Therapeutic intervention scoring system in medical intensive care

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Summary

A scoring system based on therapeutic intervention on critically ill patients called the therapeutic intervention scoring system (TISS) was used to assess the quantity of care provided in a medical intensive care unit. Besides observing the unit census, the severity of illness and the work load were studied. The survival rate was 77 percent. The non-survivors had admission TISS points higher than the survivors and their mean daily TISS was more than 20 points. The survivors at discharge had a mean TISS of five points. The work load showed that a nurse can effectively manage two patients who together may accumulate 24 TISS points per day. TISS points per patient rather than bed occupancy is a better indicator of the nurse's work load. Admission criteria and procedures before death certification are outlined.

Key words: Intensive care, therapeutic index, death definition.

Introduction

Quantitative evaluation of therapeutic intervention in patients who need intensive care therapy is useful to assess the performance of an intensive care unit and its cost effectiveness. An evaluation method which is entirely devoid of default and universally acceptable is difficult to design but a method known as therapeutic intervention scoring system (TISS) was first introduced in 1974 to assess patient care in intensive care units in USA and has since been accepted widely.[1,2]

In this system (TISS) each therapeutic intervention is scored on scale of one to four (Table I). TISS for each patient is recorded at the same time each day by a physician or an experienced nurse irrespective of the time of admission to the intensive care unit. This system assumes that the same therapeutic intervention will be applied to a critical illness by any attending physician, a debatable assumption as many factors including patient, physician and facilities influence the type of therapeutic intervention.

Materials and method

A medical intensive care ward which caters for non-post-operative and non coronary-care patients was commissoned with eight beds, four nurses and a medical team of three doctors. Patients

Table I
Therapeutic intervention scoring system*

Score 4 for	1.	Resuscitation after cardiac arrest.
	2.	Ventilatory support (with respirator).
	3.	Peritoneal dialysis.
Score 3 for	1.	Pacemaker temporary
	2.	Tracheal intubation
	3.	>3 parenteral lines
Score 2 for	1.	Central venous pressure
	2.	Tracheostomy with spontaneous respiration
Score 1 for	1.	E.C.G. monitoring
	2.	I–O chart
	3.	Urinary catheters
	4.	Intermittent IV medications.

*(For complete listing see Ref. 1 and 2).

were admitted either from the accident/emergency unit or transferred from the medical wards if they needed intensive care. Where possible, especially during the eight to four (day) session a member of the team would assess the patient before admission to the unit. Data was collected on 100 patients treated over a period of 133 days. The patients were graded on a scale of one to four based on their mean daily TISS points. In the initial stage of this study the patients with TISS point of ten or less who were discharged to the general medical ward were observed by one of us till they were discharged from the hospital.

Aims to achieve

The aim of the study was to observe the unit census, the appropriate utilisation of the intensive care facilities, severity of illness, workload of the nurses such as nurse-patient ratio and TISS point-nurse ratio. In addition, criteria for admission and death definition were formulated.

Results

Unit census: During the observation period 100 patients were admitted to the Medical Intensive Care Unit (MICU). Of these 47 were from the Emergency Unit (direct admission). Fifty-three were transferred from the general wards because a) cardiac arrest, b) respiratory arrest or c) septicemia. Some, admitted overnight to the general wards, deteriorated relatively fast necessitating immediate intensive care, for example bronchial asthma developing into status asthmaticus.

Seventy-seven patients were discharged alive to the general ward for less-intensive care before leaving the hospital and 23 patients died in MICU (Table II).

Severity of illness: The mean TISS for all admission was 16.40 points with 13.39 for the patients who survived and 26.48 for the non-survivors. The mean TISS at discharge for the survivors

was 5.14 points (Table III). Of the non-survivors 17 had a mean daily TISS of 20 points or more (grade three or above). The mean duration of stay for a patient was 3.9 days.

Work load: The total TISS for the unit per day varied between 5.00 and 97.00 points with a mean of 42.91 for the 133 days. The mean number of beds occupied per day was approximately three. The work load of the nurses was measured both by nurse-bed ratio and TISS point-nurse ratio. One nurse was in charge of a maximum of two beds (approximate) and mean TISS per nurse was 10.73 points with a maximum of 24.25 (Table IV). An overlay plot of the total TISS points against the number of beds occupied per day showed that even with one bed occupancy the TISS points varied between five to 45 (Fig. 1).

Follow-up in the general medical wards: None of the patients who were observed in the above wards following transfer from the MICU required the intensive medical care available in the MICU.

Discussion

Critical care medicine has been defined as service for patients with potentially recoverable disease who can benefit from more detailed observation and treatment than is generally available in standard wards.[3] Strict application of this principle will not be acceptable to most intensive

Table II
Grade and outcome of 100 patients based on the severity of TISS

TISS Grades	Discharge	Dead	Total
Gr I (0–9)	38	0	38
Gr II (10–19)	31	6	37
Gr III (20–39)	8	15	23
Gr IV >40	0	2	2
	77	23	100

Table III
Severity of illness of patients according to their admission and discharge TISS and duration of stay in MICU

Label	Mean	Minimum	Maximum	N
All patients first-day TISS	16.40	2.00	46.00	100
Non-survivors first-day TISS	26.48	11.00	46.00	23
Survivors first-day TISS	13.39	2.00	43.00	77
Survivors discharge TISS	5.14	0.00	18.00	77
Duration of stay	3.99	1.00	34.00	100

Table IV
Work load of MICU measured by four parameters for 133 days

Label	Mean	Minimum	Maximum	N
Total TISS per day	42.91	5.00	97.00	133
No. of beds occupied	2.95	1.00	7.00	133
Nurse-bed ratio	0.74	0.25	1.75	133
TISS-nurse ratio	10.73	1.25	24.25	133

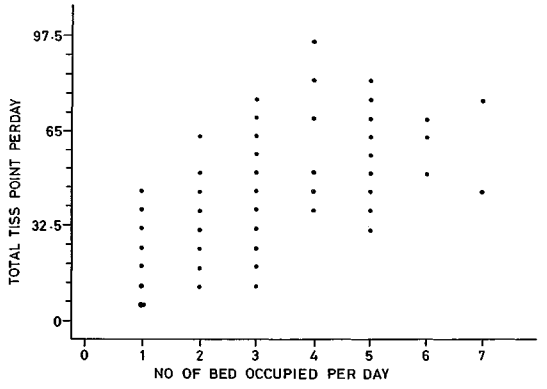

FIG-1 : OVERLAY PLOT OF TISS POINT WITH BED OCCUPANCY

care doctors as a potentially salvageable patient may be denied intensive care due to the absence of definite criteria for admission to the intensive care unit (ICU) and predictors of outcome of intensive care. The proportion of bed allocated to intensive care varies in different centres. In U.S.A. 15 to 20 percent of all medical patients are treated in an ICU whereas the recommended provision for intensive care services in U.K. is between one and two percent.[4,5] In the Universiti Hospital where this work was done there are 14 intensive medical care beds (including both coronary-care and MICU) for a total 168 beds in the medical unit.

The reported rate of survival in an intensive care unit was 89 percent but in those needing mechanical ventilation the rate was 67 percent.[6] The overall survival in our MICU was 77 percent and more than 50 percent of the non-survivors needed mechanical ventilation. When the patients were grouped according to their mean daily total TISS points, 17 of the 23 non-survivors had points of 20 or more (Grade III and IV). None of the patients who had mean daily TISS of more than 40 points survived (Table II).

The mean first day TISS of all patients admitted to Unit was 16.40 points and for the survivors it was 13.39. Whereas for the non-survivors it was 26.48. The mean discharge TISS for survivors was 5.14 points. Keene et al.,[2] suggested that patients with less than ten TISS points on the first day should not be admitted to the ICU. However we feel this may not be always applicable as facilities such as minimal cardiac monitoring and simple ventilatory support without the use of ventilators amongst others in a general ward would influence admission TISS point

to the ICU. In this study a third of the admitted patients had less then 10 TISS points. This might have been due to over enthusiasm of the unit staff to fill up the beds or undue demand by the doctors in the general wards. A study of TISS in a general ward of a hospital would probably reveal an ideal admission TISS point for the ICU. The mean duration of stay per patient in the unit was four days.

Admission criteria: Based on observation, we propose a selection criteria for patients who may accumulate a total first day TISS of ten or more points (Table V) and merit admission to medical non-coronary intensive care. Neuro-resuscitation includes patients who are comatose and other neurologically unstable patients who are waiting for neurosurgery. Immunocompromised septicemic patients need multiple venous lines, central venous pressure observation, and parentral nutritional support thus merit intensive care. Peritoneal dialysis can be carried out in a general ward but if additional support such as mechanical ventilation and arterial blood gas monitoring are needed we believe such patients need intensive care.

Table V
Criteria for admission (TISS >10)

1. Respiratory support with mechanical ventilation.
2. Cardiovascular resuscitation (not due to myocardial infarction) needing continuous monitoring, c–v line, continous infusion of cardio-active drugs.
   Acute arrhythmias.
3. Neuro-resuscitation (medical or before neurosurgery).
4. Septicemia (immunocompromised patients).
5. Gastrointestinal bleeding (needing multiple venous lines and dopamine support for BP).
6. Peritoneal dialysis with respiratory support.
7. Acute liver failure.
8. Diabetic coma.
9. Poisoning.

Effective utilisation of intensive care facilities can be assessed by the work load of the unit as a whole and of the nurses. The work load for the unit as a whole was measured by the total TISS points and the number of the beds occupied per day. Since survival rate in the MICU is comparable with those reported from elsewhere, both measurements mentioned above show acceptable figures for effective intensive care. Even with the maximum utilisation of beds in the unit, a nurse has only two patients to care for but this may not depict actual work load of the nurses as the therapeutic intervention for per bed occupancy varies considerably.

Ideally a patient should be transferred out when the degree of therapeutic intervention and monitoring reaches a level which can be managed in a general ward. However other factors such as bed availability both in the ICU and in the general wards and appeal by a concerned person to prolong the intensive care will influence the dishcarge from the ICU. The mean discharge

TISS for the survivors was 5.14 points. Based on the observation of the patients discharged to the general wards, we believe that a patient who averages ten or less TISS points per day should be transferred out from the ICU. Such a patient on transfer should not have intensive or invasive cardiac monitoring, or mechanical ventilation or intravenous infusion pumps for drug delivery.

Death definition: The objective of ICU is not simply to keep the patient alive in the hospital. Prognosis and quality of life after discharge must be weighed when making decisions about acute care. With the availability of technically advanced method of life support cessation of cerebral function, respiration and heart beat does not coincide. This necessitates formulation of guiding principles to shut off the external life support devices. After a patient lapses into coma a CT scan and or LP is done to exclude a surgically treatable intracranial condition or to exclude an infection which might have been missed earlier. Next, after all the neuro-modifying drugs has been withdrawn a clinical neurological assessment followed by an EEC is carried out to identify brain death. Following this the next-of-kin is informed about state of the patient and the supporting IV lines are withdrawn but not the mechanical ventilation if this life support has been introduced earlier. The patient is monitored with bed-side ECG scope and BP monitor. Occasionally, the patient is taken back home at this stage by the next of kin following signature of AOR form. If the patient survives for another 24 hours or more he is then transferred out of the unit to a general ward. However an effort is made to wean off from the ventilator. When ECG scope shows no electrical activity, mechanical ventilation is stopped and the patient is declared dead (Table VI).

Table VI
Procedures for certification of death

1.	CT scan/LP
2.	Clinical neurological assessment and EEG
3.	Supporting IV lines stopped
4.	ECG and BP monitoring
5.	Mechanical ventilation stopped when ECG shows no electrical activity.

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