

# An Evaluation of the Intensive Care Unit Resources and Utilization in Trinidad

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## ABSTRACT

**Objectives:** To evaluate resources and utilization of Intensive Care Units in Trinidad and Tobago.

**Design and Methods:** This was a prospective observational study to evaluate Intensive Care Units (ICU) of three public and two private hospitals in Trinidad with respect to their infrastructure, process of care and patient outcome. Structure of ICUs was assessed by interviews and personal observations. A Cost Block Model was used to determine the expenditure for ICUs. The process of ICU was assessed by Therapeutic Intervention Scoring System (TISS-28). For outcome evaluation, two prognostic scoring systems namely Simplified Acute Physiology Score (SAPS II) and Paediatric Index of Mortality-2 (PIM-2) were used.

**Results:** The total number of ICU beds was 27. The overall bed occupancy was 66.2%. One hundred and eighteen patients consecutively admitted to ICU during a two-month period were enrolled for process and outcome evaluation. The overall median age of patients was 44 years [Interquartile range (IQR) 25, 59].

The mean cost per patient in the public hospitals was TT \$64 746 compared to \$77 000 in a private hospital. The average total daily TISS per patient was  $27.01 \pm 5.4$  (SD). The median length of stay was five days (IQR 2, 9). The overall predicted mortality was 32.9%, the observed mortality was 29.7% and thus the standardized mortality ratio (SMR) was 0.9.

**Conclusions:** The overall bed availability in ICUs with respect to Trinidad and Tobago's population and case-mix is low compared to developed countries, although the process of ICU care is comparable. Outcome of patients was good in terms of risk-adjusted mortality. The study highlights the need to further increase bed-strength and optimize the resource utilization of ICUs in Trinidad and Tobago.

# Una Evaluación de los Recursos y la Utilización de las Unidades de Cuidados Intensivos en Trinidad

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## RESUMEN

**Objetivos:** Evaluar los recursos y su utilización en las Unidades de Cuidados Intensivos en Trinidad y Tobago.

**Diseño y métodos:** Se trata de un estudio prospectivo observacional con el propósito de evaluar las Unidades de Cuidados Intensivos de tres hospitales públicos y dos privados en Trinidad, con respecto a su infraestructura, proceso de cuidado y respuesta clínica (resultado) del paciente. La estructura de las UCIs fue evaluada mediante entrevistas y observaciones personales. Un modelo de bloques del costo fue usado a fin de determinar los gastos en relación con las UCIs. El proceso de la UCI fue evaluado mediante el Sistema de Puntuación de Intervención Terapéutica (TISS-28). Para la evaluación del resultado clínico, se utilizaron dos sistemas de puntuación pronóstica, a saber, la puntuación simplificada de fisiología aguda (SAPS II) y el Índice Pediátrico de Mortalidad (PIM2).

**Resultados:** El número total de camas de UCI fue 27. La ocupación general de las camas fue de 66.2%. Los ciento dieciocho pacientes ingresados consecutivamente en la UCI durante un período de dos meses, fueron incorporados a la evaluación del proceso y los resultados. La edad mediana general de todos los pacientes fue de 44 años y el rango intercuartil (IQR) 25,59. El costo medio por paciente en

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*los hospitales públicos fue TT \$64 746 en comparación con \$ 77 000 en un hospital privado. Según el TISS, el total promedio diario por paciente fue  $27.01 \pm 5.4$  (SD). El tiempo mediano de estadía fue de 5 días (IQR 2, 9). La mortalidad general anticipada fue de 32.9%, la mortalidad observada fue de 29.7%, y por consiguiente la razón de mortalidad estandarizada (SMR) fue 0.9.*

**Conclusiones:** *La disponibilidad total de camas en las UCIs con respecto a la población y la casuística de Trinidad y Tobago, es baja en comparación con los países en desarrollo, aunque el proceso de cuidado de las UCIs es comparable. El resultado clínico de los pacientes fue bueno en términos de la mortalidad ajustada por el riesgo. El estudio pone de relieve la necesidad de aumentar aún más la disponibilidad de camas hospitalarias y optimizar la utilización de los recursos de las UCIs en Trinidad y Tobago.*

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## INTRODUCTION

Intensive care is a service for patients with potentially recoverable conditions who can benefit from detailed observation and invasive treatment more than that which can be provided safely in general wards or high-dependency areas (1, 2). Additionally, Intensive Care Units (ICUs) consume a larger part of the budgetary allocations of a hospital (3). In recent years, there has been an increase in the need for ICUs with more aggressive therapeutic procedures and/or for the increased use of invasive treatment for advanced diseases (4). Because of the high-technology care offered in ICUs and the higher cost involved with this, proper utilization of the ICU resources should be of very high priority (5).

Proper utilization of ICU resources is influenced by many factors. One important factor is the admission criteria employed by the ICUs (6). Early diagnosis of the condition and referral to ICU is important and if referral is delayed either from the general wards or the community, this lead time may jeopardize the patient's management and outcome in the ICU (7).

In general, most ICUs admit only patients who are expected to make a reasonable recovery. However, in the Caribbean, due to unclear statutory regulations, patients are admitted to ICUs and continue to receive treatment (8) even when recovery is not expected. At the other end of the spectrum, patients who strictly do not require ICU care, but only intermediate care in a High Dependency Unit are also admitted into ICUs (9).

Another factor that influences ICU utilization is the length of stay of patients (10). This is profoundly influenced by the discharge criteria and accordingly length of stay of patients in ICUs varies widely throughout the world (11). Elective postoperative surgical patients and patients requiring minimal respiratory and cardiovascular support may require short ICU stay (12). However, patients having multiple organ dysfunctions may require ICU care for several weeks to months (13).

Presently, there is little or no documentation of the status of ICUs in Trinidad and Tobago's hospitals. Hence, the authors sought to prospectively determine the availability of ICU resources and its utilization.

Among the existing seventeen hospitals in Trinidad and Tobago, six have established ICU facilities. These are located in three public institutions (Eric Williams Medical

Sciences Complex, Port of Spain General Hospital and San Fernando General Hospital) and three private hospitals (St Clair Medical Centre, Community Hospital of Seventh Day Adventists and West Shore Hospital). Tobago does not have an ICU and still depends on airlifting sick patients to ICUs in Trinidad. During the present study, one of the ICUs in a private hospital was not fully developed and hence five ICUs were evaluated, with the hope that the findings would pave way for the improvement of the quality of critical care delivery in Trinidad and Tobago.

## METHODS

This is a prospective observational study that evaluated the current status of the infrastructure, resource utilization, case-mix of patients and process of care in all the available ICUs in Trinidad and Tobago.

Performance of healthcare is ideally evaluated by the three definable parameters namely "structure", "process" and "outcome" as suggested by Donabedian (14). Structure may be defined as "what the healthcare system has to offer", process as "how the system offers it" and outcome as "what the system achieves with respect to the patient illness" (15). This methodology has been recently extended to the performance evaluation of intensive care units (16). The study adopted this approach for the evaluation of ICUs in Trinidad. The evaluation included the ICUs of the Eric Williams Medical Sciences Complex (EWMSC), Port of Spain General Hospital (POSGH), San Fernando General Hospital (SFGH), St Clair Medical Centre (SCMC) and the Seventh Day Adventist Community Hospital (SDAH). The study included all patients admitted to the ICUs of these hospitals during the period May to July 2005. Neonatal Intensive Care Units (NICU) were excluded from the study.

The Ethics Committee of the University of the West Indies, St Augustine, approved the study and waived individual informed consent from individual patients, due to the observational nature of the study. Subsequently approvals were obtained from the authorities of all the five hospitals.

### Structure of ICUs

In order to quantify the structure of ICUs and to qualify their standards, a data sheet was devised with input from recommendations of the American College of Critical Care Medicine, Society of Critical Care Medicine and Joint Commis-

sion on Accreditation of Healthcare Organizations, in consultation with ICU clinicians including three authors (17–20).

Data concerning the infrastructure of ICU from each of the identified facilities were collected on a scheduled visit. Using personally administered interviews, observations and available records, the bed capacity and occupancy, overall staffing pattern including nurse-patient ratio, availability of technology and equipment at the respective ICUs were identified. Other qualitative data such as maintenance of equipment, maintenance of records, supply-chain management of drugs and equipment, admission-discharge protocols, antibiotic protocols, infection control practices, communication between patients/surrogates and the ICU staff were also recorded.

Data were also collected by interviewing the managers and the staff attached to the related departments. Bed capacity was defined as the number of available beds in the ICU (21). Bed occupancy was defined as the number of beds occupied by a patient in a given timeframe (22). The overall staffing pattern was evaluated by recording the availability of number of nurses, the number of doctors/intensivists, physiotherapists and other supportive staff. The number of available “beds” was noted and a “bed” was defined as one which comprised the physical bed, a mechanical ventilator, complete monitoring facility, a console and nursing care.

The cost of ICU treatment was determined utilizing a “cost block” model developed in the United Kingdom (UK) (23). The costs were broken down into six blocks: capital expenditure, estate, non-clinical support services, clinical support services, consumables and staff. The definitions of each block were followed, and data were obtained from the Human Resources, administration, finance, pharmacy, stores and biomedical engineering departments of all the hospitals. The cumulative costs of all the blocks were used to derive the annual costs of each ICU, from which the average daily costs were calculated. The median length of stay multiplied by the mean daily cost was used to calculate the total cost per ICU patient.

### **Process of ICUs**

The process of ICUs was assessed by assigning a score for the therapeutic interventions carried out in patients using the Therapeutic Intervention Scoring System 28 (TISS- 28) (24). This is one of the widely applied scoring systems which exclusively rely on therapeutic, diagnostic and nursing activities (25). Besides evaluation of the therapeutic interventions, TISS also assists in quantification of nursing workload, ICU cost evaluation and has been proposed as a valuable tool for analyzing the utilization of ICU facilities (26). TISS-28, a simplified version of TISS was published in 1996 and is being used as a tool for assessing ICU process and also prognosis after discharge (27).

Therapeutic Intervention Scoring System-28 was scored on a daily basis from the day of admission to the day of discharge or death of every patient. Data were collected

from ICU patient charts and files. The TISS handled by a nurse was calculated by dividing the product of the mean daily TISS and the number of patients by the number of nurses in a given ICU. The cost per TISS point was calculated by dividing the total annual cost of the three public ICUs by the product of average TISS, number of days in the year and number of ICU beds.

### **Outcome of ICU patients**

The evaluation of outcome was done by applying two “severity of illness” scoring systems namely the Simplified Acute Physiology Scoring System II (SAPS II) for adults and the Paediatric Index of Mortality 2 (PIM-2) for children (28).

The SAPS II was originally developed from a large database involving patients from medical, surgical, and mixed ICUs in 10 European and 2 North American countries (29). Specifically, it determines the probability of survival, taking into account 14 physiological variables in addition to accounting for factors such as age, type of admission and three diseased states: Acquired Immune Deficiency Syndrome (AIDS), metastatic malignancies or haematological malignancies and has been validated by many studies. The PIM-2 was an improvement of the earlier PIM scoring system by examining eight physiological variables with a better prognostic ability (30).

Both SAPS II and PIM2 were recorded according to the recommendations, as the worst physiological scores during the first 24-hour period following ICU admission.

Epidemiologic and baseline data included patient age, gender, ethnicity, admitting diagnosis and the length of stay in ICU. The predicted mortality of each patient was calculated from the logistic regression equations published with the scoring systems. Observed mortality in each ICU was recorded. The ratio of observed to predicted mortality, the standardized mortality ratio (SMR) was calculated as the risk-adjusted mortality.

All data were analysed using the Statistical Package for Social Sciences, Version 12 (SPSS® -12.0 for Windows®) software. Selected data variables were analysed for normal distribution after which appropriate statistical tests were employed.

Descriptive analyses were conducted on the variables such as predicted mortality, prognostic scores, observed mortality rates, therapeutic intervention scores, length of stay, diagnostic categories as well as standard demographics of age, ethnicity and gender.

The independent Student’s t-test was used to compare the mean SAPS II, predicted death rate, average daily TISS and length of stay between survivors and non-survivors.

A one way ANOVA test was used to compare the mean predicted death rate, last day TISS, day-1 TISS, average daily TISS and length of stay among the five ICUs studied. A Tukey test was used to further discern significant variations between groups of ICUs (public *versus* private) and within groups (comparisons within the public ICUs).

For all analytical statistical tests, the level of significance was considered at a  $p$  value of less than or equal to 0.05 and Confidence Intervals at 95%.

A Receiver Operating Characteristic (ROC) curve was constructed and the area under the curve (AUC) and the 95% confidence intervals were obtained to measure the discriminating ability of the two prognostic scoring systems applied in the study (SAPS-II and PIM-2).

## RESULTS

Five hospitals were evaluated in the study period, of which, three were public and two were private. During the study period, a total of 118 patients were admitted to the ICUs. Two patients who stayed in the ICU for a prolonged period of time (> 6 months) predominantly for mechanical ventilatory support were not included in the data collection for severity of illness scores and TISS.

Demographic data showed that overall, there were more male patients admitted to the ICUs (55.9%) than female patients (44.1%). The ethnic distribution consisted of patients predominantly African descent (35.6%) and East Indian descent (33.1%). The overall median age of the patients in the ICU was 42.4 [Interquartile range (IQR) 25, 59] years; 7.6% of the patients were < 16 years of age and 15.3% were > 65 years. The overall median length of stay was 5 days (IQR: 2, 9); 16.9% of patients stayed for one day in the ICUs.

The overall case mix was grouped into one of the following categories in accordance with their diagnoses, namely: central nervous system, cardiovascular system, respiratory system, renal failure, trauma, gastrointestinal system, poisoning and others which included miscellaneous diagnoses. The distribution of these patients and their severity of illnesses are depicted in Fig. 1.

The ICU at the Public Hospital-1 admitted only adult patients with the common case mix being trauma, central nervous system and respiratory illnesses. The ICU at Public

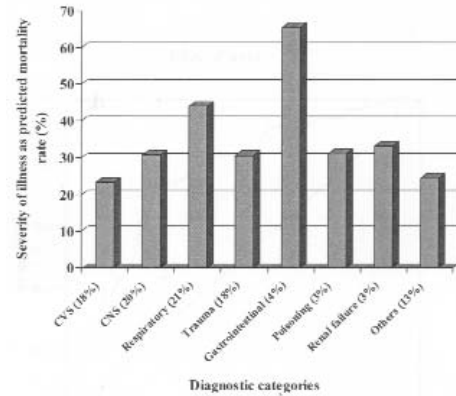


Fig 1: Case-mix of patients admitted to ICUs and their severity of illness.

Hospital-2 was a multidisciplinary ICU predominantly admitting children; the common diagnoses were respiratory illnesses. The ICU at Public Hospital-3 admitted only adult patients, the major diagnoses being central nervous system and respiratory illnesses. The ICU at Private Hospital-1 admitted mostly adult neurological patients and the ICU at Private Hospital-2 admitted mostly cardiovascular and post-operative adult open-heart surgery patients.

## Infrastructure

All the ICUs were open units and the total number of physical ICU beds in the five hospitals was 29. However, since we had previously defined a “bed” as one with all available facilities rather than physical bed alone, in fact only 27 of the beds were taken into account as “ICU beds”. The overall average number of beds per ICU was 6. Other data concerning the infrastructure of the ICUs are shown in Table 1. Interviews and personal observations in all the public hospitals revealed the following:

- C All ICUs had a registrar and/or a senior house officer around the clock under the supervision of a senior consultant intensivist;

Table1: Infrastructure, case mix and overall costs in different ICUs

Institution	Number of Physical Beds	Number of ICU beds*	Bed Occupancy per month (%)§	Case Mix as Mean Predicted Death Rate (%) ¶	Cost per Patient (TT \$)
Public Hospital-1	10	5	80.0	31.9	48850
Public Hospital-2	10	9	66.7	39.7	24388
Public Hospital-3	3	3	95.1	28.4	24917
Private Hospital-1	4	4	68.3	22.6	NA
Private Hospital-2	6	6	21.1	14.9	77000

\* ICU Bed is defined as a furnished physical bed with a monitor, a ventilator and nursing care.

§ Bed Occupancy =  $\frac{\text{Number of occupied beds}}{\text{Number of available staffed beds}} \times 100$

¶ ANOVA:  $F= 3.3$ ,  $df = 4$ ,  $p = 0.014$  (Significant)

NA = not available

1 US \$ = 6.3 TT \$

- \* Nurse to patient ratio was mostly 1:1; however at times it was 1:2 in a public hospital. On many occasions, the nurse-in-charge who is expected to do managerial work had to provide bedside nursing care;
- \* All ICUs had state-of-art monitoring facilities and mechanical ventilators;
- \* However, the maintenance of equipment was inadequate and repair of faulty equipment was not quickly done; ICUs did not have standby equipment and admission policies to cope with this breakdown period;
- \* None of the ICUs had admission/discharge protocols and antibiotic protocols;
- \* Overall, the maintenance of patient records was poor; sometimes records were lost during transport of patients;
- \* The nursing charts were better filled in the public ICUs when compared to private ICUs;
- \* Infection control practices were good among the ICU staff; however it was not strictly practiced by the visitors;
- \* There was effective communication between the hospital staff and the patient relatives;
- \* Supply-chain management of drugs and equipment was not optimal in public ICUs

By the cost block model, the total annual expenditure of the ICUs of Public Hospitals 1, 2 and 3 were TT \$12 014 907, \$11 833 962 and \$3 307 173 respectively (1 US\$ = 6.3 TT\$). The average cost per patient per day in the public hospitals was TT\$ 4402. The cost per patient in the different ICUs is shown in Table 1.

**Process and Outcome**

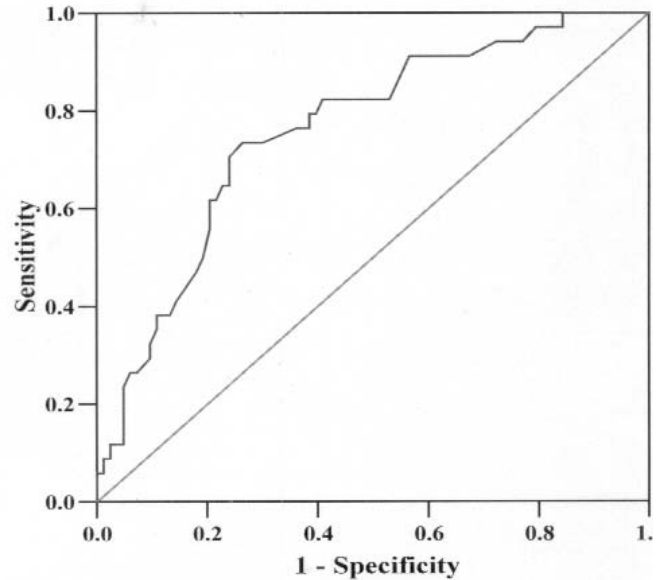
The mean daily TISS per patient was  $27.0 \pm 5.4$  (Standard Deviation, SD); the mean day-1 TISS score per patient was  $27.8 \pm 6.7$  (SD) and the mean last day TISS score per patient was  $24.1 \pm 6.9$  (SD). The average TISS handled by a nurse was 26.2 per day and the cost per TISS point was TT\$ 162.

Of the 118 patients admitted to the ICU during the study period, 66.9% were discharged and 29.7% died. The overall mean SAPS II score was  $40.5 \pm 17.9$  (SD) for adult patients. The overall mean predicted death rate was  $32.9\% \pm 29.2$  (SD). Thus, the overall standard mortality ratio (SMR) was 0.9.

The Receiver Operating Characteristic (ROC) curve is shown in Fig. 2. The area under the curve was 0.76 and 95% confidence intervals (CI) 0.67, 0.85.

The independent student's t-test comparing the mean SAPS II, predicted death rate, day-1 TISS, last day TISS, average daily TISS and length of stay between survivors and non-survivors showed statistical significance. This is shown in Table 2.

The one way ANOVA test to compare the last day TISS, day-1 TISS, daily TISS and length of stay among the five ICUs showed statistical significance ( $F = 3.8, 2.5, 5.0, 4.1, df: 4, p < 0.05$ ).



Area under the curve: 0.76 [95% CI 0.67, 0.85]

Fig 2: Receiver operating characteristic (ROC) curve for prognostic scoring systems (SAPS II and PIM2).

Table 2: Comparison between survivors and non-survivors

Variable	Survivors (n = 79)	Non-survivors (n = 35)	Significance* (p value)
Age (Mean ± SD)	41.5 ± 19.5	45.1 ± 25.1	0.403
<b>Gender (n)</b>			
Men	47	18	
Women	32	17	
<b>SAPS II score (Mean ± SD)</b>	36.4 ± 16.7	51.6 ± 16.6	< 0.001
<b>Length of stay (days) (Mean ± SD)</b>	6.4 ± 6.9	8.0 ± 7.4	0.267
<b>Predicted mortality rate (%) (Mean ± SD)</b>	24.9 ± 26.0	52.1 ± 28.0	< 0.001
<b>Day-1 TISS (Mean ± SD)</b>	26.8 ± 6.9	29.8 ± 6.26	0.073
<b>Daily TISS (Mean ± SD)</b>	24.5 ± 4.9	29.3 ± 5.3	0.001

\* As calculated by Independent student's t test

Further analysis utilizing Tukey test revealed that there was no statistically significant differences among the ICUs of public institutions for the variables namely: predicted mortality, day one TISS, last day TISS, average daily TISS and length of stay ( $p$  values 0.5, 0.4, 1.0, 0.1 and 0.9). There were however statistically significant differences between one of the private institutions (Private-2) and public institutions for the variables namely: predicted mortality, last day TISS, average daily TISS and length of stay ( $p$  values 0.01, 0.02, 0.01 and 0.02).

## DISCUSSION

The present study found that with regards to the infrastructure, the ICUs in Trinidad and Tobago were deficient with respect to bed availability. Overall, the process of care was good although there were some gray areas of sub-optimal and supra-optimal utilization of resources. With regards to outcome of patients, although the severity of illness of the case-mix of patients admitted to ICUs was high, the overall observed mortality of patients was well within the predicted mortality.

With a current population of 1.3 million, Trinidad and Tobago has approximately two ICU beds per 100 000 people. The United States of America (USA) and the UK, have 30.5 and 8.6 beds per 100 000 respectively (31).

The nurse to patient ratio ideally should be 1:1, although some ICUs in UK have more than one nurse per patient (32). In some of the ICUs, in the present study, the nurse to patient ratio sometimes decreased from the recommended 1:1 ratio. To overcome this and to create a more flexible staffing pattern, the guidelines set by the Task Force of the European Society of Intensive Care Medicine may be followed, which requires a triage of the ICU patients (33).

The overall mean cost per patient per day for the public hospitals (TT\$ 4402) was similar to that seen in Barbados which was TT\$4455 (34) and is considerably less than that in the USA, which ranges from TT\$189 000 to \$252 000 (35). Cost per TISS point has been used to standardize cost for the quantity of intensive care provided (36). In the present study, the cost per TISS point in the public hospitals was TT\$162 which is much lower than the cost per TISS point reported from the USA (TT\$1890) and the UK (TT\$340) (37). This may probably be due to the lesser cost of medication, equipment and staff salaries in Trinidad and Tobago.

The mean day-1 TISS points of the present study (27.9) is comparable to those reported from North America and Europe which range from 25 to 30 points, which may imply that the therapeutic interventions in the ICUs of Trinidad and Tobago are similar to those of these countries (38, 39). Also, the mean day-1 TISS in Trinidad and Tobago was higher when compared to the report from Barbados (34). However, this may be due to the difference in case mix because the Barbados study was done in a surgical ICU whereas the present study involved multidisciplinary ICUs. The number of TISS points handled by a nurse in the index study was within the recommended standards (40), and was comparable to those handled by nurses in Barbados.

The overall mean SAPS II score for adult patients admitted to the Trinidad ICUs was 40.5, which is higher than that reported from North America (32.1); similar to that reported from UK (42.1) and France (40.5) (32). The standardized mortality ratio (SMR) accounts for differences in case-mix and can therefore be used to compare performance of different ICUs (41). An SMR of less than 1 may indicate that the observed mortality is less than the predicted mortality (42). The overall SMR for the ICUs in Trinidad was

0.9, which was comparable to the SMR reported from ICUs in more developed countries such as the USA and UK (0.96), another Caribbean country Barbados (0.97), and lower when compared to other developing countries such as Brazil (1.67) and India (1.67) (32, 36, 43, 44). Although this may suggest that ICUs in Trinidad are performing well, the short duration of study may be a limiting factor.

The demand for intensive care (number of patients admitted to ICUs/ number in need of ICU care) was very difficult to determine because the information needed to calculate this ratio (the denominator) could not be obtained. This problem is not unique to the present study and other authors have acknowledged the difficulty of obtaining data regarding the demand for ICU care (31).

The area under the ROC curve indicates the performance of the prognostic scoring systems to discriminate between survivors and non-survivors (45, 46). The area under the ROC curve in the present study (0.76) may imply that the prognostic scoring systems did perform reasonably well in its predictions. A major pitfall of applying the scoring systems is that the systems were developed elsewhere in a different case-mix and has to be validated when applied for another region (47). Although SAPS II and PIM-2 were devised using different case-mixes, they have performed considerably well for the case-mix in Trinidad and Tobago as validated by the ROC curve. Another important feature of the prognostic scoring systems is that they are more useful to estimate the risk of mortality and/or morbidity for a group of patients having similar severity of illness rather than any individual patient (48). Hence, the authors reported the outcome for groups of patients.

The bed occupancy is an important factor in evaluating the infrastructure and resource utilization of ICUs (49). It is recommended that for an ICU, the average bed occupancy should range between 60% and 70% (32). ICUs which consistently have bed occupancy above 70% are considered to be too small and require more resources, while units which have a consistent occupancy below 60% are considered to be too large (32). The present study determined that while the overall bed occupancy (66.4%) was in the desirable range, one of the public hospitals had a very high bed occupancy rate of 95.1%. This ICU has to be considered too small and may require an increase in the number of beds. On the other hand, one of the private hospitals had a very low occupancy rate of 21.1%, and therefore, may be inefficiently utilizing its resources.

The comparison of public and private ICUs showed that one of the private hospitals was significantly different from the public hospitals with respect to mean predicted mortality, last day TISS and daily TISS. This is because of the striking variation in the case-mix of this particular hospital. In this ICU, the majority of patients were admitted with cardiovascular illnesses and 41% of the patients stayed only one day in the unit recovering from surgery. This again may indicate that this ICU admits patients with less severe illness.

Although this may be due to the admission's policy of the hospital, this in fact has to be interpreted as inappropriate utilization of an ICU. Because of the higher cost of this hospital (Table 1), it is also difficult to refer patients to this ICU.

Many developed countries have established organizations devoted to the management and advancement of critical care units (50). At present, no such body exists in the Caribbean. The authors suggest the introduction of a Caribbean Critical Care Society whose members would comprise personnel specialized in the area of critical care. Such a society would be able to create a database of information on critical care that could be used for future research. In addition, this society may be given the responsibility of formulating guidelines geared towards improving the overall structure and utilization of resources in critical care units.

In conclusion, the present study comprehensively evaluated the structure, process of care and outcome of patients in the ICUs of Trinidad and Tobago. Albeit many aspects of critical care are comparable to the developed countries, there is still room for improvement in specific areas such as bed capacity and resource utilization.

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