



Original article

Patterns and outcomes of admissions to the medical acute care unit of a tertiary teaching hospital in South Africa

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ABSTRACT

Background: A Medical Acute Care Unit (MACU) was established at Chris Hani Baragwanath Academic Hospital (CHBAH) to provide comprehensive medical specialist care to the patients presenting with acute medical emergencies. Improved healthcare delivery systems at the MACU may result in shorter hospital stays, better outcomes, and less mortality.

Objectives: The study's objective was to describe the demographics, diagnoses, disease patterns, and outcomes, including patient's mortality, admitted to the MACU at CHBAH.

Methods: Records of 200 patients admitted, between March 2015 to August 2015, to the MACU at CHBAH were reviewed. Patient demographics, diagnosis at admission, duration of stay, and outcomes were documented. Patients transferred to the medical ward, the Intensive Care Unit (ICU), or discharge. The leading causes of mortality were documented.

Results: Of the 200 patients, 59% were females. The patients' mean age was 46 (17.2) years, and the mean duration of stay at the MACU was 1.45 (1.25) days. Non-communicable diseases accounted for 76% of admissions. The most frequently diagnosed conditions included: diabetic ketoacidosis acidosis (DKA) and hyperosmolar non-ketotic (HONK) (17.5%), non-accidental self-poisoning (16%), hypertensive emergencies (9.5%), decompensated cardiac failure (8%) and ischemic heart disease (7%). Infectious diseases comprised 14% of the diagnoses, of which cases of pneumonia were the most common (5%). Most patients (77.5%) were transferred to medical wards, 12% to ICU, while 10% demised at the MACU. The leading causes of death included sepsis (25%), DKA/HONK (20%), non-accidental self-poisoning (10%), and cardiac failure (10%).

Conclusion: Non-communicable diseases, particularly diabetic emergencies, were the leading causes of admission to the MACU at CHBAH. During the study period, high rates of case improvement, patient discharge, shorter hospital stay, and less mortality were observed. The leading cause of mortality was sepsis related.

African relevance

- This study was conducted in the largest hospital in Africa, the Chris Hani Baragwanath Academic Hospital.
- Most patients in this study were resident in the surrounding urban township, Soweto.
- This cross-sectional study highlights the acute medical conditions that patients have and their outcomes

Introduction

As a result, hospitals looked for structural reforms to improve the

quality of care. The admission process of the Emergency centre (EC) for acutely ill medical patients to Internal Medicine needed to be improved [7]. This led to the introduction of a Medical Acute Care Unit (MACU), and "Acute Medicine" emerged as a branch of Internal Medicine in the developed world [7]. Acute Medicine is a subspecialty of Internal Medicine focused on the immediate and early specialist management of acute medical patients presenting to hospitals as emergencies [7]. The MACU is a dedicated ward where this takes place [8].

This model of health care has been widely implemented in the United Kingdom (U.K.) [7], Australia [9], and New Zealand [10], resulting in reports of good outcomes in terms of patients care and service delivery [11,12]. Currently, Acute Medicine is not a formally recognised

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specialty of Internal Medicine in South Africa. The MACU health care model is a new concept that we have adapted at Chris Hani Baragwanath Academic Hospital (CHBAH), a tertiary institution located in Soweto, South Africa (S.A.).

Since the MACU was established at the CHBAH, there have not been studies regarding disease and mortality patterns. It is essential to understand acute medical admissions causes to develop or amend preventive and therapeutic protocols for specific diseases. This information is also essential for health care planners as it identifies areas of priority for ongoing service development.

Objectives

This study aims to describe the pattern of diseases and outcomes, including mortality, in acutely ill medical patients admitted to the MACU at the CHBAH.

Methods

Study setting

Chris Hani Baragwanath Academic Hospital is a tertiary referral hospital in Soweto, South Africa. It provides medical care to an indigent population of 3.6 million in all specialties. The Department of Internal Medicine has 500 beds. It is the hospital's busiest department with admits 36,000 admissions annually, with an average of 100 patients per day. Patients are referred from the EC, secondary hospitals, and clinics. Patients are assessed first by EC doctors and then referred to the medical registrar allocated to the MACU. The MACU is a 16-bed facility located close to the EC and radiology. It is a specifically equipped ward where haemodynamic monitoring and specific therapeutic services, excluding mechanical ventilation, can be provided. It is staffed by general medical registrars, nurses, and allied health professionals and supervised by a specialist physician. Patients with acute reversible illnesses with predicted favourable outcomes are accepted to the MACU. The general medicine specialist on duty for the day regularly reviews the patients and initiates the post-admission rounds at the MACU. The resuscitation and subsequent observations to monitor response to the therapy given are ensured. Any predicted adverse outcomes are documented and acted upon immediately. Once the acute illness is resolved, patients can be discharged home or transferred to the medical wards. Patients requiring mechanical ventilation or invasive haemodynamic monitoring are referred to the Intensive Care Unit or coronary care unit depending on the acute illness.

Study population

We included a convenient sample of 200 patients 18 years and older, with any form of medical emergency admitted to the MACU between March 2015 to August 2015. This period is not limited to one season.

Study design

A retrospective review of the admission register of the MACU was performed. Demographic data, including gender and age, initial diagnosis, and outcomes, were recorded. In addition to the MACU register, patients' hospital files containing clinical details, duration of stay, and mortality were reviewed.

The initial diagnosis was assigned to systemic subgroups according to the organ system affected: cardiovascular, respiratory, renal, neurology, endocrine, non-accidental poisoning, and others. The initial diagnosis was further subdivided into specific diagnostic categories to assess the pattern of diseases.

The outcome was defined as the patient's discharge endpoint, i.e., directly home, transfer to the medical wards, ICU/ High Care, or death. The leading causes of mortality were documented.

Statistical analysis

The statistical package, STATA®, version 12, was used for the data analysis. For descriptive data, means with standard deviations and medians with inter-quartile ranges were used. Demographic characteristics were expressed as frequencies and percentages. Analytical data were expressed using the Chi-square test. Variables having a two-tailed $p < 0.05$ were considered significant.

Ethics permission

The study was approved by the Human Research Ethics Committee of the University of the Witwatersrand (certificate no: M159953).

Results

In the study cohort, there was a predominance of females, and the mean age of the patients was 46 (17.2) years. Patients in the 46–60 age group were the most frequently admitted, constituting a third of all admissions (Table 1).

The central organ systems affected in the study group included: cardiac (24.5%), endocrine (19.5%), and non-accidental self-poisoning (18.5%) (Table 2).

Non-accidental self-poisoning occurred more commonly in younger patients with a mean age of 28(1.21) years. Non-accidental self-poisoning and respiratory system disorders affected mainly females in the study population.

The most common diagnoses of the patients on admission to the MACU included diabetic ketoacidosis/hypermolar non-ketotic (17.5%), non-accidental self-poisoning with organophosphate and other agents (16%), hypertensive emergencies (9.5%), decompensated cardiac failure (8%), and ischemic heart disease (7%). Infectious diseases (14%) such as pneumonia, malaria, gastroenteritis, tuberculosis, and meningitis were noted. (Table 3).

The duration of stay of the study population at the MACU was short, with 22.5% of patients stayed for less than one day (Fig. 1).

The mean duration of stay at the MACU was 1.45(1.25) days, which differed in the different age groups. It was longer, 1.90 (1.44) days in the younger patients 18–30 years old. The shortest mean duration of stay, 1.00 (1.69), was noted in older patients >75 years old. However, this difference in duration of stay was not significant (p -value 0.07). The duration of stay did not differ significantly among males versus females. There was no significant relationship between duration of stay and the organ system affected or diagnosis.

The outcomes of admissions to the MACU were favourable in most patients (77.5%), showed recovery, and transfer to the general medical

Table 1
Demographics of patients admitted to the MACU at Chris Hani Baragwanath Academic Hospital, South Africa (n = 200).

| Characteristic | n (%) |
|---------------------|-----------|
| Gender | |
| Male | 82.0 (41) |
| Female | 118 (59) |
| Age groups in years | |
| 18–30 | 41 (20.5) |
| 31–45 | 52 (26.0) |
| 46–60 | 65 (32.5) |
| 61–75 | 34 (17.0) |
| >75 | 8.0 (4.0) |
| Ethnicity | |
| African | 182 (91) |
| Asian | 8.0 (4.0) |
| White | 6.0 (3.0) |
| Mixed ancestry | 4.0 (2.0) |

Table 2

Reasons for admission by organ system affected, mean age and gender distribution of the study population at MACU, Chris Hani Baragwanath Academic Hospital, South Africa (n = 200).

| Affected organ system | Mean age in years | Male | Female | n (%) |
|-------------------------------|-------------------|------|--------|------------|
| Cardiac | 50(1.21) | 22 | 27 | 49 (24.5%) |
| Endocrine | 48(1.11) | 23 | 16 | 39 (19.5%) |
| Non-accidental self-poisoning | 28(1.21) | 13 | 24 | 37(18.5%) |
| Others | 46(1.41) | 11 | 20 | 31(15.5%) |
| Respiratory | 43(1.31) | 7.0 | 15 | 22 (11.0%) |
| Neurology | 60(1.41) | 7.0 | 8.0 | 15 (7.5%) |
| Renal | 55(1.21) | 2.0 | 5.0 | 7.0 (3.5%) |

Table 3

Frequency of the Diagnoses of patients admitted to the MACU at Chris Hani Baragwanath Academic Hospital, South Africa (n = 200).

| Diagnosis | Frequency n (%) |
|---|-----------------|
| Diabetic ketoacidosis/Hyperosmolar non-ketotic | 35 (17.5) |
| Hypertensive emergency | 19 (9.5) |
| Non-accidental self-poisoning with organophosphates | 17 (8.5) |
| Decompensated cardiac failure | 16 (8.0) |
| Non-accidental self-poisoning with other toxic agents | 15 (7.5) |
| Myocardial infarction | 14 (7.0) |
| Cerebrovascular accident | 13 (6.5) |
| Pneumonia | 10 (5.0) |
| Exacerbation of asthma | 6.0 (3.0) |
| Exacerbation of Chronic obstructive pulmonary disease | 6.0 (3.0) |
| Gastroenteritis | 6.0 (3.0) |
| Malaria | 6.0 (3.0) |
| Non-accidental self-poisoning with paracetamol | 5.0 (2.5) |
| Septic shock | 5.0 (2.5) |
| Pulmonary embolism | 4.0 (2.0) |
| Disseminated Tuberculosis | 4.0 (2.0) |
| Acute renal failure | 4.0 (2.0) |
| Chronic renal failure | 3.0 (1.5) |
| Meningitis | 2.0 (1.0) |
| Epilepsy | 2.0 (1.0) |
| Hypoglycaemia | 2.0 (1.0) |
| Thyroid storm | 2.0 (1.0) |
| Alcohol intoxication | 1.0 (0.5) |
| Systemic lupus erythematosus | 1.0 (0.5) |
| Pyelonephritis | 1.0 (0.5) |
| Thrombotic thrombocytopenic purpura | 1.0 (0.5) |

wards. A few patients (12%) required invasive haemodynamic monitoring and were subsequently transferred to the ICU, and (1%) were discharged home. A proportion of 10% of the patients admitted to the MACU, demised.

Of 20 patients who demised in MACU, the leading causes of death were sepsis-related (25%), diabetic ketoacidosis/hyperosmolar non-ketotic (20%), non-accidental self-poisoning with organophosphates and other toxic agents (15%), cardiac failure (10%), and hypertension (5%) (Fig. 2).

Discussion

To the best of our knowledge, this was the first study describing the patterns of diseases in acute medical admissions to the MACU in S.A.

In this study, most patients were females (59%), in keeping with demographics seen in MACUs from the developed world. [13,14] The predominant age group of all the patients admitted at the MACU was 40–60 years (32.5%), also reported elsewhere [13,14]. Most of the patients in this sample were of African ethnicity (91%).

In the present study, 76% of admissions at the MACU were due to non-communicable diseases such as diabetic ketoacidosis/ hyperosmolar non-ketotic, hypertensive emergency, non-accidental self-poisoning, cardiac failure, ischemic heart disease, and cerebrovascular accident. The most commonly encountered disorders were within the scope of cardiology, endocrinology, non-accidental self-poisoning, and neurology, which is like data reported by other medical acute units in the developed world [7,13,14,15] (Table 4).

There is a shortage of data on the pattern of diseases at the MACUs in a developing country like S.A.; therefore, a local comparison was not possible. However, the findings of the current study could be explained by several reasons: there is a rising prevalence of the non-communicable diseases of urbanisation that were previously unknown in rural S.A. [16], such as diabetes [17] and cardiovascular diseases. [18] Chris Hani Baragwanath Academic Hospital serves Soweto’s population, where risk factors for these diseases [19], such as obesity and smoking [20,21,22], are highly prevalent predisposing the individuals towards non-communicable diseases. Communicable diseases like HIV/AIDS and tuberculosis were the causes of epidemics in S.A. [23]. However, the reduced frequency of these disorders observed in this study might reflect effective case management with specific therapies. Widespread use of highly active antiretroviral therapy (HAART) in S.A. since 2005/6 resulted in increased survival of patients with HIV/AIDS with an accompanying rise in non-communicable disease co-morbidities in this subgroup [24]. Interestingly, metabolic syndrome, altered glucose metabolism, dyslipidaemia, and lipodystrophy are seen frequently in

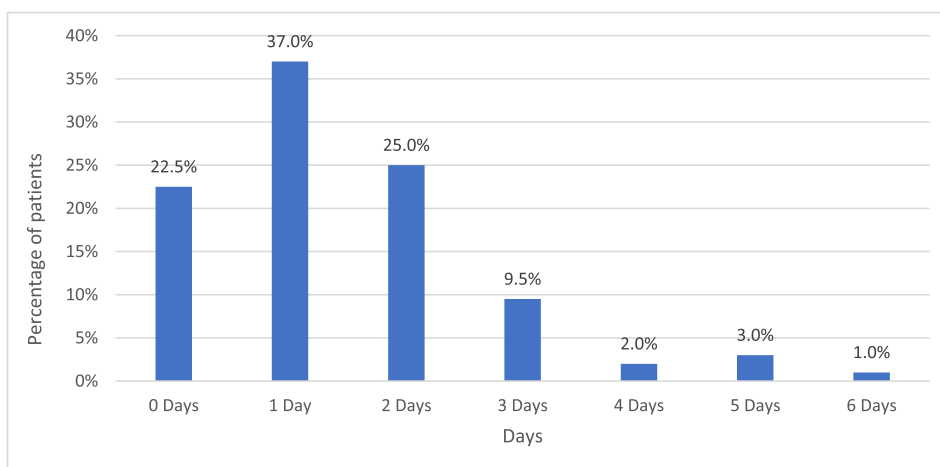


Fig. 1. Duration of stay of patients at MACU, Chris Hani Baragwanath Academic Hospital, South Africa (n = 200). PE = Pulmonary Embolus, HONK = Hyperosmolar non-ketotic.

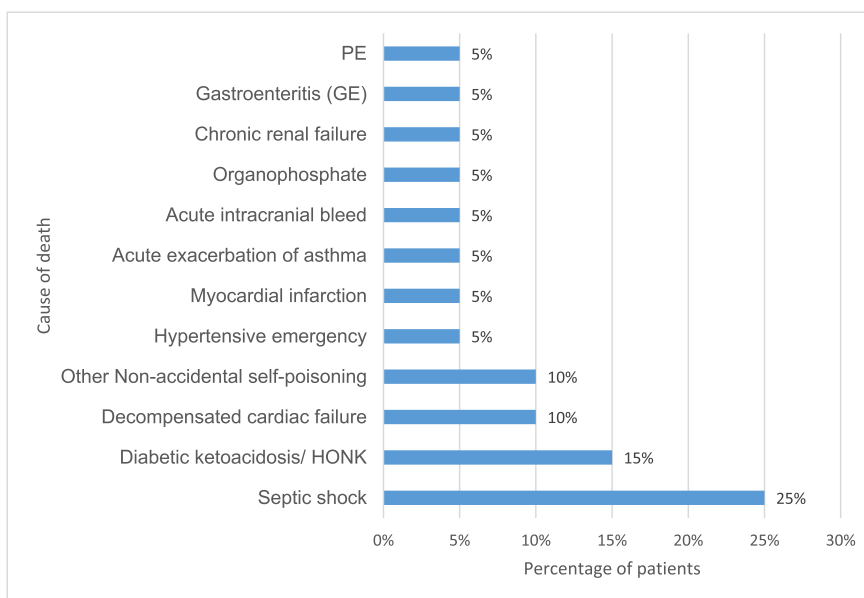


Fig. 2. Causes of death of study patients who demised in MACU presented as percentages (n=20).

Table 4

Patterns of diseases at the MACU, Chris Hani Baragwanath Academic Hospital, South Africa, and other international units.

| South Africa Present study | United Kingdom [7] | United Kingdom [13] | United Kingdom [14] | Ireland [15] |
|----------------------------|--------------------------------|-------------------------|---------------------------|-----------------------------|
| DKA/HONK | Nonspecific chest pain | Cellulitis | Chest pain | Heart failure |
| Self-poisoning | Pneumonia | Psychiatric | Falls | Atrial fibrillation |
| Hypertensive emergency | Urinary tract infection | Endocrine | Pneumonia | Diabetes |
| Cardiac failure | COPD | CVA | COPD | Hyponatremia |
| Ischemic heart disease | Acute bronchitis | Alcohol excess | Gastrointestinal bleeding | COPD |
| CVA | Cardiac dysrhythmias | Self-poisoning | Diarrhoea and vomiting | Anaemia |
| Pneumonia | Coronary artery disease | Collapse | Urinary tract infection | Altered mental status |
| Exacerbation of asthma | Skin and soft tissue infection | Headache/Migraine | CVA | Pneumonia |
| Exacerbation of COPD | Epilepsy | Urinary tract infection | Self-poisoning | Neoplasia |
| Malaria | Cerebrovascular disease | Gastritis | CVA | Acute myocardial infarction |

CHBAH=Chris Hani Baragwanath Academic Hospital CVA = Cerebrovascular accident, COPD = Chronic obstructive airway disease, DKA = Diabetic ketoacidosis, HONK=Hyperosmolar non-ketotic, MACU = Medical Acute Care Unit.

patients with HIV/AIDS [26,26]. The use of some antiretroviral drugs in these patients, such as zidovudine, didanosine, and protease inhibitors, can predispose them to an increased risk of diabetes [27]. However, data from the present study did not include information on the HIV status of patients. Also, patients with advanced HIV/AIDS or disseminated tuberculosis with poor prognosis may not meet the criteria for admission in the MACU and are admitted directly to the medical wards at CHBAH. For the same reasons, infectious diseases such as pneumonia, gastroenteritis, malaria, and meningitis were found in small numbers (12%), possibly because they also admitted directly to the internal medicine wards.

Non-accidental self-poisoning was noted as a frequent reason for admission and mortality in the present study, especially in young African females, as previously reported in S^A [28]. Most of these cases were individuals who attempted suicide [29]. The types of toxic agents used include organophosphates, paracetamol, cocaine, and other substances [30]. This could be explained based on the high prevalence of psychosocial stresses, such as untreated mental illness [31], substance abuse [32], family circumstances, and poverty [33].

During the study period, outcomes of admissions to the MACU were favourable in most cases. Most patients improved and were discharged to the medical wards (77.5%). The improved quality of care in the MACU healthcare model may partly explain this result.

The duration of stay at the MACU was short, 1.45 (1.2) days.

Similarly, a small duration of stay was reported elsewhere [13,14]. It is possible that most uncomplicated non-communicable diseases and acute communicable diseases may be treated within a shorter time period. The short duration of stay might have a positive benefit on local government health finances.

The mortality rate was lower in the MACU than the general medical wards at 10% and 13%, respectively. The differences in mortality reflect more intensive care in MACU and a different spectrum of illnesses in MACU as compared to the general medical wards. The most frequently reported causes of death (sepsis, DKA, self-poisoning, cardiac failure, and hypertension) may also be attributed to the high prevalence of these disorders and the increased percentage of older individuals in the present research. The high mortality associated with diabetes also raises concerns about whether suboptimal care is offered to diabetics at a community health clinic level [34,35] or whether these patients may delay in presenting to healthcare facilities.

Sepsis remains a problem in the South African context [36]. High mortality due to sepsis in this study may indicate loopholes in the management and failure to institute the time-sensitive resuscitation process, which is vital to the control of sepsis.

Our results on mortality patterns were like reported elsewhere in the developed world [15]. However, due to the lack of data from MACUs in South Africa, our results do not have local comparisons.

The current study has several limitations. One of them is poor record-

keeping, as is described in retrospective record reviews. We tried to overcome this through a precise search and retrieval of the data available. We excluded patients with incomplete data. There is a possibility of diagnostic errors due to a lack of diagnostic standards available for the study. Unfortunately, the percentage of patients that were discharged home after being discharged from MACU is not known. A further weakness is that only patients admitted to the MACU were included in the study, and the data does not consider acute medical patients that required direct admission to the general ward or ICU. Nonetheless, the data represents disease patterns, not the actual number of patients with acute conditions.

Furthermore, this study was conducted over a short duration. The conduction of similar studies over a more extended period would offer more robust evidence for these findings. Considering the study's limitations, the community's actual disease pattern may not be accurately reflected. However, this study provides a valuable foundation for further studies on acute admission patterns at Chris Hani Baragwanath Academic Hospital despite these limitations.

Conclusion

Non-communicable diseases, particularly diabetic emergencies, were the leading causes of admission to the MACU at CHBAH. During the study period, outcomes of admissions to the MACU were favourable in most cases. High rates of case improvement, patient discharge, shorter hospital stay, and less mortality were observed. The leading causes of mortality were sepsis-related, diabetes, and non-accidental self-poisoning.

Dissemination of results

The results of this study were presented at the academic meeting at the Chris Hani Baragwanath Academic Hospital.

Author's contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: UK contributed 40%; CM 30%; and NG 30%. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of competing interest

The authors declared no conflicts of interest.

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