trauma care. Provisions are also made for the management of the occasional primary level surgical patient that presents to our services from time to time, since GSH does have a small direct drainage area which is not covered by the district health services.

The ACSU admits all the acute surgical cases at any time of the day or night, every day of the week. Admissions are to the dedicated ACSU ward, where patients are either treated appropriately (operatively or non-operatively) until discharge, or referred to one of the subspecialty units (Hepatobiliary, Colorectal, Endocrine/ Oncology, or Vascular) for further management.

Despite an ever increasing workload in our health system, having an ACSU in which elective commitments are separately resourced, allows for referrals to be seen sooner

and the time from referral to review, and appropriate management, is greatly reduced allowing for better use of hospital resources. This unit does differ from other ACSUs in that it has two elective lists per week which are run by a registrar and a consultant. The elective service is offered as GSH also has a direct drainage area associated with it and is part of the secondary level hospital system. This is seen to be part of the service delivery for level two in our health system.

One of the minor limitations is that there is only a single emergency theatre which runs during the day for all surgical disciplines (except Obstetrics and Paediatric Surgery) to share. There are two emergency theatres available after hours and on weekends which are also shared.

The staffing of the ACSU is as follows:

- 4 Full Time Consultants
- 4 Registrars that rotate on a 3 monthly basis
- 1 Permanent Medical Officer
- 2 Interns

The calls are covered on a rotational basis by the registrars and the medical officer. Their role is to manage all the acute admissions, manage the ward patients appropriately, and conduct the required surgical procedures as necessary. The registrar on call is covered by the junior consultants from the Division of General Surgery who are primarily attached to the subspecialist units, and have their own roster. There is a second consultant call system in place that is run by the full-time consultants of the

ACSU as a support system to the junior consultants. The interns form part of a larger pool of interns from the Division of General Surgery that function on their own call roster.

Common conditions managed by the ACSU include acute appendicitis, abdominal sepsis, biliary pathology, soft tissue infections including abscesses, upper and lower gastrointestinal bleeding, small and large bowel obstruction, complicated hernias, acute pancreatitis, chronic non-salvageable limb ischaemia and a variety of other conditions.

There is a full complement of support services at GSH, and access to these services all aid in the management and decision making processes surrounding the patient .

Most of the patients access the Hospital via the Emergency Unit (EU) The EU is headed by a Senior Physician consultant, and is staffed by a second Senior Physician consultant, an Emergency Medicine Specialist, rotating emergency medicine registrars, and rotating Internal medicine registrars. There are also permanent medical officers and interns. The EU offers a 24 hour service and receives all non-trauma emergencies. Patients are seen by the EU, a primary diagnosis made, the work-up started, and the patient duly referred to the appropriate department.

There is a 24 hour Radiology service available allowing access to X-rays, CT Scans and ultrasounds at any time of day or night. They have a limited interventional radiology service after-hours and over weekends and public holidays. MRI is currently only

available as an “office-hours” service, although the ACSU is generally not affected by this. Most of the essential radiographic imaging required by the ACSU is available.

GSH has an onsite 24-hour laboratory that is responsible for all the biochemistry and haematological testing. Microbiology and anatomical pathology are available after hours, but this is partially restricted to severe emergencies, and their services are generally pre-arranged.

There is a large Blood bank on site at GSH, with almost all necessary blood products thus being available at very short notice. They also stock emergency and whole blood should it be required.

The Critical Care unit (ICU) is a combined unit for both General Surgical and Medical departments. The departments do however have their own beds in separate units. There are eight dedicated surgical and eight dedicated medical ICU beds, although patients can be admitted to either unit. The Cardiothoracic service has its own ICU with six beds, and they also do allow for non-septic patients requiring ICU admission to be admitted and treated if there is a bed occupancy problem.

The advantage for the ACSU functioning within the tertiary setting such as GSH, gives one access to the paramedical services, namely, Physiotherapy, Occupation Therapy, Dietetics and Speech Therapy, allowing patients to be seen and evaluated, with appropriate therapy initiated as an in-hospital patient.

What makes the ACSU unique in the academic setting, is that this service involves prioritizing procedures to best address complex surgical needs and thus allowing for the

development of evidence-based surgical care and management guidelines to cater for patients. This in turn, decreases variability in treatment, cost of care and ultimately improves patient outcomes. It is anticipated that in future acute care surgery will be accepted officially as a recognised specialty or subspecialty. The ACSU is committed to high quality care despite certain resource constraints experienced in the public health sector.

### **Emergency Surgery Triage System**

In acute care surgical emergencies, decision making and implementation of a treatment plan is critical. Each patient has to be individually evaluated as soon as possible and early appropriate intervention planned. Most presentations and admission to an ACSU are usually for diseases of short duration. The timing of surgical intervention is of utmost importance. However most studies on the timing of surgery have investigated impact of the delays in surgery. These results usually highlight problems of resource availability, administrative issues, and poor planning. The appropriate use of a triage system using colour coding can assist in reducing these problems.

The importance of using a colour coding triage system is to alert all involved staff to various emergencies. It conveys a common and repetitive language and can be seen as being essential for the distribution of rapid, comprehensible and well-accepted information.

The triage of non-trauma surgical emergencies involves the same principles used in the management of the trauma patient. Early initiation of management protocols are the hallmarks of the acute care surgery approach for the most severely ill. A prompt team response is necessary for the smooth handling of the triaged patient, and having the resources immediately available is essential. This is possible by setting realistic time frames to the different triage colours. However, some patients may suddenly deteriorate, and need to be up-scaled on the triage colour chart.

For the benefit of standardising the triage system used for acute surgical diseases, the criteria should include simple hemodynamic and clinical data. These criteria will thus direct the acute care surgical team to properly triage each patient, and allow the appropriate waiting time to surgery. In this time, if there should be a waiting period for theatre, appropriate treatment should be undertaken for optimizing patient physiological status alongside antibiotics administration and pain control (28,29,30).

Considering the above, colour coding can be used to categorise the following into a triage system of acute care surgery cases:

***Immediate (RED)*** - extremely sick patient that is markedly decompensated physiologically. This may be due to overwhelming sepsis, or bleeding, from the gastrointestinal tract, ruptured aneurysm etc. Despite early resuscitative measures, these cases need to be taken to theatre so that the cause may be treated for resuscitation to be successful. In this category, life or tissue loss is imminent (28,29,30).

***Within an hour from diagnosis (ORANGE)*** - these patients have signs and symptoms of some sort of vascular compromise, be it an incarcerated hernia with bowel entrapment, mesenteric vascular occlusion, or limb ischemia. Other patients who would fall into this category include patients with diffuse peritonitis due to uncontained hollow viscus perforation. There are many pathologies which may require surgery “within an hour” as is the presence of necrotizing fasciitis with sepsis. Patients in this category also require adequate resuscitation and managed appropriately whilst awaiting theatre. These patients are to be carefully watched as rapid physiological decompensation may occur. Once again, as in the “RED” category, tissue loss is imminent in a majority of cases (28,29,30).

***Within 6 hours from diagnosis (YELLOW)*** - this is a group of patients who present with localized peritonitis or soft tissue infection in need of surgery, but are physiologically stable, with no sign of spreading or progression of the disease process. However, these patients have the potential to deteriorate clinically and physiologically into a more serious condition if surgery is delayed. Early antibiotic treatment and adequate fluid administration should be initiated immediately after diagnosis, and these patients are to be periodically reviewed whilst waiting for surgery (28,29,30).

***Within 12 hours from diagnosis (GREEN)*** - these patients are in need of urgent surgery, though evidence- based knowledge indicates that a delay in surgery while under medical treatment does not lead to clinical deterioration. As an example, delay in treatment of acute appendicitis without local peritonism has been shown to have no

deleterious effect on outcomes, as long as appropriate antibiotic therapy is initiated, and the patient is operated upon (28,29,30).

***Within 24 or 48 hour from diagnosis (No COLOUR)*** - these patients may be put onto the next available elective surgery list, or should be operated on in day-time, and not as emergencies late at night/early hours of the morning. Surgery is definitely indicated, and if excessively delayed, the process may progress and worsen the morbidity of the operation. Patients who can wait for surgery are the “non-salvageable” critical limb ischaemia patients who have no focal source of sepsis, only severe pain and associated tissue loss, or the acute cholecystitis due to gallstone disease. This category also allows for the patients who were operated under emergency conditions, and wound debridement or re-laparotomy was decided upon during the index procedure. This may be for large wound inspections and dressing changes, for peritoneal cavity rinsing or for assessment of bowel perfusion and viability.

This form of triage system, and its principles, needs to be adopted, understood and appreciated by all personnel involved in the treatment of these patients with surgical emergencies. Ultimately, the triage decision rests on the surgeon who assesses the patient, and takes responsibility for the patient’s care (28,29,30).

## **Chapter 3**

# ***Study, Results and Discussion***

## **ABSTRACT:**

### **An audit of the impact of the workload on Acute Care Surgical Services at Groote Schuur Hospital following the closure of a local referring community hospital**

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#### **Background**

Groote Schuur Hospital (GSH) has a 40 bed dedicated Acute Care Surgical Unit (ACSU) that functions in a tertiary environment. Acute trauma care is excluded, thus making it a unique concept. GF Jooste Community Hospital (GFJ) closed during September 2013. The patient workload was meant to be shared between a new district hospital and acute care surgical services at GSH. We reviewed the number of referrals two months before closure and three months after closure to calculate the true impact of the closure and reviewed the surgical work load and procedures conducted during this time period.

#### **Materials and Methods**

A prospective, HREC approved audit was conducted over a five month period. The primary end point was to see if the closure of GFJ had any influence on the workload of the ACSU. The surgical profile of the patients seen was also reviewed. Categorical groups of data was analysed using the Chi Square test.  $p < 0.05$  was considered significant.

## **Results**

On average, the two months pre-GFJ closure recorded 125 multi-centre referrals per month, compared with 166 referrals post-closure, thus showing a statistical significance in overall direct referrals to the ACSU following the closure of GFJ [ $p < 0.0044$ ]. Total number of patients admitted over the 5 month study period was 646, with 518 surgical procedures being performed. The top 5 surgeries performed were: amputations (n=87), hernias (n=78), exploratory laparotomies (n=67), appendicectomies (n=64), and cholecystectomies (n=44). All cases were operated on the emergency list except for 56 hernias and 37 cholecystectomies that were electively done.

## **Conclusion**

The closure of the nearby GFJ showed a significant increase in the multi-centre direct referrals. The new district hospital by inference is not functioning as planned. The ACSU in GSH is a new and unique concept in the South African surgical setting offering purely non-trauma emergency surgery care.

## **INTRODUCTION**

Acute Care Surgery refers to the surgical management of serious, emergency conditions, requiring some form of immediate surgical care or intervention. This offers the surgeon a unique opportunity to instantaneously have an impact on the outcome of the critically ill patient, by making a working diagnosis, and intervening appropriately (1). Acute Care Surgery Units (ACSU) provide acute surgical management in a timely manner i.e. management which includes both diagnostic and therapeutic services. The various pathologies include emergency abdominal pathology, such as acute cholecystitis, acute appendicitis, acute bowel obstruction, and acute hernias, the management of life threatening surgical infections, and acute limb ischaemia (5).

There are fewer surgeons to-day, both locally and internationally, interested in pursuing careers as general surgeons, opting instead for subspecialty training. This has resulted in no or only minimal exposure in emergency surgical care. This shift to subspecialization has resulted in fewer general surgeons being available to take emergency department calls to care for patients with time-sensitive general surgical conditions. The consequence has been the introduction of the concept of acute care surgery. A variety of models of acute care surgery are practiced throughout the world. In many cases acute care surgery has been described as a multidisciplinary approach involving Emergency Surgery, Trauma Surgery, and Critical Care Medicine.(6,7,8)

As treatment paradigms shift and emergency surgical disease management evolves, a need arises for properly trained surgeons, whose goal it is to provide optimal urgent

care (surgical or conservative) for these surgical emergencies. Acute Care Surgery involves timely decision making and implementation of an appropriate treatment plan. Each patient has to be evaluated individually as soon as possible and early intervention planned. Most admissions to an ACSU are for diseases of short duration and the timing of surgical intervention is of utmost importance. However previous studies on the timing of surgery have investigated the impact of surgical delays on the outcomes. These studies have tended to highlight the problems of resource availability, administrative issues, and poor planning. The appropriate use of triage system can assist in reducing these problems.

In September 2013, GF Jooste Hospital (GFJH), one of the District / Regional Hospitals which drains to GSH, was closed down. The aim of this study was to investigate the impact of the closure of GF Jooste Hospital on the surgical workload at GSH by reviewing the number of referrals and types of surgical procedures undertaken by the ACSU before and after the closure.

#### **METHOD:**

The study was approved by the Human Research Ethics Committee (HREC) of the Health Sciences Faculty of the University of Cape Town. This prospective study included all adult admissions to the ACSU over a six month period between July and December 2013. Patient data was collected between July and August 2013, which was the period prior to the closure of GFJH, and between October and December, which

was the period after the closure of GFJH. The patient data was captured by the admitting doctor electronically in an admissions database. The data recorded included the patient demographics, the referral pattern, and the clinical diagnosis. The type of surgical intervention was also recorded.

A dedicated ACSU was established at Groote Schuur Hospital in 2010. The unit is responsible for all the acute non-trauma surgical emergency admissions. The ACSU has 40 dedicated beds in a single unisex ward with multiple separate cubicles, and functions as a secondary and tertiary level General Surgery Unit. All acute trauma patients are excluded and are managed in a dedicated Trauma Unit. The ACSU has dedicated staff which includes four consultants, five rotating general surgery registrars, one medical officer and two interns. After hour cover for the registrar on call is provided by the junior consultants in the subspecialist general surgery units.

If the patient underwent any form of surgical intervention, the nature of such procedures was noted, as well as the degree of urgency based on a colour coded triage system for each individual case. The patient is booked on the Emergency List in Theatre as a RED case if the patient has to go to theatre immediately, as an ORANGE case if surgery must be done within one hour, as a YELLOW case if surgery can be delayed for up to six hours, and GREEN if surgery can be delayed for up to 24 hours. All surgical emergencies which were not urgent and could be delayed beyond 24 hours were included on the Emergency List in Theatre but were not colour coded.

In order to determine the full effect of the GFJH closure, data was also collected for the Trauma and Intensive Care Units respectively over the same time period. Only referral and admissions data for the latter two was used.

Although the District and Regional hospitals within the “Western Cape Metropole” region have their own “geographical” drainage, patient flow is not always constant. Patient dynamics, and their disease processes do not necessarily allow for them to follow this “geographical” drainage pattern, and any small change in the system can alter the entire pattern. Thus a further breakdown was done of the broad-based referrals to the ACSU from all the hospitals in the Western Metropole, including New Somerset Hospital (NSH), Mitchell’s Plain District Hospital (MPDH) and Victoria Hospital (VH), to see if there was any change that may have obscured the expected increased flow.

Statistical methods: Chi Square analysis was performed to test for differences between groups of categorical data. This was done using the Analysis Tool Pack of Microsoft Excel. Differences are expressed as p-values, with an alpha value of less than 0.05 taken to indicate a significant difference.

## **RESULTS:**

There were a total of 646 admissions to the ACSU during the study period, and included 249 admissions in the two-month period prior to the closure of GFJH and 397 admissions in the three month period after the GFJH closure. There were 330 males and 312 females, with an average age of 46 (+/- 9) years (range13-98).

The number of admissions to the ACSU during the study period is shown in Table 1. There was no difference in the average number of admissions per month to the ACSU prior to the closure of GFJH compared to the average number of admissions per month after the GFJH closure (124 versus 132;  $p > 0,05$ ).

The number of referrals to the Trauma Unit and the Intensive Care Unit during the study period is shown in Table 1. Although there was a numerical increase in the total number of referrals to the Trauma Unit, when looking at the year-on-year data, the difference was not statistically significant ( $p > 0,05$ ). Similarly, admissions to the Intensive Care Units was also not statistically significant ( $p > 0,05$ ).

Table 1: Average referrals per month to ACSU, Trauma Unit and Intensive Care Unit

<b>ACTUAL</b>			
	<b>ACSU</b>	<b>Trauma Unit</b>	<b>Critical Care Unit</b>
<b>Pre</b>	125	1001	88
<b>Post</b>	132	1212	139
<b>p-value</b>			
	0.0849		

The number of referrals to the ASCU from the various Regional and District Hospitals in the Western Metropole is shown in Table 2. It was noticed that the referrals, in general that came via GFJ, were now coming from the new Mitchells Plain Day Hospital (MPDH) area. This “geographical” drainage was previously directed to GFJ, and is now supplying MPDH, but because Mitchells Plain Community Health Center (MPCHC) was functional prior to the opening of the MPDH, and that there is still an Emergency Hub

functional at the old GFJ, the flow of patients did not necessarily have such a widespread ripple effect as was suspected. When looking at this subset of referrals, there was a statistically significant increase in referrals (p-value <0.05).

Table 2: Referrals to the ACSU from Casualty, GFJH, NSH, and VH

ACTUAL								
	Cas	GFJ	Hub+MPDH	GSH	NSH	VH	Private	Other
Pre	93	5	0	19.5	1	0.5	1	4.5
Post	132.33	0	12	14	2.33	1	1.67	2.67
p-value								
		0.004422						

Cas = Emergency unit, GFJ = GF Jooste Hospital. Hub= GF Jooste Emergency hub, MPDH= Mitchells Plain District Hospital, GSH + ward referrals, NSH = New Somerset Hospital, VH Victoria Hospital

The changes in the number of emergency and elective operations performed by the ACSU before and after the closure of GFJH are shown in Table 3. There were a total of 358 emergency surgeries and 157 elective surgeries performed during the study period. The average number of emergency surgeries performed per month before and after the closure of GFJH were similar (76 vs 67;p>0,05). The average number of elective operations performed before and after the closure of GFJH was also similar (31 vs 31; p>0,05). There was also no difference in the number of red, orange, yellow and green coded cases before and after the closure of GFJH (Table 3).

Table 3: Number of emergency and elective surgeries performed before and after the closure of GFJH, and the colour coding of the cases.

	Total	Red	Orange	Yellow	Green	Elective	Emerg Cases Totals	%
<b>July</b>	104	3	16	37	11	37	67	64
<b>August</b>	111	2	14	52	17	26	85	76
<b>October</b>	110	4	5	43	17	41	69	63
<b>November</b>	104	1	15	48	9	31	73	68
<b>December</b>	86	2	1	38	7	22	64	74
<b>Total</b>		12	51	218	61	157		
<b>Averages</b>								
<b>Jul, Aug</b>	107.5	2.5	15	44.5	14	31.5		
<b>Oct, Nov, Dec</b>	100	2.67	7	43	11	31.33		
			<b>elective</b>	<b>emergency</b>				
		<b>before</b>	31.5	76	107.5			
		<b>after</b>	31.33	63.67	95			
			62.83	139.67	202.5			

The most commonly performed surgical procedures in the ACSU during the study period are shown in Table 4. Amputations were the most commonly performed operation, followed by hernia repair, exploratory laparotomy, appendectomy and cholecystectomy. The closure of GFJH did not impact on the types of surgery being performed.

Table 4: Most commonly performed surgical procedures in the ACSU.

	<b>Amps</b>	<b>Hernias</b>	<b>Exp Lap</b>	<b>Appendix</b>	<b>Chole</b>	<b>Debride</b>	<b>EUA</b>	<b>I+D</b>	<b>Relook</b>
<b>Total</b>	87	78	67	64	44	41	39	34	20
<b>Jul</b>	13	11	13	14	9	15	8	15	6
<b>Aug</b>	19	12	17	13	13	5	9	4	1
<b>Oct</b>	16	17	11	14	11	10	10	11	2
<b>Nov</b>	23	21	13	10	5	6	9	2	3
<b>Dec</b>	16	13	13	13	5	5	1	2	8

Amps= Amputations, Exp Lap = Exploratory laparotomy, Appendix = appendicectomy, Chole = Cholecystectomy, Debride = wound debridements, EUA= Examination under anaesthesia, I=D, Incision and Drainage, Relook= Scheduled relook of laparotomy, wounds or washout.

## **DISCUSSION**

The aim of this study was to investigate the effect of the closure of one of the local District/Regional hospitals on the patient numbers presenting to the ACSU in the Tertiary institution. The study showed that there was no significant increase in the number of referrals to the ACSU and the Trauma Unit in the three months following the closure of GFJH compared to the two months preceding the closure.

The study period included July and August before the closure and October, November and December after the closure. The data for September was excluded from the analysis because although the theatre complex at GFJH was closed at the end of August 2013 for elective cases, there were still emergency operations being performed until mid-September.

When reviewing the over-all numbers of the admissions to all the units there is a definite increase in the volume of work, but it is not statistically significant ( $p > 0.05$ ).

The ACSU at GSH also has an elective surgery component. This adds to the operative numbers of the unit, whilst also offering the doctors in the unit a greater exposure to general surgical procedures. The number of emergency cases ranged between 63-76% of the operative cases performed by the unit over the 5 month study period.

The urgency of the cases does vary every month, with the majority of the emergency cases booked for theatre as yellow. The triage colour coding was dependent on the attending surgical registrar that booked the case with the theatre complex. Despite the triage colours, cases were not always operated in the suggested time frame. The reason for this being multifactorial, but one reason that may be highlighted is the fact that there is often insufficient theatre time or restricted shared theatre access.

The specific procedures performed in the ACSU at GSH were varied. The highest number of a specific procedure was appendicectomies, with a total of 64 being done over the five months. Exploratory laparotomies in total were 67, but these were done for multiple different reasons, such as for small bowel obstruction, adhesiolysis, cancer surgery with hemicolectomies or diverting stoma's, and even total colectomies for fulminant colitis. Planned, and un-planned, relook procedures and wound washouts constituted a further 20 cases, with an additional seven being performed for application or change of a vacuum-assisted wound dressing for various reasons. Six patients were operated on for perforated peptic ulcer disease, whilst five emergency endoscopies

were conducted in theatre. These were comprised of one colonoscopy for a sigmoid volvulus which was successfully de-torted, and did not require emergency surgical intervention, and four gastroscopies for severe upper gastrointestinal bleeding. Of these four gastroscopies, two were patients who presented with bleeding oesophageal varices, due to portal hypertension, and required emergency banding of the bleeding varices.

Of the 78 hernia repairs undertaken by the ACSU, 22 were emergency procedures, and 52 were conducted on the ACSU elective theatre list. Some of the elective inguinal hernia repairs were conducted laparoscopically.

Lower limb amputations make up another large portion of the ACSU work-load. These are mostly for chronic non-salvageable limb ischaemia due to peripheral vascular disease, or due to tissue loss and sepsis in patients with uncontrolled diabetes, and end-organ damage. The latter are mostly due to neuropathic ulcers with secondary infection. The types of amputation include Ray amputations for single toe pathology, transmetatarsal amputations (TMA) if more than 2 toes involved, and supramaleolar (guillotine) amputations (SMA) for source control of sepsis with secondary formalization as either a below knee(BKA), or above knee amputation (AKA).

Drainage of abscesses also contribute largely to the workload. During the study period a total of 34 abscesses were incised and drained, including 14 perianal abscesses and 10 cases of necrotizing fasciitis.

Gallstone disease is also commonly seen. Most patients are treated conservatively in the acute setting, with interval cholecystectomy being done after six weeks. This is purely due to the high demand for theatre time, with limited access. Out of the 44 cholecystectomies performed, seven were done as emergency cases. What constitutes an emergency case is acalculous cholecystitis, cholecystectomy on same admission for gallstone pancreatitis, and patients with recurrent attacks of cholecystitis, not responding to no-operative therapy.

### **CONCLUSION:**

The ACSU in GSH is a new and unique concept in the South African surgical setting, even though its structure differs from that of the International ACSU's described in the literature. The closure of the nearby GFJ did not have the effect that everyone expected, but there was a statistical significance in the direct referrals. The ACSU plays an important role in the care of the acutely ill non-trauma patient, and takes the strain off the sub-specialty departments, allowing them to focus more on elective work. Having direct access to such a unit means that the waiting, and turnaround times of these acutely ill patients, may be drastically reduced and their package of care is streamlined.

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