

# **HIV infection and penetrating abdominal trauma :**

## **Does HIV influence the outcome?**

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## DECLARATION

I, Deidré Estelle Kathleen McPherson, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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## **ABBREVIATIONS**

AAST	American Association for the Surgery of Trauma
AIS	Abbreviated Injury Scale
ANC	Antenatal clinics
ART	Antiretroviral treatment
CCI	Charlson Comorbidity Index
CDC	Centres for Disease Control
GCS	Glasgow Coma Scale
HAART	Highly active antiretroviral therapy
HBsAg	Hepatitis B antigen
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HREC	Human research ethics committee
ICU	Intensive care unit
ISS	Injury Severity Score
NTDB	National Trauma Data Bank
PATI	Penetrating Abdominal Trauma Index
RTS	Revised Trauma Score
SPSS	Statistical Package for Social Sciences

TB	Tuberculosis
UNAIDS	Joint United Nations program on HIV/AIDS
VCT	Voluntary counselling and testing
WHO	World Health Organization

## **ABSTRACT**

### **HIV and penetrating abdominal trauma: does HIV influence the outcome?**

**Dr Deidré Estelle Kathleen McPherson**

**Background:** Human immunodeficiency virus (HIV) infection and trauma are significant contributors to the burden of disease in South Africa. There is an increase in prevalence of HIV sero-positivity in trauma patients. However, there are conflicting reports about the influence of HIV in outcomes after trauma or surgery. Although HIV and the acquired immunodeficiency syndrome (AIDS) can potentially affect outcomes, there have been few studies comparing trauma outcomes in HIV positive versus HIV negative patients. To the best of our knowledge, there have been no studies to date that have compared HIV-positive and HIV negative patients with penetrating (gunshot or stab) abdominal wounds requiring an exploratory laparotomy. The purpose of this study was to determine whether the outcome of hemodynamically stable patients undergoing exploratory laparotomy for penetrating abdominal trauma differed in HIV positive patients versus HIV negative patients.

**Methods:** This was an observational prospective study over a 16-month period from February 2016 to May 2017. All hemodynamically stable patients with penetrating abdominal trauma requiring a laparotomy were included in the study. To evaluate the impact of HIV on outcome, the mechanism of injury, the HIV-status, age, the penetrating abdominal trauma index (PATI), and the revised trauma score (RTS) were entered into a binary logistic regression model. Outcome parameters were in-hospital death, morbidity (defined as one or more distinct complications during hospitalization) was graded as per Clavien-Dindo classification of

complications, admission to intensive care unit (ICU), relaparotomy within 30 days, and length of stay longer than 30 days. Variables were sought in bivariate analysis.

**Results:** A total of 209 patients, 94% male, with a mean age of  $29 \pm 10$  years were analysed. Twenty-eight patients (13%) were HIV positive. The mean CD4 count in the HIV positive group was  $401 \pm 254$ . The two groups were comparable except for race; 79% were black in the HIV positive group vs. 41% in the HIV negative group. All patients underwent exploratory laparotomy of which 10 (4.8%) laparotomies were negative. There were two (0.96%) deaths, both in HIV negative group. The complication rate was 34% (n=72). There was no association between CD4 count and complications (p=0.234). Twenty-nine patients (14%) were admitted to the ICU. A higher PATI, advancing age, and a lower RTS were significant risk factors for worsened outcome. After 30 days, 12 patients (5.7%) were still in hospital. PATI was the single independent predictor in multivariate analysis. Twenty-four patients (11%) underwent a second laparotomy and the PATI was again the only significant predictor of outcome.

**Conclusion:** The incidence of HIV in our cohort is 13%; which is similar to the reported incidence of HIV in the Western Cape of 15%. There were no significant baseline differences between the HIV positive and negative groups. Our results further showed that HIV status was not an independent predictor for morbidity, admission to ICU, relaparotomy, prolonged hospital stay or mortality. The patient's HIV status does not influence their outcomes in penetrating abdominal trauma.

**Total word count: 500**

## **Chapter One**

### **Literature Review**

#### **1.1 History of Human Immunodeficiency Virus (HIV)**

Since the emergence of the Human Immunodeficiency Virus (HIV) epidemic in young gay men in 1981 in the United States of America, more than 70 million people have been infected with it. About 35 million people have died worldwide. At that stage doctors believed that the disease affected gay men only, but in December of that same year, it became clear that the disease affected other population groups, including injecting drug users (AVERT, 2017). Currently, HIV infection is increasingly being viewed as a chronic illness, as the survival of HIV-infected patients has improved dramatically since the introduction of highly active antiretroviral therapy (HAART) (Chichom-Mefire et al., 2015). Current therapies for this infection and associated complications are prolonging the survival of patients with HIV infection, thereby increasing the likelihood of future surgeries being performed (Howard, 1990, Harris and Schecter, 1997, Pietrabissa et al., 1997). Approximately 20% - 25% of patients are likely to require either an elective or emergency surgical procedure sometime during their illness for a HIV-related condition, or incidental trauma unrelated to the HIV infection, respectively (Owotade et al., 2003).

HIV is a member of the lentivirus family, a subgroup of retroviruses. The retrovirus principally infects helper T-lymphocytes, also known as CD4 or T4 helper-cells, which normally function, via cytokines and other cellular signals, to regulate immune function. The virus gains entry into the cell via binding of the HIV envelope protein to the CD4-receptor on the cell surface. The retrovirus encodes its genetic information in RNA and uses viral enzyme known as reverse transcriptase to copy its genome into a double-stranded DNA-intermediate. This is then incorporated into host DNA as a provirus. Once internalized, the resulting HIV double-

stranded DNA is incorporated into the cellular DNA; the virus thereafter remains quiescent for some time. Activation later by some factor or factors, including other infectious agents, drugs, or cytokines, results in new viruses infecting CD4 cells. There is a direct relation between the HIV burden, expressed as viral load, and loss of circulating CD4 cells. In addition to HIV-induced CD4 cell loss, HIV infection results in significant impairment of immune function. Thus, HIV-infected individuals exhibit multiple immunologic abnormalities; neutrophil function, however, remains intact. Most patients experience an acute viral syndrome several weeks following infection. If measured, these patients have lower numbers of both CD4 and CD8 T-cells and very high levels of circulating virus. Antiviral antibodies appear 6–8 weeks following infection. Concomitant with this appearance of antibodies is an increase in the absolute numbers of CD4 and CD8 cells, viral clearance, and resolution of the acute syndrome. Acquired Immunodeficiency Syndrome (AIDS) is defined by a loss of CD4 T lymphocytes or the occurrence of opportunistic infections or cancers in patients who are HIV positive (Bender and Bender, 1993, Madiba et al., 2009).

#### Clinical Staging of HIV Infection (WHO Criteria)(WHO, 2017b)

The World Health Organization (WHO) has developed criteria for clinical staging of adolescents and adults >15 years of age with established HIV infection, but without additional laboratory testing for CD4 lymphocyte counts, HIV-1 RNA levels, or other laboratory measures of ongoing immunologic status. At least one clinical condition must be present for assignment to one of four clinical stages (Table 1). Once assigned to a particular stage, persons remain in that stage even if recovery occurs from the condition that led to assignment. The clinical stage determines antiretroviral treatment (ART) strategies (Fauci, 1993).

The World Health Organization staging system differs from the US Centres for Disease Control (CDC) system as it is predominantly based on the presence of clinical features of opportunistic infections and malignancies.

**Primary HIV Infection**

Asymptomatic or acute retroviral syndrome

**Clinical Stage 1 (ART if CD4-count  $\leq 350/\mu\text{l}$ ):**

Asymptomatic or persistent generalized lymphadenopathy (lymphadenopathy of at least two sites, not including inguinal, for longer than 6 months)

**Clinical Stage 2 (ART if CD4-count  $\leq 350/\mu\text{l}$ ):**

Moderate unexplained weight loss (<10% of presumed or measured body weight)  
Recurrent respiratory tract infections (sinusitis, bronchitis, otitis media, pharyngitis)  
Herpes zoster  
Angular cheilitis  
Recurrent oral ulcerations  
Papular pruritic eruptions  
Seborrheic dermatitis  
Fungal nail infections of fingers (onychomycosis)

**Clinical Stage 3 (offer ART):**

Severe weight loss (>10% of presumed or measured body weight)  
Unexplained chronic diarrhea for longer than one month  
Unexplained persistent fever (intermittent or constant for longer than one month)  
Oral candidiasis  
Oral hairy leukoplakia  
Pulmonary tuberculosis (TB) diagnosed in last two years  
Severe presumed bacterial infections (e.g. pneumonia, empyema, pyomyositis, bone or joint infection, meningitis, bacteremia)  
Acute necrotizing ulcerative stomatitis, gingivitis or periodontitis  
Unexplained anemia (<8 g/dl), and or neutropenia (<500/ $\mu\text{L}$ ) and or thrombocytopenia (<50,000/ $\mu\text{L}$ ) for more than one month

**Clinical Stage 4 (all AIDS-defining illnesses, offer ART):**

HIV wasting syndrome  
Pneumocystis jiroveci pneumonia  
Recurrent severe bacterial pneumonia  
Chronic herpes simplex infection (orolabial, genital or anorectal of >1 month's duration or visceral at any site)  
Esophageal candidiasis (or candidiasis of trachea, bronchi or lungs)  
Extrapulmonary tuberculosis  
Kaposi sarcoma  
Cytomegalovirus disease (retinitis or infection of other organs, excluding liver, spleen and lymph nodes)  
Central nervous system toxoplasmosis  
HIV encephalopathy  
Extrapulmonary cryptococcosis including meningitis  
Disseminated nontuberculous mycobacterial infection  
Progressive multifocal leukoencephalopathy  
Chronic cryptosporidiosis  
Chronic cytoisporiasis  
Disseminated mycosis (histoplasmosis, coccidioidomycosis)  
Recurrent septicemia (including nontyphoidal Salmonella)  
Lymphoma (cerebral or B cell non-Hodgkin)  
Invasive cervical carcinoma  
Atypical disseminated leishmaniasis  
Symptomatic HIV-associated nephropathy or HIV-associated cardiomyopathy  
Clinical Stage 4 (All AIDS-defining illnesses, offer ART):  
HIV wasting syndrome  
Pneumocystis jiroveci pneumonia  
Recurrent severe bacterial pneumonia

Table 1: Clinical staging of HIV infection

In April 2014, the CDC published the Revised Surveillance Case Definition for HIV Infection. According to the CDC staging system, a patient who is confirmed to be HIV positive is grouped into one of five infection stages (0, 1, 2, 3 or unknown). Classification is usually based on CD4 count: adults with <200 cells/ $\mu$ l are deemed to have stage 3 HIV, those with 200–499 cells/ $\mu$ l are deemed to be stage 2 and those with  $\geq$ 500 cells/ $\mu$ l are deemed to be stage 1. If an individual has tested negative for HIV at some point in the preceding six months and is now testing positive, he or she is classed as stage 0. This stage persists for six months following diagnosis. In addition, the stage is not based on CD4 count if the criteria for stage 0 are not met and the patient has an opportunistic infection; in this case, the individual is deemed to have stage 3 disease, regardless of the CD4 results (Centres for Disease and Prevention, 2014).

## **1.2 Global burden of HIV and the current status of HIV in South Africa**

According to World Health Organisation (WHO), globally, 36.7 million [34.0–39.8 million] people were living with HIV at the end of 2015 (WHO, 2017a). Presently, an estimated 0.8% [0.7-0.9%] of adults aged 15–49 years worldwide are living with HIV, although the burden of the epidemic continues to vary considerably between countries and regions (Figure 1).

Sub-Saharan Africa remains the most severely affected, with nearly 1 in every 25 adults (4.4%) living with HIV and accounting for approximately 70% of the total global population living with HIV. According to UNAIDS 2016 (Joint United Nations program on HIV/AIDS), the current African countries most affected with a prevalence of more than 6.4 %, are South Africa, Botswana, Zimbabwe, Zambia, Tanzania, Uganda, Ethiopia, Chad, Mali, Niger, Nigeria, Cameroon, Burkina Faso, Guinea and Senegal. This is in stark contrast to the rest of the world, where the prevalence of HIV is seemingly decreasing (UNAIDS, 2017b).

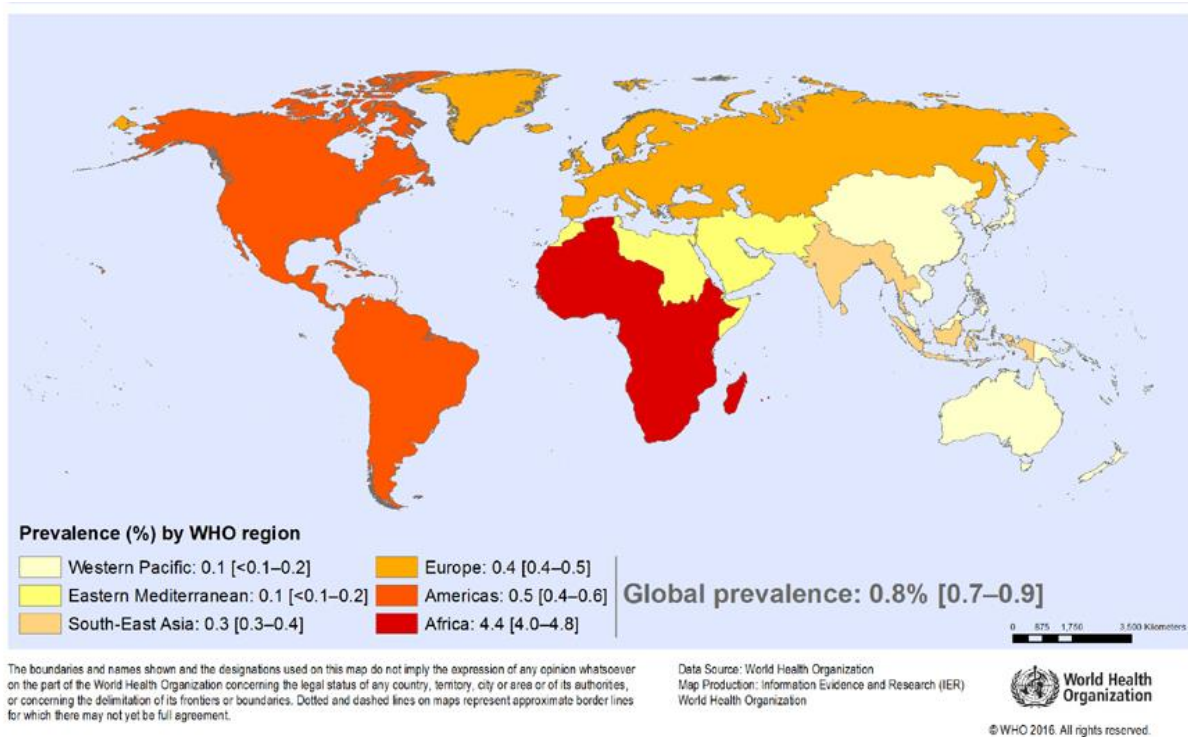


Figure 1: Adult HIV prevalence (15 – 49 years), 2015 (WHO, 2017a)

According to UNAIDS 2017, South Africa has the highest prevalence in Africa, including globally, with 4.1 million people currently infected with HIV. In Africa, this is followed by Mozambique (890 000), and Kenya (880 000). The only other countries outside of Africa with a similar prevalence is Brazil (300 000), Colombia (40 000), and Venezuela (38 000) in South America (UNAIDS, 2017a).

In 2016, Statistics South Africa (Stats SA) reports an overall estimated HIV prevalence rate of approximately 12.7% (7 million) in a total population count of 55.91 million people (SA, 2017). For adults aged 15–49 years, an estimated 18.9% of the population is HIV positive.

The rate at which the population in South Africa is being infected is declining marginally yearly from 1.77% in 2002 to 1.27% in 2016. The Western Cape Province of South Africa, where the study is being conducted, has approximately 6.29 million people, representing 11.3% of the country's total population (SA, 2017). In this province, the prevalence of HIV was 16.9% in

2011 (SAHO, 2017). Kwazulu -Natal (39.5%) and Mpumalanga (34.7%) accounted for the highest and second highest prevalence in South Africa, respectively.

To date, estimations for the HIV epidemic in South Africa are based primarily on the prevalence data, which is collected annually from pregnant women attending public antenatal clinics (ANC) since 1990. However, it has been reported that the antenatal surveillance data produce biased prevalence estimates for the general population because only a select group of people, (viz; pregnant women attending public health services), are included in the sample (SA, 2017). To correct this bias, the ANC prevalence estimates were adjusted by considering relative attendance rates at antenatal clinics and for the difference in prevalence between pregnant women and the general adult population (SA, 2017). Furthermore, adult HIV incidence is disaggregated into female and male incidence by specifying the ratio of new female infections to new male infections. The statistical report by stats SA assumes a ratio of female to male prevalence for those aged 15–49 of 1.5:1 in 2016 statistics (SA, 2017, Shisana et al., 2014).

The total number of deaths in South Africa in 2006 was 681 434. The number of AIDS-related deaths has constantly declined since 2006 from 325 241 (47.7%) to 150 759 (27.9 %) in 2016. However, it is still the leading cause of premature mortality across all districts of the Western Cape (Horberg et al., 2006). Anti-retroviral therapy (ART) have extended the lifespan of many individuals living with HIV/AIDS in South Africa, who would have otherwise died at an earlier age, evident in the decline of AIDS deaths post-2005 (SA, 2017) .This could be attributed to the increase in the roll-out of ART over time. National rollout of ART began in 2005 with a target of one service point in each of the 53 districts of South Africa (SA, 2017).

In 2010, it was noted that HIV/AIDS (13.0%) accounted for the leading cause of death in Cape Town, followed by interpersonal violence (9.7%) and tuberculosis (7.7%). This is slightly different from the Western Cape Province's overall mortality ranking for HIV/AIDS (12.4%), tuberculosis (8.6%) and interpersonal violence (8.3%) (Groenewald P et al , 2017).

### **1.3 Global burden of trauma and the current status of trauma in South Africa**

Globally, trauma continues to be an escalating problem. More than 5 million people die each year as a result of injuries. This accounts globally for 9% of all deaths, nearly 1.7 times the number of fatalities that result from HIV/AIDS, tuberculosis and malaria combined. Approximately a quarter of the 5 million deaths from injuries are the result of suicide and homicide, while road traffic injuries account for nearly another quarter. Other main causes of death from injuries are falls, drowning, burns, poisoning and war. Injuries and violence are a significant cause of death and ill health in all countries, but they are not evenly distributed around the world or within countries – some people are more vulnerable than others (Davis PA et al,1999).

Injuries affect all age groups but have a particular impact on young people and people in their prime working years (PA et al,1999). For people between the ages of 15 and 29 years, three injury-related causes are among the top five causes of death. Road traffic injuries are the leading cause of death in this age group, with suicide and homicide the second and fourth leading causes of death, respectively, together accounting for more than one quarter of all deaths in this age group (PA et al,1999).

Trauma is one of the four pandemics in South Africa, the others being infectious diseases (HIV/AIDS and TB) and non-communicable diseases such as cardiovascular conditions, cancer and mental health (Norman et al., 2007). South Africa has high death rates from unnatural causes and the second highest homicide rate in the world, second to Colombia (Dorrington et al., 2006). An estimated 70 000 South Africans are killed due to trauma every year, while over 1.5 million patients seek medical attention and are admitted to hospital for trauma related injuries (Matzopoulos et al., 2006, Foschi et al., 2006).

Trauma care in South Africa has a number of unique challenges (Brysiewicz, 2001). South Africa is a large country with an uneven distribution of services; a restrictive infrastructure; severe financial restraints on the entire health system; and an overwhelming incidence of

patients with HIV/AIDS and TB (Brysiewicz, 2001). Substance abuse and interpersonal violence are common triggers for trauma. Most trauma patients sustain penetrating injuries as a result of interpersonal violence (Figure 2). The incidence of infectious disease is very high and contributes to the morbidity and mortality of injured patients (Brysiewicz, 2001). In South Africa, injury-related mortality rates is seven times higher compared to what is found internationally (Norman et al., 2007). Trauma-related mortality, particularly due to interpersonal violence and road traffic injuries, remains extremely high and specifically amongst young adult males: 170 per 100 000 in age group 20 - 24 years (Horberg et al., 2006).

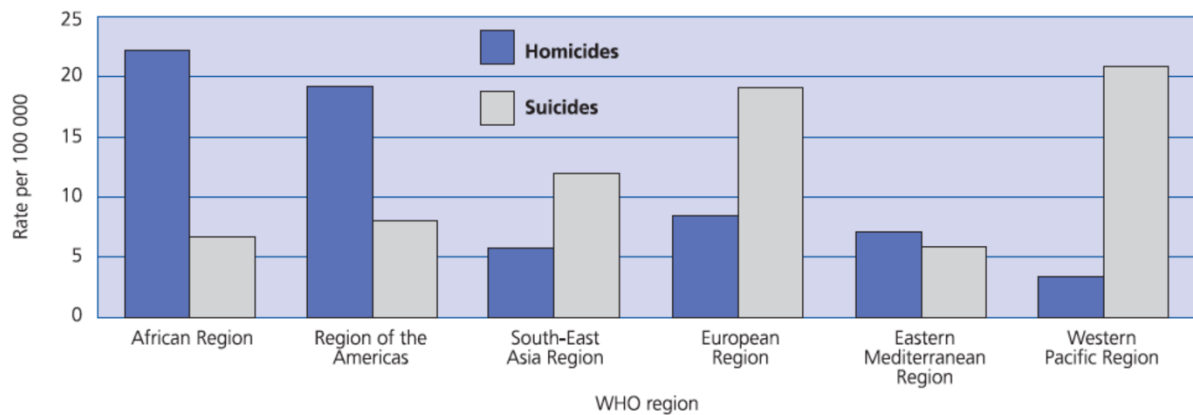


Figure 2: Homicide and suicide rates, 2000 (WHO, 2017c)

At the Groote Schuur Hospital trauma unit in Cape Town, we saw 9236 patients in 2011, and of these interpersonal violence accounted for 72% of patient visits (Nicol et al., 2014). This reflects some of the highest numbers currently seen in the world.

#### **1.4 Influence of HIV on surgical outcome**

The association between HIV and the outcomes of surgery has been studied. Initially, when HIV was first recognized, an increase in surgical patient mortality and morbidity was observed (Vipond et al., 1991). This increase was a direct result of these patients being HIV positive, and dying from an AIDS-related illness. The early reports regarding emergency surgery in AIDS patients revealed complication rates of up to 40% and mortality rates of 55-70%. These findings prompted some authors to advise against major surgery in the setting of AIDS (Bender and Bender, 1993). In 1995, however, two reports have provided data that strongly contradict the poor early experience with surgery (Bizer et al., 1995, Yii et al., 1995). The problem with earlier studies was that they did not differentiate between HIV infection and AIDS. A careful analysis of the literature by Harris and Schechter (1997) showed that the presence of AIDS-related pathology as a cause of emergency abdominal surgery confers a three- to fourfold operative morbidity risk over other causes, and increases the associated average mortality from 15% to 44%. However, patients with AIDS comprise only up to 37% of

patients undergoing surgery compared to HIV-infected non-AIDS patients (Harris and Schechter, 1997). Furthermore, these studies provided incomplete information about the pathologic findings encountered at surgery and the cause of death, making it difficult to determine outcome and the surgical morbidity and mortality rates in these patients.

More recent morbidity and mortality rates were significantly lower, and most authors now agreed that surgical therapy should not be withheld from patients with HIV. In 2005, it was found that during the previous two decades, the operative mortality in HIV-infected patients had dropped drastically from 85% to less than 15% (Saltzman et al., 2005), especially in those requiring an urgent laparotomy for sepsis (Wilson et al., 1989, Deneve et al., 2010). This could be accounted for by the introduction of ART, and earlier diagnosis of the disease (Vipond et al., 1991).

The risk is of surgery in patients with HIV infection is unknown and difficult to estimate especially as no prospective trials have examined this question, and many of the retrospective studies have yielded conflicting results (Bender and Bender, 1993). There is still debate and concern regarding the evaluation and surgical management of HIV-infected patients, with some health care providers having a nihilistic attitude toward them. Furthermore, there is a common perception that patients with AIDS are poor surgical risks with a high postoperative complication rate, increased need for intensive care treatment, and a high mortality rate (Bender and Bender, 1993, Madiba et al., 2009).

Madiba et al. (2009) in a review article, compared surgery in HIV negative, HIV positive, and AIDS patients and evaluated the outcomes. The combined results indicated that the outcomes of surgery for patients, who are HIV negative, HIV positive and those with AIDS, are variable in terms of morbidity, mortality, and duration of hospital stay. HIV infection should therefore not be considered as a significant independent factor for major surgical complications. The study concluded that appropriate surgery should be offered as per normal surgical patients without the concern of an unfavourable outcome. HIV positive patients without AIDS-defining criteria have a surgical course similar to that of HIV negative patients. The outcome following surgery, including postprocedural complications, is similar in HIV positive and HIV negative patients regardless of the site of surgery, with the exception of anorectal surgery.

Since 2008, a further 12 reports have compared HIV positive and negative surgical patients. Of all these, only six investigated the trauma population which included predominantly blunt mechanism of trauma (more than 80%). Table 2 is an extended summary of the conclusions of these papers and those previously reviewed by Madiba et al.

Authors	Country	Year	N	Discipline	Conclusions
<b>Non trauma</b>					
Wakeman et al (27)	UK	1990	112	General surgery, elective and emergency, including sepsis	HIV positive patients have a slower wound healing
Safavi et al (28)	USA	1991	62	Anorectal diseases, including septic and non-septic	AIDS patients have a poor healing
Ayers et al (29)	USA	1993	343	All surgical disciplines	No relevant differences in outcomes
Binderow et al (30)	USA	1993	25	General surgical patients	AIDS patients have a higher mortality
Devito and Robinson (31)	USA	1995	62	Gynaecological surgery	No relevant differences in outcomes except a higher blood loss in HIV positive patients
Consten et al (32)	The Netherlands	1995	83	Anorectal diseases, including septic and non-septic	AIDS patients with a lower CD4 cells count have a disturbed wound healing
Yii et al (21)	Australia	1995	45	General surgery including emergencies	AIDS patients have a higher morbidity
Hewitt et al (33)	USA	1996	57	Hemorrhoidal disease	No relevant differences in outcomes
Bhagwanjee et al(34)	South Africa	1997	402	Surgical critical care including <b>trauma (54% mostly penetrating)</b>	HIV positive patients have more organ failure and septic shock with no mortality difference at discharge
Lord,(35)	Australia	1997	101	Anorectal diseases, including septic and non-septic	HIV positive patients with less than 50 CD4 cells/ $\mu$ l have a poor wound healing
Curi et al (36)	USA	1999	104	Vascular	HIV positive patients have a higher morbidity
Davis et al(37)	UK	1999	64	General surgery laparotomy only including 5% trauma	HIV positive patients have more wound dehiscence
Morandi et al(38)	Italy	1999	48	Hemorrhoidal disease	HIV positive and AIDS patients have a slower wound healing, AIDS patient have a higher morbidity
Nadal et al.(39)	Brazil	1999	1860	Anorectal diseases, including septic and non-septic	AIDS patients have a slower wound healing
Tran et al.(40)	USA	2000	55	All surgical disciplines	No relevant differences in outcomes
Nickas and Wachter, (41)	USA	2000	443	Critical care	AIDS patients have a higher long-term mortality
(Jjuuko and Moodley, (42)	South Africa	2002	270	Gynaecological surgery	HIV positive patients have a higher wound sepsis rate
Lewis et al., (43)	Malawi	2003	445	All medical and surgical admissions with <14% trauma	HIV positive patients have a higher mortality
Mkony et al.,(44)	Tanzania	2003		General surgical patients	HIV positive patients have a higher mortality
Narasimhan et al(45)	USA	2004	441	Critical care	No relevant differences in outcomes
Fiore et al(46)	Europe	2004	408	Maternal mortality and complications in obstetrics	HIV positive patients have a higher morbidity
Cacala et al.(47)	South Africa	2006	550	General surgical patients	No relevant differences in outcomes
Horberg et al (17)	USA	2006	704	General surgical patients	No relevant differences in outcomes except a higher pneumonia rate in HIV positive patients
Doumgba et al(48)	Central African Republic	2006	207	General surgery, elective and emergency cases	HIV positive patients have a higher wound sepsis rate
Martinson et al (49)	South Africa	2007	537	General surgery including 31% trauma	No relevant differences in outcomes
Dua et al(50)	UK	2007	477	General surgery including septic and non-septic cases	AIDS patients have a higher morbidity
Ramogale et al (51)	South Africa	2007	378	Maternal mortality in obstetrics	HIV positive patients have a higher mortality
Masoomi et al.(52)	USA	2011	800	Appendicitis	AIDS patients have a higher morbidity
Cunin et al (53)	UK	2014	44	Anal cancer	HIV positive patients have a higher morbidity
Feng et al(54)	China	2015	803	General surgery including 7.5% trauma	Low CD4 count is a risk factor for sepsis
Izadmehr et al.(55)	USA	2016	13	Prostate cancer	No relevant differences in outcomes
Leeds et al(56)	USA	2016	308	Anal cancer	No relevant differences in outcomes
Phakathi et al(57)	South Africa	2016	31	Breast cancer	No relevant differences in outcomes
<b>Trauma</b>					
Guth et al(58)	USA	1996	53	<b>Trauma, blunt and penetrating (57%)</b>	No relevant differences in outcomes
Stawicki et al(5)	USA	2005	1173	<b>Trauma, predominantly blunt, penetrating (19%)</b>	Significant pulmonary and infective complications in HIV positive patients, no difference in mortality
Duane et al(6)	USA	2008	254	<b>Trauma, predominantly blunt, penetrating (18%)</b>	Significant pulmonary and renal complications in HIV positive patients, no difference in mortality
Mayala et al(59)	Tanzania	2010	250	<b>Trauma, blunt and penetrating</b>	HIV positive patients have a higher mortality and a longer length of stay
Morrison et al(7)	USA	2010	1461580	<b>Trauma, predominantly blunt, penetrating (11%)</b>	Significant pulmonary complications in HIV positive patients, no difference in mortality
Patel et al(8)	USA	2011	356448	<b>Trauma, predominantly blunt, penetrating (less than 17%)</b>	HIV was a significant risk factor for complications, but not for mortality
Salehi et al(60)	Iran	2017	969	<b>Burns only</b>	HIV positive patients stayed longer in the hospital

Table 2: Overview of studies comparing surgical HIV negative and HIV positive patients

#### *1.4.1. Influence of CD4-count*

The CD4 count can be used as a marker for the progressive immunological deterioration that eventually leads to the development of AIDS in HIV positive patients (Centres for Disease and Prevention, 2014). Earlier studies showed that there was no correlation between HIV and CD4 count and the eventual outcome post-surgery. Madiba et al. (2009) suggested that CD4 counts in HIV-infected patients should not be used as an isolated parameter to decide on surgical management. Those with very low CD4 counts are likely to be chronically ill, nutritionally depleted, often infected with pulmonary or systemic tuberculosis, and fulfil AIDS-defining criteria. Patients should be treated on their own merit and not on their CD4 counts or viral load (Madiba et al., 2009). An additional study performed by Cacala et al. showed that in HIV seropositive surgical patients, CD4 counts had no relation to in-hospital outcomes in a heterogeneous group of surgical patients. This is in contrast to Deneve et al. (2010), who found that patients presenting with lower CD4 counts, and AIDS, are more likely to require an urgent operation and experience a complication with increased mortality. Chichom-Mefire et al. (2015) prospectively compared the outcome of major abdominal surgery in 63 patients (one group were HIV-negative patients and two groups were HIV-infected patients on ART with different CD4 counts). The overall and the septic complication rates were both higher in the group with a low CD4 count. However, the mortality rates were similar. The duration of ART and the World Health Organisation stage of the disease did not significantly influence surgical outcomes. The authors concluded that HIV-infected patients on ART can safely undergo major abdominal surgery with good results though still relatively poorer than those of HIV-negative subjects.

Supporting these results is a study by Green et al. (2017), that specifically looked at the effect of the HIV stage, determined by CD4-count, on clinical outcome of surgical sepsis in South Africa. Their conclusion was that the CD4 count is important and must be considered when stratifying patients' risk for surgery as a significant difference in outcome was noted between HIV positive patients with a CD4 count of  $<200$  cells/ $\mu$ l and those with counts of  $\geq 200$  cells/ $\mu$ l.

HIV infected individuals with surgical sepsis who have a CD4 count of <200 cells/ $\mu$ l were 36 times more likely to die than those who had a CD4 count of  $\geq$ 200 cells/ $\mu$ l. The clinical presentation and spectrum of surgical sepsis disease in patients with stage 1 and stage 2 HIV was not markedly different (Green et al., 2017).

#### *1.4.2. Influence of anti-retroviral therapy*

The data available with regards to HIV, HAART and surgery are conflicting, and no definite consensus with regards to actual effect has been established. As recently as 2015, Chichom-Mefere et al. showed that HIV-infected patients on ART can safely undergo major abdominal surgery with encouraging results though still relatively poorer than those of HIV negative subject. Foschi et al. (2006) found that HAART is known to reduce the complication rate of abdominal surgery performed for a range of indications, whereas a study by Deneve et al. (2010) found that patients on HAART did not show any significant improvement in operative outcome, number of postoperative complications or overall mortality.

#### *1.4.3. Influence of viral load*

Viral load has also been described as a marker for immune status and opportunistic infection risk in patients with advanced HIV and AIDS (Deneve et al., 2010). However, results comparing the impact of viral load on overall outcomes are less clearly defined than data related to CD4 count. Some authors have identified a correlation between higher viral load counts and infectious risk (Tran et al., 2000, Foschi et al., 2006), whereas others have shown a relationship with increased mortality.

## 1.5 Trauma and HIV

Patients depend on their physiological and immunological reserves for an uncomplicated recovery after trauma. Host factors such as the presence of comorbidities, lessen this reserve and are thought to contribute to adverse outcomes. Specifically patients with pre-existing medical conditions, have been found to have significantly longer hospital lengths of stay and increased morbidity and mortality after sustaining traumatic injury (Wardle, 1999).

Studies of patients with penetrating trauma in the USA have shown a higher prevalence of HIV and hepatitis C virus infection compared to the general population (Chambers and Lord, 2001). In an Australian-based study, Chambers et al. (2001), showed a high prevalence of risk factors for HIV and HCV in patients with major penetrating wounds. The prevalence of documented HIV and HCV infection was subsequently greater than expected for the general population, highlighting the risks to health-care workers managing these patients. Several studies have shown that there is an increased incidence or higher rates of infection when compared to the general population. With regards to trauma and HIV, an increased prevalence of HIV infection in trauma patients is something several institutions have demonstrated (Tardiff et al., 1998). Seamon et al. (2011) from Philadelphia, USA, showed that more than 9% of their penetrating trauma patients tested positive for anti-HIV, HBsAg (Hepatitis B antigen) or anti-HCV, although less than 75% were aware of their diagnosis prior to their injury. Tardiff et al. (1998) found a 7.2% HIV seropositive rate among trauma victims over three years in New York City, New York in the USA.

Although HIV and AIDS can potentially affect outcomes, there are few studies comparing HIV positive to HIV negative patients with trauma to determine any differences in outcomes (Carrillo et al., 1995, Guth et al., 1996, Stawicki et al., 2005, Duane et al., 2008, Morrison et al., 2010, Mayala et al., 2010), (Table 2).

Carrillo et al. (1995) reviewed the records of 21 HIV positive patients who underwent emergency surgical procedures, including exploratory laparotomy (62%), exploratory

thoracotomy (20%), and vascular repair or neck exploration (18%) after penetrating trauma. There was a 95% survival rate and a 19% wound infection rate. All of the wound infections occurred in patients with a CD4 count less than 100/ $\mu$ l. While this study documented the rate of complications and death in the HIV positive trauma patients with penetrating trauma, there was no comparison with HIV negative trauma patients.

Guth et al. (1996) retrospectively reviewed 56 consecutive HIV positive patients treated at their level I trauma centre ranging from penetrating chest trauma resulting in uncomplicated pneumothoraces to lethal multiple blunt trauma. They examined the relationship between CD4 counts, Injury Severity Score (ISS) and bacterial infectious complications. Nine patients developed complications secondary to bacterial infections in the posttraumatic period. They concluded that only a higher ISS was associated with infectious complications. This study demonstrated that HIV positive trauma patients do not appear to have an increased complication rate as CD4 counts decrease.

Stawicki et al. (2005) retrospectively reviewed the Pennsylvania Trauma Outcome Study database (mainly blunt) to compare HIV positive patients to HIV negative age-matched controls. They had 559 HIV positive patients and 614 HIV negative patients. Pulmonary complications were significantly greater in the HIV positive patients, which were further associated with a greater mortality. Infection/sepsis and renal complications were also more common in HIV positive patients. Although there was no difference in mortality between the two groups, hospital and ICU (intensive care units) lengths of stay were both longer for the HIV positive patients. In addition, HIV negative patients were more likely to be discharged to home shortly after surgery. While this study does compare HIV positive to HIV negative patients, it considered trauma patients as a whole and no sub-group analysis of penetrating injuries.

Duane et al. (2008) performed a retrospective review of trauma patients over a five year period and compared 54 HIV positive patients with 200 HIV negative matched controlled patients. The HIV positive group had a 22% overall complication rate compared to 9% in the HIV

negative group. No differences were found between the two groups with regards to outcome, including ventilator duration, intensive care unit (ICU), hospital lengths of stay and mortality. They further stratified the HIV positive patients into two groups, one with a CD4 count less than, and, a second with a CD4 count greater than 200 cells/ $\mu$ l. They found no statistical difference in complications between the two groups. As in previous reports, this study did not include specific analysis of patients with penetrating injuries.

Morrison et al. (2010) utilized the National Trauma Data Bank (NTDB) to retrospectively compare HIV positive and HIV negative patients. The overall mortality rates were not significantly different, however, the HIV positive patients had longer lengths of hospital stay. They were also more likely to develop septic complications, such as pneumonia, bacteraemia or surgical site infections. This represents an additional study where all trauma patients were considered as a combined group and no separate analysis of patients with penetrating injuries was performed.

Mayala et al (2010), investigated the prevalence of HIV infection among trauma patients admitted to Bugando Medical Centre, Mwanza, Tanzania and its influence on outcome. A total of 250 trauma patients were recruited and studied. ISS, RTS, HIV, and CD4-count were found to be significantly associated with mortality and increased length of stay. They concluded that HIV positive patients with a CD4-count more than 200 cells/ $\mu$ l have a similar prognosis as HIV negative patients and therefore should be treated the same.

Patel et al. (2011) analysed the influence of chronic hepatic failure, end-stage renal disease, immunodeficiency, and acquired coagulopathy on outcome in trauma patients, and found that HIV / AIDS was a risk factor for complications only, whereas the former were risk factors for both complications and mortality.

To date, to the best of our knowledge, no studies have been conducted, both internationally or in South Africa, on penetrating abdominal trauma and HIV by comparing HIV negative to

HIV positive patients and considering mortality and morbidity outcomes. Furthermore, there have been no studies documenting the relationship between CD4 count, and outcome of the stable patient who undergoes a laparotomy for penetrating abdominal trauma.

It is our aim to determine whether there is any correlation between the HIV status and outcomes of patients undergoing laparotomy for penetrating abdominal trauma. The effect of CD4 count, viral load, and ART administration will also be investigated. The endpoint of this study is to provide general and trauma surgeons performing trauma laparotomy with some insight on the expected outcomes of procedures for HIV positive patients with major penetrating abdominal trauma. This could further contribute to establishing a guideline for future management of HIV positive patients that require a major abdominal surgical procedure.

**Word count without references: 5478**

**Word count with references: 7743**

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## **Chapter Two**

**Publication ready manuscript**

## **Title**

HIV and penetrating abdominal trauma - Does HIV influence the outcome?

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**Brief title**

HIV and penetrating abdominal trauma

## **Abstract**

### **Background**

The purpose of this study was to determine whether the outcome of hemodynamically stable patients undergoing laparotomy for penetrating abdominal trauma differed as a result of HIV-status.

### **Study Design**

This was an observational prospective study from February 2016 to May 2017. All hemodynamically stable patients with penetrating abdominal trauma requiring a laparotomy were included. The mechanism of injury, the HIV-status, age, the penetrating abdominal trauma index (PATI), and the revised trauma score (RTS) were entered into a binary logistic regression model. Outcome parameters were in-hospital death, morbidity, admission to intensive care unit (ICU), relaparotomy within 30 days, and length of stay longer than 30 days.

### **Results**

A total of 209 patients, 94% male, with a mean age of  $29 \pm 10$  years were analysed. Twenty-eight patients (13%) were HIV positive. The mean CD4 count in the HIV positive group was 401 (range 82 – 1142). The two groups were comparable. Ten (4.8%) laparotomies were negative. There were two (0.96%) deaths, both in the HIV negative group. The complication rate was 34% (n=72). There was no association between CD4 count and complications ( $p=0.234$ ). HIV status was not an independent predictor for morbidity, admission to ICU, relaparotomy, prolonged hospital stay or mortality. PATI score was the single independent predictor for complications in multivariate analysis.

## **Conclusions**

The incidence of HIV in our cohort is 13%; which is similar to the reported incidence of HIV in the Western Cape of 12%. The patient's HIV status does not influence their outcomes in penetrating abdominal trauma.

## **Keywords**

HIV; laparotomy; outcome; penetrating abdominal trauma

**Word count: 250**

## **Abbreviations**

AAST	American Association for the Surgery of Trauma
AIS	Abbreviated Injury Scale
ART	Antiretroviral treatment
CCI	Charlson Comorbidity Index
CDC	Centres for Disease Control
GCS	Glasgow Coma Scale
HAART	Highly active antiretroviral therapy
HIV	Human Immunodeficiency Virus
HREC	Human research ethics committee
ICU	Intensive care unit
ISS	Injury Severity Score
NTDB	National Trauma Data Bank
PATI	Penetrating Abdominal Trauma Index
RTS	Revised Trauma Score
SPSS	Statistical Package for Social Sciences

## **Introduction**

More than 70 million people worldwide have been infected with the Human Immunodeficiency Virus (HIV) since 1981. Half of them have since died (1). At the end of 2015, 37 million people worldwide were living with HIV (2). HIV infection and trauma are significant contributors to the burden of disease in South Africa. Seven million people (13%) with HIV were living in South Africa in 2016 (3). In 2010, HIV/AIDS accounted for the leading cause of death in Cape Town (13%), followed by interpersonal violence (9.7% - mainly penetrating injuries) and tuberculosis (7.7%) (4). There is an increase in prevalence of HIV sero-positivity in trauma patients. Although HIV and the acquired immunodeficiency syndrome (AIDS) can potentially affect outcomes, there have been few studies comparing trauma outcomes in HIV positive versus HIV negative patients. The association between HIV and the outcome of surgery remains unanswered with many studies yielding conflicting results. HIV treatment has also made paramount improvements in the past decades and as a result of this, HIV positive patients can now live a normal life. Despite this, in some previous studies there seems to be a tendency towards a higher morbidity and mortality in HIV positive patients undergoing trauma surgery (5-8). While some of these studies did compare HIV positive to HIV negative patients, they considered all mechanisms of trauma and did not differentiate between blunt and penetrating injuries. To date, no studies have been conducted on penetrating abdominal trauma and the influence of HIV on outcomes. The primary purpose of this study was to determine whether the HIV status of hemodynamically stable patients undergoing exploratory laparotomy for penetrating abdominal trauma had any influence on outcomes. The secondary objectives of the study were to determine whether CD4 count in the HIV positive patients plays a role, if any, in the outcome of these patients.

The endpoint of this study is to provide general and trauma surgeons performing trauma laparotomy with some insight on the expected outcomes of procedures for HIV positive patients with major penetrating abdominal trauma. This could further contribute to establishing

a guideline for future management of HIV positive patients that require a major abdominal surgical procedure.

## **Methods**

In a prospective observational study from February 2016 to May 2017 (16 months), all patients admitted with a penetrating abdominal injury (stab and gunshot wounds) requiring a laparotomy at a Level I trauma centre in Cape Town, South Africa, were considered for inclusion in this study. This study was approved by the human research ethics committee (HREC: 819/2015) of the University of Cape Town and Groote Schuur hospital.

The inclusion criteria were hemodynamic stability, penetrating abdominal trauma with an inherent need for laparotomy as result of a peritonitic abdomen, no severe head trauma (Glasgow Coma Scale (GCS) <9), a signed informed consent, and a HIV test with a positive or negative result. Patients who had more than one area of penetrating trauma, as well as patients with blunt trauma elsewhere were included in the study, as long as the other inclusion criteria were met. Patients undergoing a damage control procedure at the index operation were excluded. However, the attending surgeon may have opted for a damage control procedure in the patient who was initially hemodynamically stable, and these patients were also included in the study. All patients were treated as per our institutional protocol and received the same presumptive preoperative antibiotic coverage and postoperative analgesia and antibiotic regimen.

Once the patient was found to clinically require a laparotomy, informed consent for surgery was taken. As it was a concern that these individuals would be vulnerable at the time of going for surgery, participants for the study were recruited post-operatively, while admitted to the trauma ward, after they had undergone their surgery. Pre- and post-test counselling for HIV testing was done by trained medical practitioners. A standardized counselling form was used. Those individuals with known HIV positive status before inclusion in the study were retested.

It is standard for patients who are newly diagnosed HIV positive on admission not to routinely start antiretroviral therapy. Once patients were discharged they were referred to a local clinic for further HIV counselling and treatment. Patients with a CD4 count of less than 500cells/ $\mu$ l are usually put on antiretroviral therapy.

Basic demographics, mechanisms of injury, laparotomy findings, estimated intra-operative blood loss, length of hospital stay, admission to ICU, morbidity and mortality were recorded. The Charlson Comorbidity Index (CCI) was used to calculate the severity of comorbidities (9). Injury severity was categorized calculating the physiological scores {Revised Trauma Score (RTS) and Kampala score (10, 11)}, and the anatomical scores (American Association for the Surgery of Trauma (AAST), Abbreviated Injury Scale (AIS) (12), Injury Severity Score (ISS), Penetrating Abdominal Trauma Index (PATI) (13). Complications were stratified according to the Clavien-Dindo classification (14). Hemodynamically stable patients had a systolic BP greater than 90mmHg. Responders were patients with an initial BP lower than 90mmHg, however stabilized after 1-2-litres of fluid. A peritonitic abdomen was based on the physician's clinical judgement.

The primary outcome was morbidity defined as presence of one or more complications. Secondary outcomes were in-hospital death, admission to intensive care unit (ICU), relaparotomy within 30 days, and length of stay. The patients were stratified into two groups, HIV negative and HIV positive, for the analysis. The association between the CD4 counts in the HIV positive group, CDC stage, and morbidity were further analysed.

A sample size of 205 patients was needed to achieve a power of 80% and type I error rate of 5%, if the complication rate of the HIV negative group is 7% (5, 8), the sampling ratio of HIV negative: HIV positive is 9, and we assume a clinically relevant difference of 7% compared to

the HIV negative group, that is 14% (5-8). Continuous data was presented in mean and standard deviation numbers, and categorical data in absolute and relative numbers. Chi-square, T-, and Fisher-Test, where applicable, were used to do bivariate analysis. HIV status and the bare minimum (patient age, PATI score for anatomic severity, RTS score for physiologic severity, and mechanism of injury) were entered in multivariate binary logistic regression analysis to evaluate HIV as an independent predictor for a negative outcome (morbidity, in-hospital death, admission to ICU, relaparotomy within 30 days, and length of stay longer than 30 days). Since female gender had a low prevalence, this co-factor could not be entered into a regression analysis. Five patients had missing respiratory rates at admission, these patients with missing variables were not included in multivariate analysis.  $P < 0.05$  was considered statistically significant. The Statistical Package for Social Sciences (SPSS, Version 23, IBM Corp., Armonk, NY, USA) was used for statistical analysis.

## Results

The cohort consisted of 209 patients, 196 (94%) men and 13 women, with a mean age of 29 (SD +/-10) years. Twenty-eight patients (13%) were HIV positive. We diagnosed 21 new cases of HIV, and seven patients were aware of their HIV status prior to this admission, none of them being on ART. The HIV positive and negative groups were comparable except for race (Table 1). All patients underwent an exploratory laparotomy, of these 10 were negative or non-therapeutic (4.8%). Six patients (2.9%) had missed intraabdominal injuries, four with small intestine perforations, one diaphragm laceration, and one bile duct injury.

### Morbidity

Seventy-two patients (34%) had one or more complications (Table 2). The three most common complications were: surgical site infections (12%), post-operative ileus (8.6%), and sepsis (6.2%; including intra-abdominal collections, septic shock, urinary tract infections, pneumonia, bullet tract sepsis). In bivariate analysis, the PATI score ( $p=0.001$ ), liver packing ( $p=0.004$ ), splenectomy ( $p=0.009$ ), colonic resection with primary anastomosis ( $p=0.036$ ), distal pancreatectomy ( $p=0.007$ ), wide drainage of the pancreas ( $p=0.019$ ), nephrectomy ( $p=0.049$ ), longer duration of the first operation ( $p<0.001$ ), use of intraoperative vasopressors ( $p=0.045$ ), need for blood products ( $p=0.001$ ), and higher estimated blood loss ( $p=0.001$ ) were associated with morbidity. In multivariate analysis, the PATI score was the only single independent predictor ( $p=0.001$ , OR 1.057, 95%CI 1.023 – 1.091) for morbidity. **HIV was not an independent predictor for morbidity.**

### Mortality

Two patients (0.96%), both HIV negative, died during the hospitalization, one from hypovolemic shock secondary to rebleeding from a liver injury, and the other one from septic shock from overwhelming sepsis secondary to intraabdominal contamination following a destructive colonic injury. **There was no mortality in the HIV positive group.**

### Admission to ICU

Twenty-nine patients (14%) were admitted to the ICU. The mean duration of stay was 5.0 (SD +/- 7.3) days, and 3.6 (SD +/- 6.5) days of ventilation. Age ( $p=0.007$ ), RTS ( $p=0.014$ ), the Kampala score ( $p=0.006$ ), the PATI score ( $p=0.023$ ), thoracoabdominal injuries ( $p=0.012$ ), insertion of an intercostal drain ( $p=0.002$ ), liver packing ( $p=0.029$ ), duodenal repair ( $p=0.003$ ), wide drainage of the pancreas ( $p=0.004$ ), longer duration of the first operation ( $p=0.024$ ), use of vasopressors intraoperatively ( $p<0.001$ ), need for blood products ( $p<0.001$ ), and higher estimated blood loss ( $p=0.004$ ) were associated with admission to ICU. Higher age ( $p=0.07$ , OR 1.056, 95%CI 1.015-1.098), a higher PATI score ( $p=0.018$ , OR 1.043, 95%CI 1.007-1.080), and a lower RTS ( $p=0.002$ , OR 0.089, 95%CI 0.020-0.399), **but not HIV status**, were independent predictors for admission to an ICU.

### Hospitalization more than 30 days

After 30 days, 12 patients (5.7%) were still in hospital. An acute spinal cord injured patient ( $p=0.024$ ), drainage of the pancreas ( $p=0.040$ ), the PATI score ( $p=0.043$ ), duration of the first operation ( $p<0.001$ ) and the estimated blood loss ( $p=0.030$ ) were associated with more than 30 days of hospitalization. PATI score was the single independent predictor in multivariate analysis ( $p=0.001$ , OR 1.082, 95%CI 1.031 – 1.135).

### Relaparotomy within 30 days

Twenty-four patients (11%) underwent a relaparotomy. The reasons were planned (damage control, n=7), new or ongoing bleeding (n=3), intestinal obstruction (n=2), omental evisceration (n=1), multiple intraabdominal abscesses (n=1), peritonitic / septic (n=3), or other reasons (n=7). The PATI score (p=0.046), liver packing (p=0.006), stomach repair (p=0.041), longer duration of the first operation (p=0.047), use of vasopressors intraoperative (p=0.005), need for blood products (p=0.001), and higher estimated blood loss (p=0.023) were associated with relaparotomy. The PATI score (p=0.003, OR 1.052, 95%CI 1.017-1.088) was again the only significant predictor of relaparotomy.

### Other findings

Any damage control procedure or open abdomen was associated with morbidity, admission to ICU, hospitalization longer than 30 days and relaparotomy. Perioperative antibiotics were only recorded in 86%, which is a major violation in the protocol. However, it was not significantly associated with a negative outcome in this cohort.

Twenty-two patients had CD4-counts: 31.8% were stage 1 (CD4 count > 500 cells/ $\mu$ l), 36.4% were stage 2 (CD4 count 200-499 cells/ $\mu$ l), and 31.8% were stage 3 (CD4 count <200 cells/ $\mu$ l).

**The CDC stage in the HIV positive group was not associated with morbidity (p=0.380).**

The average CD4 count in the HIV positive group was 401 +/- 254. It was also not associated with morbidity (p=0.234).

## **Discussion**

Globally, 36.7 million people were living with HIV at the end of 2015 (2) . South Africa has the highest prevalence in Africa with 4.1 million people currently infected with HIV. The Western Cape Province of South Africa, where the study was conducted, has approximately 6.29 million people, representing 11.3% of the country's population (3). In this province, the prevalence of HIV was 16.9% in 2011(15). In South Africa, injury-related mortality rates are seven times higher compared to what is found internationally (16). Trauma-related mortality, particularly due to interpersonal violence and road traffic injuries, remains extremely high and specifically amongst young adult males: 170 per 100 000 in age group 20 - 24 years (17). It is therefore, not uncommon for young adult patients, who are HIV positive, who have sustained some sort of trauma, to be managed in our busy level I urban trauma centre.

The association between HIV and the outcomes of surgery has been previously studied. When HIV was initially first recognized, an increase in surgical patient mortality and morbidity was observed (18). This increase was a direct result of these patients being HIV positive, and dying from an AIDS-related illness. The early reports regarding emergency surgery in AIDS patients revealed complication rates of up to 40% and mortality rates of 55-70%. These findings prompted some authors to advise against major surgery in the setting of AIDS (19). In 1995, however, two reports emerged providing data that strongly contradict the poor early experience with surgery (20, 21). The problem with earlier studies was that they did not differentiate between HIV infection and AIDS. A careful analysis of the literature by Harris and Schechter (1997) showed that the presence of AIDS-related pathology as a cause of emergency abdominal surgery confers a three- to fourfold operative morbidity risk over other causes, and increases the associated average mortality from 15% to 44%. However, patients with AIDS comprise only up to 37% of patients undergoing surgery compared to HIV-infected

non-AIDS patients (22). Furthermore, these studies provided incomplete information about the pathologic findings encountered at surgery and the cause of death, making it difficult to determine outcome, the surgical morbidity and mortality rates in these patients.

More recent morbidity and mortality rates were significantly lower, and most authors now agree that surgical therapy should not be withheld from patients with HIV. In 2005, it was found that during the previous two decades, the operative mortality in HIV-infected patients had dropped drastically from 85% to less than 15%(23), especially in those requiring an urgent laparotomy for sepsis (24, 25). This could be accounted for by the introduction of ART, and earlier diagnosis of the disease (18) .

The risk of surgery in patients with HIV infection is unknown and difficult to estimate especially as no prospective trials have examined this question, and many of the retrospective studies have yielded conflicting results (19). There is still debate and concern regarding the evaluation and surgical management of HIV-infected patients, with some health care providers having a nihilistic attitude toward them. Furthermore, there is a common perception that patients with AIDS are poor surgical risks with a high postoperative complication rate, increased need for intensive care treatment, and a high mortality rate (19, 26).

Madiba et al. (2009) compared surgery in HIV negative, HIV positive, and AIDS patients and evaluated the outcomes (26). The results indicated that the outcomes of surgery for patients, who are HIV negative, HIV positive and those with AIDS, are variable in terms of morbidity, mortality, and duration of hospital stay. HIV infection should therefore not be considered as a significant independent factor for major surgical complications (26). The study concluded that appropriate surgery should be offered as per normal surgical patients without the concern of an unfavourable outcome. HIV positive patients without AIDS-defining criteria have a surgical course similar to that of HIV negative patients. The outcome following surgery, including post procedural complications, is similar in HIV positive and HIV negative patients regardless of the site of surgery, with the exception of anorectal surgery (26).

Since 2008, a further 12 reports have compared HIV positive and negative surgical patients. Of all these, only six investigated the trauma population which included predominantly blunt mechanism of trauma (more than 80%). Table 3 is an extended summary of the conclusions of the current available literature on HIV status and surgical outcomes(4).

In this study, the HIV incidence is similar to that in the Western Cape Province. In hemodynamic stable patients requiring laparotomy for penetrating abdominal trauma HIV was not an independent predictor for morbidity, ICU admission, length of hospital stay, and relaparotomy. A CD4 count greater than 200 cells/ $\mu$ l has been shown to be a good marker of immune function in patients who are HIV positive. Most of our patients were CDC stage 2 (CD4 count between 200 and 500 cells/ $\mu$ l) with an average of 400. The CD4 count did not influence outcome of our patients and since none of our patients were on ART during the time of the study, as such did not make a difference in outcome. The CDC staging does not have any impact on the progress and outcome of the patient undergoing an exploratory laparotomy in this study. This is in contrast to previous studies which suggested that the CDC staging has a direct impact on the outcome of the HIV positive patient. In multivariate analysis, the PATI score was the only single independent predictor for morbidity, ICU admission, length of stay and relaparotomy. There were only two deaths, both HIV negative patients, suggesting that HIV was probably not an independent predictor of mortality.

Despite the prospective design, the study has several limitations. The viral load was not available due to cost constraints. This could have helped to further stratify the HIV positive patients and allow us to investigate the influence of viral load, if any, on outcomes.

There were 41 patients who refused HIV testing and as such could not be included in our study.

Despite adequate counselling about HIV testing, and numerous public health programs underway in the country, including the VCT program (voluntary testing and counselling), there appears to be still a reluctance amongst young adult males to be tested. Though,

quite controversial and possibly unethical, there is a proposal to routinely test the HIV status without counselling in the trauma population (61).

Although the mortality rate was very low, we are not able to make any definitive conclusion about HIV status in the current study. To achieve statistical significance in difference in mortality between the two groups, a population of 702 patients is required. The study is still ongoing and recruiting patients for this specific purpose.

## **Conclusions**

Trauma patients with HIV are frequently seen in busy trauma centers in South Africa. There are conflicting reports about the influence of HIV on surgical outcomes. The purpose of the study was to evaluate the impact of HIV on outcome after an exploratory laparotomy. We found that the incidence of HIV in our cohort was 13%; which is similar to the reported incidence of HIV in the Western Cape of 12%. There were no significant baseline differences between the HIV positive and HIV negative groups. The patient's HIV status as well as the CD4 count did not influence their outcomes in penetrating abdominal trauma and we recommend that these patients be treated as HIV negative patients. The PATI score was found to be a significant predictor of morbidity and was validated in our cohort of patients, as higher PATI scores were associated with poorer outcomes.

**Word count: 3023**

Parameter		Total		HIV				p-value
		(n=209)		negative (n=181)		positive (n=28)		
		n	%	n	%	n	%	
Age (years +/- SD)		29	10	29	10	31	9	0.277
Gender	Male	196	93.8%	172	95.0%	24	85.7%	0.078
	Female	13	6.2%	9	5.0%	4	14.3%	
Race	Black	97	46.4%	75	41.4%	22	78.6%	<b>0.001</b>
	Coloured	103	49.3%	98	54.1%	5	17.9%	
	Other	9	4.3%	8	4.4%	1	3.6%	
Charlson Comorbidity index (score +/- SD)		0.10	0.34	0.08	0.31	0.21	0.50	0.168
Mechanism of injury	Gunshot wound	158	75.6%	138	76.2%	20	71.4%	0.771
	Sab	50	23.9%	42	23.2%	8	28.6%	
	Other	1	0.5%	1	0.6%	0		
Admission delay (hours +/- SD)		4.5	7.8	4.4	8.1	5.3	5.4	0.463
Thoracoabdominal injury		54	25.8%	44	24.3%	10	35.7%	0.199
Spinal cord injury		12	5.7%	10	5.5%	2	7.1%	0.666
Haemodynamic stability	Stable	178	85.2%	155	85.6%	23	82.1%	0.577
	Responder	31	14.8%	26	14.4%	5	17.9%	
Presenting hemoglobin		12.4	2.1	12.5	2.1	11.9	2.4	0.165
Presenting white cell count		16.16	6.82	16.38	7.00	14.78	5.53	0.25
Revised trauma score (score +/- SD)		7.743	0.260	7.739	0.269	7.766	0.198	0.613
Kampala trauma score (score +/- SD)		14	0	14	1	14	0	0.167
PATI score (score +/- SD)		14	11	14	11	12	7	0.273
ISS score (score +/- SD)		19	9	18	9	21	9	0.255
Duration first operation (hours +/- SD)		2.21	1.14	2.21	1.16	2.20	0.99	0.953
Estimated blood loss (ml +/- SD)		824	947	845	980	675	660	0.431
Prophylactic antibiotics given?		180	86.1%	154	85.1%	26	92.9%	0.383
Perforation of abdominal organ found at operation?		178	85.2%	153	84.5%	25	89.3%	0.775
Bowel resection performed		79	37.8%	66	36.5%	13	46.4%	0.312
Stoma formed?		27	12.9%	20	11.0%	7	25.0%	0.063
Morbidity		72	34.4%	61	33.7%	11	39.3%	0.563
Death		2	1.0%	2	1.1%	0		1.0
Admission to intensive care unit		29	13.9%	27	14.9%	2	7.1%	0.383
Still in hospital > 30 days		12	5.7%	12	6.6%	0		0.375
Relaparotomy within 30 days of principle procedure		24	11.5%	23	12.7%	1	3.6%	0.212

Table 1: Overview of Results

Complications		Total		HIV			
		n	%	negative		positive	
				n	%	n	%
	No	137	65.6%	120	66.3%	17	60.7%
Grade	I	12	5.7%	11	6.1%	1	3.6%
	II	23	11.0%	17	9.4%	6	21.4%
	IIIa	11	5.3%	9	5.0%	2	7.1%
	IIIb	13	6.2%	12	6.6%	1	3.6%
	IVa	3	1.4%	3	1.7%	0	0.0%
	IVb	8	3.8%	7	3.9%	1	3.6%
	V	2	1.0%	2	1.1%	0	0.0%

Table 2: Complications according to Clavien-Dindo Classification

Authors	Country	Year	N	Discipline	Conclusions
<b>Non trauma</b>					
Wakeman et al.(27)	UK	1990	112	General surgery, elective and emergency, including sepsis	HIV positive patients have a slower wound healing
Safavi et al.(28)	USA	1991	62	Anorectal diseases, including septic and non-septic	AIDS patients have a poor healing
Ayers et al.(29)	USA	1993	343	All surgical disciplines	No relevant differences in outcomes
Binderow et al.(30)	USA	1993	25	General surgical patients	AIDS patients have a higher mortality
Devito and Robinson(31)	USA	1995	62	Gynecological surgery	No relevant differences in outcomes except a higher blood loss in HIV positive patients
Consten et al.(32)	The Netherlands	1995	83	Anorectal diseases, including septic and non-septic	AIDS patients with a lower CD4 cells count have a disturbed wound healing
Yii et al.(21)	Australia	1995	45	General surgery including emergencies	AIDS patients have a higher morbidity
Hewitt et al.(33)	USA	1996	57	Hemorrhoidal disease	No relevant differences in outcomes
Bhagwanjee et al.(34)	South Africa	1997	402	Surgical critical care, including <b>trauma (54%-mostly penetrating)</b>	HIV positive patients have more organ failure and septic shock,no mortality difference at discharge
Lord et al.(35)	Australia	1997	101	Anorectal diseases, including septic and non-septic	HIV positive patients with less than 50 CD4 cells/ $\mu$ l have a poor wound healing
Curi et al.(36)	USA	1999	104	Vascular	HIV positive patients have a higher morbidity
Davis et al.(37)	UK	1999	64	General surgery laparotomy only including 5% trauma	HIV positive patients have more wound dehiscence
Morandi et al.(38)	Italy	1999	48	Hemorrhoidal disease	HIV positive and AIDS patients have a slower wound healing, AIDS patient have a higher morbidity
Nadal et al.(39)	Brazil	1999	1860	Anorectal diseases, including septic and non-septic	AIDS patients have a slower wound healing
Tran et al.(40)	USA	2000	55	All surgical disciplines	No relevant differences in outcomes
Nickas et al.(41)	USA	2000	443	Critical care	AIDS patients have a higher long-term mortality
Jjuuko and Moodley(42)	South Africa	2002	270	Gynecological surgery	HIV positive patients have a higher wound sepsis rate
Lewis et al.(43)	Malawi	2003	445	All medical and surgical admissions with <14% trauma	HIV positive patients have a higher mortality
Mkony et al.(44)	Tanzania	2003		General surgical patients	HIV positive patients have a higher mortality
Narasimhan et al.(45)	USA	2004	441	Critical care	No relevant differences in outcomes
Fiore et al.(46)	Europe	2004	408	Maternal mortality and complications in obstetrics	HIV positive patients have a higher morbidity
Cacala et al.(47)	South Africa	2006	550	General surgical patients	No relevant differences in outcomes
Horberg et al.(17)	USA	2006	704	General surgical patients	No relevant differences in outcomes except a higher pneumonia rate in HIV positive patients
Doumgha et al.(48)	Central African Republic	2006	207	General surgery, elective and emergency cases	HIV positive patients have a higher wound sepsis rate
Martinson et al.(49)	South Africa	2007	537	General surgery including 31% trauma	No relevant differences in outcomes
Dua et al.(50)	UK	2007	477	General surgery including septic and non-septic cases	AIDS patients have a higher morbidity
Ramogale et al.(51)	South Africa	2007	378	Maternal mortality in obstetrics	HIV positive patients have a higher mortality
Masoomi et al.(52)	USA	2011	800	Appendicitis	AIDS patients have a higher morbidity
Cunin et al.(53)	UK	2014	44	Anal cancer	HIV positive patients have a higher morbidity
Feng et al.(54)	China	2015	803	General surgery including 7.5% trauma	Low CD4 count is a risk factor for sepsis
Izadmehr et al.(55)	USA	2016	13	Prostate cancer	No relevant differences in outcomes
Leeds et al.(56)	USA	2016	308	Anal cancer	No relevant differences in outcomes
Phakathi et al.(57)	South Africa	2016	31	Breast cancer	No relevant differences in outcomes
<b>Trauma</b>					
Guth et al.(58)	USA	1996	53	<b>Trauma, blunt and penetrating (57%)</b>	No relevant differences in outcomes
Stawicki et al.(5)	USA	2005	1173	<b>Trauma, predominantly blunt, penetrating (19%)</b>	Significant pulmonary and infective complications in HIV positive patients, no difference in mortality
Duane et al.(6)	USA	2008	254	<b>Trauma, predominantly blunt, penetrating (18%)</b>	Significant pulmonary and renal complications in HIV positive patients, no difference in mortality
Mayala et al.(59)	Tanzania	2010	250	<b>Trauma, blunt and penetrating</b>	HIV positive patients have a higher mortality and a longer length of stay
Morrison et al. (7)	USA	2010	1461580	<b>Trauma, predominantly blunt, penetrating (11%)</b>	Significant pulmonary complications in HIV positive patients, no difference in mortality
Patel et al.(8)	USA	2011	356448	<b>Trauma, predominantly blunt, penetrating (less than 17%)</b>	HIV was a significant risk factor for complications, but not for mortality
Salehi et al.(60)	Iran	2017	969	<b>Burns only</b>	HIV positive patients stayed longer in the hospital

Table 3: Overview of studies comparing surgical HIV negative and HIV positive patients

## **Summary**

HIV had no influence on morbidity, in-hospital death, admission to ICU, relaparotomy, or length of stay in hemodynamic stable patients requiring a laparotomy after a penetrating abdominal trauma.

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## APPENDICES

### Ethics approval



UNIVERSITY OF CAPE TOWN  
Faculty of Health Sciences  
Human Research Ethics Committee



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Grootes Schuur Hospital  
Observatory 7925

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Email: [nosi.tsama@uct.ac.za](mailto:nosi.tsama@uct.ac.za)

Website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms)

31 March 2016

**HREC REF: 819/2015**

**Prof P Navsaria**  
Division of General Surgery  
J-Floor  
Old Main Building

Dear Prof Navsaria

**PROJECT TITLE: HIV AND ABDOMINAL PENETRATING TRAUMA-DOES HIV STATUS INFLUENCE THE OUTCOME? (MMed-candidate-Dr D McPherson)**

Thank you for your response letter to the Faculty of Health Sciences Human Research Ethics Committee received on the 30 March 2016.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

**Approval is granted for one year until 30 March 2017.**

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: [www.health.uct.ac.za/fhs/research/humanethics/forms](http://www.health.uct.ac.za/fhs/research/humanethics/forms))

**Please quote the HREC REF in all your correspondence.**

***We acknowledge that the student Dr D McPherson will also be involved in this study.***

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur."

Yours sincerely

Signed

**PROFESSOR M BLOCKMAN**  
**CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE**

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

HREC 819/2015



UNIVERSITY OF CAPE TOWN

HUMAN RESEARCH ETHICS COMMITTEE

28 MAR 2017

FACULTY OF HEALTH SCIENCES  
Human Research Ethics Committee



FHS016: Annual Progress Report / Renewal

HREC office use only (FWA0001637; IRB00001938)

This serves as notification of annual approval, including any documentation described below.

<input checked="" type="checkbox"/> Approved	Annual progress report	Approved until/next renewal date	30.3.2018
<input type="checkbox"/> Not approved	See attached comments		
Signature Chairperson of the HREC		<b>Signed</b>	Date Signed
			07/04/2017

Comments to PI from the HREC

Principal investigator to complete the following:

1. Protocol information

Date (when submitting this form)	27/03/07		
HREC REF Number	619/2015	Current Ethics Approval was granted until	30/3/17
Protocol title	HIV and Penetrating abdominal trauma: Does HIV influence the outcome?		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
If yes, could you please provide the HREC Refs for all sub-studies? Note: A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Professor P Navsaria		
Department / Office Internal Mail Address	General Surgery/Division Trauma Surgery/Pradeep.navsaria@uct.ac.za		

1.1 Does this protocol receive US Federal funding?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
1.2 If the study receives US Federal Funding, does the annual report require full committee approval?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.3 Has sponsorship of this study changed? if yes, please attach a revised summary of the budget.	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

## **HIV AND TRAUMA STUDY CONSENT FORM**

### **WHY IS THIS STUDY BEING DONE?**

This study is being done to compare HIV positive and negative patients who present to the trauma unit after a penetrating (stab or gunshot) injury to the abdomen. It will see if there are any differences in the outcomes of these patients after they have surgery.

### **WHAT DOES IT MEAN?**

It means that the study will allow us to see if HIV has any effect on the outcome of trauma to the abdomen. This may help us take care of future patients better if there is a difference.

### **HOW LONG WILL THE STUDY LAST?**

The study will last until all the data is collected.

### **HOW MANY PEOPLE WILL TAKE PART IN THE STUDY?**

Approximately 200 people- 100 of which will be HIV positive, 100 who will be HIV negative. This is the number of patients needed to make any findings we might have significant to make a change.

### **WHO CAN PARTICIPATE IN THE STUDY?**

Any patient who understands what the study is about and who has had a penetrating (stab or gunshot) injury to the abdomen. In addition, you must also consent to have the HIV blood test. (See HIV Test Consent Form)

### **WHAT ARE THE ADVANTAGES FOR YOU?**

Participation in this study will let you know whether you are HIV positive or negative. This is important to know, as you may need further treatment if you are HIV positive and we will help arrange that.

### **ARE THERE ANY DISADVANTAGES OR HARMFUL EFFECTS TO YOU?**

This study has no disadvantages to you. If you participate, you will have a small blood sample (less than a teaspoon) taken to test for HIV. Regardless of your HIV test results you will be managed in the same way as all other patients with similar injuries, according to the Groote Schuur hospital trauma unit guidelines.

The UCT's Faculty of Health Sciences Human Research Ethics Committee can be contacted on 021 406 6338 in case you have any ethical concerns or questions about your rights or welfare as a participant on this research study

### **WHAT WILL HAPPEN IF YOU TEST HIV POSITIVE DURING THIS STUDY?**

If the test shows that you are HIV positive, we will provide posttest counselling for you. We will also refer you to the appropriate outpatient facility so that you can be followed up regularly for monitoring of your disease and to start treatment, if needed.

### **WHAT WILL HAPPEN IF YOU TEST NEGATIVE FOR HIV?**

If the test shows that you are HIV negative, we will provide you with posttest counselling so that you are able to make informed decisions about your future health.

### **WHY ARE YOU BEING ASKED TO TAKE PART?**

You have been stabbed or shot in the abdomen, and you have had surgery to repair anything that may have been injured.

### **WHAT WILL HAPPEN IF YOU DECIDE TO TAKE PART IN THE STUDY?**

A sample of blood, less than a teaspoon, will be taken from a vein in your arm and it will be tested to see if you have HIV or not. Information regarding your injuries and your hospital course will be recorded. We will look at this information to see if there are any differences between patients who have HIV and those who do not. If you agree to the study but later decide not to participate, your information and results will be removed from the study, and there will be no change in your medical care.

### **WHAT OTHER CHOICES DO YOU HAVE?**

You may refuse to be part of the study and you will be treated the same way as any patient.

### **WHAT WILL HAPPEN WHEN THE STUDY IS OVER?**

The results of the study will be published in a medical journal, and from this we will know how and if HIV influences the outcome of trauma patients with injuries such as yours.

### **WILL THE TEST RESULTS BE SHARED WITH YOU?**

The results of the HIV test will be shared with you. All information regarding your test results will be kept confidential and will only be seen by the medical staff treating you and the doctors doing the study.

If you have any further questions, the person in charge of the study is:

Dr DEK McPherson

0720620196

( Co Principal Investigator)

I , the undersigned, do agree and give consent to use my data in this research project. My data will be used but my personal information will be kept confidential. I have had the opportunity to ask questions. Any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate in this research. It has been explained to me that I do not have to agree to this research project and this will no way affect my treatment.

**PRINT NAME AND FOLDER NUMBER OF PARTICIPANT:**

**SIGNATURE OF PARTICIPANT:**

**DATE:**

**WITNESS (For those unable to read):**

I witnessed the accurate reading of the consent form to the potential participant and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

**PRINT NAME OF WITNESS:**

**SIGNATURE OF WITNESS:**

**DATE:**

**RESEARCHER/PERSON TAKING CONSENT:**

I have accurately read out the consent form and to the best of my ability made sure that the participant understands the purpose of participation.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

**PRINT NAME OF RESEARCHER/PERSON TAKING THE CONSENT:**

**SIGNATURE OF RESEARCHER /PERSON TAKING THE CONSENT:**

**DATE:**

## **CONSENT FORM FOR HIV ANTIBODY TEST**

### **WHAT IS HIV?**

The Human Immunodeficiency Virus (HIV) is a virus which causes AIDS (Acquired Immune Deficiency Syndrome).

### **HOW DO PEOPLE GET HIV?**

There are several ways people may be infected with HIV. Most common are:

- By having sex with someone who is infected with HIV and not using a condom
- Sharing the same needle while using drugs with someone who is infected
- Being born to a mother who is infected

### **HOW IS THE HIV TEST DONE?**

A small amount of blood (less than a teaspoon) is taken from a vein in your arm. It is tested for HIV.

### **WHAT HAPPENS IF YOU HAVE A POSITIVE TEST?**

A positive test means that you have HIV. We will provide counseling, and you will be referred to an outpatient facility so you can be followed up regularly for monitoring of your disease and to start treatment, if needed.

### **WHAT HAPPENS IF YOU HAVE A NEGATIVE TEST?**

A negative test means that there was no HIV found in your blood at this point. There is still a chance that you have HIV if you have had sex without condoms or shared needles within the past six months. We will provide counseling so that you can make informed decisions about your future health.

### **WHO WILL KNOW MY TEST RESULTS?**

All of your information will be kept confidential and only you and the medical team caring for you will be aware of your test results.

I, the undersigned, do agree and give consent to an HIV test. I understand that the test is voluntary. I have had the opportunity to ask questions. Any questions that I have asked have been answered to my satisfaction.

**PRINT NAME AND FOLDER NUMBER OF PARTICIPANT:**

**SIGNATURE OF PARTICIPANT:**

**DATE:**

**PERSON TAKING CONSENT:**

I have accurately read out the consent form and to the best of my ability made sure that the participant understands the purpose of his/her HIV test.

I confirm that the participant was given an opportunity to ask questions about the test, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

**PRINT NAME OF PERSON TAKING THE CONSENT:**

**SIGNATURE OF PERSON TAKING THE CONSENT:**

**DATE:**

## PRE TEST COUNSELLING CHECK LIST GUIDELINE FOR HEALTH CARE PRACTITIONER

- 1) Greet and welcome the client , introduce yourself and explain your role
- 2) Explain confidentiality and its limits
- 3) Mention the reason for pre-test counselling: that it is a legal and ethical requirement and that it is a test with possibly vast implications and that they need to feel sure about having the test.
- 4) It is their decision to make.
- 5) Review what issues will be covered in pre-test counselling
- 6) Invite the client to provide any appropriate background information (age, relationship status, living arrangement, occupation, previous test history), remembering that people are concerned about confidentiality.
- 7) Inform the client about the reason for HIV testing and assess through the reply:
  - the urgency to have the test,
  - their knowledge of HIV, and
  - their emotional state.
- 8) As we are suggesting the test ,it is important explain:
  - a) why the test is being requested,
  - b) that it is in their best interests to start treatment as soon as possible, if necessary,
  - c) that testing is voluntary and that you have the right to refuse a HIV test, or 'Opt-out' by stating that you do not want to be tested.
- 9)The HIV pre-counselling and testing process may be anxiety-provoking for some, it is useful to remember to:
  - a) validate feelings, allowing space for personal expression,
  - b) holds on to any negative reactions, and has empathy and understanding,
  - c) reduce anxiety through a calm and relaxed manner and appropriate reassurance,
  - d) encourages the client to talk about insecurities and feelings that may accompany a crisis.
- 10) Ask the client respectfully what he or she knows about HIV and AIDS - listen and then offer to fill in any gaps in knowledge. This must cover definitions of HIV and AIDS, transmission, symptoms, progression from HIV to AIDS at a level the client can understand. The amount of information given will depend on the client's pre-existing knowledge, comprehension level and need. **The information must be shared verbally, must be accurate, and clear.**
- 11) Discuss the HIV test method and what it will measure, reveal, and not reveal.
- 12)Invite the client to participate in a risk assessment. On the basis of confidential information shared, how she or he sees their risk. Give your feedback and come to a shared understanding of the risk. The client needs to recognize the risks, request the test, and have ownership of the results – he or she must “buy in” to the process.
- 13)Explain that you are now going to explore the implications of the test, first the negative result and then the positive result. Ask the client how he or she might feel about a negative result and explore reactions and responses.

It is important to cover:

  - the window period for that test, and its implications
  - staying HIV negative through safer sex, and not sharing needles
  - if appropriate, a demonstration of male and female condoms
  -
- 14)Now explore the positive result: “If your test result comes back positive, what will you do, and how will you feel?” Be prepared if the client becomes anxious, and assist the client by focusing on solutions.
- 15) Explore psychosocial reactions:
  - the client's coping mechanisms (inner resources)
  - friend, family or community support and concerns
  - partner, or spouse support and concerns
  - other possible support (outer resources)
  -
- 16)Explore disclosure to a partner and whether the partner knows the client has come for a HIV test. Discuss any relationship implications
- 17)Explore other disclosures to family, friends and previous sexual partners and the risks attached to this. Emphasize that support is important and that there are support groups and organizations that can help.
- 18) Be prepared that the client may not know their partners names due to being involved in 'survivor sex' in order to provide money for food, shelter, or drugs, and now how to provide resources for a client in this situation
- 19)Explore issues around employment and explain that:
  - termination of employment on the grounds of HIV status is not legal
  - pre-employment testing is not legal
  - there is no legal requirement to inform the employer
  - they might be forced to disclose if they become too ill to work
- 20) Discuss other implications: family planning, pregnancy, children, finances, insurances, treatment options, medical costs, stigma, confidentiality, legal, physical, mental emotional, spiritual, sexual, lifestyle and healthy living.
- 21) Help the client to weigh these implications up into advantages and disadvantages to assist with the decision to test.

22) Assess the client's suicide risk using an approved guide for risk assessment/suicide prevention training tools. Ask, are you suicidal? If you find out you are HIV positive would you contemplate suicide? Be prepared to refer to a trained and qualified counsellor immediately if the answer is yes.

23) Discuss the test procedures and repeat information on what the test will and will not. For example, it will only reveal the presence or absence of antibodies (if the antibody test is being done) within the limitations of the window period.

24) Ask the client if there are any further questions or concerns

25) Ask the client if she or he is now ready to be tested, and start the process if the answer is 'yes'. If the answer is 'no', accept that some clients may wish to think further about the matter. It is important that **safer sex and/or reducing harm practices** have been discussed. This can be a difficult time. Offer appropriate support. If applicable, discuss coping mechanisms during the waiting period. 26) Complete any informed consent requirements and make an appointment for follow-up counselling after the test results have been shared.

### **Checklist for Pre-test Counselling and Informed Consent**

Inform your patient about **confidentiality** and **your legal responsibilities**. Patient consent is always required.

- Discuss possible **transmission routes of HIV**, what HIV is, and treatment options.
- Explain that there is a **3 month window period**, what an antibody test is, and what the test involves
- Ensure your patient is aware of the possibility of a **positive result**
- Explain that positive results will be documented for the study
- Be aware of **cultural understandings** of illness, wellbeing, and any barriers to comprehending the Medical information
- Check that the patient knows when **the test results will become available**
- Access to post-counselling must be present, and an additional follow-up appointment for post-counselling should be made for questions that may come up after

## Post-Test Counselling

The counselling provided when an individual receives his or her HIV test result is called post-test counselling, and includes one or more sessions. A second post-test counselling session would be valuable for clients who may need more time to ask questions, or who may be in shock due to a positive result. The counselling session should include feedback and understanding of results, and discussions on:

### If the result is negative:

- Strategies for risk reduction
- Possibility of infection in the 'window period', dependent on when a person may have been at risk and the type of test used

### If the result is positive:

- Immediate emotional reaction and concerns
- Personal, family and social implications
- Difficulties a patient may foresee and possible coping strategies
- Who the client wants to share the results with, including responsibilities to sexual partners
- Immediate needs and social support identification
- Follow up with supportive counselling
- Follow-up with medical care

## Post-Test Counselling for a Client with a Negative Result

- Prepare yourself for the result-giving by:

- a) checking you have the right result and it is matched to the right client
- b) making sure you understand what the results mean
- c) making sure you have enough time

- Greet and welcome the client and check their readiness to receive

the result.

- Give the result calmly and professionally.
- Wait for the client's response. Accept any response and feelings that have been evoked and ensure not to personalize by reacting.
- You may wish to explore with the client by asking:
  - a) what the test result means to them?
  - b) how the waiting period was?
  - c) who they may wish to tell about the result?

- It is extremely important to help the client stay HIV negative and stress that the client is our partner in this epidemic and that we wish to assist them to stay HIV negative. It is therefore important to discuss:

- abstinence, or safer sex and condom practices
- relationship issues around safer sex
- negotiating skills with people who may be at risk and may be trying to influence them
- assertiveness in saying 'no' to risky behaviour and following through with healthy choices
- safer drug use practices, and where to access needle exchange
- information about drug rehabilitation treatment programs
- self-responsibility

Remember that some clients:

- may be repeat testers and may be "worried well", someone who is at very low or no risk for infection fearing that they may have the disease anyway
- feel immune or reckless
- are fatalistic
- are depressed
- may feel "survivor guilt", that is a guilt from someone who has survived from risky behaviour and someone they know has not
- are left feeling angry after being put through test trauma
- may have anxiety attacks
- Encourage the client to ask any questions and empower them feel to feel resolved or "worked through" about the result.
- Make any follow-up appointment if necessary

## Post-Test Counselling: Positive Result

Prepare yourself for the result-giving by:

- Checking you have the correct result and it is matched to the right client
- Making sure you understand what the results mean before sharing
- Making sure you have the time to spend with the client
- Be sure **you are emotionally ready**, by being there to empower the client, and if you are not, if available, find another qualified health professional to support the client or receive coaching before you meet with the client by a trained counsellor

Greet and welcome the client and assess if the client is ready for the result. Allow the client to lead the session and provide a safe and caring environment. Do not overwhelm the client and if necessary, allow the following issues to be discussed at the client's pace.

- Give the result calmly, professionally and empathically.
- Wait for the client's response. Accept and normalize any of your responses and feelings that have been evoked.
- Common feelings are shock, disbelief, numbness, anger, guilt, blame, loss, sadness, hopelessness, helplessness, fear, anxiety, agitation or even a seeming indifference and denial.
- Some clients may shut down, want silence with time to reflect, or want to leave immediately be prepared for a variety of reactions. If a client leaves ensure that the client has someone they trust with them or phone to pick them up, and ensure they are not suicidal before they leave.
- At this time the client needs to feel the presence of the counsellor and that she or he is able to disclose feelings. The client may forget or block out this period however will remember you were there for them.
  - The client is facing multiple losses: health, future, normality, fitting in, sexuality (such as abstinence), etc. and it may be useful to think of the client as having to grieve and mourn for these losses.
  - If the client is symptomatic (showing signs of the disease or injury), there will be a sense of urgency.
  - Be mindful of the possible mode of infection and the implications of this for coping and strategies: being infected through rape, a needle stick, an infidelity or a loving relationship will create unique dynamics.
  - You may feel helpless and there is often a need to over-reassure.
  - Allow all feelings to occur naturally – there is usually time to make decisions.
  - Work with feelings first. Answer any questions compassionately and appropriately however be careful not to collude with over-intellectualization or by handing out too many brochures, pamphlets and resource guides on HIV. Give them clear written information that is appropriate for the level of understanding.
    - Discuss disclosing to a supportive person such as an Elder, spiritual healer, or family member that they can trust.
  - Ask whether there is a partner involved and how this person will be told.
  - If the client cannot tell their partner that they have HIV, discuss how they can negotiate safer sex, or safer practices such as, the dangers of sharing needles or other drug equipment until they have disclosed.
  - Help the client to know that experiencing pain and working through feelings is a part of healing. Validate all feelings. Answer all questions and give information and resources.
  - Discuss legal concerns and rights of HIV positive people. Stress that rights go with responsibilities. • Explore the client's current relationship, and if there is a relationship then discuss disclosure of HIV status.
  - Be prepared to give thorough assistance to the client with the "telling", and being there when it happens for anyone they may want to disclose to. Be prepared to provide culturally appropriate educational and awareness material.
- Explore other disclosures and contact tracing to:
  - past or future sexual partners
  - drug partner(s)
- Explore other disclosures to:

- family and friends
  - health care providers
  - the employer
  - insurers
  - children
- Explore disclosure to Elders or spiritual leaders that the client is practices traditional ceremonies with, and how to share education and awareness regarding HIV if needed in a respectful and culturally sensitive way.
- Explore concerns around children to include:
    - pregnancy and its risks
    - prevention of vertical transmission
    - termination
    - family planning
- Explore medical options that include:
    - follow-up tests and what they mean
    - developing a health plan with family physician, and specialist
    - alternative health options (including traditional healers and naturopathic doctors).
- Discuss welfare options including disability grants and how these are accessed.
  - Explore lifestyle changes that includes:
    - cutting down or abstaining from alcohol or harmful substances
    - getting sufficient rest and sleep
    - appropriate daily physical activity
    - managing stress and anxiety
    - eating nutritious food and a balanced healthy diet
    - use of supplements and immune boosters
    - safer sexual behaviour and re-infection
    - safer blood practices and infection control
    - ways to practice traditional wellness.
- Work appropriately with hope and empowerment by:
    - supporting the client's realistic hopefulness and being encouraging without discounting the client's concerns or avoiding talking about death and dying
    - focusing on promising research and new programs
    - focusing on quality of life issues
    - encouraging the client to take control of his/her health
    - encouraging the use of resources
    - stressing that people with HIV are living productive lives
- Plan in a clear and concrete manner how the client will manage the next 24hours.
  - Give appropriate contact numbers and arrange a follow-up appointment, for the next day if needed. Assess the need for future support and contract for appropriate number of sessions with yourself or another health professional.
  - Before the client has left, assess their suicide risk and respond accordingly.
  - Assess the client's suicide risk and respond appropriately and immediately.
  - If necessary, access your own support systems and debrief when needed.
  - In sum, focus on the whole person as social, emotional, sexual beings with medical, legal and financial needs.

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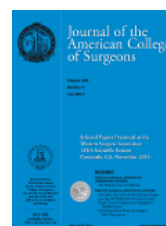


# JOURNAL OF THE AMERICAN COLLEGE OF SURGEONS

## AUTHOR INFORMATION PACK

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1. Franklin ME Jr, Rosenthal D, Abrego-Medina D, et al. Prospective comparison of open vs. laparoscopic colon surgery for carcinoma: five-year results. *Dis Colon Rectum* 1996;39:S35-S46.

Organization as author:

1. Japanese Research Society for Gastric Cancer. The general rules for the gastric cancer study in surgery and pathology. *Jpn J Surg* 1981;11:127-139.

No author given:

1. Cancer in South Africa [editorial]. *S Afr Med J* 1994;84:15.

Editor(s), compiler(s) as author

1. Kleinbaum DG, Kupper LL, Muller KE, eds. *Applied regression analysis and other multivariate methods*. 2nd ed. Boston: PWS-Kent Publishing Co; 1988:37-53.

#### **Chapter in a book**

1. Henderson I, Harris J, Kinne D, Hellman S. Cancer of the breast. In: DeVita V, Hellman S, Rosenberg S, eds. *Principles and Practice of Oncology*. 3rd ed. Philadelphia: Lippincott-Raven; 1989:1197-1268.

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#### **Websites**

World Health Organization. The world health report 2006-working together for health. Geneva, Switzerland. Available at: <http://www.who.int/whr/2006/en/index.html>. Accessed October 16, 2007.

### **Newspapers and magazines**

1. Kifner J. From Wild Talk and Friendship To Five Deaths in a Schoolyard. New York Times, March 29, 1998, 14.

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