MORTALITY PATTERNS IN A MEDICAL INTENSIVE CARE UNIT

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ABSTRACT

We studied the mortality rate and patterns in a 6-bedded Medical Intensive Care Unit in a busy general hospital. We found a high mortality rate (26% in-ICU and 42% in-hospitalization) and that mortality was strongly associated with the following factors: cardiac arrest, respirator support, duration of stay in ICU, infection and the immunocompromised state. Lack of formal patient selection and entry criteria and Critical-Care Specialists may be contributing factors.

Keywords: Intensive Care Unit (ICU), Medical Intensive Care Unit (MICU), Mortality Rate, Mortality Patterns, Critical Care Specialists.

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INTRODUCTION

Tan Tock Seng Hospital is a 1400-bedded general hospital located in the North-East of the island of Singapore. The hospital has 3 Departments of Medicine with particular interests in Rheumatology and Pulmonology. Other departments are those of Geriatric Medicine, Cardiology, Neurology, Rehabilitation Medicine, General Surgery, Orthopaedics, Neurosurgery and Radiology. There are 4 intensive care units in the hospital, namely the Neurosurgical ICU, Surgical ICU, Coronary Care Unit and the Medical ICU. The Medical Intensive Care Unit (MICU) has 6 beds and serves the critically ill patients belonging to the various medical disciplines. Nursing staff is shared with the neighbouring Coronary Care Unit. Medical staff consisted of a Resident rotated from 3 Medical Departments. Therapeutic decisions are made by the attending staff from the patient's originating department who review the patient daily. After office-hours, care of the patient is delegated to an on-call Resident under the supervision of the Physician-on-call.

Admission to the MICU was subject to bed availability and were from 2 sources, the wards and the emergency room. There were no formal defined entry criteria. This study was performed to study the mortality rate and patterns in this MICU.

MATERIALS AND METHODS

All consecutive admissions to MICU during the period between July 1989 to October 1989 were included in the study. Information gathered was based on daily analyses of patients' case-notes. The chi-square test was used for test of statistical significance.

RESULTS

A total of 137 patients were enlisted into the study. The sex distribution worked out to 71 males and 66 females. Ages ranged between 13 to 91 years. Race distribution was 70% Chinese, 17% Malays, 12% Indians and 1% Others, reflecting the race distribution in the country. The primary diagnoses of the cohort are shown in Table I.

Table I - Primary Diagnoses of Patients

	Primary Diagnoses	Number of Patients	(%)
1	Respiratory	40	(29%)
2	Cardiovascular	32	(23%)
3	Infections	17	(12%)
4	Neurological	13	(10%)
5	Metabolic	9	(7%)
6	Renal	7	(5%)
7	Poisoning	6	(5%)
8	Gastrointestinal	3	(2%)
9	Others	10	(7%)
	- Electrical Injury	1	
	- Systemic Lupus Erythematosus	9	
	Total	137	100%

There was a total of 58 deaths in the cohort which gave an in-patient mortality rate of 42%. Of this, 36 deaths occurred in the MICU; hence the MICU mortality rate was 26%. An attempt was made to study various parameters and its correlation with mortality. See Tables II to VIII.

Table II - Relation between Cardiac Arrest (CA) and Mortality

	CA	No CA
Mortality	31	27
No Mortality	0	79

$p<0.001$

Table III - Relation between Respirator Support (RS) and Mortality

	RS	No RS
Mortality	39	19
No Mortality	17	62

$p<0.001$
(No patient on a respirator for more than 8 days survived)

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Table IV - Relation between Immunocompromised State (IC) and Mortality

	IC	No IC
Mortality	29	29
No Mortality	19	60

p<0.001
(IC-Malignancies, use of steroids, diabetes mellitus, SLE, renal failure, liver cirrhosis)

Table V - Relation between Infection (IF) and Mortality

	IF	No IF
Mortality	34	24
No Mortality	22	57

p<0.001
(Presence of infection was ascertained by attending physician's clinical diagnoses as recorded in case notes rather than defined clinical/ bacteriological criteria)

Table VI - Relation between duration of stay and mortality

Range	1 - 31 days
Mean	3.5 days

p<0.05
(No patient whose duration of stay in ICU exceed 14 days survived)

Table VII - Relation between age and mortality

	Geriatric	Non-geriatric
Mortality	30	28
No Mortality	29	50

p>0.05
(WHO definition of geriatric as age > 65)

Table VIII - Relation between source of admission and mortality

	ER	Non-ER
Mortality	22	36
No Mortality	47	32

p<0.05
(ER-Emergency Room)

DISCUSSION

The ICU is a very important place in the hospital because of the level of activity that goes on daily. Besides, health care in this department is extremely expensive because of the expensive equipment involving high technology and the high staff: patient ratio.

While coronary care units and post-operative intensive care units are more defined in terms of patient selection and treatment, the same cannot be said about the MICU. In this country, very little work has been previously published about the MICU. This study revealed an extremely high mortality in this ICU (26% ICU mortality and 42% in-hospital mortality). Other studies generally quote a mortality rate of up to 20% [1 3]. It is also well known that medical patients have a much higher mortality rate than those of surgical patients [2] because most studies in surgical ICUs include routine post-operative patients who are generally younger and fitter.

The commonest primary diagnosis in most other MICUs is cardiac in origin[1]. This MICU receives a high load of patients with respiratory disorders and Systemic Lupus Erythematosus (SLE), both conditions of which portend a bad prognosis. The reason for the first group is because many respiratory cripples have concomitant tuberculosis and treatment of this in this hospital is free. It is also significant that almost all patients with SLE and other connective tissue disorders in this country are followed up in one of the Medical units in this hospital.

A possible reason for the high mortality is the lack of Critical-Care Specialists being in charge of the ICU. Experience elsewhere[4] has shown that an ICU run by fulltime Critical Care physicians has much lower mortality than those where the attending physicians manage their own patients in the ICU.

In this ICU there are no formal patients selection criteria. Proper selection would help ensure that only those patients who would benefit from ICU care are admitted to the MICU. In general these would be those with an acute reversible element eg acute renal failure, diabetic ketoacidosis, acute pulmonary edema. Patients with irreversible end organ failure with no plans for transplant should generally not be candidates for admission to the ICU. Indiscriminate admission of such patients would not only skew the mortality rate but also lower staff morale.

This study also found that as in other ICUs, factors like cardiac arrest, respirator support, infection, immunocompromised state and duration of stay were strongly associated with higher mortality rate [5 8]. The following points are worthy of mention:

a Cardiac arrest and respirator support. These two variables, as expected, were found to be associated with higher mortality. One possible reason is that these two variables would select a more sick population. Also, it is common practice to put successfully resuscitated patients into ICU although the outlook may be poor.

b Infection and immunocompromised state. As in (a), these individuals tend to be more ill.

c Duration of stay. This was found to be positively correlated with a higher mortality. One possible reason is that the incidence of nosocomial infections would rise with prolonged ICU stay. Another reason is the onset of Multi-System Organ Failure (MSOF) and its attendant high mortality [9].

d Chronological Age. There was no association between age and higher mortality in our study. A possible reason is that of a relatively high load of young patients in our study had connective tissue disease (9 out of 137) compared with other ICUs.

e Source of admission. It may appear surprising that higher mortality was found in patients transferred from wards than those direct admissions from the ER. This might reflect the relatively ill in-patients in this hospital. Another reason could be the relative inexperience of ER doctors resulting in less deserving patients admitted to the MICU. Unfortunately, our study did not address the issue of criteria for admission amongst admitting doctors.

Resources in the ICU are scarce and expensive. It is hence prudent to use these resources in the most effective way to the benefit of the critically ill patient. Formal training in critical care medicine and proper patient selection criteria based on an

understanding of the natural history of various illness could help address this issue.

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