MANAGEMENT OF PATIENTS WITH NON TRAUMATIC HYPOTENSION PRESENTING AT EMERGENCY DEPARTMENT MUHIMBILI NATIONAL HOSPITAL.

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By

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A Dissertation Submitted in (partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Emergency Medicine) of Muhimbili University of Health and Allied Sciences

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled, M***anagement of patients with non-traumatic hypotension presenting at Emergency Department Muhimbili National Hospital,*** in (Partial) fulfillment of the requirements for the degree of Master of Medicine (Emergency Medicine) of Muhimbili University of Health and Allied Sciences.



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I, **Mgalula Sifael**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

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LIST OF ABBREVIATIONS

ABG	Arterial blood gases
BP	Blood pressure
CCP	Comprehensive chemistry panel
DBP	Diastolic blood pressure
ECG	Electrocardiograph
EMD	Emergency medicine department
FBP	Full blood picture
HR	Heart rate
ICU	Intensive care unit
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Science
RR	Respiratory rate
RBG	Random blood glucose
RDT	Rapid diagnostic test
SBP	Systolic blood pressure
UPT	Urinary pregnancy test
USS	Ultrasound

ABSTRACT

Background: Hypotension is associated with high morbidity and mortality among emergency department patients. The diagnostic workup and management of hypotensive patients may vary greatly based on suspected etiology and regional burden of disease. Unfortunately, little is known about the emergency department (ED) diagnostic evaluation, treatment, and discharge diagnoses of patients with non-traumatic hypotension in sub-Saharan Africa.

Objectives: This study aims to characterize the diagnostic test utilization, treatment, and final EMD diagnosis for patients presenting to the MNH ED with non-traumatic hypotension.

Methodology: This was a prospective descriptive cohort study carried out from April to November 2012 at the MNH ED. A total of 65 adult patients with non-traumatic hypotension were enrolled. Data collected at presentation included history, physical examination findings, diagnostic testing, and final EMD diagnosis. Follow-up data collected included hospital length of stay, discharge diagnosis, and 24-hour and in-hospital mortality. Descriptive statistics were used to report the type and frequency of laboratory tests used in the evaluation of study patients.

Results: Out of 65 patients, 53 (88%) were referred from other hospitals, and 12 (18%) were self-referred. The mean systolic blood pressure at arrival was 84mmHg and diastolic of 50mmHg. At MNH ED, 54 (83%) patients had ECGs done which were abnormal in 32 patients (59%). Bedside USS done to all 65 and 45 (69%) had abnormal findings. Fifteen (23%) of the patients received X rays and 11(73%) had abnormal findings. All patients underwent laboratory work up. Amongst the 53 patients referred from an outside hospital only 20 (38%) patients received fluids prior to arrival. While at the EMD 63 patients

(97%) received fluids. Mean systolic blood pressure after intervention was 91mmHg (median90 mmHg), while diastolic was 60mmHg (median 6).For patients who survived to discharge the mean systolic was 92mmhg and diastolic of 56mmHg. The mean hospital length of stay was 2 days in those who died and 4 days for those who survived till discharge. In 78% patients, the EMD diagnosis matched hospital discharge diagnosis. Overall mortality in this study was 26% (17) patients, with 7 (48%) of these deaths occurring in the first 24hours.

Conclusion The most common diagnostic tests performed in the ED were: USS, ECG, plain X RAYS, RBG, RDTFBP, ABG and rapid for HIV. Seventy eight percent of EMD diagnoses were the same as final discharge diagnosis. There was a high overall mortality in patients presenting with hypotension and many of these patients died within the first 24hours of admission.

1.0 INTRODUCTION AND LITERATURE REVIEW

Little is known about the emergency department (ED) diagnostic evaluation, treatment, and discharge diagnoses of patients with non-traumatic hypotension in Tanzania and elsewhere in the developing world. Previous studies in North America have revealed a high mortality rate among emergency department patients manifesting with hypotension [2]. In one study, ED patients with a single systolic blood pressure measurement <100 mm Hg during ambulance transport had an in-hospital mortality rate of 25% [13]. Another study of 50 consecutive ED patients presenting with non-traumatic, symptomatic hypotension revealed an 18% in-hospital mortality rate. In the latter study, emergency physicians accurately determined the etiology of hypotension in only 24% of patient [3].

Although blood pressure varies from person to person, a measurement of less than 90/60 is generally considered hypotension. Other authors have defined hypotension as a systolic blood pressure less than 100 mm Hg in a patient with at least one sign and one symptom of inadequate tissue perfusion [2].Potential symptoms of hypotension include weakness, dizziness and syncope. Potential signs include altered metal status, agitation, and delayed capillary refill.

There are multiple potential causes of non-traumatic hypotension, including left ventricular dysfunction, hemoperitoneum, severe dehydration, pericardial tamponade, pulmonary embolism, sepsis, aortic dissection, thyrotoxicosis, dysrhythmia, occult gastrointestinal hemorrhage, abdominal inflammation, tension pneumothorax, anaphylaxis, neurogenic shock, valvular dysfunction, occult medication error or overdose, ruptured aneurysm, myocardial

ischemia/infarction, adrenal failure, autonomic dysfunction, and mesenteric ischemia [3]. In severe cases, hypotension can be life-threatening due to end organ failure [4].

There are several non-specific treatments, including intravenous fluids and medications that can raise blood pressure, but it is important to identify the underlying cause to ensure prompt and appropriate treatment [6]. A study from England study shows that 90% of patients with hypotension required emergency hospital admission for further workup, because conditions associated with non-traumatic hypotension have a high mortality rate [7]. Among the above noted causes of non-traumatic hypotension, many can be identified through diagnostic testing in the emergency department. The number and type of tests utilized to diagnose hypotensive patients in a resource limited emergency department have not been studied.

There are multiple available diagnostic options for the ED evaluation of hypotensive patients. These include blood tests for anemia, electrolyte imbalance, renal or hepatic dysfunction, HIV status and the presence of an infectious focus, such as malaria. The ECG may be used to screen for arrhythmia, ischemia, or infarction. Imaging modalities, such as ultrasound and x-rays may reveal clues to the underlying pathology. Few of these diagnostic modalities have been rigorously studied to know which are most useful in determining the underlying etiology of hypotension.

However, there is evidence supporting the use of bedside ED ultrasound (US) in the diagnostic evaluation of non-traumatic hypotension. A single-center study of emergency physicians with prior ultrasound experience demonstrated that these doctors could accurately categorize left ventricular function [12]. The criterion standard in this investigation was a cardiologist's

interpretation of the ultrasound images. A subsequent study at the same center revealed that incorporation of a goal-directed ultrasound protocol in the evaluation of patients with non-traumatic hypotension helped to narrow the differential diagnosis and led to a more accurate physician final EMD diagnosis [3].

Another study investigating the use of USS to assess cause of non-traumatic hypotension on patient EMD arrival showed that early USS allowed earlier intervention and improved prognosis [3].

While the evidence above demonstrates that USS may be useful in the evaluation of the non-traumatic hypotensive patient other modalities have not been as well studied.

The MNH ED is a relatively new department and the first facility of its kind in East Africa.

As important early step for the development and modernization of any ED is an assessment of the current state of care, which will define areas of potential improvement [1]

2.0 PROBLEM STATEMENT:

Hypotension can be associated with a wide range of etiologies, and appropriate investigations and treatment may vary greatly depending on suspected etiologies. The number and type of diagnostic tests, treatment, and emergency department diagnoses have not previously been studied among patients presenting to developing world emergency departments with non-traumatic hypotension [13] and we have no data on the type and number of diagnostic tests used in the initial evaluation of these patients. The diagnostic workup and management of hypotensive patients may vary greatly based on suspected etiology and regional burden of disease. Unfortunately, little is known about the emergency department (ED) diagnostic evaluation, treatment, and discharge diagnoses of patients with non-traumatic hypotension in sub-Saharan Africa.

Characterizing the clinical presentations, and current workup and management of patients presenting to the emergency department with hypotension will facilitate the development of targeted protocols to improve care and reduce morbidity and mortality in these high-risk patients.

3.0 RATIONALE

The diagnosis of hypotensive circulatory disorders is based on a variety of criteria and classifications. This results of this investigation may be useful in the developing a standardized approach to patients presenting to the ED with non-traumatic hypotension. Such an approach may prove beneficial in reducing morbidity and mortality in this patient population.

Currently we are not aware of how many patients present at the ED with hypotension and what are the common causes of non-traumatic hypotension [13]. This will help us as a growing department to know the diagnostic tests of hypotension and its causes in our setting. By knowing this we can establish guidelines for the management of non-traumatic hypotensive patient seen at ED, these guidelines will be based on prevalence of the causes, because at the end of the study will have identified the top 10 final diagnoses.

The study will also help demonstrate the magnitude of non-traumatic hypotension among the patient attending EMD at Muhimbili National Hospital which will help to address for preventable causes

All patients in the study will be categorized according to age and sex to allow differentials to be narrowed down according to sex and age.

The study will use wide range of diagnostic tools and laboratory equipment available at our department, these tools which are available include portable ultrasound, x ray, ECG machine, labs include pregnancy test, rapid diagnostic test for HIV, urine dip stick, ABG and RDT for malaria.

This variety of tools will help the physician to diagnosis the cause of non-traumatic hypotension in patients seen at the department.

4.0 OBJECTIVES

4.1 Broad objectives.

The aim of this prospective descriptive cohort study was to provide a description of the number and type of diagnostic tests, treatments, diagnoses, and outcomes among patients presenting to the MNH ED with non-traumatic hypotension.

4.2 Specific Objectives:

1. To describe the number and type of diagnostic tests performed in the EMD evaluation of patients presenting with non-traumatic hypotension.
2. To describe the EMD and hospital length of stay among patients with non-traumatic hypotension.
3. To describe the EMD and hospital discharge diagnoses among patients with non-traumatic hypotension.
4. To measure the 24-hour and in-hospital mortality within among patients with non-traumatic hypotension.

5.0 MATERIALS AND METHODS

5.1 Study design

Prospective descriptive cohort study

5.2 Study population and sample size

Adult patients presenting to the emergency department at Muhimbili National Hospital with non-traumatic hypotension (Defined in this study as SBP < 90 mmHg).

Assuming 90% confidence interval precision of 0.1 in worst case scenario: mortality in non-traumatic adult hypotension is 50%, using the formula N= $(1.645/d)^2 \prod(1-\prod)$the sample size of 65 patients.

Study was done at the Emergency Department, Muhimbili National Hospital from April 2012 to November 2012.

VARIABLES

5.4 Predictor; Diagnostic testing USS, x ray, ECG

Diagnostic labs upt, rdt, determine for HIV.

VBG, lactate, FBP, CCP, malaria smear.

Demographic, Age

Sex

Race

Vital signs: BP, HR, RR, and TEMPERATURE.

Intervention: Type and amount of IV fluid in the ED

Blood product.

Antibiotic therapy

Vasopressors therapy

Surgical procedure.

5.5 Outcome; Final EMD diagnosis i.e. intestinal obstruction, sepsis, RHD, Anaphylactic, MI

Mortality within 24hrs [13]

Diagnosis and tests done at EMD including results

Disposition. i.e. to ICU, ward, theatre, discharged

Vitals final i.e. BP, HR, TEMPERATURE, RR.

Time of in hospital stay.

5.6 Inclusion criteria

Hypotensive symptomatic patients with SBP less than 90mmHg [14]

Adult patients aged above 17years [3]

No history of trauma for the past 24hrs [13]

5.7 Exclusion criteria

Coding patient.

5.8 Recruitment of study participants

Convenience sample of patients who met the entry criteria and were easily accessible in the emergency department during the study period.

5.9 Data collection and instruments

Data was collected by the physicians on call who were trained and were given instructions on completing a structured data sheet that was later collected by principal investigator. The questionnaire contained different components, including demographic data, dates, physical examination, referral complaint, initial diagnosis, diagnostic tests, medication, final EMD diagnosis and outcome of patient.

5.10 Data Analysis

Data was entered into an Excel data sheet and then analysed using StatsDirect (Stats Direct LTD, Cheshire, UK). Descriptive statistics were used to report the type and frequency of diagnostic tests used in the evaluation of study patients. Regression analysis was used to examine the relationship between emergency department lab testing, the 24-hour and in-hospital mortality, and hospital length of stay.

5.11 Ethical Considerations and Clearance

Ethical clearance to carry out this study was obtained from the Research and Publications Committee of MUHAS and the director of clinical services of MNH. Informed consent was obtained from patients or patient proxy. All data were collected and held by the researcher with no patient identifiers in any process. Data was stored in locked cabinets and encrypted computers

6.0 RESULTS

A total of 65 patients included in the study (see Table 1). Thirty nine (60%) of the patients were female and the remaining 26 (40%) were male.

Fifteen (23%) of the patients were over 55 years old. Eleven (17%) were aged between 46 and 55. The remaining groups of patients were spread between the ages of 26 and 35 which accounts for 14 (21%) and 13 (20%) of patients were aged 36 to 45.

Table 1: Patient demographics

	Patients in Study
Age (mean, median, range)	Percentage (%)
All ages	100%
18 – 25	12(18)
26 – 35	14(21)
36 – 45	13(20)
46 – 55	11(17)
>55	15(23)
Gender	
Male	26(40)
Female	39(60)

Regarding the chronic disease patterns and characteristics of the 65 patients (Table 2), amongst the 30 (46%) patients with any chronic disease, 9 (30%) had HIV disease, 8 (27%) had diabetes mellitus, 5 (17%) had congestive cardiac failure, and 3 (10%) had tuberculosis. Hypertension and coronary artery disease affected 2 (7%) patients each. Only one patient had a history of a cerebrovascular accident.

A minority of patients were taking medications. Thirteen (20%) reported taking at least one prescribed medication due to a chronic disease condition, and 2 (3%) of the patients in the study were taking herbal or other alternatives medications prior to hospital admission.

Most (88%) patients were referred from an outside hospital either within Dar es Salaam or outside the city. prior to arriving at MNH.

Table 2: Patient Characteristics

	Number of patients N=65(%)
Chronic disease prevalence	
Any chronic disease	30(46%)
Hypertension	2(7)
Coronary Artery Disease	2(7)
Congestive heart failure	5(17)
Diabetes mellitus	8(27)
Cerebrovascular accident	1(3)
HIV/AIDS	9(30)
Tuberculosis	3(10)
Cancer	0
Asthma	0
Chronic Obstructive Pulmonary Disease (COPD)	0
Reported taking home medications	13(20)
Reported taking herbal/alternative medicines	2(3)
Referred from outside hospital	53(88)
Self referral	12(18)

The distribution of chief complaints among these patients at the time of arrival in EMD is described in Table 3. Gastrointestinal symptoms including vomiting, hematemesis, GI

bleeding, abdominal distension and abdominal pain and together accounted for 37 (52%) of all patients. Cardiopulmonary symptoms including shortness of breath /chest pain accounted for 15 (23%) of all patients. Four (6%) of patients were complaining of body weakness and an additional 4 (6%) had altered mental status . The remaining 12 (18%) of patients had other symptoms including vaginal bleeding, headache, back pain, and lower limb edema.

The mean systolic blood pressure at time of arrival was 84 mmHg and diastolic blood pressure of 50 mmHg. 49 (75%) of patients were tachycardic (100>bpm), 30 (46%) were tachypnoeic (20>bpm), 3(5%) patients had an oxygen saturation less than 95% on room air and 5 (8%)of patients have fever of greater than 38°C.

Table 3: Patient Signs & Symptoms at time of arrival

	Number of Patients (%)
Chief Complaint	
Chest Pain	5(8)
Shortness of Breath	10(15)
Weakness	4(6)
Vomiting	14(22)
GI Bleeding	5(8)
Altered Mental Status	4(6)
Abdominal Pain	14(22)
Others	12(18)
Vital Signs	
Mean Systolic Blood Pressure	84
Mean Diastolic Blood Pressure	50
Tachycardia (>100 BPM)	49(75)
Tachypnea (>20)	30(46)
Hypoxemia (<95% on RA)	3(5)
Febrile (>38 C)	5(8)

When comparing imaging studies conducted at outside hospitals and at the EMD it shown that outside hospitals, in general, performed far fewer diagnostic studies than MNH EMD (Table

4). At the outside hospitals, no patients received an electrocardiogram (ECG), bedside ultrasound, x rays or CT scans .

In the EMD, 54 (83%) patients had an ECG and among them 32 patients (59%) were found to have at least one abnormal finding.

Bedside ultrasound was performed on all 65 patients and 45 (69%) of them had abnormal findings.15 of the patients received x rays and 11(73%) had abnormal findings. CT scan was not conducted on any patient.

On the other hand laboratory tests were completed on 14 (21.5%) of patients at the outside hospital. Of those receiving a laboratory study, 7 (50%) were a full blood picture. Of those receiving a full blood picture 3 (42%) had abnormal results. Six (43%) of patients received an HIV test and 3 (50%) had positive results. Only one patient had a random blood glucose test (RBG) performed and the result was abnormal (low).

At the EMD, by contrast, the patients received a full laboratory work up. All patients received an RBG and 6(9%) of them had abnormal results. 49 (75%) patients were tested for malaria and none was positive. 45 (69%) patients had HIV tests performed and 14 (31%) were positive. 64 (98%) patients received a full blood picture and amongst them 33(21%) had abnormal WBC while 14(22%) had abnormal hemoglobin levels (low).Venous bood gas was completed on 38 (58%) patients and 21 (55%) of them had abnormal findings.42 (65%) patients had serum electrolytes studies of whom 16(38%) had abnormal results.

Table 4: Diagnostic Tests Performed

	Number of patients receiving study at outside hospital prior to arrival	Percentage of patients with abnormal findings at OSH	Number of patients receiving study at EMD	Percentage of patients with abnormal findings at EMD
Imaging Studies				
Electrocardiogram	0	0	54(83)	32(59)
Bedside Ultrasound	0	0	65	45(69)
Plain film x-ray	0	0	15	11(73)
computed tomography (CT) scan	0	0	0	0
Laboratory Studies				
RBG	1	1(100)	65	6(9)
Rapid malaria			49	0(0)
Rapid HIV	6	2(33)	45	14(31)
Full blood picture (Wbc)	0	0	64	21(33)
Full blood picture (Hb)	7	3(42)	64	14(22)
Venous blood gas (PH)	0	0	38	21(55)
Serum electrolytes	0	0	42	16(38)

Amongst the 53 (82%) patients referred from an outside hospital only 20 (38%) received fluids prior to arrival. The most commonly administered fluid was ringers lactate with an average of 1500 mL per patient, (range: 500 to 2500 mL) .None of the patients received colloids.

While at the EMD 63 patients (97%) received fluids. The most frequently used fluid in resuscitation was normal saline. 41 (65%) patients received normal saline with an average of 1300mls and 19 (30%) of patients received ringers lactate with an average of 1200mls. 2

patients (3%) received colloids (dextra) and 1 patient (2%) receive DNS. 2 patients (3%) received dextrose at average of 500mls each.

Only 5 patients (25%) received blood products (whole blood) at the outside hospital with a median of 1unit. While at the EMD, 23 (35%) patients received blood with a media of 2 units. No patients included in the study received fresh frozen plasma or platelet transfusions.

The most commonly administered treatments given at outside hospitals were antibiotics to 18 (34%) patients, followed by diuretics given to 4 (8%) of patients. Other medications included analgesics, antipyretics, steroids, ant retroviral and tuberculosis treatment.

At the EMD 34 (52%) of patients received antibiotics.6 (9%) received pressors and 3 (5%) received diuretics. Other medications were administered to 15 (23%) patients and these included analgesics, antipyretics, steroids, nitroglycerine, aspirin, oxygen and antacids.

Table 5: Interventions

	Number of patients receiving intervention at outside hospital prior to arrival N (%)	Mean number of units received	Number of patients receiving treatment at EMD N=65	Mean number of units received
Fluids (mL)	20 (38)		63(96.6%)	
NS	4 (xx)	1000ml	41	1300
Ringer's Lactate	8	1500 ml	19	1200
Dextrose	1	500	2	500
Colloids	0	0	2	500
DNS	2	1000	1	500
Blood Products (units)			23	
Packed RBCs	0	0	0	0
Whole blood	5	1	23	1.5
FFP	0	0	0	0
Platelets	0	0	0	0
Antibiotics	18(34)	-	34(52)	-
Anti-malarials	1(2)	-	0(0)	-
Pressors	0	-	6(9)	-
Diuretics	4(8)	-	3(5)	-
Other meds	22(42)	-	15(23)	-
		-		-

The average systolic blood pressure after interventions for all patients was 91mmHg, while diastolic was 60 mmHg. For patients who survived to discharge the mean systolic blood pressure was 92 mmhg and diastolic was 56mmHg.

34 of the patients were still having tachycardia and 28 of patients having tachypnea. Amongst those who survived to hospital discharge 26 (54%) still had tachycardia and 17 (%) tachypnea.

Amongst the patients who died prior to hospital discharge, 8 (47%) had persistent tachycardia and 11 (%) tachypnea. No patient was febrile after interventions.

Table 6: Patient Vital Signs after intervention

	All Patients (N=65)	Change from time of arrival	Patients who lived (N=48)	Patients who died N=17
Systolic Blood Pressure (mean)	91	7	91	92
Diastolic Blood Pressure (Mean)	60	10	59	56
Tachycardia(>100)	34(patients) %	15	26(54)	8(47)
Tachypnea(>20)	28(patients)	2	17(35)	11(65)
Febrile(<38)	0(patients)	5	0	0

The mean length of stay in minutes at the EMD was longer for those who died (202 minutes) compared to those who survived to in hospital discharge (169 minutes). None of the patients in this study were discharged from the EMD. Of the patients who died, the majority (10/17) died within the first 24 hours. The mean hospital length of stay to discharge or death, in days, was shorter in those who died (2 days) compared to those who survived until discharge (4 days).

Table 7: Length of Stay

	Patients who survive to hospital discharge.	Patients who died
	N= 48	N=17
Mean EMD Length of Stay, minutes	169 minutes	202 minutes
Patients discharged from EMD	0	0
Mean Hospital Length of Stay, days	4 days	2 days
Patients surviving >24 hours	48 patients(100%)	7 Patients

The top EMD diagnosis was anaemia in 16 (25%) patients, followed by heart disease in 11 (17%), septicemia in 8 (12%), liver failure in 6 (%), renal failure in 4 (%) and tuberculosis in 3 (5%).

Compared to hospital discharge diagnosis/cause of death it shows that in 51(78%) patients EMD diagnosis matches either discharging diagnosis or diagnosis at time of death.

Table 8: EMD Diagnosis versus Hospital Diagnosis

Top EMD Diagnosis	Discharge diagnosis or cause of death
Anaemia(16)	Heart disease(17)
Heart disease(11)	HIV(12)
Sepsis(8)	Upper GI bleed(9)
Liver failure(6)	Liver failure(6)
Renal failure(4)	Septicemia(6)
TB(3)	TB(4)
Gastroenteritis (3)	Others(11)
Others(13)	
Percentage where any EMD diagnosis matched discharged diagnosis or cause of death: 51(78%)	

7.0 DISCUSSION

This single-center prospective study documents the EMD investigations, management, and subsequent mortality of patients presenting to the ED with hypotension.

Among these patients, the majority were over 35 years of age and were female, perhaps suggesting that younger adults and males may have fewer non-traumatic disease conditions that cause hypotension. More studies are needed to evaluate the relationship between age and non-traumatic hypotension [3].

As the study was conducted at Muhimbili National Hospital, which is the national tertiary care referral hospital, 88% of the patients enrolled in the study came from other hospitals, either within the city or outside Dar es Salaam. We found that outside hospitals did very limited diagnostic tests and investigations to determine the cause of hypotension. None of the patients received diagnostic imaging tests prior to arrival, and only 14 patients received any laboratory study, including the rapid diagnostic test for malaria, random blood glucose and full blood picture.

In particular, we found that bedside ultrasound is the number one diagnostic imaging tool used in hypotensive patients in the EMD, and it was used on all patients.. Ultrasound identified a likely etiology for hypotension in 45 (69%) of patients [15]. Abnormal findings included pericardial effusion, pulmonary edema, intra-abdominal masses, abdominal fluids, defective heart valves and cardiomyopathies [16].

The second most frequently used diagnostic tool in our department was the ECG, which was used in 54 patients of which 32 (59%) of patients had abnormal findings, including

arrhythmias, heart blocks, electrolyte imbalances, structural abnormalities and evidence of prior heart injuries.

Only 15 (23%) patients underwent X- rays to establish a cause of hypotension. Among the 15 patients undergoing x-ray, 11 (73%) were found to have abnormalities, including pleural effusion, intestinal obstructions, infiltrates/consolidations consistent with pneumonia and cardiomegaly.

Another diagnostic tool useful in investigating the underlying cause of non traumatic hypotension is venous blood gas which provides electrolytes and hematocrit in addition to respiratory indicators. This very important tool is relatively new to our department and has been instrumental in enabling us to more rapidly intervene and resuscitate patients. In addition, electrolytes abnormalities such as hypo/hyperkalemia may be life threatening but not obvious on exam, and immediate results can allow immediate life-saving intervention. HIV is a widespread problem in our patient population and early diagnosis is essential. In this study 45 patients were tested for HIV, and 14(31%) of patients were found to have positive results. Implementing rapid HIV testing in the EMD has reduced the inconvenience of long waits for results from the laboratory and also made it easier for physicians in the EMD to initiate appropriate treatment.

Other tests are done at the laboratory but results rarely come back to the department before the patient leaves the department. These include full blood picture and chemistry panels, specifically creatine and urea. 64 patients had full blood picture and 21(33%) had abnormal values, i.e white blood cells and platelets, while 14(22%) patients were found to have low

hemoglobin (less than 6). Out of the 42 patients who had serum electrolyte studies 16(38%) were found to have abnormalities in urea and creatinine.

The full evaluation of the non-traumatic, symptomatic, undifferentiated hypotensive adult patients results in a higher probability of identifying the underlying etiology and a more accurate physician impression of final diagnosis.

This study also compared the treatments given at outside hospitals and in our department. We found that out of 53 patients transferred from outside hospitals only 20 patients received intravenous fluids prior to arrival. We also found that none of the outside hospital used colloids as a plasma expander for unstable patients.

In our department 63 patients out of 65 received fluids, primarily crystalloids. Only two patients recieved colloids and this was because of lack of availability in the department. Another study noted that there are side effects in each type but recommended a fluid challenge in all patients with suspected hypovolemia (suspected inadequate arterial circulation). They may be given fluids at a rate of 500–1000 mL of crystalloids or 300–500 mL of colloids over 30 minutes and repeated based on response (increase in blood pressure and urine output) and tolerance (evidence of intravascular volume overload[17]

In the management of shock, for example in septic patients, type of fluid doesn't matter and it depends on availability. The choice of crystalloid or colloid may be influenced by their effects on various physiological parameters, including coagulation and renal function, although further studies are need to clarify the importance of these on outcome. Crystalloid solutions have been associated with hypercoagulability, whereas colloids like hydroxyethyl starches were described to exert inhibitory effects on plasmatic coagulation and platelet aggregation.

Third-generation hydroxyethyl starches, however, probably cause fewer effects on coagulation, which is of particular importance in the surgical/trauma patient. Effects on renal function may also be important. In a randomized, controlled study of 129 patients with severe sepsis or septic shock (12), 6% hydroxyethyl starch (200 kDa, 0.60–0.66 substitution) administration was associated with higher frequencies of acute renal failure and oliguria and higher serum creatinine concentrations than gelatin administration. Another area of keen interest is the regional effect of fluids on tissue oxygenation in septic hypovolemic patient [17].

In outside hospitals only 5 patients received blood on average of one unit each, compared to our department where 23 patients received blood on average of 1.5 units each. Management of these patients with sepsis goes together with administration of antibiotics and pressors but at outside hospitals only 34% of patients were given antibiotics and none given pressors. In our department 52% of patients received antibiotics and 9% pressors. The lack of intervention at outside hospitals tells us why many patients are critically ill by the time they arrive at our department; it is clear that outside hospitals are missing the initial management, likely due to lack of resources[18].

Vital signs after interventions which showed that there was mean change of systolic blood pressure by 7 mmHg increase (from 84-91) and diastolic pressure by10mmHg increase. In comparing change in blood pressure with 24 hour and in-hospital mortality, we found that there was no relationship between change in systolic blood pressure and mortality. The relationship between severity of hypotension and outcome was not apparent and many patients with persistent low diastolic pressure died.

According to one study, patients exposed to hypotension had a threefold increased risk of in-hospital death and a 10-fold increased risk of sudden, unexpected in-hospital death. Patients with any one SBP < 80 mm Hg had a sixfold-increased incidence of in-hospital death, and patients with a SBP < 100 mm Hg for > 60 min had almost a threefold-increased incidence of in-hospital death[3]

We found that a single episode of ED hypotension confers significantly increased risk of death during hospitalization, and the more severe and prolonged the hypotension, the higher the risk of death.

Our study shown that patients who survived to hospital discharge spent a shorter amount of time in the EMD compared to those who died. That suggests that those who died needed more time for resuscitation in the EMD before being disposed to ward.

Regarding EMD diagnosis compared to hospital discharge diagnosis/cause of death, it shown that in 51(78%) patients the EMD diagnosis matched with either discharge diagnosis or diagnosis at time of death. This means that the diagnostic tools rapidly available in the EMD had a high degree of accuracy for finding the underlying cause of hypotension. The top diagnosis found were Anaemia(due to upper GI bleeding, pv bleeding and infections like HIV), Heart disease, Sepsis, Liver failure, Renal failure, Gastroenteritis and Tuberculosis. HIV was not a primary cause of hypotension but the opportunistic infections that cause hypotension [17].

8.0 STUDY LIMITATIONS

The most important limitation of our study is the small sample size, which was to some extent a result of the fixed data collection period. We hope that our results will serve as a pilot to guide larger future prospective studies.

Follow up of patients was delayed in a few cases due patients being transferred between wards without proper documentation. However, ultimately, complete follow-up data was located for all patients.

Our study did not include description of ward-based interventions, which limits our ability to identify factors contributing to mortality.

During some periods, diagnostic workup was limited due to problems with equipment and supply availability (including blood sample tubes, no electricity, and reagent for ABG). This may influenced the relative frequency of use of some modalities. However, we believe that our results nonetheless reflect the range of diagnostic studies done in our setting.

9.0 CONCLUSION

This study shows that hypotensive patients evaluated at primary and district facilities receive very limited diagnostic workup prior to transfer. The management of non traumatic hypotension at a dedicated urban emergency department at Muhimbili Hospital involves many different diagnostic modalities, and bedside ultrasound is the most common. Emergency department clinical impression is quite accurate, with a 78% agreement rate between the EMD diagnosis and the final hospital diagnosis or cause of death. Hypotension carries significant mortality of 26% in this study. Of those who died, the majority died within the first 24 hours after arrival. Among these patients, the majorities were over 35 years of age and were female; this suggests that young adults may have fewer non-traumatic disease conditions that cause hypotension, though larger studies are needed to confirm these findings.

10.0 RECOMMENDATIONS

Larger prospective studies are to further characterize the relationship between diagnostic testing and clinical outcomes in non-traumatic hypotensive patients. Larger samples will identify whether the demographic distribution in our results is due to chance.

In addition, a needs assessment of referral hospitals should be conducted to better identify underlying root causes for lack of investigative studies, interventions, and delays in transfer to MNH.

More studies are needed to reevaluate relationship between age and non-traumatic hypotension.

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APPENDICES

Appendix I: Ethical Clearance

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 65001
DAR-ES-SALAAM
TANZANIA
Telefax: 255-022-2150465
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TEL: (255-022)-2150302-6 Ext. 207
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Ref. No. MU/PGS/SAEC/Vol. VI/

18th April, 2012

Dr. Mgalula Sifael,
MSc. Emergency Medicine,
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "MANAGEMENT TO PATIENT WITH NON TRAUMATIC HYPOTENSION RPESENTING AT EMERGENCY DEPARTMENT MUHIMBILI NATIONAL HOSPITAL"

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has on behalf of the Senate approved ethical clearance for the above-mentioned study.

Thus ethical clearance is granted and you may proceed with the planned study.

Please liaise with bursar's office to get your research fund.

Prof. Z. Premji
DIRECTOR, POSTGRADUATE STUDIES

/emm
c.c. Vice Chancellor, MUHAS
c.c. Deputy Vice Chancellor – ARC, MUHAS
c.c. Dean, School of Medicine, MUHAS

Appendix II: Consent Form (English Version)

DIAGNOSTIC TESTING, TREATMENT, AND FINAL EMERGENCY DEPARTMENT DIAGNOSIS AMONG PATIENTS PRESENTING TO MUHIMBILI NATIONAL HOSPITAL WITH NON-TRAUMATIC HYPOTENSION

My name is Dr. Mgalula sifael a 2nd year resident in the department of Emergency Medicine at Muhimbili University of Health and Allied Sciences (MUHAS).

I am conducting a study with the above title as part of my study program.

Aims of the study:

The aim of this observational cohort study is to provide a description of the number and type of diagnostic tests, treatments, diagnoses, and outcomes among patients presenting to the MNH ED with non-traumatic hypotension.

Participation in this study:

All patients arriving at EMD with symptomatic non traumatic hypotension will be requested in the enrolment into the study. Patient him/herself or the next of kin if the patient has altered mental status can give a written consent as to be enrolled into the study. The study involves diagnostic test, medication and fluids or blood product will be given to the patient and hence come up with final diagnosis at EMD, not only that patient will be followed up for outcome in the hospital.

If you choose not to participate in this study, you/ your patient will continue to receive the normal care at the EMD and will not be compromised in any way.

Risks:

This study will have no risks to the community rather minor pain from procedures like cannulation, catheterization and others which will require anesthesia patient will be explained.

Benefits

Patient who participates in this study investigation will fill a gap in the current medical knowledge regarding the number and type of diagnostic tests used in the evaluation of non-traumatic hypotension as well as treatment rendered and emergency department diagnosis.

Confidentiality:

All data collected will be treated with strict confidence and stored in locked cabinets and on encrypted computers and will not be revealed to anybody outside the research team.

Cost:

You will not be required to make any payments to participate in this study and no payment will be made to you.

For further information, questions or queries, you can contact:

1. The Principal Investigator,
   Dr. Mgalula sifael,
   Department of Emergency Medicine,
   MUHAS P. O. Box 65001,
   Dar es Salaam.
   Tel: +255 713 343673
   Email: smgalula@yahoo.ca
2. Prof. Victor Mwafongo,
   Head of Department of Emergency Medicine,
   MUHAS. P. O. Box 65001
   Dar es Salaam
   Tel: +255 754 285660

3. Prof. Teri Reynolds,
   University of California, San Francisco, MUHAS.
   Tel: +255 787 629362 ,E-mail: teri.reynolds@ucsf.edu

4. Prof. Michael Runyon
   Director of Medical Student Education,
   Carolinas Medical Center,
   Michael.runyon@carolinahealthcare.org.
5. Prof. M. Aboud,
   Director of Research and Publications,
   MUHAS.
   Tel No: +255 22 2150302-6.

I, _____, have read/been told of the contents of this form and have understood its meaning. I agree to participate in this study. OR

I,_____, husband/wife/father/mother/_____ have read/been told of the contents of this form and have understood its meaning. I agree to enroll _____ (patient's name in full) in this study

Signature of patient/Next of kin_____

Signature of Researcher _____

Date _____

Appendix III: Consent Form (Kiswahili Version)

FOMU YA RIDHAA YA KUSHIRIKI KATIKA UTAFITI

Jina langu ni Dr. Mgalula sifael, mwanafunzi wa udaktari bingwa wa mahututi (Emergency Medicine) katika chuo kikuu cha afya na sayansi shirikishi Muhimbili (MUHAS). Utafiti ninaofanya ni kuangalia vifaa vingapi na vya aina gani vinavyoweza kutumika katika kugundua sababu zinazofanya kupungua kwa shinikizo la damu pasipo kupata ajali na matibabu yapi yatolewayo kwa aina hii ya mgonjwa pamoja na maendeleo yake anapolazwa hospitalini.

Madhumuni ya utafiti:

Utafiti huu utatusaidia katika kuboresha huduma kwa mgonjwa mwenye kupungua kwa shinikizo la damu hasa wale ambao hawajapata ajali,hii ni pamoja na kujua vifaa vya kutumia aina za dawa za kumpa mgonjwa au damu pamoja na sababu ya kupungua kwa shinikizo la damu kwa haraka zaidi.

Ushiriki katika utafiti:

Wagonjwa wote wenye shinikizo la damu chini ya kiwango tunachohitaji na wenye dalili wataombwa kushiriki katika uchunguzi huu.Masharti ni pamoja na kuwa hajapata ajali kwa kipindi cha masaa 24yaliyopita na wae mtu mzima kuanzia miaka17.Wagonjwa hawa watafanyiwa uchunguzi kwa vifaa vilivyopo idarani,na kupewa matibabu kikamilifu kabla ya kuruhusiwa kwenda idara zingine ndani ya hospitali,pia watafuatiliwa maendeleo yao mpaka kuruhusiwa kwao.Wagonjwa watakao kataa kushiriki watapata matibabu sawa na watakaoshiriki.

Hatari:

Uchunguzi huu unamadhara madogo ambayo mgonjwa ataelezwa ikiwa ni pamoja na maumivu madogo wakati wa matibabu au uchunguzi kama sindano na mpira wa mkojo,itakapohitajika kupewa dawa ya usingizi mgonjwa ataelezwa madhara yake pia.

Faida za utafiti:

Uchunguzi huu utamfaidisha mgonjwa pamoja na wagonjwa wengine watakaokuja wakiwa na tatizo hili kwa kujua aina,matibabu na maendeleo pamoja na vitu vinavyosdababisha kupungua kwa shinikizo la damu,itakuwa rahisi kupanga mwongozo wa maelekezo kwa matibabu ya haraka kwa wagonjwa wa aina hii.

Usiri:

Taarifa zote zitakazokusanywa katika utafiti huu zitakuwa siri, hivyo ushiriki wako hautajulikana na mtu. Taarifa hizi zitajulikana kwenye timu ya watafiti tu.

Malipo:

Kwa kushiriki kwenye utafiti huu, hautalipwa wala hautalipa chochote.

Ukiwa na swali au tatizo lolote, unaweza kuwasiliana na wafuatao:

1. Mtafiti Mkuu,
   Dr. Mgalula sifael,
   Idara ya Mahututi (Emergency Medicine),
   MUHAS S.L.P 65001,
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   Simu: +255 713 343673
   Barua pepe: smgalula@yahoo.ca
2. Prof. Victor Mwafongo,
   Mkuu wa Idara wa Mahututi,
   MUHAS. S.L.P 65001
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3. Prof. Teri Reynolds,
   Chuo cha California, San Francisco, MUHAS
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   Carolina Medical Center.
   Michael.runyon@carolinashealthcare.org
5. Prof. M. Aboud,
   Director of Research and Publications,
   MUHAS.
   Simu: +255 22 2150302-6.

Mimi, _____, nimesoma/nimesomewa maelezo yote yaliyomo kwenye fomu hii na nimeelewa. AU

Mimi, _____, mume/mke/baba/mama/_____ nimesoma/nimesomewa maelezo yote yaliyomo kwenye fomu hii na nimeelewa. Nakubali mgonjwa wangu ashiriki katika utafiti huu.

Sahihi ya mzazi/mbadala _____

Sahihi ya Mtafiti _____

Tarehe _____

DATA SHEET

Registration#_____ Date seen_____

Name_____ Time arrived in EMD_____

Address_____ Time seen by Dr_____

Gender: Female Male Age_____

Referring hospital:_____

Referral Diagnosis:_____

Treatment received

PTA:_____

Triage vital signs: BP_____/_____ HR_____ R_____ T_____

Sp02_____%

Chief complaint_____

Duration of symptoms_____

Past medical history: HTN CAD CCF DM CVA HIV TB Cancer Asthma COPD

Other_____

Home medications_____

Physical examination (positive findings)_____

ECG: QTC_____ LVH RBBB LBBB

STEMI? Yes No which leads?_____

ST Depression? Yes No which leads? _____

T wave inversion? Yes No which leads? _____

Tachyarrythmia? Yes No which one? _____

Bradyarrythmia? Yes No which one? _____

US: Pericardial effusion? Yes No If yes, tamponade physiology? Yes No

Cardiac function? Normal Hyperdynamic Mod reduced Poor

Free intraperitoneal fluid? Yes No If yes, which views? MP PS RV

Aortic aneurysm? Yes No If yes, how big?_____

Pneumothorax? Yes No If yes, which lung?_____

IVC: Normal □resp variation □resp variation

Xray (body part imaged and findings)_____

CT (body part imaged and findings)_____

RBG_____ RDT: Pos Neg Rapid HIV: Pos Neg

WBC_____ N_____ M_____ L_____ B_____ E_____ Bands_____

Hemoglobin_____ Hematocrit_____ Platelets_____

Na_____ K_____ Cl _____ CO2_____ BUN_____ Cr_____ Gluc _____

Ca_____

pH_____ Pc02_____ P02_____ HCO3_____ BE_____ Lactate_____

Treatment

Time	Medication	Dose	Route

IV fluids (type and total volume infused in the EMD)_____

Blood products (type and total volume infused in the EMD)_____

Repeat vital signs

Time	BP	HR	Resps	Temp	Sp02

EMD Diagnosis_____

Disposition: Ward ICU OR Morgue Transfer to_____

Time patient left the EMD_____

Patient alive at 24 hours? Yes No

If no, time of death_____ cause of death_____

Patient alive at hospital discharge? Yes No

If no, date/time of death_____ cause of death_____

If yes, date discharged_____ discharged diagnosis_____