UNIVERSITY of RWANDA

COLLEGE OF MEDICINE & HEALTH SCIENCES
SCHOOL OF MEDICINE & PHARMACY

FEASIBILITY AND UTILITY OF ROUTINE BLOOD ALCOHOL LEVEL TESTING FOR TRAUMA PATIENTS

An observational study done at a tertiary level referral hospital in Rwanda, Kigali University Teaching Hospital, in the Emergency Department

A research project submitted to the college of Medicine and Health sciences at the University of Rwanda, in partial fulfillment of the requirement for the award of Master's degree of Medicine in **EMERGENCY MEDICINE AND CRITICAL CARE**.

By **Joseph NIYONZIMA, MD**

Reg N°**:** 10105940

Supervisor: **NOAH Rosenberg, MD, FACEP**

Department of Emergency Medicine, ***Brown University***.

Co-Supervisor: **Olivier Félix UMUHIRE, MD, MMed EMCC.**

Department of Emergency Medicine, ***University of Rwanda***.

April, 2019

DECLARATIONS

I, Dr Joseph NIYONZIMA, to the best of my knowledge hereby declare and certify that the work presented in this dissertation entitled ***"Feasibility and Utility of Routine Blood Alcohol Level Testing for Trauma Patients Presenting to the University Teaching Hospital of Kigali Emergency Department"*** is entirely my own and original work and it has never been presented or submitted in whole or in part to any other University.

Principal Investigator: **Dr. Joseph NIYONZIMA**.

Emergency Medicine and critical care

Student ID: PG10105940

Supervisors:

We hereby declare that this dissertation has been submitted for examination with our approval as the University supervisors.

Dr. Noah ROSENBERG

Department of Emergency Medicine, / HRH Faculty

Dr. Olivier Félix UMUHIRE

Emergency Medicine Program director, / University of Rwanda,

College of Medicine and Health Sciences.

April 2019

DEDICATION

To my beloved wife, Faina NYINAWUMUNTU

To both my children, Henry Darcy and Keza Davia

To my Mother Fernand M

To my Father Augustin G

To my brothers and sisters

To my classmates in Emergency medicine

To the HRH faculties in the Emergency department

To all my friends

This work is dedicated with great pleasure.

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To the College of Medicine and Health Sciences at the University of Rwanda for their education and endless efforts to improve healthcare in Rwanda

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To colleagues and friends for their support

May all receive the expression of my sincere gratitude!

Dr. Joseph NIYONZIMA

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LIST OF ACRONYMS AND ABBREVIATIONS

BAC: Blood Alcohol Concentration

CHUK: University Teaching Hospital of Kigali

CMHS: College of Medicine and Health Sciences

CT: Computed tomography

Dr.: Doctor

ED: Emergency department

FIM: functional independence measure

GCS: Glasgow Coma Score

HRH: Human Resources for Health

ICU: Intensive care unit

IQR: Interquartile range

IRB: Institutional Review Board

OR: Odd ratio

UR: University of Rwanda

RNP: Rwanda national Police

RTA: Road traffic accident

TBI: Traumatic brain injury

USA: United States of America

WHO: world Health Organization

ABSTRACT

Introduction

The blood alcohol concentration (BAC) is measured in trauma patients in developed countries and results in changes in clinical management. Rwanda holds the 9th place in Africa in terms of trauma and it is on the 2nd place in matter of alcohol consumption. The most recent data from 2013, according to the Rwanda National Police records, showed that 349 traumatic injuries were treated at CHUK of which 60% were under the influence of alcohol and 45% of them died.

Methods

The study was a prospective observational, single center study of 304 patients done at a tertiary level hospital, CHUK in Kigali Rwanda from October 2018 to January 2019. All patients had a GCS greater than 14 after physician evaluation. After the initial management plan, physicians had the option to obtain a BAC measure and we assessed if this changed management. We measured changes to management by looking at ED outcomes (discharge, admit) and CT scan orders.

Results

304 patients with traumatic injuries were screened and enrolled in the study. The blood alcohol level was requested in 257(84.54%) patients and it was not requested in 47(15.46%) patients. In those whom the blood alcohol level was requested, 127(41.77%) had positive results with the average BAC of 0.09 and 130(42.77%) had negative results. 73.68% (14/19) of physicians at the emergency department confirmed that BAC testing in patients helped in the decision making and it changed management. CT scan orders quadrupled (OR = 4.62, $p<0.0001$) after BAC orders. Furthermore, the number of discharges doubled (OR = 2.02, $p<0.0001$) after BAC orders.

Conclusion

The measurement of BAC changed the physician's plan and helped both patients and the ED staff. The treating physician has to consider other factors beyond the clinical examination including CT scans. Routine measurement of BAC could increase in discharges and decrease length of stay, save money and decrease overcrowding of the ED.

CHAPTER ONE: INTRODUCTION

1.1. Study overview

Blood alcohol level (BAC) is measured in trauma patients in developed countries and results in changes in clinical patient management[1, 2, 4,5,11]. In Africa, Rwanda holds the 9th place in terms of trauma with a rate of 32% and is 2nd in terms of alcohol consumption[3,8]. There not enough data on alcohol related injuries in our settings and we hypothesized that the routine blood alcohol level testing for trauma patients with a GCS above fourteen presenting to the ED could result in a change in clinical management.

1.2. Background

Alcohol intoxication is a major risk factor for traumatic injuries [9, 10]. People who consume alcohol present with abnormal behaviors and this contributes to injuries[1, 2,9,10]. Traffic injuries account for most of the injuries in the emergency department (ED) of Kigali University Central Hospital (CHUK)[6]. The most recent data from 2013, according to the Rwanda National Police records, showed that 349 traumatic injuries were treated at the CHUK and more than 60% of those were found to have been under the influence of alcohol. 45% of those who were under the influence of alcohol died in the hospital, suggesting that alcohol consumption is a risk factor for injury in Rwanda.[7] The national police study collected data based on ED visits where the rate of trauma patients is 30% compared to all ED admissions[6].

There is no other available data on alcohol related injury since 2013. At CHUK, BAC testing is not obtained and it is possible that we are not effectively managing these patients in the appropriate manner.

After identifying this lack of data on alcohol related injuries, we hypothesized that the routine blood alcohol concentration testing for trauma patients with a GCS > 14 presenting to the ED could result in a change in clinical management. We also set out to determine the incidence of a positive BAC in patients who presented with a traumatic injury and GCS > 14 to the ED at CHUK. This study will help us to understand the relationship between blood alcohol concentration, the type of injury and management.

1.3. Problem statement

Little data is available on alcohol related injury in Rwanda. At CHUK, the blood alcohol test is not obtained and we are not possibly effectively managing those patients in the appropriate manner. This can lead us to miss some diagnoses and over/under-use our resources.

1.4. The aim of the study

The aim of the study is to demonstrate the feasibility of blood alcohol testing in trauma patients presenting to the emergency department at CHUK.

1.5. Research objectives

1.5.1. Primary Objectives

i. To determine the incidence of patients with positive BAC in all patients who presented to the emergency department at CHUK with a traumatic injuries.

1.5.2. Secondary Objectives

i. To determine the percentage of patients in which clinical decision changed after knowledge of the BAC
ii. To demonstrate that BAC test is feasible and identify potential barriers in our settings.

1.6. Research question

Does knowledge of blood alcohol concentration change the management for trauma patients?

1.7. Significance of the study

Alcohol intoxication is a major risk factor of trauma worldwide [2,13,16]. In this study we wanted to demonstrate this statement in our settings and show that the knowledge of blood alcohol level can affect the patient's care. As part of our project, we performed a limited pilot project analyzing blood alcohol concentration in samples from traumatic patients who were able to follow breathalyzer instructions, and this increased the knowledge of alcohol consumption as a risk factor of injuries. Based on results of this study, health providers can optimize care of trauma patients so that they cannot miss any diagnoses. This study will help the Rwandan population to adjust their lifestyle so that alcohol related injuries can decrease. Also based on the results, the Rwanda National Police can use them to educate people in road safety and decrease alcohol abuse.

1.8. Definition of concepts structure/ organization of the study

During the designated study period the investigator approached the clinician on duty and ask if blood alcohol testing was clinically indicated for each new trauma patient on arrival. If yes, the treating physician got a consent. The consent was obtained in patients who were able to follow on breathalyzer instructions, those who were not able, were removed from the study. The treating physician filled out the form after measurement, indicating the current management plan for trauma patient (admit, discharge, observe, CT scan or not, ..) and documented all epidemiological information about the mechanism of injury. This first survey was completed by the treating physician after his or her initial evaluation but before any testing was done. Patients were breathalyzed using the available equipment to test for alcohol in blood and report results to the treating physician. The treating physician then will be asked again regarding management plan (admit, discharge, observe, CT scan or not,..) The interval between the pre-BAC and post-BAC survey ranged from 10 to 20 minutes. We calculated odd ratios and we used descriptive statistics to evaluate characteristics of the study population.

CHAPTER TWO: LITERATURE REVIEW

2.1. Theoretical Literature

Alcohol is a sedative hypnotic drug and it depresses the central nervous system at high doses and it is a stimulant at low doses[17]. After drinking alcohol, it peaks in the human blood after 30 to 90 minutes. Alcohol can remain in the human body for a period of 15 hours and is metabolized by the liver with renal elimination. Alcohol consumption in Rwanda is increasing. Different types of alcohol are available with different concentrations up to 40%.[6]

In 2009, Amanda Hayman et al, demonstrated in their study "Interdependence of Alcohol and Trauma in the clinical settings" that alcohol use not only doubles the risk of being involved in a traumatic event, but it can also complicate the initial evaluation and result in wrong initial diagnoses and impair management of the patient. In the same study, they established that alcohol acts as a confounding factor in clinical assessment[9].

After consuming alcohol, patients can present with a falsely depressed Glasgow Coma Scale (GCS), which may impair the appropriate treatment, such as intubation or insertion of an intracranial pressure monitor if available.[9] The management of the intoxicated patient is more expensive than management of a non-intoxicated patient in the trauma settings. The increased number of required interventions and

studies, given the poor histories obtained and physical examinations performed on these uncooperative patients9 explains this.

In 2009, O'Keefe et al showed that intoxicated trauma patients were more likely to require invasive procedures (including intubation and urinary catheter insertion) and be admitted to either an inpatient unit or intensive care unit. The hospital charges of patients who were intoxicated with alcohol were $1,833 greater than the hospital charges of non-intoxicated patients with similar clinical characteristics[14].

2.2. Empirical Literature

In 2009, the World Health Organization published that effects of alcohol has been established as a causal factor in more than 60 major types of diseases and injuries, which result in approximately 2.5 million deaths per year worldwide[19].

In the industrialized world, alcohol impaired driving in the 1980s drastically declined. Suggested reasons for the decline include improved laws, enhanced enforcement, and public awareness brought about by population concerns. Other possible explanations included lifestyle changes, demographic shifts, and economic conditions[18].

A study done by Salim and colleagues concluded that toxicology screens among TBI patients that were positive for methamphetamines or alcohol were associated with high mortality[12]. A prospective cohort study of TBI patients showed that higher BAC measures were associated with poor performance on the disability rating scale and in the same study; there was no association with short-term clinical outcomes or scores on the Functional Independence Measure (FIM).[13]

In 2000, data from a survey done by Moskowitz et al demonstrated that alcohol consumption can lead to decreases in cognitive and physical functioning that can impair driving performance at BACs as low as 0.03[20].

In 2010, Amanda Killoran, et al demonstrated that intoxicated drivers are more likely to have difficulties with attention, recognition, processing of visual stimuli, general information processing and impaired decision making.[22]

In 2000 to 2006, Delvin et al did a retrospective study on the analysis of singe vehicle fatality crashes in Australia at various BACs. They founded that a significant number of drivers that had recorded BACs exceeding 0.05 were involved in road traffic crashes. The analysis also demonstrated that excessive speeding was associated with BACs ranging in 0.02 to 0.03..[21]

In 2015, the U.S Department of Transportation showed in their research "Traffic Safety Facts" that there was a statistically significant association between driver alcohol level and crash risk both before and after adjustment for demographic factors. Findings from this study indicated that crash risk grows exponentially with increasing BAC. The study showed that low levels of BAC (<0.03) increased the risk of accident by 20%, a moderate BAC of 0.05 doubled the risk compared to that of sober drivers, and at higher level of BAC (>0.10), the risk increased to five and a half times. At a BAC of 0.15, the risk is 12 times, and finally, a BAC of 0.20 and above the risk of accident is 23 times greater.[23]

In Columbia, 9,967 people died in alcohol impaired driving crashes in 2014 of which 6,391 drivers (64%) had a BAC of 0.08 g/dl or higher. The remaining fatalities consisted of 2,752 motor vehicle occupants (28%) and 824 non-occupants (8%). 1,070 children 14 years old and younger were killed in motor vehicle traffic crashes. 19% died in alcohol impaired driving injuries. 56% were occupants of vehicles with drivers who had blood alcohol concentration of 0.08 g/dl or higher and 14% were non-occupants (pedestrians, bicyclists, or others).[24]

In New Zealand, the Ministry of Transport reported that as crash severity increased, so did the contribution of alcohol and drugs. From 2014 to 2016, alcohol and drugs were a factor in 29% of fatal crashes, 14% of serious injury crashes and 10% of minor injury crashes. 13 alcohol-affected pedestrians died on New Zealand roads. In some of these cases, an alcohol-affected driver was also involved.[25]

In Kenya, Wilson Odero et al 2003 showed that 40% of drivers and 20.2% pedestrians were involved in road traffic accident and were intoxicated with alcohol at the time of accidents. Unfortunately, the alcohol was not recorded as a risk factor of these injuries because of lack of technology and laboratory test.[26]

2.3. Critical Review and Research Gap identification

In general, there is little research on alcohol related injuries in Rwanda. Traumatic injuries account for most of the injuries in the ED of CHUK.[6] The most recent data from 2013, according to the Rwanda

National Police records, showed that 349 traumatic injuries were treated at the CHUK and more than 60% of those were found to have been under the influence of alcohol. 45% of those who were under the influence of alcohol died in the hospital, suggesting that the alcohol consumption is a risk factor for injury in Rwanda.[7] The study collected data based on ED visits where the rate of trauma patients is 30% compared to all ED admissions[6].

An increase in alcohol consumption in a population may also cause increased incidence of drunk driving unless effective countermeasures are carried out. As documented from many studies worldwide, the use of alcohol is one of the main causes of road traffic crashes. Rwanda has an official legal blood alcohol level limit of 0.08. In our hospital we do not have breathalyzers to perform efficient controls of blood alcohol level. Our laboratories do not have equipment for analyzing alcohol in biological samples. Consequently, we do not have data on how large a proportion of injuries are related to alcohol.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Research design

The study design was prospective, single-centered observational study at the emergency department in CHUK.

3.2. Research approach

The treating physician and patient triage records collected patient demographic information such as injury type, mechanism and severity. If the treating physician concluded that the blood alcohol level test was required, the investigator measured the blood alcohol concentration by using a breathalyzer machine. Results were reported to the treating doctor. At the closure, the treating doctor filled out the post-result survey to determine if there was a change in clinical decision. The interval between the pre-result and the post-result survey ranged from 10 to 20 minutes. We calculated odd ratios and descriptive statistics to evaluate characteristics of the study population.

3.3. Research setting

This was a single center study, conducted at a large tertiary care center in Kigali Rwanda with an average of 30 ED visits per day and with a high incidence of traumatic injuries. From September to December 2018, we prospectively collected data on patients who presented to ED in CHUK with traumatic injuries and who were able to follow breathalyzer instructions (GCS above14).

3.4. Population

The study includes all trauma patients who arrived at the CHUK emergency department and who were able to follow breathalyzer instructions (GCS above 14) during the study period. In total we screened 304 patients.

3.4.1. Inclusion and Exclusion criteria

All trauma patients presenting ED during the study period who were able to follow instructions for breathalyzer testing and for whom the treating clinician were ordered blood alcohol level testing were included in the study. Any patient under age of 16 year, unable to follow instructions of the breathalyzer, or with a GCS<14 were excluded from the study.

3.5. Sampling

Sampling process was based, upon ED admission for all trauma patients. We captured patients during the entire day over seven days for a collection period for 4 months.

3.5.1. Sample size

The average number of ED visits per day was 30 patients and we collected data in 4 months. Our population (estimated trauma patients) was 1080 in 4 months and we know that the rate of trauma patients in ED is 30%. Our confidence level was 95% with a confidence interval of 5. By using the formula below, our calculated sample size was 284 patients.

$Ss= Z^2p(1-p)/e^2$

Where: Ss = Sample size, Z = Confidence level, p = estimated prevalence of trauma patients, and e = range of confidence interval (allowable error).

3.5.2. Sampling strategy

Given that little is known on the prevalence of alcohol related trauma at the Emergency Department, the study collected data based on ED visits, with a target of 500 patients to be enrolled in 4 months period (average of 4 trauma patients per day).

3.6. Validity and reliability of research instruments

The breathalyzer, which was used, is a device to measure alcohol in human blood. Measurements obtained by this device are used in the diagnosis of alcohol intoxication.

The BACTRACK (select S80 Breathalyzer) is a professional alcohol screening device used for the detection of alcohol in the blood. The BACTRACK provides a digital result indicating the approximate BAC (Blood Alcohol Content) of the test subject. The BACTRACK is powered by 2 AA batteries and is very easy to use. The alcohol concentration in the blood is related to that in the blood, and because of this, an individual's BAC can be determined by measuring alcohol in the blood. The ratio of breath alcohol to blood alcohol is generally estimated to be 2,1:1 (therefore, 2,1ml of alveolar air will contain approximately the same amount of alcohol as 1 ml of blood).

3.7. Data Collection

Data were collected on paper and entered into a database; no identifying data was collected (names or patient file number). All patients were identified by date and collection order. Age and gender were collected for each patient.

3.8. Data analysis

For categorical variables, proportions and odd ratios were calculated. For continuous variables, medians with interquartile ranges (IQRs) were calculated. Significance was assessed at $p<0.05$.

3.9. Ethical considerations

All data were collected on a paper form and then entered into an electronic data capture tool. Papers were destroyed at the conclusion of the study. Electronic data were kept on a hard drive in a secure location. Per protocol, patient name, date of birth and medical record number were not collected. The only demographic data collected included age and gender. There was no risk of inadvertent loss of privacy due to data breach.

3.10. Data management

Data was collected by the researcher indicated on the local IRB. Patient safety was ensured via oversight by the principal investigator and the study supervisor. The principal investigator was also responsible for documentation of all findings.

3.11. Data Dissemination

The principal investigator collected data and the study statistician conducted the data analysis in conjunction with the primary investigator, who prepared all results for dissemination.

CHAPTER FOUR: RESULTS

4.1. Introduction

In total, 304 patients with traumatic injuries were screened and enrolled in the study. The blood alcohol level was requested in 257(84.54%) patients and it was not requested in 47(15.46%) patients. In those whom the blood alcohol level was requested, 127(41.77%) had positive results with the average BAC of 0.099 . and 130(42.77%) had negative results. 73.68% (14/19) physicians at the emergency department confirmed that the knowledge of blood alcohol testing in trauma patients was helpful in decision making.

The average age of total patients was 35 ± 13 years. The average age of patients with positive blood alcohol concentration was 33.78 ± 10.73 years and for patients with negative blood alcohol concentration it was 35.74 ±15.28 years.

In all patients where BAC was ordered, male patients were the most common 224 (73.68%). There was no significant difference of ED admission of trauma patients between day and night shift. We found that more positive BAC findings occurred during night shifts, 67 (22.04%), and more negatives BAC findings occurred during the day shifts, 72 (23.68%).

The most common mechanism of injury were RTA 172 (56.57%) followed by falls 72 (23.69%) and assaults 48 (15.78%) The most common injuries associated with alcohol consumption were head injuries 46(15.13%) as it was diagnosed by the treating physicians followed by fractures 41(13.48%).

ED discharges were increased after testing the BAC in both groups of patients who had positive and negative results (OR = 2.02, $p<0.0001$). The death rate was double in patients with positive blood alcohol concentration 10(3.28%) compared with patients with negative blood alcohol concentration 5(1.64%) OR = 2.02, $p<0.0001$.

After testing the blood alcohol level in trauma patients, the number of discharged patients increased from 39 (12.82%) to 72 (23.68%) in patients with negative blood alcohol concentration and from 3 (10.2%) to 41 (13.15%) in patients with positive blood alcohol concentration (OR = 7.32, $p<0.001$). Conversely, admissions decreased from 64 (21%) to 45 (14.8%) in patients with negative blood alcohol concentration and from 65 (21.38%) to 54 (17.75%) in patients with positive blood alcohol concentration. CT orders increased in both groups from 27 (8.9%) to 36 (11.8%) in patients with negative blood alcohol concentration and from 19 (6.25%) to 93 (30.6%) in patients with positive blood alcohol concentration ($p<0.001$).

4.2. Demographic characteristics

TABLE I. Patient Demographics

Characteristics	**Total patients**	**Patients with a positive BAC (≥0.01)**	**Patients with a negative BAV (=0.00)**	**No BAC ordered**
Total patients	304(100%)	127(41.77%)	130(42.77%)	47(15.46%)
Age (Years)	35 ± 13	33.78 ± 10.73	35.74±15.28	34.21±12.75
Gender				

Males	224(73.68%)	96(31.47%)	102(33.55%)	26(8.55%)
Females	80(26.31%)	31(10.19%)	28(9.21%)	21(6.9%)
ED Presentation				
Day Shift	160(52.63%)	60(19.73%)	72(23.68%)	28(9.21%)
Night Shift	144(47.84%)	67(22.04%)	58(19.26%)	19(6.25%)
Mechanism				
Fall	72(23.69%)	28(9.21%)	31(10.19%)	13(4.27%)
Assault	48(15.78%)	21(6.9%)	23(7.56%)	4(1.31%)
RTA	172(56.57%)	74(24.34%)	69(22.69%)	29(9.53%)
Land sliding	1(0.32%)	0	0	1(0.32%)
Explosion	1(0.32%)	1(0.32%)	0	0
Burns	8(2.63%)	2(0.64%)	6(1.97%)	0
Bite	1(0.32%)	0	1(0.32%)	0
Unknown	1(0.32%)	1(0.32%)	0	0
Types of Injury				
Head	87(28.61%)	46(15.13%)	28(9.21%)	13(4.27%)
Spinal	15(4.93%)	5(1.64%)	7(2.3%)	3(0.98%)
Chest	20(6.57%)	5(1.64%)	11(3.61%)	4(1.31%)
Fracture	100(32.89%)	41(13.48%)	44(14.47%)	15(4.93%)
Abdominal	3(0.98%)	0	1(0.32%)	2(0.64%)
Wounds	42(13.81%)	14(4.6%)	24(7.89%)	4(1.31%)
Muscle contusion	7(2.3%)	3(0.98%)	2(0.64%)	2(0.64%)
Dislocation	15(4.93%)	6(1.97%)	8(2.63%)	1(0.32%)
Burns	3(0.98%)	1(0.32%)	1(0.32%)	1(0.32%)
Facial	2(0.64%)	1(0.32%)	1(0.32%)	0
Pelvic	5(1.64%)	3(0.98%)	0	2(0.64%)

Polytrauma	5(1.64%)	2(0.64%)	3(0.98%)	0
ED Outcomes				
Discharged	198(65.13%)	79(25.98%)	89(29.27%)	30(9.86%)
Admitted	87(28.61%)	38(12.5%)	36(11.84%)	13(4.27%)
Died	19(6.25%)	10(3.28%)	5(1.64%)	4(1.31%)

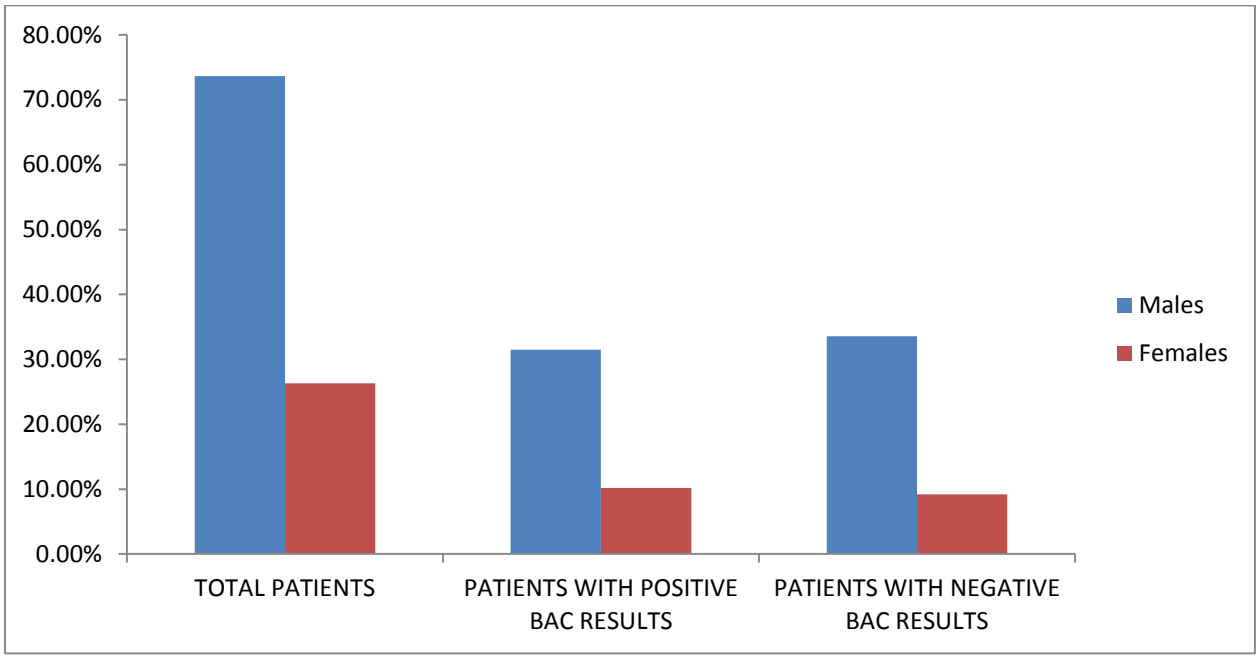
TABLE II. The Incidence of decision making change according to the BAC results

	Patients with a negative BAC		Patients with a positive BAC	
	Pre-BAC decision	Post-BAC decision	Pre-BAC decision	Post-BAC decision
Discharges	39(12.82%)	72(23.68%)	31(10.2%)	41(13.15%)
Admissions	64(21%)	45(14.8%)	65(21.38%)	54(17.75%)
Observation	26(8.5%)	12(4%)	32(10.5%)	32(10.5%)
C-Collar	24(7.8%)	24(7.8%)	19(6.25%)	28(9.21%)
CT requests	27(8.9%)	36(11.8%)	19(6.25%)	93(30.6%)

TABLE III. BAC RELATION WITH SEVERITY (Triage category)

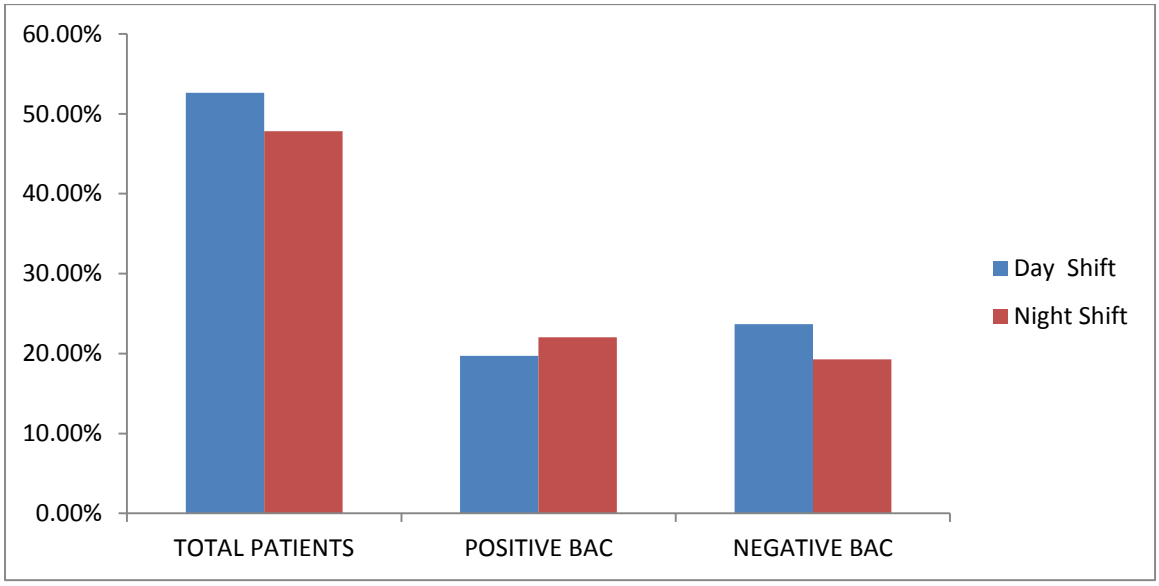
Severity	**Patients with a positive BAC**	**Patients with a negative BAC**	**BAC Not Requested**
Red	18(5.92%)	8(2.63%)	9(2.96%)
Orange	55(18.09%)	52(17.10%)	16(5.26%)
Yellow	51(16.77%)	65(21.38%)	19(6.25%)
Green	3(0.98%)	5(1.64%)	3(0.98%)

Figure 1: Comparison of Male and Female in both results group patients with positive BAC results and with negative BAC results.



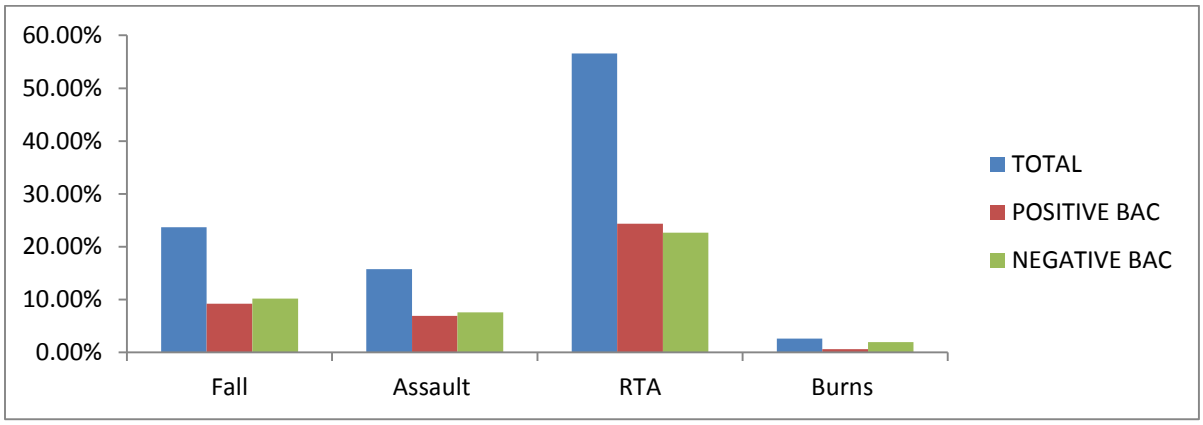
There was no big difference of gender in both groups of patients with negative and positives BAC results.

Figure 2: Time of day presenting patients with positive BAC results compared with negatives BAC results.



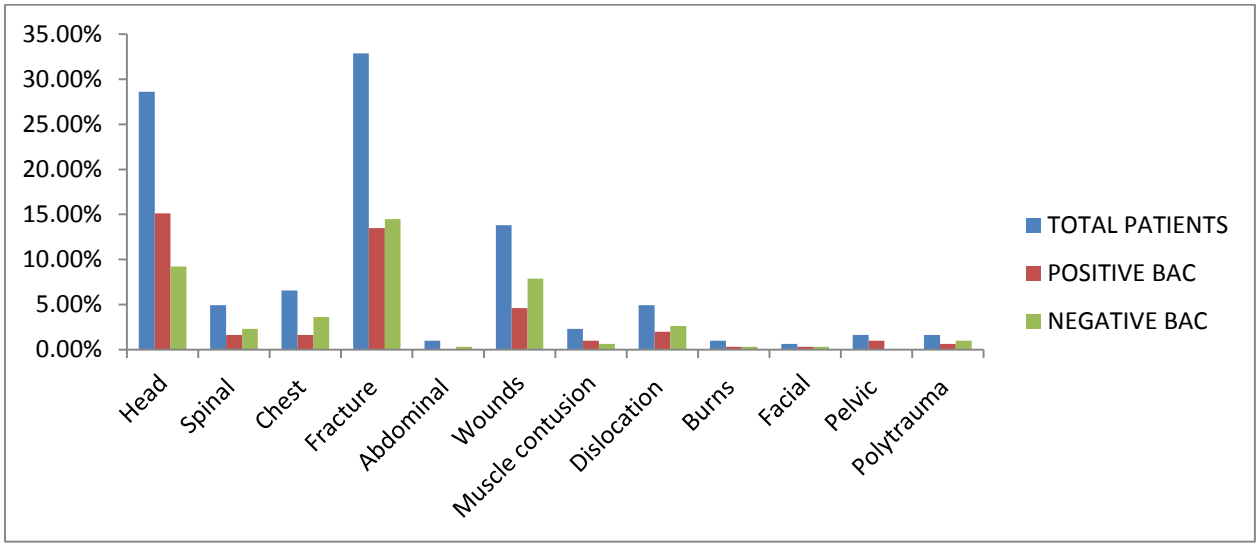
Night shifts (from 07:00pm to 07:00am) accounted for more patients with positive blood alcohol concentration results compared with the day shift (from 07:00am to 07:00pm).

Figure 3: Mechanism of injury in patients with positive BAC results compared with negative BAC results.



Fractures, head injuries and assaults are the most associated with alcohol consumption.

Figure 4: Types of injury in patients with positive BAC results compared with negative BAC results.



Fractures, head injuries (as the treating physicians diagnosed it) and assaults are the most associated with alcohol consumption in both positive and negative BAC patients.

Figure 5: Comparison of ED Outcomes in patients with positive BAC results compared with negative BAC results. Most of patients were discharged home from the ED

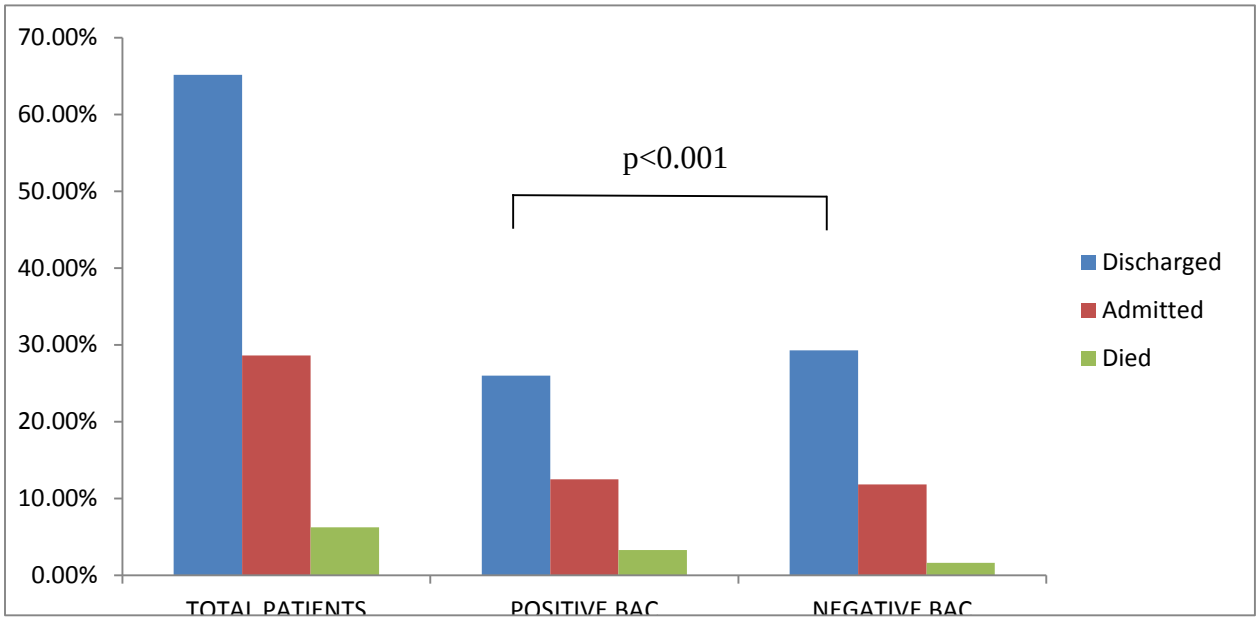
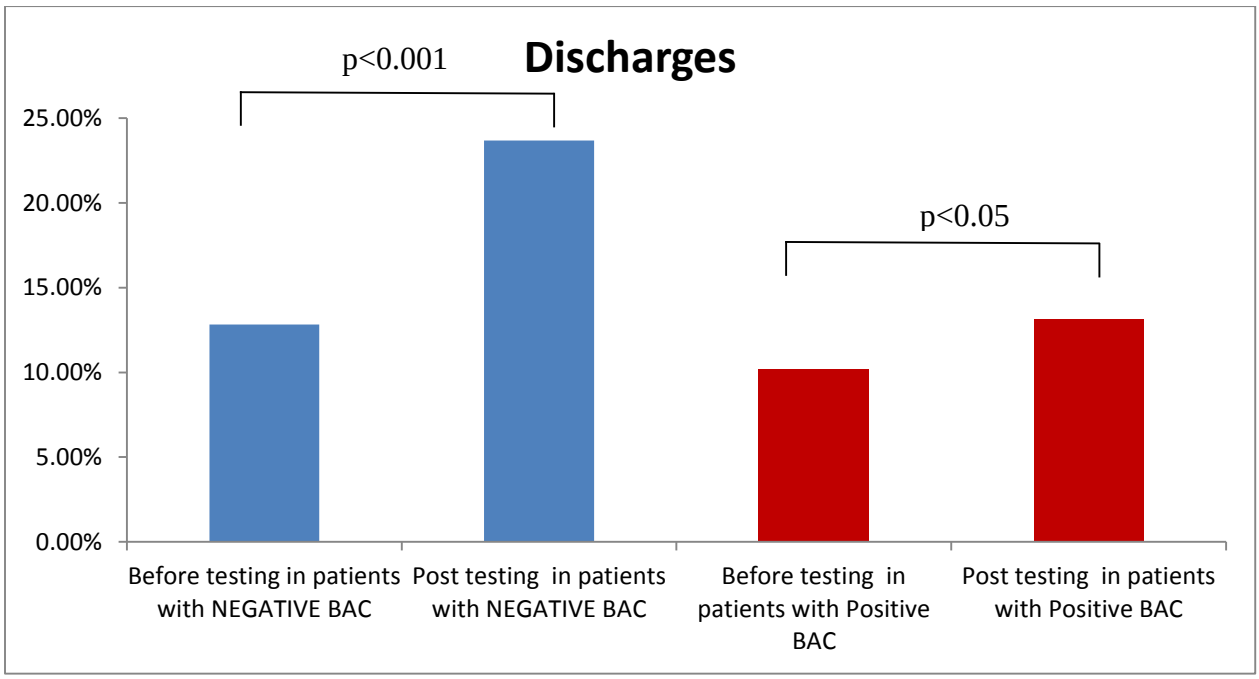
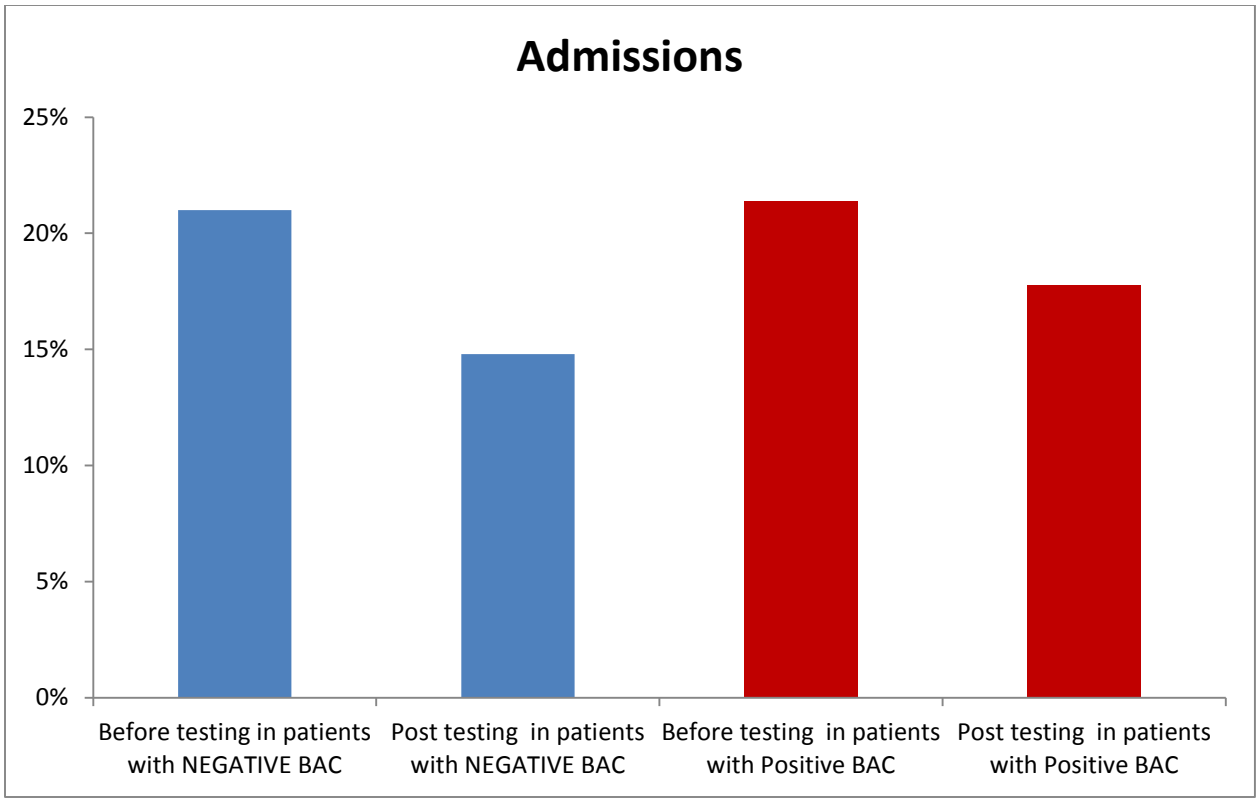


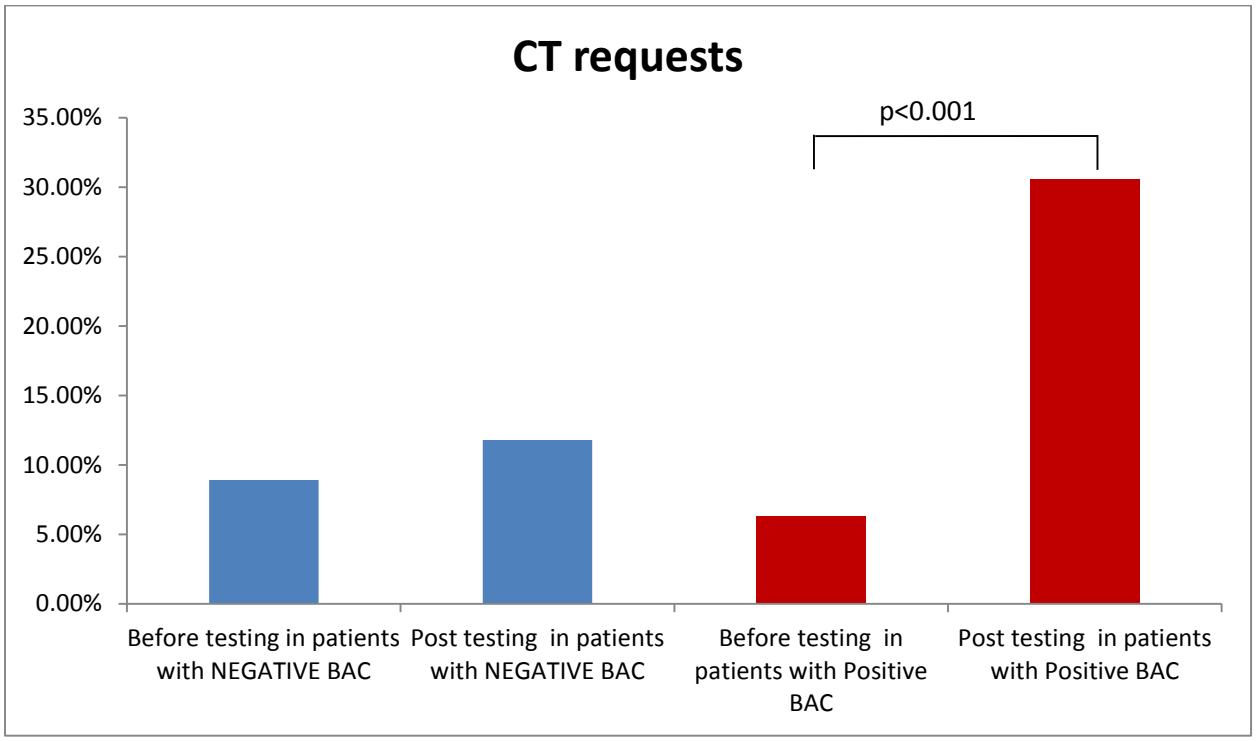
Figure6: Comparisons of decision change on disposition in patients with negative and positive BAC results.



The number of discharges was increased

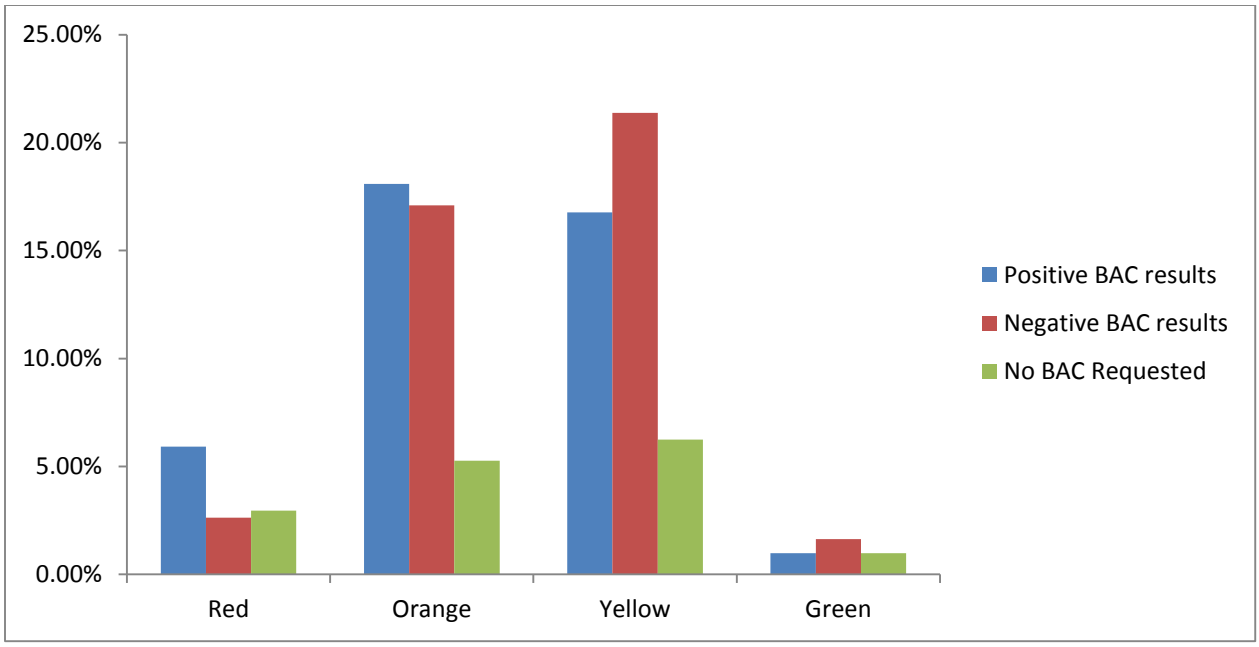


The number of admissions decreased after testing the blood alcohol concentration.



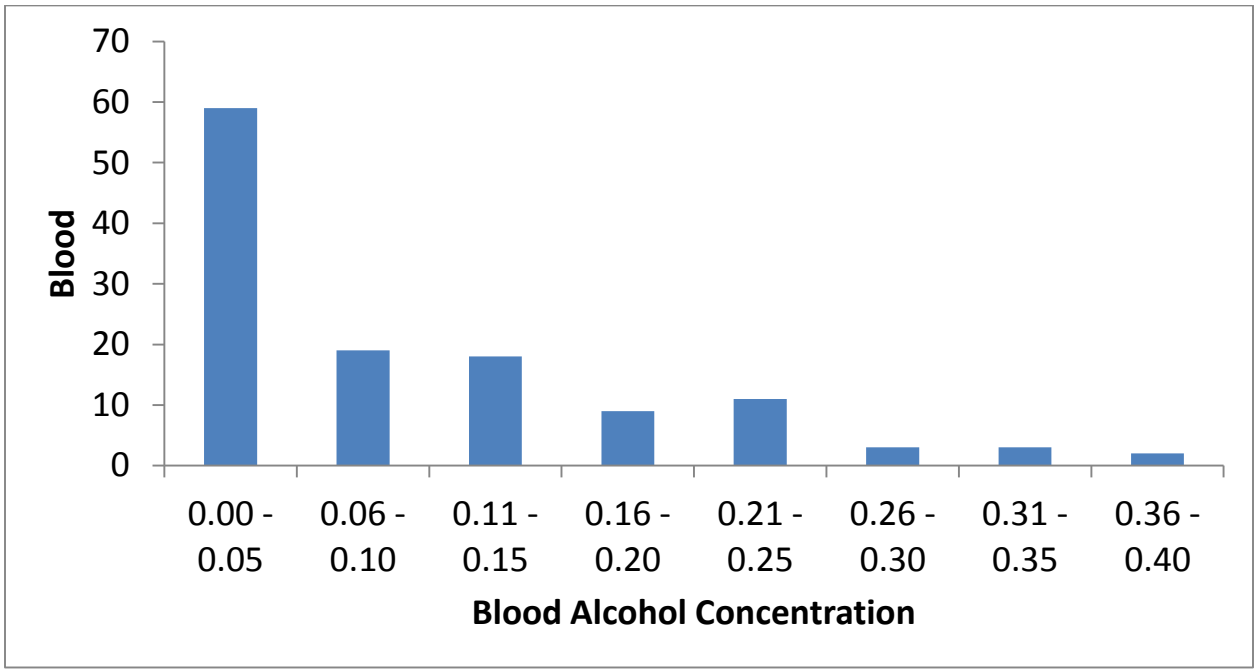
The number of CT Scan orders was increased in after measuring the blood alcohol concentration in both groups.

Figure7: Comparison of types of injury and triage category



Patients with positive blood alcohol concentration needed a review in less than 10 minutes (red and orange) which was greater than those who had negative blood alcohol concentration.

Figure8: Frequency of BAC



Most of the patients with alcohol related injuries had a BAC above the cut off (0.08) at the national level.

CHAPTER FIVE: DISCUSSION

We conducted a prospective, single centered study assessing the impact of blood alcohol measure in patients with a GCS above 14. We found that after BAC measurements were obtained for patients and this resulted in more discharges from 39 (12.82%) to 72 (23.68%) and patients with negative blood alcohol concentration and from 3 (10.2%) to 41 (13.15%) in patients with positive blood alcohol concentration. This is important to both patients and the hospital staff as it decreases the length of stay in ED and the patients save their money and minimize the risk of developing hospital-acquired infections. Also by increasing the number of ED discharges, it is an advantage to ED staff and the hospital because it decreases overcrowding in the ED and results in better high quality and timely patient care in the department. This is crucial, as studies have shown that overcrowding is a factor that contributes to poor ED performance[27].

We found that CT orders increased in both groups from 27 (8.9%) to 36 (11.8%) in patients with negative blood alcohol concentration and from 19 (6.25%) to 93 (30.6%) in patients with positive blood alcohol concentration. This is a benefit for intoxicated trauma patients. CTs help the treating physicians to rule out other differentials and ensure accurate diagnosis in the emergency department. Physicians often do not acquire clear histories or accurate physical exams from intoxicated patients, thus by increasing CT orders physicians are ensuring that they are not missing other injuries. Other studies have shown that management of intoxicated patients was difficult because of the lack of information and poor communication during the physical exam[9,21,8,4]. Intoxicated patients required more attention and testing thus also increasing their associated cost[9].

The number of male patients is elevated compared with female patients in all groups. This is similar to the recent publication of The Rwanda Non-Communicable Committee Report[14.] Studies showed that women drink less alcohol and have fewer alcohol related problems than men. Women don't manifest high characteristics associated with excessive drinking including aggressiveness and drinking to reduce distress[28]. There was no big difference in patient admission during the day and night shift. Based on this, we concluded that the ED is continuously receiving intoxicated trauma patients.

The most common mechanism of injury associated with alcohol consumption in patients presenting to the ED are head injuries, fracture and assaults. The small numbers of other mechanisms are rare in the ED including some patients who presented with unknown mechanisms. Studies showed that 50% of head injuries patients are associated with alcohol intoxication followed by fractures[29].

The death rate of patients with positive blood alcohol concentration results was double of patients with negative blood alcohol concentration result. This is partly due to side effects of alcohol in the human body. Alcohol is a risk factor for many diseases and the study showed that alcohol consumption is related to numerous medical conditions, significant morbidities and premature death worldwide[30].

Patients with a positive blood alcohol concentration need more attention, as alcohol intoxication reduces GCS level. In our study those patients were seen by a physician in less than 10 minutes (red and orange). Those patients require a rapid intervention and assessment as they can deteriorate rapidly or develop further injury by falling or aspiration during vomiting

5.1. Limitations and challenges

We missed a lot of patients because they were not able to follow instructions for breathalyzer or had a GCS below 14.

It is unclear (possibly insufficient understanding of the new test) why some treating physicians do not want to test BAC for trauma patients without any reason, given that this practice is done in most of the world.

Unknown time interval between trauma and measuring of BAC could lead to underestimation of impact of BAC. It was not able to get information related to the real time of injury.

Confounding factors such as culture and religion (worry of stigma) about alcohol consumption were challenges in the study.

Not enough data related on alcohol and trauma in our settings

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusion

We breathalyzed trauma patients who were admitted to the ED and we compared the physician decision before and after testing. Discharge rate was increased after testing the blood alcohol concentration. CT orders increased after testing the blood alcohol concentration. The measurement of blood alcohol concentration helped in the management of patients and a great number of physicians at the emergency department confirmed that the knowledge of blood alcohol testing in trauma patients was helpful in their decision making. The main challenge was the number of patients who were not able to follow instructions of the breathalyzer machine, patients with GCS <14, and persons who do not adapt easily to the new change. Having a positive blood alcohol concentration is one of the risk factors of trauma in our settings and it increases morbidity. The treating physician has to consider other factors as clinical examinations, comorbidities, severity of the injury and ask the level of blood alcohol level because this study shows that it feasible and helpful in our settings.

6.2. Recommendations

TO THE ED CLINICIANS

- To measure the BAC to trauma patient in the ED.

TO THE HOSPITAL

- Training of all hospital staff on breathalyzer.
- To avail the test in the laboratory,
- Initiate a routine BAC test to every trauma patient

TO THE PATIENTS

- Change their life style, knowing that the alcohol is the major risk of in jury

AT THE NATIONAL LEVEL AND POLICE

- Education of population based on the evidence
- Elaborate prevention measures as the average BAC was 0.09 (and the cut off is 0.08 for not driving)[fig8].

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APPENDICES

1. Data collection sheet

Feasibility and Utility of Routine Blood Alcohol Level Testing for Trauma Patients Presenting to the University Teaching Hospital of Kigali Emergency Department''.

Patient Age: …….

Patient Gender: M / F Shift: Night / Day

Date and Time of accident: ……../……. /…….. (Date/Month/Year) Time: …….h…….

Date and time of ED admission: ……/ ……./…….. (Date/month/Year) Time: ……h…..

Mechanism of Accident description: ……..

Types of Injuries: ……

Alcohol smelling on the patients?: YES / NO

The patient took alcohol before accident? YES / NO / No infos

Plan of care management (1): Discharge: YES / NO ,

Admit: YES / NO

Observe: YES / NO

C-Collar: YES / NO

CT Scan: YES / NO

[] Brain

[] C-spine

[] Other _____

Blood Alcohol Concentration is needed?: YES / NO

If yes, if no Don't fill this below

BAC: …… (Values)

Plan of care management (2): Discharge: YES / NO ,

Admit: YES / NO

Observe: YES / NO

C-Collar: YES / NO

CT Scan: YES / NO

[] Brain

[] C-spine

[] Other _____

2. IRB approval from the University of Rwanda

UNIVERSITY OF RWANDA — COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14th /08/2018

Dr NIYONZIMA JOSEPH

School of Medicine and Pharmacy, CMHS, UR

Approval Notice: No 293/CMHS IRB/2018

Your Project Title *"Feasibility and Utility of **Routine Blood Alcohol Level Testing for Trauma Patients Presenting to the University Teaching Hospital of Kigali Emergency Department**"* has been evaluated by CMHS Institutional Review Board.

Name of Members	Institute	Involved in the decision		
		Yes	No (Reason)	
			Absent	Withdrawn from the proceeding
Prof Kato J. Njunwa	UR-CMHS		X	
Prof Jean Bosco Gahutu	UR-CMHS	X		
Dr Brenda Asiimwe-Kateera	UR-CMHS	X		
Prof Ntaganira Joseph	UR-CMHS	X		
Dr Tumusiime K. David	UR-CMHS	X		
Dr Kayonga N. Egide	UR-CMHS	X		
Mr Kanyoni Maurice	UR-CMHS	X		
Prof Munyanshongore Cyprien	UR-CMHS	X		
Mrs Ruzindana Landrine	Kicukiro district		X	
Dr Gishoma Darius	UR-CMHS	X		
Dr Donatilla Mukamana	UR-CMHS	X		
Prof Kyamanywa Patrick	UR-CMHS		X	
Prof Condo Umutesi Jeannine	UR-CMHS		X	
Dr Nyirazinyoye Laetitia	UR-CMHS	X		
Dr Nkeramihigo Emmanuel	UR-CMHS		X	
Sr Maliboli Marie Josee	CHUK	X		
Dr Mudenge Charles	Centre Psycho-Social	X		

After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 14th August 2018, **Approval has been granted to your study.**

Please note that approval of the protocol and consent form is valid for **12 months.**

EMAIL: researchcmhs@ur.ac.rw P.O. Box: 3286, Kigali, Rwanda WEBSITE: http://cmhs.ur.ac.rw/ www.ur.ac.rw

You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 14th August 2018

Expiration date: The 14th August 2019

For Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Gakuto
Chair

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate Studies, UR

3. Ethical committee approval from the hospital/CHUK

C.H.U.
Quality Health Care
training & Research

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Ethics Committee / Comité d'éthique

September 5th, 2018 **Ref.: EC/CHUK/672/2018**

Review Approval Notice

Dear Joseph Niyonzima

Your research project: ***"Feasibility and utility of routine blood alcohol level testing for trauma patients presenting to the emergency department at CHUK "***

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 5th September 2018 to evaluate your protocol of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your renewal.

You are required to present the results of your study to CHUK Ethics Committee before publication.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

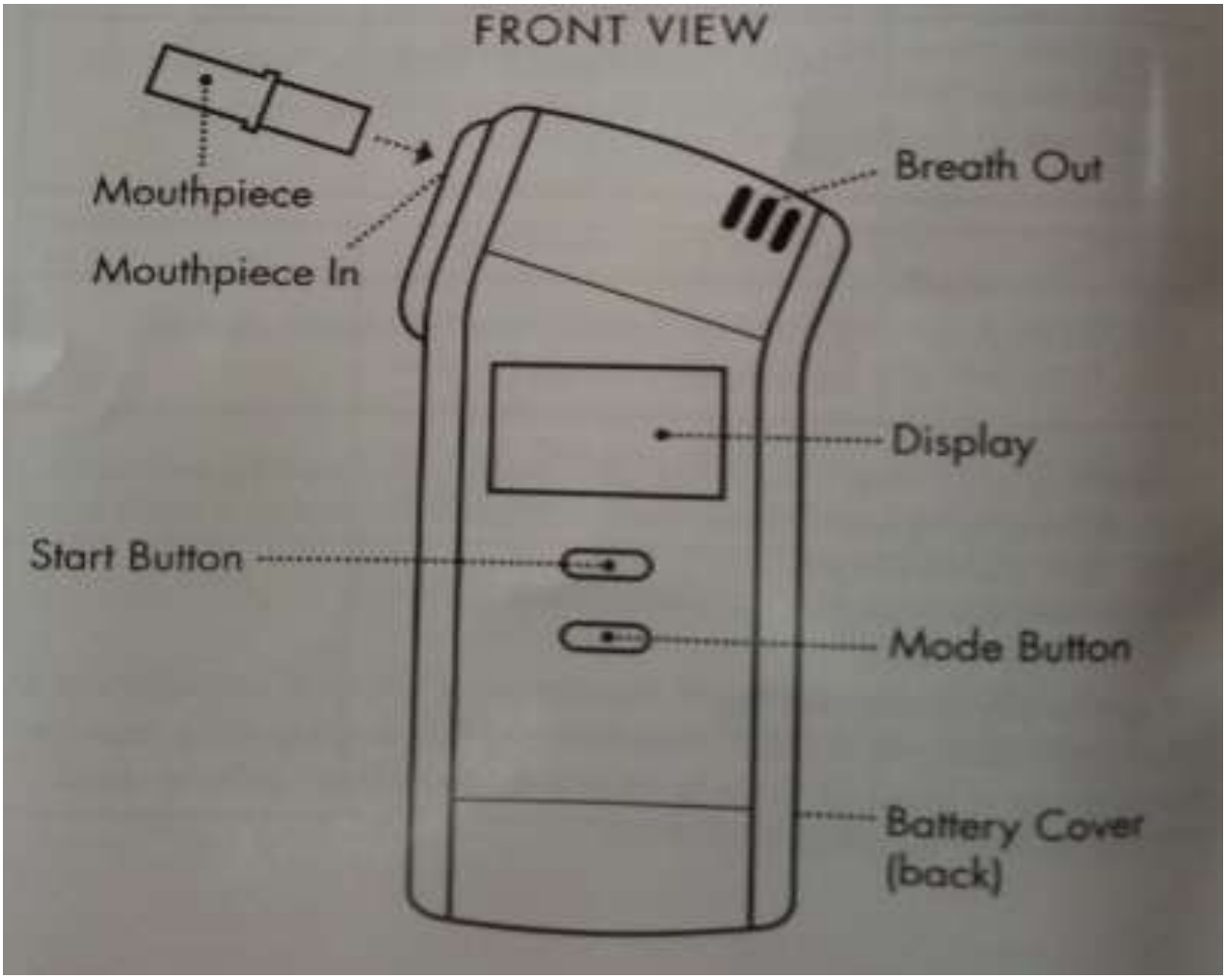
ETHICS COMMITTEE CHUK

Dr. Rusingiza Emmanuel
The President, Ethics Committee,
University Teaching Hospital of Kigali

<<University teaching hospital of Kigali Ethics committee operates according to standard operating procedures (Sops) which are updated on an annual basis and in compliance with GCP and Ethics guidelines and regulations>

B.P. :655 Kigali- RWANDA www.chk.rw Tél. Fax : 00 (250) 576638 E-mail :chuk.hospital@chukigali.rw

4. Breathalyzer machine review and usage.



USAGE

1. Insert mouthpiece

2. Press, hold start button until countdown begins

3. Before countdown reaches 0, have patient blowing continuously into mouthpiece up to 5-6 seconds

4. Have patient continue blowing until double beep is heard

5. Head result

Remark: If it alarms Flo, there is insufficient blood and if it alarms Out there is no blood detected.